CHAPTER 1

INTRODUCTION

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CHAPTER 1

INTRODUCTION

The Wasatch Plateau area of Carbon County, Utah, contains seams of high quality bituminous coal with a long history of coal mining activities. The Horizon No. 1 Mine is located in Consumers Canyon approximately 14 miles northwest of Price, Utah.

The surface facilities, diversions, culverts, and the sedimentation pond will be installed in compliance with Utah Division of Oil, Gas and Mining (UDOGM) regulations.

The permit area (Plate 1-1) is characterized by steep, narrow canyons containing conspicuous sandstone cliffs. Intermittent and perennial streams occupy the drainages. The complex geological and geomorphological conditions have produced a variety of site specific soils that support a variety of vegetation communities. The area supports a variety of wildlife.

A distinction of an underground mine is its minimal effect on the ecosystems. The relatively small scale of surface disturbance when operated with proper drainage and sedimentation controls, causes negligible impact to the prevailing hydrologic balance of the area. Subsidence, a potential problem with any underground mining, will be monitored as mining progresses. The temporary loss of wildlife habitat due to the construction of surface facilities is negligible in light of the available nearby habitat. Upon cessation of mining and portal sealing, the reestablishment of final topography and drainage will proceed. Revegetation of disturbed areas will replace native habitat and restore the land to accommodate proposed post-mining land use(s).

~~Horizon Coal Corporation~~Lodestar Energy Inc. has assigned ownership of this permit application to ~~Lodestar Energy~~Hidden Splendor Resources, Inc.. All references in the text, tables, figures, plates, public documents, and consultant reports will hereafter apply to ~~Lodestar Energy,~~Hidden Splendor Resources Inc., and Horizon Mine No. 1.

Chapter 2
Legal and Financial

Clean Copy

CHAPTER 2

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

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CHAPTER 2

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

110 MINIMUM REQUIREMENTS FOR LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

111 Introduction

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The information contained in this section is intended to fulfill the requirements of R645-301-100 and to ensure that all relevant information on the ownership and control of the mining activities is supplied to the regulatory agency(s).

112 Identification of Interests

112.100 Business Entity

Hidden Splendor Resources, Inc. is incorporated under the laws of the State of Nevada and is in good standing and has legal corporate existence.

112.200 Assignment of Permit Applicant and Mine Operator

The permit applicant and mine operator is:

Hidden Splendor Resources, Inc.
50 West Liberty Street, Suite 880
Reno, Nevada 89501
Telephone: (775) 322-0626
Employer I.D. No. 88-0315046

Applicant's Resident Agent:

The resident agent who will accept service of process is:

Alexander H. Walker, III
57 West 200 South, Suite 400
Salt Lake City, Utah 84101
Telephone: (801) 521-3292

The abandoned mine land reclamation fee will be paid by:

Cecil Ann Walker
Hidden Splendor Resources, Inc.
50 West Liberty Street, Suite 880
Reno, Nevada 89501
Telephone: (775) 322-0626

112.300 Officers of the Applicant

Principal Officers	Position	Address
Cecil Ann Walker 550-22-2400	President and Director	50 West Liberty St., Suite 880 Reno, NV 89501 (775) 322-0626
Alexander H. Walker, III 528-06-0223	Vice President	57 West 200 South, Suite 400 Salt Lake City, UT 84101 (801) 521-3292
Amanda W. Cardinalli 528-06-0227	Treasurer And Director	50 West Liberty St., Suite 880 Reno, NV 89501 (775) 322-0626
Alexander H. Walker, Jr. 199-16-9180	Secretary and Director	50 West Liberty St., Suite 880 Reno, NV 89501 (775) 322-0626

112.400 Coal Mining and Reclamation Operation Owned or Controlled

Hidden Splendor Resources, Inc.,50 West Liberty Street, Suite 880, Reno, Nevada 89501 is a corporation that controls 100% of Hidden Splendor Resources, Inc. The ownership is 50% Alexander H. Walker, Jr. and 50% Cecil Ann Walker. The officers and directors of Hidden Splendor Resources, Inc. control no other coal mining entities.

112.500 Legal or Equitable Owner of the Surface and Mineral Properties

The legal and equitable owners of the surface and mineral properties to be directly affected by this mining operation during the duration of the permit period are:

Hidden Splendor Resources
50 West Liberty Street, Suite 880
Reno, NV 89501

United States of America
Bureau of Land Management
2370 South 2300 West
West Valley City, Utah 84084

Steve and Pete (Jr.) Stamatakis
1111 South 450 West
Price, Utah 84501

Roy M. and Tessie K. Farley
5240 So. Highland Drive
Salt Lake City, Utah 84117

Arthur J. Anderson, Et al
4190 Fortuna Way
Salt Lake City, Utah 84117

Surface and coal ownership are shown on Plates 4-2 and 4-3.

112.600 Owners of Record of Property Contiguous to Proposed Permit Area

Owners of Surface Properties

1. U P & L
   P.O. Box 899
   Salt Lake City, Utah 84110

2. Hidden Splendor Resources
   50 West Liberty Street, Suite 880
   Reno, NV 89501

3. J. Mark & James Jacobs
   734 S. Cherry Drive
   Orem, Utah 84057

4. Agnes and Eldred E. Peirce, Jr.
   3432 South 500 East
   Price, Utah 84501

5. Steve and Pete (Jr.) Stamatakis
   1111 South 450 West
   Price, Utah 84501

6. United States of America
   Bureau of Land Management
   2370 South 2300 West
   West Valley City, Utah 84084

7. R. L. Bird
   1840 East Bryan Avenue
   Salt Lake City, Utah 84108

8. Nielson Ltd.
   P.O. Box 620
   Huntington, Utah 84528

9. Roy M. and Tessie K. Farley
   5240 So. Highland Drive
   Salt Lake City, Utah 84117

10. Robert and Linda N. Jewkes
    Wellington, Utah 84542

11. Luke G. and Gene S. Pappas
    2030 S. Cave Hollow Way
    Bountiful, Utah 84010

12. Milton A. Oman
1714 E. Millcreek Way
Salt Lake City, Utah 84106

13. Utah Division of Wildlife Resources
455 West Railroad Avenue
Price, Utah 84501

14. K.C. Jensen and Tonda Hampton
P.O. Box 957
Price, Utah 84501

15. Carbon County
Courthouse Building
Price, Utah 84501

16. Arthur J. Anderson, Et al
4190 Fortuna Way
Salt Lake City, Utah 84117

17. Utah State Fish and Game
1095 West Motor Avenue
Salt Lake City, Utah 84116

112.700 MSHA Numbers

The MSHA numbers issued April 20, 1995 by the Department of Labor to Horizon Mining, LLC have been transferred to Hidden Splendor Resources, Inc. as follows:

- Horizon Mine MSHA Number 42-02074
- Horizon No. 2 Mine MSHA Number 42-02075 (not opening at present time)

112.800 Interest in Contiguous Lands

Hidden Splendor currently owns the Federal Coal Lease UTU-74804 (by assignment from Lodestar Energy, Inc. ("Lodestar") filed with BLM for approval) which is contiguous to the current permit area, and has fee coal interests in SE$^1/_4$SE$^1/_4$, E$^1/_2$SW$^1/_4$SE$^1/_4$ Section 17; and fee coal and surface interests in S$^1/_2$NW$^1/_4$SW$^1/_4$, W$^1/_2$SW$^1/_4$SE$^1/_4$ Section 17 and NE$^1/_4$NW$^1/_4$, NW$^1/_4$NE$^1/_4$ Section 20, Township 13 South, Range 8 East, SLM but has no interest, options or pending bids on other contiguous lands.

112.900 Certification of Submitted Information

Information submitted to the Division is certified as required by the UDOGM regulations.

113 Violation information

Neither Hidden Splendor nor any subsidiary, affiliate, member or manager, or persons controlled by or under common control with the applicant has had a federal or state mining permit suspended or revoked in the last five years; nor forfeited a mining bond or similar security deposited in lieu of bond.

Violation notices in connection with permit C/007/020 are listed in Appendix 2-4

114 Right of Entry information

Under date of March 24, 2003, Lodestar by its Chapter 11 Trustee, pursuant to an Order dated March 18, 2003 by the U.S. Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, assigned Hidden Splendor all right, title and interest in the Horizon Mine. The assignment was made subject to Division approval of the transfer of Mine Permit No. C/007/020. Concurrently, Lodestar, by its Trustee, also executed and delivered a Designation of Operator to Hidden Splendor covering the period prior to DOGM's approval of the permit transfer.

Hidden Splendor bases its right to enter and undertake coal mining on: (1) the Assignment from Lodestar by its Chapter 11 Trustee, pursuant to the March 18, 2003 Order (Appendix 2-1); (2) the Designation of Operator executed by Lodestar (Appendix 2-1); and (3) the Federal coal lease UTU-74804 (Appendix 2-3).

Horizon Mine was issued a Right-of-Way SL 063011 through BLM lands in 1996 to facilitate mining coal from fee lands. The Right-of-Way was incorporated into the Federal coal lease UTU-74804 on September 1, 1998. Appendix 2-3.

The following is a description of lands within the permit boundary for the Horizon Mine comprised of part of the Hidden Splendor lease and a part of the Federal coal lease (Beaver Creek Tract) UTU-74804 which was acquired on September 1,1998.

Township 13 South, Range 8 East, SLM

Section 8: W1/2SE1/4, SE1/4SW1/4, S1/2SW1/4NE1/4, S1/2NE1/4SW1/4, NE1/4NE1/4SW1/4NE1/4, S1/2SW1/4SW1/4, NE1/4SW1/4SW1/4, S1/2NW1/4SW1/4SW1/4, S1/2NE1/4SW1/4NE1/4, NE1/4NE1/4SW1/4, SE1/4NW1/4NE1/4SW1/4, SE1/4SE1/4SE1/4NW1/4,SE1/4SE1/4NW1/4SW1/4

Portion NW1/4NE1/4SW1/4NE1/4 Portion NE1/4NW1/4SW1/4NE1/4
Portion SE1/4NW1/4SW1/4NE1/4 Portion SW1/4NW1/4SW1/4NE1/4
Portion SW1/4NW1/4NE1/4SW1/4 Portion NW1/4NW1/4NE1/4SW1/4
Portion NE1/4NW1/4NE1/4SW1/4 Portion SE1/4SW1/4SE1/4NW1/4
Portion SW1/4SE1/4SE1/4NW1/4 Portion NW1/4SE1/4SE1/4NW1/4
Portion NE1/4SE1/4SE1/4NW1/4 Portion SE1/4NE1/4NW1/4SW1/4
Portion NE1/4SE1/4NW1/4SW1/4 Portion NW1/4SE1/4NW1/4SW1/4
Portion SW1/4SE1/4NW1/4SW1/4 Portion SE1/4SW1/4NW1/4SW1/4
Portion NE1/4NW1/4SW1/4SW1/4 Portion NW1/4NW1/4SW1/4SW1/4

Section 17: NW1/4NE1/4, N1/2NW1/4SW1/4, NE1/4SW1/4, NW1/4SE1/4, N1/2SE1/4SW1/4, N1/2SW1/4SE1/4, SW1/4NE1/4, NW1/4

Section 18: NE1/4NE1/4

Section 7: SE1/4SE1/4SE1/4, S1/2SW1/4SE1/4SE1/4, NE1/4SW1/4SE1/4SE1/4, S1/2SE1/4SW1/4SE1/4
Portion NE1/4NE1/4SE1/4SE1/4 Portion SE1/4NE1/4SE1/4SE1/4
Portion SW1/4NE1/4SE1/4SE1/4 Portion SE1/4NW1/4SE1/4SE1/4
Portion NW1/4SW1/4SE1/4SE1/4 Portion NE1/4SE1/4SW1/4SE1/4
Portion NW1/4SE1/4SW1/4SE1/4 Portion SW1/4NW1/4SE1/4SE1/4

Containing 711 acres more or less consisting of 305 acres more or less of Fee coal (Hidden Splendor Resources) and 406 acres more or less of Federal leased coal.

The surveyed disturbed area boundary was found to contain 8.23 acres, however the reclamation bond calculations will continue to include reclamation of 9.15 acres. The disturbed area is located within:

Township 13 South, Range 8 East, SLM

Section 17: Portion NW1/4NW1/4SE1/4 Portion NE1/4NE1/4SW1/4
Portion NW1/4NE1/4SW1/4 Portion SE1/4NE1/4SW1/4
Portion SW1/4NE1/4SW1/4

115 Status of Unsuitability Claims

The permit area is not within an area or under study as an area designated as unsuitable for mining under R645-103-400, nor has any petitions been filed with the UDOGM under R645-103-420 that could affect the proposed permit area (see Plate 1-1). No surface operations or facilities are located within 300 feet of an occupied dwelling or within 100 feet of a cemetery. A public road right-of-way passes through the permit area and provides access to public property. Coal haulage activities will occur within 100 feet of the public road right-of-way where the permit area road joins a public county road. Multiple letters were received from Carbon County during 1996 concerning the use of the county road(s) by the Horizon Mine, these letters are included in Appendix 3-1 and discussed in Chapter 3.

116 Permit Term

Hidden Splendor Resources began operation of the Horizon Mine in August, 2003 and projects mining to continue over the remaining Permit term. Chapter 3 discusses the extent of underground mining activities to be conducted over the remaining permit term.

117 Insurance, Proof of Publication, and Facilities and Structures Used in Common

A copy of the Certificate of Insurance issued to Hidden Splendor Resources, Inc, is on file with the Division. Subsequent insurance renewal documents will be submitted to the Division and included in Appendix 2-2.

Notice of the permit transfer application was published in the Sun Advocate, Price, Utah on April 8, 2003. Proof of publication was submitted to the Division pursuant to R645-303-322 and a copy is included in Appendix 2-2.

118 Filing Fee

A copy of this permit application is on file with the Utah Division of Oil, Gas and Mining (UDOGM), P.O. Box 145801, Salt Lake City, Utah 84114-5801. A copy of the filing fee receipt is located in Appendix 2-2.

120 PERMIT APPLICATION FORMAT AND CONTENTS

This permit application will comply with R645-301-120.

130 REPORTING OF TECHNICAL DATA

All technical data submitted in the permit application will be accompanied by the name or organization responsible for the collection and analysis of data, dates of collection and descriptions of methodology used. Technical analyzes will be planned by or under the direction of a qualified professional in the subject to be analyzed.

140 MAPS AND PLANS

The maps and plans in the Mining and Reclamation Plan will correspond with the requirements in R645-301-140.

150 COMPLETENESS

Hidden Splendor believes the information in this permit application to be complete and correct.

Appendix 2-1
Lease Documents

Insert
March 18,2003 Bankruptcy Court Order
Assignment of Permit
Assignment of Mining Leases, Water Leases, etc.
Assignment of Federal Lease UTU-74804
March 24, 2003 Designation of Operator
Hidden Splendor letter to be DO until permit transfer
April 16, 2003 BLM Transfer of Interest and Recognition of Name Change

APPENDIX 2-1

LEASE DOCUMENTS

EASTERN DISTRICT OF KE[illegible]
FILED

MAR 18 2003

AT LEXINGTON
JERRY D. TRUITT, CLE[illegible]
U.S. BANKRUPTCY C[illegible]

IN THE UNITED STATES BANKRUPTCY COURT
FOR THE EASTERN DISTRICT OF KENTUCKY
(LEXINGTON DIVISION)

IN RE: LODESTAR ENERGY, INC. LODESTAR HOLDINGS, INC. INDUSTRIAL FUELS MINERALS CO. DEBTORS.	CHAPTER 11 PROCEEDING CASE NOS. 01-50969, 01-50972 and 03-70015 Jointly Administered Under Case No. 01-50969 Judge Joseph M. Scott, Jr.

ORDER PURSUANT TO §§ 105(A), 363, 365, 503 AND 507 OF THE BANKRUPTCY CODE AUTHORIZING (A) SALE TO HIDDEN SPLENDOR RESOURCES, LTD. OF CERTAIN OF DEBTORS' PROPERTY FREE AND CLEAR OF ALL LIENS, CLAIMS AND ENCUMBRANCES AND (B) ASSUMPTION AND ASSIGNMENT OF CERTAIN UNEXPIRED REAL ESTATE LEASES AND EXECUTORY CONTRACTS

This matter came before this Court at a hearing (the "Sale Hearing") on January 31, 2003, to consider approval of the sale of a portion of Lodestar Energy, Inc.'s, and Lodestar Holdings, Inc.'s (collectively the "Debtors") property at auction (the "Auction") held on January 30, 2003, to Hidden Splendor Resources, Ltd. ("Hidden Splendor") in accordance with the procedures set forth in the (a) ORDER PURSUANT TO SECTIONS 105(A), 363, 365, 503 AND 507 OF THE BANKRUPTCY CODE (I) AUTHORIZING AND SCHEDULING A PUBLIC AUCTION AND SALE OF SUBSTANTIALLY ALL OF THE DEBTORS' PROPERTY FREE AND CLEAR OF ALL LIENS, CLAIMS AND ENCUMBRANCES; (II) APPROVING PROCEDURES FOR THE SUBMISSION OF BIDS; (III)

APPROVING CURE AMOUNT PROCEDURES FOR ASSUMED AND ASSIGNED UNEXPIRED LEASES AND EXECUTORY CONTRACTS; (IV) SCHEDULING A HEARING TO CONSIDER APPROVAL OF THE ASSET SALE; AND (V) APPROVING THE FORM AND MANNER OF NOTICE OF THE AUCTION AND SALE PROCEDURES PURSUANT TO RULE 2002 OF THE FEDERAL RULES OF BANKRUPTCY PROCEDURE (doc. no. 1678), dated December 24, 2002 (the "Sale Order") and (b) AMENDED NOTICE OF AUCTION, BIDDING PROCEDURES, ASSUMPTION AND ASSIGNMENT OF EXECUTORY CONTRACTS, UNEXPIRED LEASES, LICENSES AND PERMITS, AND HEARING FOR AN ORDER AUTHORIZING THE SALE OF THE DEBTORS' ASSETS (doc. no. 1756) ("Notice of Bidding Procedure"). The Court, being fully advised of the relevant facts and having heard the arguments of counsel at the Sale Hearing, and after due deliberation and sufficient cause appearing therefor:

THIS COURT HEREBY FINDS THAT:

A. The Court has jurisdiction over the matter pursuant to 28 U.S.C. §§ 157 and 1334.

B. Notice of the Sale Hearing was adequate and sufficient under the circumstances and complied in all respects with the applicable provisions of the Sale Order, the Notice of Bidding Procedures, the Bankruptcy Code, the Bankruptcy Rules and the Local Bankruptcy Rules.

C. On January 23, 2003, Hidden Splendor submitted a good faith, bona fide offer (the "Hidden Splendor Offer") to purchase the property identified in numbered paragraph 1 below (the "Horizon Mine Property"). The Hidden Splendor Offer, as modified by Hidden Splendor's stipulation to the Debtor's counsel dated January 29, 2003, was deemed by the Debtors to qualify as an Initial Accepted Offer (as defined in the Notice of Bidding Procedures).

D. On January 23, 2003, Hidden Splendor filed an objection (doc. no. 1788) (the "Hidden Splendor Objection") in the form of a letter to the Court, to the cure amount listed in

Exhibit A to the Debtors' NOTICE OF CURE CLAIMS PROCEDURE AND AMOUNT OF CURE CLAIMS FOR ASSUMPTION AND ASSIGNMENT OF EXECUTORY CONTRACTS, UNEXPIRED LEASES, LICENSES AND PERMITS IN CONJUNCTION WITH SALE OF DEBTORS' ASSETS for that certain Mining Lease (the "Mining Lease"), dated February 1, 1995, by and between Hidden Splendor, Owner, and Horizon Coal Corporation, Lessee, as amended by Amendment dated June 30, 1997 and Second Amendment dated November 1, 1998, which Mining Lease was subsequently assigned in 1999 to Lodestar Energy, Inc.

E. Hidden Splendor has made its own independent inspection of the Horizon Mine Property, any liabilities of the Debtors that will be assumed by Hidden Splendor in connection with its purchase thereof and all such other matters relating to or affecting the Horizon Mine Property as Hidden Splendor has deemed necessary and appropriate. Hidden Splendor has acknowledged that in proceeding with its purchase of the Horizon Mine Property and the assumption of all of the Debtors' rights, duties and obligations relating thereto, it has done so solely upon its independent inspection and investigation of the Horizon Mine Property.

F. In accordance with the sale procedures set forth in the Notice of Bidding Procedures (the "Sale Procedures"), Hidden Splendor has provided the Debtors with an Initial Deposit (as defined in the Notice of Bidding Procedures), equal to $10,000.00, corresponding to ten percent (10%) of its Initial Accepted Offer.

G. The Debtors determined at the Auction, which was conducted in accordance with the Sale Procedures, that the Hidden Splendor Offer was the highest and best offer and the Final Accepted Offer (as defined in the Notice of Bidding Procedures) for the Horizon Mine Property.

H. On January 31, 2003, the United States Trustee filed his Notice of Appointment of Chapter 11 Trustee, whereby Mr. William Bishop was appointed as the Chapter 11 Trustee (the "Trustee") in the Cases under section 1104 of the Bankruptcy Code.

I. Thereafter, an objection was made by Blue Ridge Services, LLC ("Blue Ridge") to the sale of certain equipment to Hidden Splendor. The matter was settled by the parties, with the settlement terms incorporated in that certain Order Approving Stipulation and Authorizing Sale to Blue Ridge of Certain of Debtors' Utah Properties ("Blue Ridge Order"), and also incorporated herein as set forth below. The Blue Ridge Objection was withdrawn. No other objections were made to the sale of the Horizon Mine Property to Hidden Splendor.

NOW, THEREFORE, IT IS ORDERED THAT:

1. The sale of the Horizon Mine Property (the "Sale"), at the Purchase Price (as defined in the Notice of Bidding Procedures) of $100,000.00, free and clear of all liens, claims and encumbrances (collectively, the "Liens"), pursuant to sections 365(f) and (m) of title 11 of the United States Code is hereby approved, contingent upon the closing of such sale (the "Closing") no later than 11 days after the date of the entry of this Order. The Closing may occur after 11 days after the entry of this Order upon the mutual consent of Hidden Splendor and the Trustee. For purposes of this Order, the Horizon Mine Property shall consist of:

A. The Mining Lease, which includes all right, title and interest of Hidden Splendor in the following described lands situated in Carbon County, State of Utah:

<u>Township 13 South, Range 8 East, SLM</u>

Section 8:	SE¼SW¼
Section 16:	W½SE¼
Section 17:	NW¼NE¼, W½SE¼, SE¼SE¼, S½NW¼, N½SW¼, SE¼SW¼, excluding a 66 foot right-of-

way within the E½SW¼ referred to as the "Realigned Parcel" and more particularly described in Exhibit A to Attachment I of the Lease

Section 20: NE¼NW¼, NW¼NE¼, SE¼NE¼

Section 21: NW¼NE¼

Including a 66 foot wide roadway containing approximately 1.31 acres referred to as the "Vacated Parcel" and more particularly described in Exhibit B to Attachment I of the Lease

(containing in total 640.00 acres, more or less)

together with all dumps, plants, fixtures, improvements, rights and privileges, in anywise belonging.

B. United States Department of the Interior Bureau of Land Management Coal Lease UTU-74804 (the "BLM Lease"), issued to Horizon Mining, LLC under date of September 1, 1998, pertaining to the following described lands:

<u>Township 13 South, Range 8 East, SLM</u>

Section 6:	SE¼SW¼, S½SE¼, NW¼SE¼
Section 7:	Lots 1-3, E½, E½W½
Section 8:	SW¼NE¼, NW¼NW¼, S½NW¼, N½SW¼, SW¼SW¼, W½SE¼
Section 17:	N½NW¼, SW¼NE¼
Section 18:	NE¼NE¼

C. Water Lease Agreement (the "Water Lease") between Florence A. Sweet and Horizon Coal Corporation, dated May 1, 1993, pertaining to certain described water rights.

D. Water Right Lease and Sale Agreement (the "Water Right Lease") between Mountain Coal Company and E. E. Peirce, dated April 7, 1993, assigned to Horizon Coal Corporation under date of June 12, 1996, pertaining to certain described water rights.

E. Grant of Easement (the "Easement") dated January 3, 2001, by Steve Stamatakis and Pete Stamatakis to Lodestar Energy, Inc., covering certain described lands.

F. All of the Debtors' interest in any and all cash bonds, accounts receivable, inventory, machinery and equipment, general intangibles, contracts and leases, furniture, fixtures and real property, permits, easements and any and all other property located on the Horizon Mine premises as of the date of this Order, and specifically including those items identified as owned or leased by Lodestar Energy, Inc. on the November 2002 Daley-Hodkin Appraisal Corporation Horizon Mine Asset List ("List"), including the following items that are not presently located on the Horizon Mine premises but are hereby deemed Horizon Mine Property and expressly subject to this Order:

(a) Located at Oak Leaf Trucking in Loma, Colorado:

1	Underground Roof Bolter Dual Mast, Electric w/ accessories	Ingersoll/Rand	TD2-43-5-AE
1	Forklift Truck with accessories	Caterpillar	
1	1991 Feeder Breaker		

(b) Located at D&D Equipment & Supply in Helper, Utah:

1	1977 Wheel Loader w/ attachments	Caterpillar	980B

(c) Loaned to Genwall Resources Inc. in Huntington, Utah:

1	Hydraulic Core Drill w/ Hydraulic Power Pack.	Hagby	ONRAM 100

Specifically excluded from this sale and Order are the following equipment on the List:

(a) the uninstalled belt conveyer which was located at Mountain States (including belting and rollers);

(b) 3 Ford pickup trucks.

2. Specifically excluded from the Horizon Mine Property and the Additional Utah Properties under the Blue Ridge Order are the following six pieces of equipment (the "Disputed Assets"), which Disputed Assets shall remain the property of the Debtors and the Debtors' estates to be dealt with as follows:

One (1) Allis-Chalmers vibrator
One (1) Jeffrey crusher
Fletcher roof support cores, serial numbers 92900, 92901, 92902 and 92903

A. Consistent with the terms of the Blue Ridge Order, entered concurrently herewith and relative to the Disputed Assets, Blue Ridge, as agent for the Trustee, and without fee or commission other than the distribution provided below, shall sell the Disputed Assets, *provided, however,* no such sales shall occur until after the Court has entered the Blue Ridge Order and the Trustee has executed and delivered to Blue Ridge the Bill of Sale and Quit Claim Deed (both defined in the Blue Ridge Order) as required by paragraph 10 of the Blue Ridge Order, and that the Trustee shall review and approve all such sale(s) and execute the necessary documents to complete such sale(s).

B. All proceeds of all sales of the Disputed Assets shall be remitted to and made payable to the Trustee. All sales of the Disputed Assets shall be pursuant to arms length, good faith negotiations, and all sales shall be to parties that are not affiliated with the Trustee, the Debtors, Hidden Splendor or Blue Ridge.

C. All proceeds received by the Trustee from the sales of Disputed Assets shall be remitted by the Trustee, as follows: 50% to Blue Ridge and 50% to Hidden Splendor; *provided,* *however,* that if the sale to Hidden Splendor pursuant to the Hidden Splendor Offer at the January 30, 2003, auction does not close by April 30, 2003, then all Proceeds shall be remitted to Blue Ridge and *further provided, however,* that the Proceeds from the sales of the Disputed Assets and the transfer of such Proceeds to Blue Ridge and Hidden Splendor, as provided above, shall not be subject to any prior liens, claims or encumbrances.

3. Contingent upon the Closing of the Sale of the Horizon Mine Property to Hidden Splendor and the application of the Cure Amount (as defined below) to the Purchase Price, the Hidden Splendor Objection is hereby withdrawn in its entirety.

4. To effectuate the sale to Hidden Splendor, the Trustee is hereby authorized, pursuant to section 365(b) of the Bankruptcy Code, to assume all leases and other executory contracts pertaining to the Horizon Mine Property and to assign them to Hidden Splendor.

5. Any and all Liens shall attach to the net proceeds received by the Trustee from the sale of the Horizon Mine Property with the same force and effect they now have, subject to further order of the Court, and any parties in interest holding any such liens are hereby directed to execute appropriate documentation releasing and terminating the same and to deliver such documentation to Hidden Splendor or its counsel.

6. The Trustee is hereby authorized and ordered to execute documents conveying the Horizon Mine Property to Hidden Splendor on the Closing date by Bill of Sale pursuant to the terms of the Sale Procedures, the Notice of Bidding Procedures and the Sale Order and to execute any and all other documents that may be required to complete transfer of the Horizon Mine Property, as described herein, to Hidden Splendor, including those documents necessary to satisfy approval requirements of regulatory agencies, without further order of this court.

7. The amount necessary to cure all defaults under the Mining Lease (the "Cure Amount") is $11,368.31, which amount shall be credited at Closing toward the Purchase Price, as described in paragraph 8, below.

8. The Initial Deposit for the Horizon Mine Property shall also constitute the Final Deposit (as defined in the Notice of Bidding Procedures), which Final Deposit has been paid timely by Hidden Splendor, in accordance with the Sale Procedures.

9. At the Closing, Hidden Splendor shall deliver to the Trustee an amount of immediately available funds equal to the Purchase Price less the Cure Amount and Final Deposit.

10. The sale of the Horizon Mine Property to Hidden Splendor is AS IS, WHERE IS and WITH ALL FAULTS, and without any representations or warranties whatsoever of the Debtors, the Trustee, their agents or representatives, express or implied, of any kind, nature or description, including, without limitation, any warranty of merchantability or fitness for a particular purpose or any express or implied warranty as to the nature, quality, value or condition of any portion of the Horizon Mine Property.

DATED: MAR 18 2003.

BY THE COURT:

Joseph M. Scott Jr.

HON. JOSEPH M. SCOTT, JR., JUDGE
UNITED STATES BANKRUPTCY COURT

TENDERED BY:

Sam P. Burchett, Esq.
200 West Vine St., Suite 400
Lexington, KY 40507-1620
Telephone: (859) 226-2100
Facsimile: (859) 226-2105
Email: spburchett@aol.com
Local Counsel for Hidden Splendor Resources Ltd.

Pursuant to Local Rule 9022-1(c), Sam P. Burchett shall cause a copy of this Order to be served on each of the parties designated to receive this order pursuant to Local Rule 9022-1(a) and shall file with the Court a certificate of service of the Order upon such parties within ten (10) days hereof.

APPROVED AS TO FORM:

GREENBAUM, DOLL & MCDONALD

By
Bruce E. Cryder
Gregory R. Schaaf
Counsel to the Trustee

L. Edwin Paulson,
Local Counsel for Blue Ridge Services, LLC

(aw)1671/07/plead/sale order

COPY

ASSIGNMENT OF PERMIT
(Number C/007/020)

LODESTAR ENERGY, INC., a Delaware corporation ("Assignor"), by William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc., the debtors In re Lodestar Energy, Inc., Case Nos. 01-50969 and 01-50972 jointly administered under Case No. 01-50969 pending in the United States Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby assigns and transfers to HIDDEN SPLENDOR RESOURCES, LTD., a Nevada corporation, whose address is 50 West Liberty Street, Suite 880, Reno, Nevada 89501 ("Assignee"), that certain Permit No. C/007/020 dated October 11, 2001 issued to Assignor by the State of Utah Division of Oil, Gas and Mining for the Horizon No. 1 Mine to conduct coal mining and reclamation operations on lands situated in Carbon County, Utah described in the Permit, in accordance with the March 18, 2003, ORDER ISSUED BY THE COURT PURSUANT TO SECTIONS 105(A), 363, 365, 503, AND 507 OF THE BANKRUPTCY CODE AUTHORIZING SALE TO HIDDEN SPLENDOR RESOURCES, LTD. OF CERTAIN DEBTORS' PROPERTY FREE AND CLEAR OF ALL LIENS, CLAIMS AND ENCUMBRANCES.

DATED this 24 day of March, 2003.

William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

STATE OF Kentucky)
:ss.
COUNTY OF Fayette)

The foregoing instrument was acknowledged before me this 24th day of March, 2003, by William D. Bishop, Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

My Commission Expires:

4-23-05

Carol A. Briggs
Notary Public State at Large
Residing at: Jessamine Co. Ky

Document #2
\167107\docs\167107 Doc 2.doc

WHEN RECORDED RETURN TO:
Oliver W. Gushee, Jr.
Pruitt, Gushee & Bachtell
1850 Beneficial Life Tower
Salt Lake City, UT 84111-1495

COPY

ASSIGNMENT

LODESTAR ENERGY, INC., a Delaware corporation ("Assignor"), by William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc., the debtors In re Lodestar Energy, Inc., Case Nos. 01-50969 and 01-50972 jointly administered under Case No. 01-50969 pending in the United States Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby assigns and transfers to HIDDEN SPLENDOR RESOURCES, LTD., a Nevada corporation ("Assignee"), 50 West Liberty Street, Suite 880, Reno, Nevada 89501, all of Assignor's right, title and interest, in and to the Mining Lease, water rights and leases, easements and other Horizon Mine property described in Exhibit A attached hereto and made a part hereof for all purposes, free and clear of all liens, claims and encumbrances in accordance with the March 18, 2003, ORDER ISSUED BY THE COURT PURSUANT TO SECTIONS 105(A), 363, 365, 503, AND 507 OF THE BANKRUPTCY CODE AUTHORIZING SALE TO HIDDEN SPLENDOR RESOURCES, LTD. OF CERTAIN DEBTORS' PROPERTY FREE AND CLEAR OF ALL LIENS, CLAIMS AND ENCUMBRANCES.

IN WITNESS WHEREOF, the undersigned has executed this Assignment as of this 24 day of MARCH, 2003.

[signature]
William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

STATE OF Kentucky)
:ss.
COUNTY OF Fayette)

The foregoing instrument was acknowledged before me this 24th day of March, 2003, by William D. Bishop, Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

My Commission Expires:
7-23-05

Carol A. Briggs
Notary Public & State at Large
Residing at: Jessamine Co. Ky

Document #5
1671\07\docs\1671.07-Doc5-v.2.doc

EXHIBIT A

Attached to and made a part of Assignment from Lodestar Energy, Inc., by William D. Bishop, Chapter 11 Trustee, to Hidden Splendor Resources, Ltd. dated MARCH 24th, 2003.

(1) Mining Lease dated February 1, 1995 by and between Hidden Splendor Resources, Ltd., a Nevada corporation, Owner, and Horizon Coal Corporation ("Horizon"), Lessee (Memorandum of Mining Lease recorded February 28, 1995 in Book 354, Page 699, records of Carbon County, Utah), as amended by Amendment of Mining Lease dated June 30, 1997 by and between Hidden Splendor Resources, Ltd., as Owner, and Horizon Coal Corporation, as Lessee, and as further amended by Second Amendment of Mining Lease effective November 1, 1998 between Hidden Splendor Resources, Ltd., as Owner, and Horizon Mining, LLC, a Utah limited liability corporation ("Lessee"), covering the following described lands situated in Carbon County, State of Utah:

Township 13 South, Range 8 East, SLM

Section 8: SE¼SW¼
Section 16: W½SE¼
Section 17: NW¼NE¼, W½SE¼, SE¼SE¼, S½NW¼, N½SW¼, SE¼SW¼, excluding a 66 foot right-of-way within the E½SW¼ referred to as the "Realigned Parcel" and more particularly described in Exhibit A to Attachment I of the Lease
Section 20: NE¼NW¼, NW¼NE¼, SE¼NE¼
Section 21: NW¼NE¼
Including a 66 foot wide roadway containing approximately 1.31 acres referred to as the "Vacated Parcel" and more particularly described in Exhibit B to Attachment I of the Lease

(containing in total 640.00 acres, more or less) together with all dumps, plants, fixtures, improvements, rights and privileges, in anywise belonging;

(2) Water Lease Agreement (the "Water Lease") between Florence A. Sweet and Horizon Coal Corporation dated May 1, 1995 (Memorandum of Water Lease Agreement dated May 1, 1995, recorded June 14, 1995 in Book 358 at Page 493, records of Carbon County, Utah) covering Water Rights Numbers 91-94, 91-353, and 91-330 with points of diversion in Sections 18 and 19, Township 13 South, Range 8 East, SLM, Carbon County, Utah, assigned to Lodestar Energy, Inc. by Horizon Mining LLC under Deed and Assignment dated July 14, 1999, recorded in Book 439 at Page 85, records of Carbon County, Utah.

(3) Water Rights Lease and Sale Agreement between Mountain Coal Company and E. E. Peirce dated April 7, 1993 covering Water User's Claim #91-4956 and the right to use a facility known as Sweet's Canyon Pond in SW¼SW¼ Section 17, Township 13 South, Range 8 East, SLM, Carbon County, Utah (assigned to Horizon Coal Corporation June 18, 1996) and assigned to Lodestar Energy, Inc. under Deed and Assignment dated July 14, 1999 recorded July 16, 1999 in Book 439 at Page 85, records of Carbon County, Utah.

(4) Grant of Easement from Steve Stamatakis and Pete Stamatakis to Lodestar Energy, Inc. dated January 3, 2001 affecting the following real property in Carbon County, Utah:

Township 13 South, Range 8 East, SLM

Section 4:	W½, W½NE¼, NW¼SE¼
Section 5:	NW¼, W½SE¼, SW¼SE¼, SE¼SW¼
Section 6:	NE¼, SE¼, SW¼, SE¼NW¼
Section 7:	NW¼, SE¼, SE¼NE¼, SE¼SW¼, N½SW¼
Section 8:	N½S½, S½NW¼, NE¼NW¼, NE¼
Section 9:	NW¼
Section 18:	N½NW¼, NE¼NE¼

(5) Any and all cash bonds, accounts receivable, books, records, coal inventory, machinery, general intangibles, contracts and leases, buildings, fixtures and improvements on the land and any other easements, rights-of-way and related facilities,

roads, and all other rights, privileges and uses belonging to the Horizon Mine and connected in any manner to the Horizon Mine land, leases, water and water rights owned or held by Assignor.

(6) The exclusive right to use the name "Horizon" and "Horizon Mine" so far as Lodestar Energy, Inc. has the power to assign such exclusive right.

WHEN RECORDED RETURN TO:
Oliver W. Gushee, Jr.
Pruitt, Gushee & Bachtell
1850 Beneficial Life Tower
Salt Lake City, UT 84111-1495

COPY

ASSIGNMENT

LODESTAR ENERGY, INC., a Delaware corporation ("Assignor"), by William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc., the debtors In re Lodestar Energy, Inc., Case Nos. 01-50969 and 01-50972 jointly administered under Case No. 01-50969 pending in the United States Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby assigns and transfers to HIDDEN SPLENDOR RESOURCES, LTD., a Nevada corporation ("Assignee"), 50 West Liberty Street, Suite 880, Reno, Nevada 89501, all of Assignor's right, title and interest, in and to the following:

United States Department of the Interior Bureau of Land Management Coal Lease UTU-74804 dated effective September 1, 1998 covering the following described lands situated in Carbon County, State of Utah:

Township 13 South, Range 8 East, SLM

Section 6:	SE¼SW¼, S½SE¼, NW¼SE¼
Section 7:	Lots 1-3, E½, E½W½
Section 8:	SW¼NE¼, NW¼NW¼, S½NW¼, N½SW¼, SW¼SW¼, W½SE¼
Section 17:	N½NW¼, SW¼NE¼
Section 18:	NE¼NE¼

containing 1,288.49 acres, more or less;

and the balance of the cash bond (BLM Bond No. UT1214) deposited by Assignor on March 29, 2001 with the Utah State Office of the Bureau of Land Management, Department of the Interior, to cover one (1) year's rental plus two (2) remaining annual installments on the lease bid for UTU-74804;

free and clear of all liens, claims and encumbrances in accordance with the March 18, 2003, ORDER ISSUED BY THE COURT PURSUANT TO SECTIONS 105(A), 363, 365, 503, AND 507 OF THE BANKRUPTCY CODE AUTHORIZING SALE TO

HIDDEN SPLENDOR RESOURCES, LTD. OF CERTAIN DEBTORS' PROPERTY FREE AND CLEAR OF ALL LIENS, CLAIMS AND ENCUMBRANCES.

DATED this 4 day of MARCH, 2003.

Will D Bishop

William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

STATE OF Kentucky)
:ss.
COUNTY OF Fayette)

The foregoing instrument was acknowledged before me this 24th day of March, 2003, by William D. Bishop, Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

My Commission Expires:

7-23-05

Carol A. Briggs

Notary Public State at Large

Residing at: Jessamine Co Ky

COPY

DESIGNATION OF OPERATOR

LODESTAR ENERGY, INC., a Delaware corporation ("Assignor"), holder of Mining Permit Number C/007/020 for the Horizon No. 1 Mine ("Permit") on the records of the Utah Division of Oil, Gas and Mining ("DOGM"), by William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc. ("Assignor") the debtors In re Lodestar Energy, Inc., Case Nos. 01-50969 and 01-50972 jointly administered under Case No. 01-50969 pending in the United States Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, hereby designates Hidden Splendor Resources, Ltd., a Nevada Corporation qualified to do business in the State of Utah, whose address is 50 West Liberty Street, Suite 880, Reno, Nevada, 89501, as its operator and local agent, with full authority to act in its behalf in complying with the terms of the Permit and regulations applicable thereto and on whom DOGM may serve written or oral instructions, with copies to the undersigned, in securing compliance with the applicable regulations with respect to the lands subject to the Permit.

It is understood that this Designation of Operator does not relieve the Assignor of responsibility for compliance with the terms of the Permit and the applicable regulations. It is also understood that this Designation of Operator does not constitute an assignment of any interest in the lands.

In case of default on the part of the designated operator, the Assignor will promptly comply with all applicable regulations and orders of DOGM.

The Assignor agrees promptly to notify DOGM of any change in the Designated Operator.

LODESTAR ENERGY, INC.

Date: March 24, 2003

By: William D. Bishop

William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc.

HIDDEN SPLENDOR RESOURCES, LTD.

FILE COPY

March 24, 2003

Lodestar Energy, Inc.
c/o William D. Bishop, Chapter 11 Trustee
Quintana Coal Company, Suite 235
2525 Harrodsburg Road
Lexington, KY 40504

Re: Designation of Operator, Horizon No. 1 Mine
Carbon County, Utah

Included among the closing documents are an Assignment of Permit (No. C/007/020) to Hidden Splendor Resources, Ltd. ("Hidden Splendor") and a Designation of Operator for Mining Permit No. C/007/020, both of which are being executed by the Trustee in his capacity as Chapter 11 Trustee for Lodestar Energy, Inc. and Lodestar Holdings, Inc.

Per your request, Hidden Splendor hereby agrees that during the period prior to the Utah Division of Oil, Gas and Mining ("DOGM") approval of transfer of Permit No. C/007/020 to Hidden Splendor, in which Hidden Splendor shall have assumed possession and orderly supervision of the area of the mining permit under the Designation of Operator, Hidden Splendor agrees to indemnify and hold Lodestar Energy, Inc. and the Trustee harmless and defend them against any and all claims, demands, suits, costs, judgments, damages, losses, fines, liabilities and costs arising or related to the operations or conduct of Hidden Splendor occurring during such period until the approval of the transfer of Permit No. C/007/020 has been delivered by DOGM to Hidden Splendor and the Trustee.

Signed:
Cecil Ann Walker

Cecil Ann Walker
President

OWG:mf
1671.07
Enclosures
\1671\07\corr\Bishop 3-03.doc

50 WEST LIBERTY ST STE 880 RENO, NEVADA 89501 | BANK OF AMERICA PLAZA | TELEPHONE (775) 322-0626 FAX (775) 322-5623

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155
www.ut.blm.gov

IN REPLY REFER TO:
3453
UTU-74804
(UT-924)

NOTICE

Hidden Splendor Resources, Inc.	:	Coal Lease
57 West 200 South, #400	:	UTU-74804
Salt Lake City, Utah 84101	:	

Transfer of Lease Interest By Operation of Law
Name Change Recognized
Amended Notice

On April 1, 2003, an order of the court regarding bankruptcy proceedings jointly administered under Case No. 01-50969 (Chapter 11) (Lodestar Energy, Inc., Lodestar Holdings, Inc., and Industrial Fuels Minerals Co., Debtors) was filed in this office. By this instrument, filed March 18, 2003, in the United States Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, Hidden Splendor Resources, Ltd. received 100 percent of the interest in Federal coal lease UTU-74804.

The transfer of interest is recognized effective March 18, 2003. Acceptable evidence has been submitted to this office that Hidden Splendor Resources, Ltd. has changed its name to Hidden Splendor Resources, Inc. The name change is hereby recognized effective the date of this notice.

The assignment, executed by William D. Bishop, in his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holdings, Inc., is unnecessary. The court order conveyed the interest in the lease to Hidden Splendor.

The principal on BLM Bond No. UT1214 will be changed to Hidden Splendor Resources, Inc. However, the bond amount is now down to $4,000. We require a minimum lease bond of $5,000. Please submit the additional $1,000 as soon as possible. Production on the lease will require a further increase in the bond to cover three months royalty.

The principal on BLM Bond No. UT1240, which is a $10,000 cash bond on a water monitoring well on the lease, will also be changed to Hidden Splendor Resources, Inc., in accordance with the court order (Page 6, Paragraph F).

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Utah State Office
P.O. Box 45155
Salt Lake City, UT 84145-0155
www.ut.blm.gov

IN REPLY REFER TO:
3453
UTU-74804
(UT-924)

APR 1 6 2003

NOTICE

Hidden Splendor Resources, Inc.	:	Coal Lease
57 West 200 South, #400	:	UTU-74804
Salt Lake City, Utah 84101	:	

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Name Change Recognized

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The principal on BLM Bond No. UT1214 will be changed to Hidden Splendor Resources, Inc. However, the bond amount is now down to $4,000. We require a minimum lease bond of $5,000. Please submit the additional $1,000 as soon as possible. Production on the lease will require a further increase in the bond to cover three months royalty.

In researching this lease, it was discovered that Lodestar holds an additional $10,000 bond (BLM Bond No. UT1240) on a water monitoring well located on the lease. It appears that this was not covered by the court order. This bond will remain as is until an acceptable replacement bond is submitted to this office.

Federal coal lease UTU-74804 was issued effective September 1, 1998. At time of issuance it contained an estimated minable reserve of 6.3 million tons. 63,000 tons must be mined by September 1, 2008, in order to achieve diligent development required by the terms and conditions of the lease (copy enclosed).

There are no more bonus bid payments due on this lease. Rental of $3,867 is due by the first of September each year.

We approved a Category 1 royalty rate reduction, for this lease, effective December 1, 1999. The royalty rate was reduced to 5 percent for production up to 900,000 tons of coal from the first three extraction panels, or a period of five years from the effective date, whichever occurs first. The reduction is subject to an annual submission of a certified statement that the conditions that justified the granting of the reduction continue to exist.

A re-certification statement was received in this office on November 14, 2002. Approval of the re-certification will not occur until the lease bond is increased to the minimum of $5,000.

/s/ Robert Lopez

Robert Lopez
Chief, Branch of
Minerals Adjudication

Enclosures:
1. Bond Form 3404-1 (1p double sided)
2. Copy of Lease (7 pp)

cc: Pruitt, Gushee & Bachtell, Attn: Oliver W. Gushee, Jr., Ste. 1850 Beneficial Life Tower Salt Lake City, Utah 84111-1495 (w/encl.)
Price Coal Office (Attn: Steve Falk)
MMS, MRM, Solid Minerals Staff, Attn: Patrick Mulcahy, MS390B2, Box 25165, Denver, CO 80225-0165
MMS, Attn: Cherry Mallard, MS 3030, Box 25165, Denver, CO 80225-0165
Lodestar Energy, Inc., 251 Tollage Creek, Pikeville, KY 41501
Lodestar Energy, Inc., HC 35 Box 370, Helper, UT 84526
Accounts (Attn: Dave Mascarenas)

Appendix 2-2
Insurance and Newspaper Acknowledgments

Insert
New Certification of Insurance
and
Affidavit of Publication

APPENDIX 2-2

INSURANCE AND NEWSPAPER ACKNOWLEDGMENTS

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)

ss.

County of Carbon,)

I, Ken Larson, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State a true copy of which is hereto attached, was published in the full issue of such newspaper for 1 (One) consecutive issues, and that the first publication was on the 8th day of April, 2003, and that the last publication of such notice was in the issue of such newspaper dated the 8th day of April, 2003.

Ken G. Larson

Ken G Larson - Publisher

Subscribed and sworn to before me this 8th day of April 2003.

Linda Thayn

Notary Public My commission expires January 10, 2007 Residing at Price, Utah

Publication fee, $ 177.76

LINDA THAYN
NOTARY PUBLIC • STATE of UTAH
845 EAST MAIN
PRICE, UTAH 84501
COMM. EXPIRES 1-10-2007

Notice is hereby given that Hidden Splendor Resources, Inc. ("Hidden Splendor" formerly Hidden Splendor Resources, Ltd., a Nevada corporation, whose address 57 West 200 South, #400, Salt Lake City, Utah 84101, has acquired the Horiz Mine from Lodestar Energy, Inc., a Delaware corporation, by William D. Bishop, his capacity as Chapter 11 Trustee of Lodestar Energy, Inc. and Lodestar Holding Inc., the Debtors In Re: Lodestar Energy, Inc., Case Nos. 01-50969 and 01 50972, jointly administered under Case No. 01-50969 pending in the United State Bankruptcy Court for the Eastern District of Kentucky, Lexington Division, accordance with the March 18, 2003 Order issued by the Court Authorizing Sale t Hidden Splendor Resources, Ltd. Pursuant to Sections 105(a), 363, 365, 503, an 507 of the Bankruptcy Code of Certain Debtors' Property Free and Clear of All Liens Claims and Encumbrances. Hidden Splendor has submitted an application to th Utah Division of Oil, Gas and Mining under the provisions of the Utah Administrativ Code Rule R645-303-300 for approval of the transfer of Permit No. C/007/02 ("Permit") to Hidden Splendor. Upon approval of the Permit transfer, the Permit an the permit area would be owned or controlled by Hidden Splendor. The permit are is located in Carbon County, Utah and is described as follows:

Township 13 South, Range 8 East, SLM

Section 8: W½SE¼, SE¼SW¼, S½SW¼NE¼, S½NE¼SW¼, NE¼NE¼SW¼NE¼, S½SW¼SW¼, NE¼SW¼SW¼, S½NW¼SW¼SW¼, S½NE¼SW¼NE¼, NE¼NE¼SW¼, SE¼NW¼NE¼SW¼, SE¼SE¼SE¼NW¼, SE¼SE¼NW¼SW¼,
Portion NW¼NE¼SW¼NE¼,
Portion NE¼NW¼SW¼NE¼,
Portion SE¼NW¼SW¼NE¼,
Portion SW¼NW¼SW¼NE¼,
Portion SW¼NW¼NE¼SW¼,
Portion NW¼NW¼NE¼SW¼,
Portion NE¼NW¼NE¼SW¼,
Portion SE¼SW¼SE¼NW¼,
Portion SW¼SE¼SE¼NW¼,
Portion NW¼SE¼SE¼NW¼,
Portion NE¼SE¼SE¼NW¼,
Portion SE¼NE¼NW¼SW¼,
Portion NE¼SE¼NW¼SW¼,
Portion NW¼SE¼NW¼SW¼,
Portion SW¼SE¼NW¼SW¼,
Portion SE¼SW¼NW¼SW¼,
Portion NE¼NW¼SW¼SW¼,
Portion NW¼NW¼SW¼SW¼

Section 17: NW¼NE¼, N½NW¼SW¼, NE¼SW¼, NW¼SE¼, N½SE¼SW¼, N½SW¼SE¼, SW¼NE¼, NW¼

Section 18: NE¼NE¼

Section 7: SE¼SE¼SE¼, S½SW¼SE¼SE¼, NE¼SW¼SE¼SE¼, S½SE¼SW¼SE¼,
Portion NE¼NE¼SE¼SE¼,
Portion SE¼NE¼SE¼SE¼,
Portion SW¼NE¼SE¼SE¼,
Portion SE¼NW¼SE¼SE¼,
Portion NW¼SW¼SE¼SE¼,
Portion NE¼SE¼SW¼SE¼,
Portion NW¼SE¼SW¼SE¼,
Portion SW¼NW¼SE¼SE¼

The permit area of the Horizon Mine contains 711 acres, more or less, consisting of 305 acres, more or less of Fee coal and 406 acres, more or less of Federal leased coal.

Pertinent comments are solicited from anyone affected by this proposed transfer of the Permit. Such comments should be filed within the next thirty (30)

Division of Oil, Gas & Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, UT 84114-5801

Published in the Sun Advocate April 8, 2003.

APPENDIX 2-3

RIGHT-OF-WAY APPLICATION AND BEAVER CREEK LEASE

Appendix 2-4
Entity Reference File

Insert
Statement of Qualifications submitted to BLM
and
Updated Horizon Mine Permit Violation History

Remove
All Lodestar Energy Corporate Structure
Mine Entities and Violation History

APPENDIX 2-4

ENTITY REFERENCE FILE

STATEMENT OF QUALIFICATIONS
OF
HIDDEN SPLENDOR RESOURCES, INC.

In compliance with 43 CFR 3472.2-2, it is hereby stated:

(1) That HIDDEN SPLENDOR RESOURCES, INC. (the "Corporation"), is incorporated under the laws of the State of Nevada.

(2) That the Corporation is authorized to hold coal leases.

(3) That the names of officers authorized to act on behalf of the Corporation are:

Name	Address	Title
Cecil Ann Walker	50 West Liberty, #880 Reno, NV 89501	President
Alexander H. Walker, III	57 West 200 South, #400 Salt Lake City, UT 84101	Vice President
Alexander H. Walker, Jr.	50 West Liberty, #880 Reno, NV 89501	Secretary
Amanda W. Cardinalli	50 West Liberty, #880 Reno, NV 89501	Treasurer

(4) That, as of this date, the percentage of common stock of said Corporation, which is the only class of stock, owned and controlled by or on behalf of persons whom the Corporation knows to be or who the Corporation has reason to believe are aliens or who have addresses outside the United States, is as follows:

> Less than ten percent (10%) of the outstanding common stock, which is the voting stock of the Corporation.

(5) That more than ten percent (10%) of the Corporation's outstanding common stock as shown by the books of the Corporation or is known to be or believed to be owned by or controlled by each of the following:

Name	Address	Citizenship	Federal Coal Acreage Holdings
Alexander H. Walker, Jr. and Cecil Ann Walker	50 West Liberty, Suite 880 Reno, NV 89501	U.S.A.	Federal Coal Lease UTU-74804

(6) That neither the Corporation nor any stockholder identified under paragraph (5) above nor any affiliate of the corporation hold an interest in any federal coal permits and/or leases (other than the acreage in UTU-74804, when the Assignment is approved).

It is hereby certified that the statements made herein are true, complete and correct to the best of the undersigned's knowledge and belief and that the officer executing this Statement has full authority to execute instruments of this nature.

Executed this 6 day of May, 2003.

HIDDEN SPLENDOR RESOURCES, INC.

By: Cecil Ann Walker
Cecil Ann Walker, President

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Licenses and permits needed to conduct a coal mining operation are listed below.

LICENSES & PERMITS - HORIZON MINE

PERMIT	ISSUING AUTHORITY
C/007/020	Division of Oil, Gas, & Mining 1594 West North Temple, Suite 1210 P.O. Box 145801 Salt Lake City, Utah 84114-5801
Construction & Air Quality DAQE-700-00	Division of Air Quality 150 No. 1950 West P.O. Box 144820 Salt Lake City, Utah 84114-4820
Construction, Sedimentation Pond and Drainage System	Division of Water Pollution Control 288 No. 1460 West P.O. Box 16690 Salt Lake City, Utah 84116-0690
Water Rights (leased)	Division of Water Rights 453 S. Carbon Avenue Price, Utah 84501
Construction Sewer Facilities	Southeastern Utah Health District 6 East Main Street Price, Utah 84501
Carbon County Planning & Zoning	Carbon County Courthouse Price, Utah 84501
UPDES (UTG040019)	State of Utah Department of Environmental Quality Water Quality Division 288 No. 1460 West Salt Lake City, Utah 84114-4870
MSHA (see Section 112.700)	U.S. Department of Labor Mine Safety and Health Administration P.O. Box 25367 Denver, Colorado 80225

CHAPTER 3

OPERATION AND RECLAMATION PLAN

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TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

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LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

CHAPTER 3

OPERATION AND RECLAMATION PLAN

3.1 Scope

This chapter outlines the scope of operation and reclamation for the Horizon Mine. The proposed coal mining and reclamation activities will be conducted in compliance with the operation and reclamation plans.

3.2 Surface Facilities Construction Plans

The Horizon surface facilities will be located in Jewkes Creek Canyon and Portal Canyon (see Plates 1-1 and 3-1).

Cross Sections and Maps

Previously Mined Areas. Plates 3-9 and 3-10 show the location and extent of known workings of active, inactive, or abandoned underground workings, including openings to the surface, within the permit and adjacent areas. Also areas within these mines that have been second mined. No previously surface-mined areas are known to exist within the permit area.

The general area in the vicinity of the Horizon Mine has long been used for coal mining. Four underground operations were formerly located on or within a short distance of the permit area. These mines were the Consumers, Sweets, National, and Beaver Creek Mines. Sweets, National, and Consumers were active from the late 1920s to the early 1950s and are presently closed. The Beaver Creek Mine was opened in 1969 and operated originally under the name of the Gordon Creek No. 3 Mine. The mine was purchased by General Exploration Co. in 1973 and then again by Beaver Creek Coal Company in January 1980. Much of the area to be occupied by the surface facilities has been disturbed by previous mining operations, with most of the major disturbances in this area occurring prior to 1950.

Existing Surface and Subsurface Facilities and Features. Other than the surface facilities directly associated with the Horizon Mine, no buildings are located in and within 1000 feet of the permit area. Furthermore, no major electric transmission lines, pipelines, or agricultural drainage tile fields exist within, passing through, or passing over the permit area.

Prior to construction of the Horizon Mine surface facilities, a public road, and some old concrete foundations existed within the current disturbed area. However, no intact buildings were present within the current disturbed area.

Landowner, Right-of-Entry, and Public Interest. Plates 4-1 and 4-2 of Chapter 4 show the boundaries of lands and the names of present owners of record of surface lands and subsurface coal, respectively, included in or contiguous to the permit area. Horizon has a legal right to enter and conduct coal mining operations on all of the lands within the permit area, as noted in Chapter 2 of this M&RP and the Appendices 2-1 and 2-3.

Mining Sequence and Planned Subsidence. The mine plan for the Horizon Mine is presented on Plate 3-3. No surface disturbances are currently anticipated within the permit area beyond that presented in this M&RP (i.e., within the disturbed-area boundary noted on Plate 3-1). Planned-subsidence mining methods will be used in all of the underground mine workings shown on Plate 3-3. A buffer zone of one hundred feet is planned along the Beaver Creek where no subsidence is planned. A line delineating the angle of draw from subsidence is shown on Plate 3-3. No subsidence causing mining methods will be practiced in the area between the angle of draw line and the Beaver Creek.

Subsidence Protection. The Beaver Creek is a perennial stream. Subsidence protection is planned for this stream. This protection will be accomplished by developing pillar centers on no less than seventy foot centers (70 foot by 70 foot undeveloped pillar projections) by driving twenty foot wide entries a fifty foot square pillar will remain. This calculates to an extraction ratio of approximately fifty percent by area. The remaining support coal should never be less than 48%.

If support pillars have been developed on larger than seventy foot centers, secondary extraction (i.e. slabbing) may be practiced. In all instances the coal pillar remaining will be at least fifty percent of the developed centers. There will not be any full extraction of coal pillars in the 100 foot buffer zone and the area delineated by the angle of draw line and the Beaver Creek.

Land Surface Configuration. Surface contours of undisturbed areas adjacent to disturbed areas associated with the mine are shown on Plate 3-1. As previously stated, surface disturbances associated with mining have been in existence in the area since the mid-1920s. As a result, pre-mining topographic maps do not exist. However, the surface contours in undisturbed areas shown on Plate 3-1 are considered generally indicative of original land slopes in the vicinity of the mine.

A map showing topographic conditions prior to disturbance by Horizon is provided as Plate 3-6.

Certification. Where required by the regulations, cross sections and maps in this permit application have been prepared by or under the direction of, and certified by, qualified registered professional engineers or land surveyors. As appropriate, these persons were assisted by experts in the fields of hydrology, geology, biology, etc.

Previously Mined Areas. A certified map showing the location of previously mined areas within the permit and adjacent areas is provided as Plates 3-9 and 3-10.

3.2.1 Site Selection and Preparation

Roads and pads that will be constructed in support of the mine will be constructed with a cut and fill technique. Topsoil resources will be conserved as outlined in Chapter 8. The surface facilities will be on privately owned surface.

3.2.2 Mine Portals

See Section 3.3.1.2 for mine portal descriptions. Portal locations are noted on Plate 3-1.

3.2.3 Surface Buildings and Structures

Locations of proposed surface buildings and structures are shown on Plate 3-1. Upon termination of mining operations, all structures will be removed and the area reclaimed as outlined in Section 3.5.

Surface Facilities. Plate 3-1 shows the locations of the following surface facilities:

- Buildings, utility corridors, and facilities to be used, including:

  Water Tank - one metal tank on concrete pad,
  Fueling Station - metal tank and containment structure with fueling equipment,
  Storage Building - portable building, to be used above ground or underground,
  Transformer - portable, to be used above ground or underground,
  Portals - see Section 3.3.1.2,
  Conveyor - see subsequent portions of this Section,
  Fan - metal structure containing a fan,
  Substation - metal structure sitting on gravel and concrete pad,
  Roads - see Section 3.2.3.300,
  Sedimentation Pond - see Chapter 7,
  Temporary Office Trailer - mobile trailer,
  ~~Proposed Office and Bath House - block and/or metal building on concrete pad.~~
  ~~Proposed Shop - block and/or metal building on concrete pad~~Temporary Bath House Trailer - mobile trailer,
  Parking Areas - soil pads,
  Storage Areas - soil pads,
  ~~Proposed~~ Crusher and Screen - metal structure on concrete pad/footings,
  Emergency Escapeway - corrugated metal,
  Dumpster(s) - metal, contractor owned,

- The area of disturbance at the mine mouth,

- Coal storage and loading facilities, and

- The explosive storage and handling facility, which includes approved explosive magazine(s).

Drainage facilities are shown on Plate 7-4, including the site sedimentation pond, culverts, and ditches.

Cross sections of the surface facilities are provided on Plate 3-2. The disturbed area shown on Plate 3-1 is the same as the land area for which a performance bond or other guarantee has been posted.

Transportation Facilities. Roads that have been constructed, used, or maintained by Horizon in the permit area for the mining and reclamation operations are shown on Plate 3-1. No rail systems or overland conveyor systems (other than the material-handling conveyors in the mine yard) will be associated with the permit area. Drainage structures associated with the roads are discussed in Chapter 7 of this M&RP. Typical cross sections of the primary roads are provided on Plate 3-4.

Two material handling conveyors exist on the surface at the mine site. As noted on Plate 3-1, the mine belt will transport coal from the mine to the stacker belt which will convey the coal to the coal stockpile/coal storage area, from which the coal will be loaded into trucks for off-site transport. These conveyors will be of sufficient size to handle the production levels coming from the mine and the anticipated truck loading rates.

The ash analyzer determines the potential quantity of ash content in coal passing through the conveyor. The analyzer relays a signal to a computerized conveyor system. The conveyor system controls three coal drops chutes, either allowing coal to be dropped in one, two, or three stockpile locations within the disturbed area boundary. The location of the drops and analyzer are shown on Plate 3-1.

Surface Facilities. Underground development waste which is generated at the Horizon Mine will be disposed of underground within the Horizon Mine prior to bringing the waste to the surface.

Should it become necessary to bring underground development waste to the surface, a permanent stockpile will be permitted.

A map of the existing topography prior to disturbance by Horizon is provided as Plate 3-6. No areas of pre-Horizon disturbance shown on Plate 3-6 are subject to the requirements of R645-200 through R645-203.

The location of the sedimentation pond is noted on Plate 3-1. No water treatment facilities will exist at the site other than the sedimentation pond.

The following facilities or activities will not exist or occur within the permit area:

- Coal preparation plant,
- Coal cleaning,
- Coal processing waste banks, dams, or embankments,
- Disposal of non-coal (non-waste rock) waste other than durable rock-type construction materials such as cinder block, and
- Air pollution control facilities.

Hence, certified maps or cross sections of these facilities are not provided in this plan. The durable rock-type construction materials will be disposed of in underground workings within the Horizon Mine without bringing this waste to the surface or at a permitted off-site solid-waste landfill.

Surface Configurations. Certified maps and cross sections showing the proposed final (post-reclamation) surface configuration of the Horizon disturbed area are provided on Plates 3-7 and 3-7A, respectively.

3.2.3.1 Plans and Engineering Designs

All plans and engineering designs presented in this M&RP were prepared by or under the direction of and certified by a qualified registered professional engineer.

Excess Spoil. No excess spoil (R645-100-200)will be generated from the permit area.

Durable Rock Fills. No durable rock fills will exist in the permit area.

Coal Mine Waste. No coal mine waste disposal facilities will exist on the surface in the permit area.

Impoundments. The only impoundment to be constructed for the mining and reclamation operation will consist of the sedimentation pond (see Plate 3-1 and Chapter 7). This impoundment has been designed under the direction of a professional engineer using current, prudent, engineering practices. These designs were certified by a qualified registered professional engineer.

Primary Roads. The design and construction of the primary roads associated with the mine have been certified by a professional engineer as meeting the requirements of R645-301-534.200 and R645-301-742.420 (see Plate 3-4).

Variance From Approximate Original Contour. No variance from the approximate original contour requirements of the regulations is being requested in this M&RP.

3.2.3.2 Utility Installation and Support Facilities

Utility Installations. All coal mining and reclamation operations will be conducted to minimize damage, destruction, or disruption of services provided by electric lines, telephone transmission stations, water lines, and sewer lines which pass over, under, or through the permit area. Areas where these utilities will be located are within non-subsidence zones. No other utility installations exist in the permit area. All utility installations associated with the Horizon Mine will be removed following mining in accordance with the reclamation plan discussed in Section 3.5 of this M&RP.

Support Facilities. Support facilities at the Horizon Mine will be operated in accordance with the permit issued for the mine. Support facilities will be located, maintained, and used in a manner that:

- Prevents or controls erosion and siltation, water pollution, and damage to public or private property;

- To the extent possible, using the best technology currently available, minimizes damage to fish, wildlife, and related environmental values; and

- Minimizes additional contributions of suspended solids to stream flow or runoff outside the permit area.

All support facilities will be removed following mining in accordance with the reclamation plan discussed in Section 3.5 of this M&RP.

Water Pollution Control Facilities. Water pollution control facilities at the Horizon Mine consist of the sedimentation pond and the appurtenant structures associated with the sedimentation pond. All water pollution control facilities will be removed following mining in accordance with the reclamation plan discussed in Section 3.5 of this M&RP. The sedimentation pond and appurtenant structures were constructed as discussed in Chapter 7.

3.2.3.3 Road Classification

Primary roads within the disturbed area include the lower haul road loop and the upper pad road. No ancillary roads exist within the disturbed area. The locations of these roads are shown on Plates 3-1 and 3-4. Typical cross sections representing these roads are shown on Plate 3-4.

The unimproved dirt roads outside of the disturbed area but within the permit area will not be classified. They may be used by Horizon for access to the lease area surfaces for the collection of monitoring data (environmental and subsidence data) as well as other uses deemed appropriate by Horizon and as allowed by the associated landowner.

3.2.3.4 Description of Transportation Facilities

No surface conveyors (other than those in the mine yard immediately adjacent to the portals) or rail systems will be constructed, used, or maintained within the permit area. A description of the conveyor systems that will be used in the mine yard is provided in this M&RP.

Road Specifications. Cross sections of roads that will be used or maintained by Horizon are provided on Plate 3-4. This plate provides information regarding road widths, gradients, surfaces, etc. Information regarding road drainage structures is presented in Chapter 7.

The road which will access the mine is the Beaver Creek county road that extends from Consumers Road to the town of Clear Creek. Letters from Carbon County regarding the use of both Beaver Creek Road and Consumers Road are provided in Appendix 3-1. As indicated in this appendix, these roads will be maintained by Carbon County. Carbon County has determined that "the interests of the public and affected landowners will be protected" even though mining and reclamation activities are planned within 100 feet of the road.

From the southern boundary of the permit area, the Consumers Road extends eastward approximately 11.5 miles, ending at U.S. Highway 6 south of Helper. The western 8.5 miles of Consumers Road between the permit area and U.S. Highway 6 is gravel surfaced, while the eastern 3 miles is paved.

Drainageway Alterations. Alterations of Jewkes Creek and Portal Canyon creek were installed to accommodate the needs of facility pads and transportation systems. These alterations consisted of installation of culverts beneath the pad areas along both creeks. Additional information regarding the design of these culverts is presented in Chapter 7 of this M&RP.

Installation of these culverts provided several advantages, including: allowing coal haulage trucks to efficiently enter and leave the surface facilities area, protecting the streams from coal fines and sediment which may be generated on the adjacent disturbed areas, providing space for equipment and material storage, and providing a location for snow to be stacked away from the operations area during winter months. Snow is to be stored in sites that will drain directly to the sedimentation pond.

Carbon County upgraded Beaver Creek County Road during a time that was coincident with the construction of the Horizon Mine surface facilities. The county deemed this upgrade necessary to accommodate not only the anticipated traffic at the mine, but also the logging and ranching operations up the canyon that were not associated with mining. To accommodate this upgrade, the County realigned the lower reach of Jewkes Creek, between the mine and Consumers Road. This alteration of Jewkes Creek was implemented by Carbon County, Hidden Splendor Resources and was not the responsibility of Horizon.

Road Maintenance. Beaver Creek Road which accesses the disturbed area is owned and will be maintained by Carbon County. In the event of a catastrophic event that causes damage to Beaver Creek Road or Consumers Road, Horizon will cooperate with the County to promote rapid repair of the affected road as soon as practical following the catastrophic damage. For all primary roads within the permit area that are not owned by the county, Horizon will itself repair the road (or cause it to be repaired) as soon as practical following the catastrophic damage.

The roads within the surface-facilities area will be maintained by Horizon as necessary to permit access to the respective facilities. The remaining roads in the permit area are unimproved dirt roads. Horizon will cooperate with and assist the respective land or right-of-way owners in the maintenance of these roads as required to permit access for environmental monitoring and subsidence surveying.

3.2.3.5 Refuse Piles

No refuse piles will exist in the permit area.

3.2.3.6 Coal Mine Waste

Coal mine waste resulting from mining activities at the Horizon Mine will be handled as outlined in this section and previously in this M&RP.

Waste Emplacement. Underground Development Waste (UNDW) will be disposed of in underground workings.

Excess Spoil Fills. No excess spoil (R645-100-200) fills will exist in the permit area.

Impounding Structures Constructed of Coal Mine Waste. No impounding structures will be constructed of coal mine waste in the permit area.

Disposal of Coal Mine Waste in Special Areas. As indicated previously, coal mine underground development waste generated at the Horizon Mine will be disposed of in underground workings within the permit area. MSHA inspectors have verified the storage of underground development waste meet safety requirements per 30 CFR 75.304, 305, 329, 330, 400, and 1711 and will inspect future storage. The source of this material will be UNDW resulting from partings and splits in the coal seam. As indicated in Chapter 6, neither acid- nor toxic-forming materials are present in the overburden, underburden, or coal (i.e., the material that will comprise the UNDW that will be generated from the Horizon Mine).
The UNDW which will be stowed underground will be backfilled into dead-end panels primarily near the outer extent of the area to be mined. Backfilling will occur prior to second mining to ensure that adequate roof support exists in the area. No influence on the active mining operation is anticipated from the backfilling process.

The underground development waste to be disposed of underground will be transported to the backfill area by mine haulage equipment and will be in an unsaturated condition. Hence, underground retaining walls to prevent seepage of the material into the mine workings will not be necessary.

After second mining, the roof will collapse, causing the UNDW rock in the mine to compact. Because the UNDW will be emplaced primarily in dead-end panels near the outer extent of the area to be mined, the surface effect of the backfilling operation will be to reduce the surface expression of subsidence in an area where subsidence will already be minimal. Hence, subsidence over the permit area in general will still occur uniformly.

As noted previously, the UNDW will be emplaced in an unsaturated condition using mine haulage equipment. Hydraulic transport media will not be used to emplace the material. As a result, the UNDW will not require dewatering, construction of barriers to retain water underground which might drain from the waste, or treatment of water from the waste which might be discharge to surface streams. Hence, no impacts on the hydrologic regime are anticipated due to disposal of the underground development waste in the underground workings.

Underground Development Waste. No underground development waste will be disposed of on the surface in the permit area.

Coal Processing Waste. No coal processing waste will be generated within the permit area.

Coal Processing Waste Banks, Dams, and Embankments. No coal processing waste banks, dams, or embankments will exist within the permit area.

Refuse Piles. No coal mine waste will be disposed of on the surface in the permit area.

Sediment Pond and Ditch Clean-out Material. Materials removed during the cleaning of both the surface ditches and the sediment pond will be placed in the areas designated on Plate 3-1 or disposed of at a State-approved solid waste disposal area. The materials associated with the clean-out should be clean and not degrade surface or underground water. Collectively the designated areas will store approximately 260 cubic yards. If the need arises, the clean-out material will be sampled and tested according to R645-301-233 and if found acceptable will be used as substitute topsoil or fill material.

The material stockpile behind the substation will contain 150 cubic yards and the stockpile behind the fan will contain 110 cubic yards. The stockpiles will have 2:1 slopes and the material in the stockpiles will be seeded in the Fall of 2000.

The material will be routinely compacted and a berm will be constructed around the perimeter of the pile to retain the soil within the storage area. Operation of the storage site will be conducted in accordance with all Utah and Federal Regulations

The Sediment Pond has been designed and certified and the pond will be cleaned out as discussed in Chapter 7.

3.2.3.7 Management of Mine Openings

Locations of the Hiawatha seam portals are shown on Plate 3-1. One of these openings serves as primary pathway for ingress and egress of personnel and machinery, one serves as a beltway for removal of coal from the mine, and one is used for mine ventilation.

Each underground mine opening will be protected from deterioration through the installation of steel sets and timbers. Concrete and liner plate steel may also be used.

Any portals which become temporarily inactive in the permit area, but have a further projected useful service, will be protected through the installation of a lockable chain-link gate to prevent unauthorized entry. Warning signs will be posted to identify the hazardous nature of the opening.

These protection and warning devices will be periodically inspected and maintained in good operating condition during the period of temporary inactivity.

3.2.3.8 Mine Structures and Facilities

Pre-Existing Structures. No intact buildings existed within the current disturbed area at the mine surface at the time construction was begun on the Horizon Mine.

As indicated on Plate 3-1, the Beaver Creek county road extending from Consumers Road to the town of Clear Creek (i.e., Beaver Creek Road) runs along the west edge of the disturbed area. Those operations to be conducted within 100 feet of this public road include construction and operation of the sedimentation pond, storage and loading of coal for off-site transport, and storage of materials, snow, or equipment. The owners of the land adjacent to the disturbed area is Hidden Splendor Resources (see Figure 4-1). The interests of the public and the landowners will be protected by:

- Complying with the requirements of the surface land lease.
- Conducting the mining and reclamation operations in compliance with the permit issued by the State of Utah.
- Maintaining a berm along the west edge of the sedimentation pond to minimize the potential for inadvertent entry into the pond.

Mine-Related Structures. Generally, all mine surface facilities are located within or in close proximity to the associated operations areas. Future building construction will generally involve grading and preparation of foundation areas, excavation and installation of foundations, building erection, interior and exterior finish work, and connection of utilities. Storage areas will generally be open graded, providing outside storage for large supplies. Both building sites and storage areas will be graded to ensure effective drainage to disturbed-area ditches and culverts as noted on Plate 7-5. Operation and maintenance of support structures and facilities at the Horizon Mine will involve regular grading of facility areas, together with inspection, cleaning, and repairs as required.

General refuse that is generated on site will be stored in a dumpster(s) to be situated at a convenient location within the disturbed area. This waste will consist predominantly of old brattice cloth, ventilation tubing, broken timbers, wire, broken machinery parts, paper, cardboard, and miscellaneous garbage. This non-hazardous, non-toxic, non-coal, non-waste rock refuse will be disposed of periodically through Carbon County at a state-approved landfill.

During site construction, operation, and reclamation activities, any spilled petroleum products such as grease, hydraulic fluid, fuel, oil, joint coating, or other pollutants will be removed immediately with the associated contaminated soil and disposed of at a state-approved facility that is permitted to receive such waste. Adequate spill collection materials (including absorbents to stop or contain contaminants that may enter a stream) will be readily available at the site during these activities to contain any such spills.

During construction and other activities at the site, wet concrete will not be allowed to enter or come into contact with stream flows. Any water at the site which is contaminated with wet concrete or other contaminants will not be discharged into stream channels. Concrete trucks and other equipment used in the mixing and placement of concrete will be washed in areas well away from stream channels.

3.2.4 Coal Handling

Coal will be brought out of the mine by conveyor. The coal stream passes under an ash analyzer to determine the potential quantity of ash content of the mined coal. The surface conveyor system consists of three (3) drop points. Points #1 and #3 are manual and Point #2 is controlled by a computerized signal from the ash analyzer. The coal flow can be dropped at Points 1, 2 or 3 at the stockpile locations within the disturbed area boundary. The coal discharged into the stockpile will be blended by the use of a front-end loader by bucket loads or by the stacking belt into the trucks. The location of the drops and the ash analyzer are shown on Plate 3-1.

3.2.5 Power System

The power obtained from Utah Power and Light Company will reach Portal Canyon substation by way of a transmission line which runs along County Road 290 then along Jewkes Canyon on the east side to the substation. The location of the power line and substation are shown on Plate 3-1. See Chapter 10 for a discussion of raptor safe power lines.

3.2.6 Water Supply

Water for non-culinary use will be stored in a tank/pond within the disturbed area.

3.2.7 Sewage System

Chemical toilets will be used during initial development, construction, and operation of the mine. A service contract will be entered for maintenance of the chemical toilets and disposal of waste therefrom. Additional sewage facilities required for normal operation of the mine (after development) will be designed in accordance with UDH regulations. Plans for sewage facilities will be submitted for review and approval by UDH prior to construction of said facilities. It is anticipated that sewage facilities will consist of a collection system and holding tank.

3.2.8 Water Diversion Structures

Diversions will be installed to direct disturbed-area runoff to sediment-control structures and/or facilities. Runoff from undisturbed areas will be diverted away from the disturbed areas to the extent practical. Detailed discussions of the design of diversion structures are provided in Chapter 7.

3.2.9 Sedimentation Control Structures and Water Treatment Facilities

All runoff from the disturbed area is directed into the sedimentation pond located directly below the area of disturbance. The pond has been designed to contain runoff resulting from the 10-year, 24-hour precipitation event. The pond spillway has been designed to safely pass the peak flow resulting from a 25-year, 6-hour precipitation event.

The location of the pond is shown on Plate 3-1. Design, construction, maintenance and operation of the pond are discussed in detail in Section 7.2.3.2.

3.2.10 Transportation

Coal will be transported from the mine via a conveyor and discharged onto the coal storage area. Coal handling is discussed in Section 3.2.4. Transportation to and from the mine site (coal, personnel, and materials) is discussed in Sections 3.2.3.300 and 3.2.3.400.

3.2.11 Total Area for Surface Disturbance During Permit Term

See Section 2.117 for the acreage of the proposed surface-disturbance.

3.2.12 Additional Areas for Surface Disturbance for Life of Mine

There are no plans to disturb any additional surface area for the life of the operation beyond that to be initially disturbed.

3.2.13 Detailed Construction Schedule

Much of the area to be included in the surface facilities has been previously disturbed. Construction of the surface facilities is planned to begin when the permit is approved. Details for construction of the sediment pond are found in Chapter 7. A detailed reclamation schedule is presented in Section 3.5.

3.3 Operation Plan

In the Horizon Mine coal will be extracted using continuous miners, loaded into shuttle cars, and hauled to an underground feeder breaker. The feeder breaker will reduce the coal to an appropriate size, after which the coal will be fed onto a conveyor to be carried to the Coal from the storage pile will be loaded onto coal trucks.

Details of the groundwater monitoring program are presented in Chapter 7.

The coal from the Horizon Mine will be sold on a run-of-mine basis, not washed. Coal of differing degrees of quality will be shipped to the coal terminal and blended to be sold. Coal to be sold by Horizon will comply with the definition in R645-100 of the State of Utah Coal Mining Rules "combutible carbonaceous rock, classified as anthracite, bituminous, subbituminous, or lignite by ASTM Standard D388-95. Appendix 3-10 includes a table with ASTM classifications and their corresponding characteristics.

Underground development waste and coal mine waste are discussed in Section 3.2.3. No impacts on the hydrologic regime are anticipated due to disposal of the underground development waste in the underground workings.

No underground development waste will be brought to the surface or will haulage occur from the Horizon Mine until the specific on or off-site facility has been approved by the Division to accept the underground development waste from the Horizon Mine.

3.3.1 Mining Plans

All mining and reclamation operations will be conducted in accordance with the approved permit and the requirements of R645-301-510 through R645-301-553.

Mining plans for the term of the proposed permit are shown on Plate 3-3. This map and Plates 3-9 and 3-10 show the location and extent of known, existing, adjacent workings as well as projections for mining within the Horizon Mine. Cross-sections, drill hole elevations, coal seam and overburden stratigraphy, and other geologic data are addressed in Chapter 6. A mine workings map will be kept current from the time of opening. These updated maps will be supplied to the Division yearly or when requested.

Horizon plans to mine coal from coal lands that are a combination of fee simple and federal coal leases. Horizon controls the fee simple land under a mining lease with Hidden Splendor Resources, Ltd. Two actions have been filed with the U.S. Department of Interior, Bureau of Land Management (BLM) to secure mining rights on federal coal lands within Horizon's projected mine plan. The first action, a BLM right-of-way will enable Horizon to commence mining with approximately 1 year of reserves. The second action, an Application for Coal Lease will enable Horizon to lease coal reserves that will serve for years of mining.

<u>Right-of-Way Application, UPU-73227, Bureau of Land Management</u>

On June 16, 1995 Horizon filed a Right-of-Way application with the BLM. The right-of-way would allow underground access to the segmented fee simple land parcels controlled by Horizon. The BLM was prepared to issue the Right-of-Way on January 22, 1996 when Horizon asked the BLM to hold approval pending an amendment. The amendment filed on January 30, 1996 states "the results of the exploration program conducted by Horizon in the Fall of 1995 under Federal Coal Exploration License UPU-74111 have condemned the economic feasibility of mining the Castlegate seam. However, the exploration confirmed that the Hiawatha coal seam development is a feasible project. The original proposed course of the underground workings portrayed in the application applied to development of the Castlegate seam. The revised application reflects a course for the right-of-way suitable for mining the Hiawatha seam". The lands for the right-of-way are included within the permit boundary of this Mine Permit Application. The BLM issue the Right-of-Way in April of 1996 Appendix 2-3).

Coal Lease Application UPU-74804, Bureau of Land Management

On August 16, 1995, Horizon Coal Corporation filed a Coal Lease Application at the Utah State Office of the Bureau of Land Management. The application for coal lands containing 1,288.49 acres was approved on September 1, 1998. The Beaver Creek Tract coal lease UTU-74804 is included in Appendix 2-1. The data presented in the Environmental Assessment submitted to the Bureau of Land Management is included as Appendix 2-6.

Horizon was issued a Right-of-Way through BLM lands in 1996 to facilitate mining coal from fee lands. The Right-of-Way was incorporated into the Beaver Creek Tract coal lease UTU-74804 on September 1, 1998. HSR stipulates that it will mine only fee coal and federal coal within the approved lease as included in the legal description in Chapter 2. HSR began operations on the lease in August, 2003 and projects mining to continue on the lands for the duration of this permit term.

3.3.1.1 Orientation and Multiple Seam Considerations

Seam separation in the area ranges from approximately 150 feet to 230 feet. With this distance and land structure indicated by drill logs, it is considered neither necessary nor feasible to columnize these workings.

3.3.1.2 Portals, Shafts, and Slopes

There will be four portals in the Hiawatha seam. The return portal (existing rock slope) will be rehabilitated and expanded for use as the primary return. A second and third portal will be faced up and new rock slopes (300 feet long) will be driven to the Hiawatha seam. These two new slopes will serve as the belt/material slope and the fan portal respectively. The fourth portal is a rehabilitated slope used as a secondary escapeway. The secondary escapeway is located at the Castlegate A Seam horizon but connects to the Hiawatha Seam by a steeply inclined rock slope. The locations of the portals can be seen on Plate 3-1.

3.3.1.3 Mining Methods, Room and Pillar, Longwall

All mining will be done with a continuous miner/shuttle car haulage. In second-mining, a standard room-and-pillar method will be used to maximize coal recovery. Recovery within a room-and-pillar panel is estimated to be about 60 percent. Longwall mining is not planned. Pillar extraction plans are found in Appendix 3-2.

3.3.1.4 Projected Mine Development, Mains, Sub-Mains, Panels, Etc.

All entries, mains, and panels, will consist of a multiple system on various centers. Room and pillar panels will be driven off the mains. Additional rooms will be driven to widen the panels during retreat mining. Barrier pillars will be left to separate panels and mains. The mains will be pulled upon final retreat of the mining operation. Safety factors for roof conditions using uniaxial compression data are presented in Appendix 3-3.

3.3.1.5 Retreat Mining

Room and pillars are laid out so that pillar cuts can be extracted with a full cut of a continuous miner using radio remote control. The pillar is extracted with successive cuts by the continuous miner. Timbers will be installed to support the roof and provide roof breaker control. It is estimated that mining will provide a recovery rate of 60 percent.

3.3.1.6 Roof Control, Ventilation, Water Systems, Dust Suppression, Dewatering, Electrical

An approval of the Roof Control, Ventilation, and Dust Control Plans will be obtained from the appropriate regulatory agency.

An assessment of groundwater conditions within the Mine can be found in Chapter 7. Dewatering plans will be developed should it become necessary.

3.3.2 Barrier Pillars

Protective barrier pillars will be utilized where necessary, normally ranging from 100 feet to 300 feet in width, depending on the depth of cover and the purpose of the barrier. Barrier pillars will be left on either side of the main entries. Barrier pillars in the mains will be extracted on final retreat.

3.3.2.1 Protection of Oil and Gas Wells

There are no oil or gas wells in this area.

3.3.2.2 Protection of Surface Structures and Streams

No surface structures exist within the zone of potential subsidence.

Stream buffer zones (100 feet each side of creek) will be maintained beneath Beaver Creek and the North Fork of Gordon Creek should mining proceed beneath either creek. Full pillar extraction will not be practiced within these buffer zones or under raptor nests without regulatory agency permission.

3.3.2.3 Property Boundaries

A protective barrier pillar with a width of approximately 80 to 100 feet will be left at all property boundaries.

3.3.2.4 Outcrop Protection

A protective barrier pillar with a width of approximately 100 feet will be left when advancing toward or along an outcrop.

3.3.2.5 Other

At any time a land slide occurs which may have an adverse effect on public property, health, safety, or the environment, the Division will be notified by the fastest available means. Horizon commits to complying with remedial measures required by the Division.

As part of the operations plan, a facilities pad will be constructed from available on-site materials. On-site materials include the embankment located at the mouth of Portal Canyon. Test pits indicate that some of the material contained in the embankment is comprised of coal and coal mine waste. It is estimated that 2500 CY of coal and coal mine waste may be contained in the embankment. This material will be removed from the embankment, placed in the facilities pad area, and covered with at least four feet of appropriate backfill material. To accomplish this task, the pad area will first be stripped of vegetation and topsoil as described in Section 8.7. The appropriate cuts of overburden will be made to achieve the rough grade. The coal and coal mine waste will then be placed in the fill areas and covered with four feet of backfill.

A potential storage volume of approximately 2740 for the coal and coal mine waste was calculated from the cross-sections illustrated on Plates 3-1 and 3-2. Appendix 3-8 contains a plate showing approximate locations of buried coal mine waste.

The Portal Canyon facilities pad will be built with 4 feet of acceptable backfill covering any coal or coal mine waste materials. No coal or coal mine waste will be used as fill in the areas planned for the reclamation stream channels in Portal or Jewkes Canyon.

3.3.2.6 Underground Development Waste

See Section 3.3.

3.3.2.7 Return of Coal Processing Waste to Underground

There is no plan to return coal processing waste to the underground.

3.3.3 Conservation of Coal Resource

The maximum quantity of coal will be extracted that is consistent with safe operation of the mine and the mining methods to be employed. Engineering, production, and supervision of mining activities will be geared toward this end. If plans for resource recovery or abandonment (including portal sealing) change in the future, the U.S. Bureau of Land Management and the Division will be properly informed.

3.3.3.1 Projected Maximum Recovery

Coal reserves within the permit area are summarized below. Recoverable reserves were estimated using a recovery rate of 60 percent of the mineable reserve base.

Area	Hiawatha Seam (million tons)		
	Total	Mineable	Recoverable
Original Permit Boundary	1.3	1.3	0.8
2000 Revised Permit Boundary	4.1	2.1	1.3
Remaining Coal Lease UTU-74804	8.45	8.31	4.95
Total	13.85	11.71	7.05

3.3.3.2 Justification for Non-recovery

All coal that can economically and safely be recovered will be recovered. Barrier pillars and buffer zones will be left only where required to protect surface resources, provide safe mining conditions, and as required by law or regulation.

3.3.3.3 Access for Future Reserves

Access to additional reserves will depend upon the results of exploration activities and obtaining leases. However, it is currently anticipated that the mine workings contemplated by this plan will provide access to reserves in Sections 6, 7, 8, and 18, T13S R8E.

3.3.4 Equipment Selection

Major equipment to be used underground will include the following:

2 - Continuous Miner
3 - Roof Bolter RD1-43
6 - Shuttle Cars
2 - Feeder Breaker
3 - Scoop
1 - Compressor
2 - Rock Dusters
5 - Conveyor Drives & Tail Pieces
3 - Drop Chutes
1 - Ash Analyzer
1 - Dust Wagon
1 - Power Center
3 - Transformers
2 - Pumps

1 - Substation

Major equipment to be used on the surface will include the following:

1 - Grader
1 - Loader
1 - Material Tractor
1 - Welder
3 - Flatbed Material Trailers

3.3.5 Mine Safety, Fire Protection, and Security Mine Safety

The mine will be operated in accordance with Mine Safety and Health Administration (MSHA) and applicable State of Utah regulations. Safety training will be taught and policies implemented for a safe operation.

Fire Protection

All surface and underground equipment will be provided with MSHA-required fire protection. In addition, belt drives will be equipped with deluge systems for fire protection. Water lines will also be equipped with outlets and fire hoses at regular intervals. Should a mine waste fire occur, it will be extinguished using water, extinguishers, rock dust, foam, or by sealing off the fire. Mine personnel will be trained in the use of fire-fighting techniques.

There will be no open burning on the surface. All garbage will be contained in dumpsters and hauled to the Carbon County Landfill. If flammable waste materials (oil, etc.) are generated, these will be disposed of in accordance with regulations promulgated by the Utah Division of Solid and Hazardous Waste. Disposal methods and locations will be determined based on the characteristics of the flammable waste.

Impoundment Hazards

Impoundment hazards will be reported promptly to the Division and the emergency procedures formulated for public protection and remedial action.

Security

Mine portals will be signed and covered by locked gates when the mine is in cessation.

3.3.5.1 Signs

Specifications

All signs will be of a standard design that can be seen and read easily. They will be made of a durable material (treated/painted wood or metal) and supported by metal or wooden posts.

Identification Signs

Mine identification signs will be placed at the entrance to the mine yard. Signs will show the mine name, company name, business address, telephone number, ID Number, and Permit Number. These signs will be maintained until bond release following reclamation. Typical mine identification signs are presented as Figures 3-3 And 3-4.

Disturbed Area Perimeter and Buffer Zone Markers

Disturbed area perimeter markers will be steel fence posts. The posts will carry signs at selected points, with the designation "Disturbed Area Perimeter Marker" (see Figure 3-4).

Blasting Signs

When preparing to blast, "Blasting" signs will be placed along the edge of any blasting area that comes within 100 feet of any public road right-of-way, and at the point where any other road provides access to the blasting area. In addition a sign which states "Warning, Explosives in Use" which describes the audible blast warning, all clear signs and markings associated with the blasting area will be placed at the entrance(s) to the permit area from public roads or highways.

Topsoil Markers

Topsoil will be stored on the mine site at the location noted on Plate 3-1. Topsoil storage piles and topsoil layered on interim reclamation slopes will be marked with signs as shown on Figure 3-4 as "topsoil storage areas".

3.3.5.2 Fences and Gates

Mine portals will be signed and covered by locked gates when the mine is in cessation.

3.3.5.3 Fire Protection

Facilities

All facilities will be equipped with fire extinguishers. Water outlets and fire hoses will be available at specific locations.

Coal Stockpiles

The coal stockpile will be temporary and will be loaded out at frequent intervals, thus reducing the potential for spontaneous combustion.

Coal Seam

No open burning will be allowed at the mine. All coal outcrops resulting from mining will be covered with incombustible material upon cessation of operations, as discussed in Section 3.5.

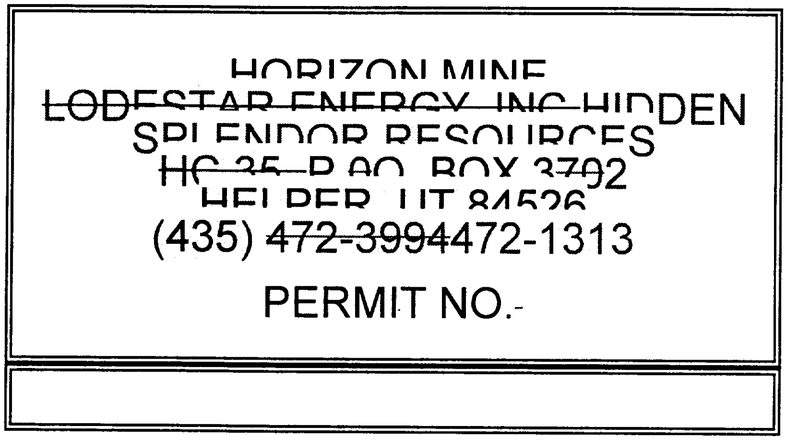

FIGURE 3-3. MINE IDENTIFICATION SIGN.

HORIZON MINE
STREAM BUFFER ZONE

18" X 12"

HORIZON MINE
BUFFER ZONE
DO NOT DISTURB

18" X 12"

HORIZON MINE
TOPSOIL STORAGE
DO NOT DISTURB

18" X 12"

HORIZON MINE
DISTURBED AREA
PERIMETER
MARKER

8" X 12"

FIGURE 3-4. IDENTIFICATION SIGNS.

3.3.5.4 Explosives

Any explosives utilized in underground operations will be used in compliance with applicable State and Federal laws. Explosives will be handled and used only by persons trained, examined, and certified as required by 30 CFR 850 and the Utah State Industrial Commission. Explosives will be stored in a facility designed for their containment and safety.

Mining and reclamation activities at the Mine may require the use of blasting or explosives on the surface during construction or destruction of the surface facilities. Horizon will comply with all local, State, and Federal laws in the use of explosives at times when blasting is required at the Mine. A certified blaster will direct all blasting operations with the help of at least one other person who has been trained (R645-301-524.140). Blasting records will be maintained per R645-301-524.700 and kept on file at the Mine for the required period of time.

A preblasting design/survey will be submitted to UDOGM when blasting activities meet the following criteria:

- Blast requires the use of more than five pounds of blasting agent or explosive,
- Residents, dwellings or structures exist within a ½ mile radius of the area of potential blasting and owners of structures request a preblasting survey.

A schedule of blasting will be made in instances when the UDOGM regulations and conditions at the Mine require a schedule.

All explosives containers used at the mine will be constructed to meet or exceed the requirements of the Mine Safety and Health Administration. The locked surface storage containers (one for caps and one for powder) will be placed in a location that will ensure the protection of the environment and personnel (see Plate 3-1).

All underground blasting activities at the Mine will be conducted under the direction of a MSHA certified blaster.

3.3.5.5 Management of Mine Openings

Four portals will serve the Hiawatha seam. Two portals exist from previous mining. Two additional rock slopes will be driven to open the new mine. For each of these portals the faceup will be secured and canopies will be installed to meet MSHA standards.

During operation of the Horizon Mine, access to all mine openings are controlled by the operator during working and nonworking hours.

Permanent sealing of underground openings is discussed in Section 3.5.3.1.

3.3.6 Operations Schedule

3.3.6.1 Annual Production Per Year for Permit Term

Coal will be produced from the mine at an anticipated rate of approximately 700,000 tons per year. The production could increase to 1.5 million tons per year when federal coal leases are secured and if the market dictates.

3.3.6.2 Operations Schedule - Days - Shifts

Production will occur in two production shifts per day and a small crew will perform maintenance work and other non-production jobs on the off production shift.

3.3.6.4 Temporary Cessation

If operations are to be temporarily ceased for more than 30 days, Horizon will submit to the Division a notice of intention to cease or abandon the operations. In accordance with R645-301-529.210, each mine entry that has further projected useful service will be protected by barricades or other covering devices, fenced, and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices will be periodically inspected and maintained by Horizon.

3.3.7 Mine Permit Area

3.3.7.1 Acreage and Delineation of Mine Permit Area

See Chapter 2 for the total acreage contained within the mine permit boundary.

3.3.7.2 Projected Mining by Year

The projected mining by year is shown on Plate 3-3.

3.3.8 Mine Plan Area

Horizon plans to mine within the mine permit boundary as shown on Plate 1-1 until it permits the remaining area of coal lease UTU-74804. The remaining lease area is shown on Plate 3-3. The permit boundary will be modified to include this area when additional baseline groundwater data is available. Plans for mining beyond the permit term will be developed as additional information is acquired. No new areas will be mined until appropriate permits have been obtained from their corresponding regulatory agencies.

3.4 Environmental Protection

3.4.1 Preservation of Land Use

Upon completion of mining operations, final reclamation work will commence. Reclamation efforts will be directed to recreating the pre-mining land use. This will be achieved by use of acceptable seed mixtures. Refer to Chapter 4 for pre-mining land use information.

3.4.1.1 Projected Impacts of Mining on Current and Future Land-Use

Current and future land uses are discussed in Sections 4.4 and 4.5.

3.4.1.2 Control Measures to Mitigate Impacts

Full pillar extraction will not occur beneath the stream channels and raptor nests indicated on Plates 3-3 and 10-1 respectively. Based on the boundaries of the present surface disturbance, no public parks or historic sites will be impacted by mining operations. A further discussion of Cultural Resources may be found in Chapter 5.

3.4.2 Protection of Human Values

3.4.2.1 Projected Impacts of Mining on Human Values

As discussed in Chapter 5, no historical sites listed on the National Register of Historical Places are known to exist within the proposed disturbed areas. In addition, no known archaeological sites exist within the proposed disturbed area.

3.4.3 Protection of Hydrologic Balance

Horizon will employ various control measures to protect the hydrologic balance of the permit area and sedimentation controls will be provided for all disturbed areas.

Water rights on file with the Utah Division of Water Rights and located in the vicinity of the permit area are noted in Appendix 3-5. Should Horizon's mining activities cause an adverse impact on the area's water supply, the applicant intends to mitigate the effects (see Sections 3.4.8.2 and 7.1.6).

Diversions will be established to direct flow from disturbed areas to the sedimentation pond. If water is encountered during mining operations, this water will be used for underground operations when possible. An UPDES permit has been obtained for the mine (see Appendix 3-6). If the quantity of underground water encountered by mining exceeds the amount required for mining operations, discharges of water from underground workings will be monitored to ensure that effluent limitations are met.

3.4.3.1 Projected Impacts of Mining on Hydrologic Balance

The probable impacts of mining on surface or groundwater resources in the area are discussed in Chapter 7. Runoff-and sediment-control facilities within the disturbed area, together with coal buffer zones beneath Beaver Creek and North Fork of Gordon Creek, will preclude significant impacts to surface water in the area. Groundwater investigation and monitoring activities associated with the Hiawatha seam and its adjacent strata will continue, thus allowing a determination of the potential groundwater impacts of mining in the Hiawatha seam. A subsidence monitoring program (see Section 3.4.8) will provide a basis for determining possible impacts due to subsidence.

3.4.3.2 Control Measures to Mitigate Impacts and Monitoring Procedures

Horizon will maintain sedimentation control structures to prevent impacts to the surface waters in Jewkes Creek and the North Fork of Gordon Creek. In the event that the quantity of groundwater encountered during mining is in excess of underground requirements, the water will be settled first in underground sumps and then discharged to the surface. Any such discharges will be monitored in accordance with the UPDES permit.

Surface and groundwater monitoring programs have been or will be implemented to assess the impacts of mining operations at the Mine on hydrologic resources in the area. Details of these monitoring programs are presented in Chapter 7.

3.4.4 Preservation of Soil Resources and Projected Impacts of Mining on Soil Resources

Soil resource information for the mine area is presented in Chapter 8. Soil surveys were performed in the area in May 1980 and in January 1990. Naturally-occurring and presently-disturbed soils were delineated. The purposes of the surveys were to identify soils and their stripping depths for salvaging suitable natural soil prior to additional disturbance and to determine the amount of topsoil available for final reclamation.

Most of the existing disturbance at the mine occurred prior to enactment of P. L. 95-87 or the Utah Interim Program that set forth regulations for salvaging topsoil (i.e., pre-1950's disturbance). However, some topsoil exists along the shoulders of cut areas where it was not disturbed during previous construction activities.

During construction of surface facilities, available topsoil resources will be segregated and stockpiled as indicated in Chapter 8. In addition, presently-disturbed soils will be carefully handled to salvage as much soil as possible for potential future use as substitute topsoil materials.

3.4.4.1 Control Measures to Mitigate Impacts to Soil Resources

Surface disturbances will be limited to the disturbed area boundary noted on Plate 1-1. Topsoil that is stockpiled for future reclamation efforts will be vegetated with an interim cover to reduce erosion of the stockpile. All areas disturbed during mining activities will be reclaimed in accordance with the approved reclamation plan (see Section 3.5).

3.4.5 Protection of Vegetative Resources

3.4.5.1 Projected Impact of Mining on Vegetative Resources

Previous mining activities have resulted in alteration of natural vegetation at the site area. The majority of this area has been disturbed previously by mining operations.

3.4.5.2 Mitigation Measures to be Employed to Reduce Impacts on Vegetative Resources

All mining activities will be conducted within the proposed disturbed area. Traffic will be confined to established roadways and pads. Upon completion of mining, all areas which are disturbed by Horizon will be reclaimed as described in Section 3.5.3.

3.4.5.3 Monitoring Procedures - Reference Areas and Revegetation

Sections 3.5.5, 3.5.6 and 9.8 discuss the monitoring procedures and revegetation to be undertaken during mining and reclamation operations.

3.4.6 Protection of Fish and Wildlife

3.4.6.1 Potential Impacts on Fish and Wildlife

Potential impacts on fish and wildlife are discussed in Section 10.4.

3.4.6.2 Mitigation and Management Plans

Refer to Section 10.5 for mitigation and management plans.

3.4.6.3 Fish and Wildlife Monitoring

Monitoring is discussed in Section 10.5.

3.4.7 Protection of Air Quality

Air quality information for the area is presented in Chapter 11.

3.4.8 Subsidence Control and Monitoring Plan

3.4.8.1 Structures

A search of the site files at the Utah Division of State History turned up no recorded sites in, or near, the project area. Since the identified sites are abandoned homestead cabins or mining camp dwellings and are not recorded as warranting preservation efforts, no special mining techniques are deemed necessary for their protection. The archaeologic survey is described in detail under Chapter 5 of this plan.

At least 6 months prior to mining beneath an area, Horizon will notify all owners of overlying surface property (see Section 4.3.1).

3.4.8.2 Renewable Resources

Hydrologic and vegetative renewable resources exist within the permit area. One perennial stream, Beaver Creek, and various springs are known to exist above the area to be mined. Based on past experience and monitoring results from this area, it is not expected that mining will affect any surface hydrologic resource through subsidence.

Protection will be provided for the perennial stream in Section 3.2.

A depression of the groundwater table is expected around the active mine workings. A rebound of this water table will occur after active mining ceases and pumping activities have also ceased. This is witnessed in the water level in the Blue Blaze mine prior to the start of the Horizon Mine. Should a substantial inflow of groundwater occur, mitigation measures may include: attempts to seal off the inflow, increased monitoring efforts, lining of the stream bed through the affected area if it is determined to be surface water, and replacement of lost water if the groundwater does not rebound after mining is completed as indicated by monitoring.

An extended mitigation plan will be enacted should a measurable impact occur to surface water due to mining activity. The mitigation plan will be correlated with Water Rights and UDOGM.

The vegetation resource above the mining area consists of rangeland for stock and wildlife grazing and a limited timber resource. If subsidence should occur, the effects would be minimal, possibly resulting in some fractures or slight depressions. Thus, the effect upon vegetation resource would also be minimal. Should impacts to vegetation occur due to subsidence, mitigation measures may include: filling of fractures, regrading of broken areas, replanting degraded areas, and intensified monitoring.

3.4.8.3 Geologic Hazards

Geologic hazards in the mine area exist in the form of steep slopes and numerous inactive normal faults. Roof conditions will typically worsen in these areas due to fracturing and slickensides; however, no surface movement or new effects have been noted to date from mining through fault zones in this area.

Movement could result in rock falls from exposed outcrops; however, no evidence of such falls or movement has been noted in this area from past mining. There are no potential landslide or slump areas known to exist that were caused by previous mining activities in the area.

3.4.8.4 Subsidence

Subsidence can normally be expected to occur over areas where second mining (pillaring - removal of greater than 50% of the coal) has taken place. Maximum potential subsidence from pillar extraction in the Mine (the Hiawatha seam) has been estimated from Figure 3-5 using the following criteria:

Panel Width = 600 ft
Average Depth = 800 ft
Width/Depth Ratio = 0.75
Seam Thickness = 7.0 ft

Using these data, subsidence due to pillar extraction in the Hiawatha seam could reach 2.33 feet directly over a pillared panel. The cumulative potential subsidence for areas where both seams are pillared is 6.18 feet (3.85 + 2.33). Again, past experience in this area suggests that subsidence would be of a lesser magnitude.

The following observations and conclusions regarding subsidence have been made from past mining activities in the vicinity of the proposed mine:

(1) Pillaring in the upper (Castlegate "A") seam has previously occurred place beneath Beaver Creek (Plate 3-9). Specifically, the northernmost west panel was pillared beneath Beaver Creek by Swisher Coal Company in January 1978 in an areas where the overburden thickness was about 650 feet. In addition, in September 1981, Beaver Creek Coal Company pillared the "A" Panel area beneath Beaver Creek in an area with an overburden thickness of approximately 425 feet. Neither of these areas show any measurable effect on Beaver Creek.

(2) The Gordon Creek No. 2 Mine overlies areas pillared up to 40 years ago in the lower seam (Sweet's Mine) with no noticeable subsidence effects. The Consumers No. 3 Mine also pillared areas in the permit area which show no noticeable subsidence effects.

(3) The overburden in the permit area above the Castlegate "A" seam (with a thickness of 600 to 800 feet) contains massive sandstone units which are unlikely to allow caving effects to reach the surface. In addition, the seams are separated by over 150 feet of similar interburden with no noticeable effects from past pillaring.

(4) Subsidence, should it occur, is not likely to affect the Beaver Creek flow due to the numerous beds of swelling shales within the overburden and interburden. Fractures within these sedimentary deposits have a strong tendency to heal due to the swelling of the shales and sandy shales contained therein.

Refer to Sections 3.4.8.2 and 7.1.6 for a discussion of water resource mitigation measures.

3.4.8.5 Subsidence Control and Monitoring Plan

The subsidence monitoring network will consist of permanent survey monuments located outside of the anticipated area of subsidence and a series of monitoring stations within the potential subsidence zone (Plate 3-3). The monitoring stations will be steel re-bar/rod with aluminum caps or other permanent metal or steel structures set so that weather, frost heave, or livestock will not disturb them. Stations will be installed above the active mining area.

Multiple readings will be taken where necessary to ensure accuracy. Monitoring of the subsidence stations noted on Plate 3-3 will be performed on an annual basis for a period of two years following final cessation of mining operations. Reports of monitoring will be sent to the UDOGM on a yearly basis.

The extent of the adjacent area outside of the permit area was determined based on a maximum overburden thickness of 1500 feet (from data presented by Hansen, 1988) and an angle of draw of 35 degrees as measured from the vertical (the maximum angle of draw recommended by Dunrud [1976]). This angle of draw is significantly in excess of the 20-degree value used by Beaver Creek Coal Company for adjacent mining operations (Guy, 1985), but will result in a conservative estimate of the extent of the adjacent area. Based on the 35-degree angle of draw and a maximum overburden thickness of 1500 feet, subsidence impacts will extend a <u>maximum</u> of 1050 feet (0.2 mile) from the edge of the permit area. Hence, for the purpose of this application, the adjacent area for potential is defined as that area within 0.2 mile of the permit area.

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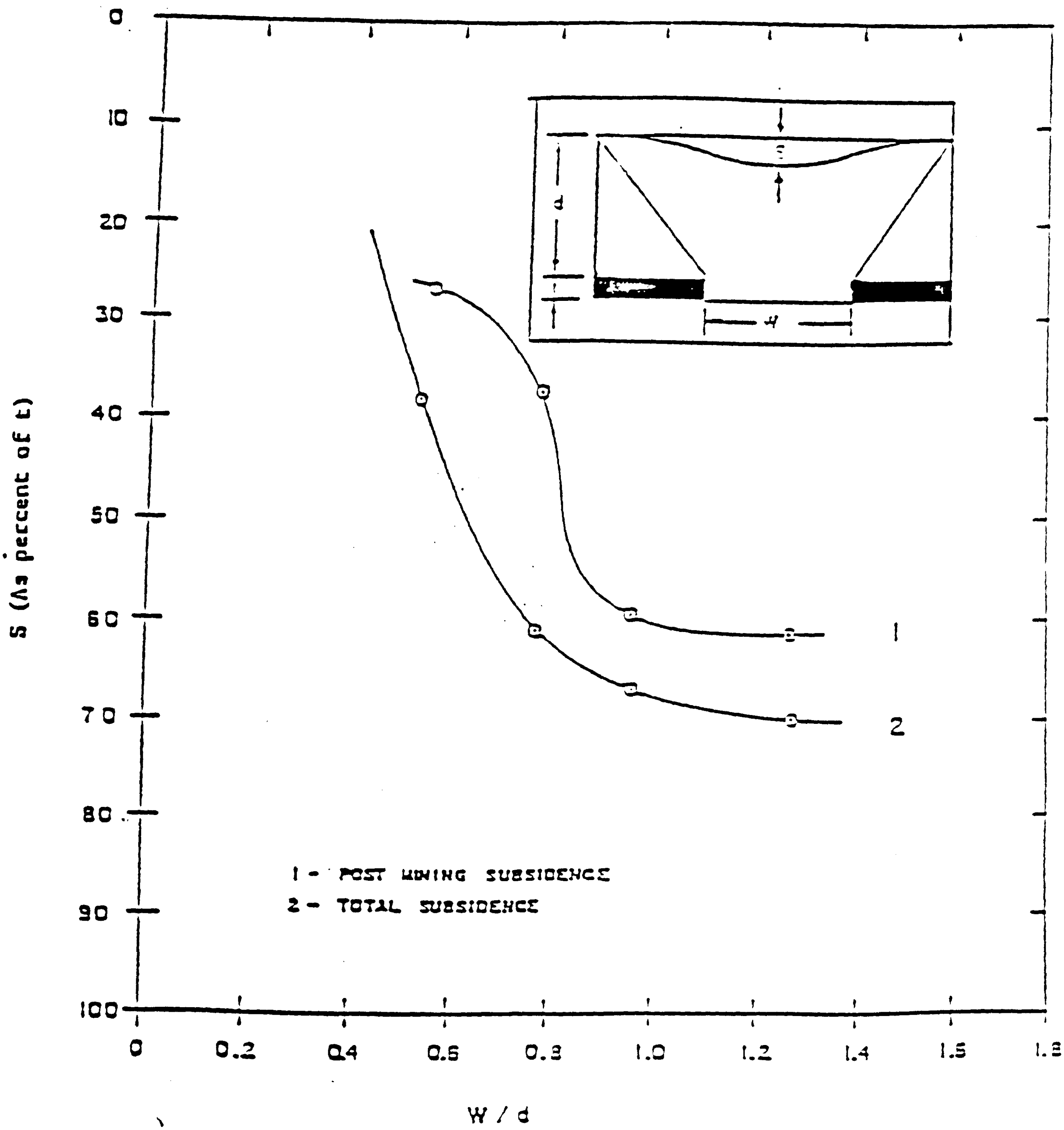
FIGURE 3-5 SUBSIDENCE/SEAM THICKNESS RATIOS (From Dunrud, 1980)



3.5 Reclamation Plan

3.5.1 Contemporaneous and Interim Reclamation

Disturbed area's when no longer needed, will be backfilled, graded, retopsoiled, and revegetated. Seeding, fertilizing, and mulching will be performed as soon as practical following redistribution of topsoil. Seed Mix #2 presented in Table 3-3 will be planted, and erosion-control matting will be installed in specific areas as described in Section 3.5.5.3. Reclamation techniques are described below. Areas that will not be redisturbed will be classified as contemporaneously reclaimed. Seed Mix #1 will be used in areas requiring soil stabilization during the operational period of mining. These areas will likely be redisturbed either during the operation or reclamation of the mine site. The areas that will be redisturbed during operation or final reclamation contouring will be classified as interim reclamation. Areas where interim reclamation contacts a steep bank dropping to a diversion ditch will be protected by attempting to control the loss of topsoil by installing a mulch mat a minimum of one foot above and below the grade break.

During October 1997, the areas designated on Plate A within Appendix 8-1 are scheduled for stabilization seeding using Seed Mix No. 1. Refer to Section 8.8 for additional information.

Underground Coal Mining and Reclamation Activities. All surface equipment, structures, or other facilities not required for continued underground mining activities and monitoring, unless approved by the Division as suitable for the post-mining land use or environmental monitoring, will be removed and the affected lands reclaimed following permanent cessation of mining operations.

Reclamation Timetable. A timetable for the completion of each major step in the reclamation plan is presented in Table 3-4.

Plan for Backfilling, Soil Stabilization, Compacting, and Grading. The regrading plan for the Horizon Mine was designed to meet the objectives of balancing cut and fill quantities and maintaining a geotechnically and erosionally stable base. The primary features of this plan are:

- Removal of the pad upon which surface activities will be constructed at the mine, thereby creating a slope which will adequately drain while minimizing long-term erosion concerns;
- Backfilling to remove portal entrances (highwalls) within the objectives noted above (cut and fill balance, site stability, and erosion control),
- Construction of stable channels across regraded areas;
- Placement of topsoil;
- Revegetation and mulching of the topsoiled site; and
- Removal of the sedimentation pond (together with accompanying regrading, topsoiling, revegetation, and mulching of the sedimentation pond area) and implementation of interim sediment-control measures.

The estimated cut quantity for the Horizon facility is approximately 11,752.91 cubic yards with an estimated fill of 10,238.74 cubic yards (see Table 3-1). Regrading activities will continue until the final surface configuration defined by Plates 3-7 and 3-7A is approximated. Details regarding topsoil placement and revegetation following regrading are provided in Chapters 3 and 8, respectively.3-3

TABLE 3-4

Reclamation Timetable

Task	Months from Start of Reclamation					
	1	2	3	4	5	6
PHASE I						
Seed/Plant Ordering*	---------					
Portal Sealing	---------					
Demolition - Structure Removal	---------	---------				
Rough and Final Grading		---------	---------	---------		
Construction of Reclamation Channels and Installation of Sediment Controls			---------	---------		
Soil Testing/Order Amendments				---------		
Topsoil Distribution				---------	---------	
Seeding & Mulching						-------
Vegetation/Water Monitoring	10 years after seeding or until bond release					
PHASE II - To Follow Phase I Bond Release						
Seed/Plant/Amendment Ordering*	---------					
Grading (Disturbed Area Access Road)					--------	
Topsoil Distribution					--------	
Seeding & Mulching						-------
Reclamation Monitoring	Until bonding requirements are satisfied					

* Seed and plants will be ordered one year prior to their proposed planting time.

TABLE 3-1

RECLAMATION CUT AND FILL CALCULATIONS

Using Ppresent surface contours from Plate 3-7 in conjunction with revised reclamation contours through AutoCad 2000 and Survcadd 2000

Area in Cut: 186,023.6 sq ft, 4.271 acres
Area in Fill: 189,050.1 sq ft, 4.340 acres
Total inclusion area: 8.611 acres
Cut to Fill ratio: 1.15
Average Cut Depth: 1.71 ft
Average Fill Depth: 1.46 ft
Cut volume: 11,752.91 cubic yards
Fill volume: 10,238.74 cubic yards

Backfilling and Compaction. As indicated previously in this M&RP, the surface at the Horizon Mine was originally disturbed between the 1920s and the 1950s by previous mining operations. These prior operators made no effort to salvage any topsoil or other soil material for subsequent site reclamation. Therefore, restoration to a contour that approximates pre-mining conditions is neither practical nor required by the regulations. However, it is the intent of Horizon to restore the area to a topography that is compatible with the post-mining land use, using materials that are available at the site.

All vegetation, organic matter, and debris will be cleared from areas to receive fill. The cut material from site regrading will be placed as fill and graded to facilitate drainage from the mine site and contributing side areas. All fill placed during recontouring of the site will be compacted to at least 85 percent of maximum Proctor density (ASTM D698). Compaction will be accomplished using repeated passes of rubber-tired equipment, rollers, and other appropriate equipment.

Side hill embankments, where the width is too narrow to allow access by compaction equipment, will be initially constructed by spreading the soil with a dozer, but only to a width necessary to allow compaction equipment access. After this is achieved, the fill will be placed in lifts and compacted to at least 85 percent of maximum Proctor density.

Care will be taken to ensure that fill materials are not frozen during placement or compaction. Any areas that are damaged by freezing will be reconditioned, reshaped, and recompacted to at least 85 percent of maximum Proctor density. All fill placement and compaction activities will be overseen by an experienced engineer.

In general, grading and backfilling operations will proceed from the upstream end of the surface facilities to the downstream end, thus allowing the sedimentation pond to remain effective for as long as possible.

Construction of Reclamation Channels. Reclamation channels will be constructed at the locations shown on Plate 3-7. These channels will be constructed to capture runoff from undisturbed areas and convey this runoff to and through Portal Canyon and Jewkes Creek. Details regarding the design and construction of these channels are provided in Chapter 7 of this M&RP.

As noted on Plate 3-7, slopes adjacent to the reclaimed streams are generally much shallower than the natural slopes upstream from the disturbed area (where natural slopes on the hillsides adjacent to the streams are typically 1.5H:1V or steeper). Hence, access to the streams by wildlife and livestock under post-mining conditions should not be hindered within the reclaimed area.

Sedimentation Pond Removal and Interim Sediment Control. Prior to the start of reclamation activities, temporary silt fences will be emplaced in Jewkes Creek perpendicular to the flow direction. A minimum of four such silt fences will be installed in the creek downstream from the by-pass culvert (UC-1) outlet but within the disturbed area prior to removal of the culvert. The silt fences will be located in an area convenient for maintenance and cleanout. The silt fences will be removed when reclamation construction activities are completed. During reclamation, the silt fences will be periodically inspected and accumulated sediment will be removed from behind the silt fences when required to minimize downstream impacts.

The sedimentation pond will be retained for as long as practical during reclamation. Once backfilling and grading operations proceed to the location of the pond, it will be removed. Because the pond is designed primarily as an excavated structure, removal of the pond will consist primarily of backfilling. This removal will be accomplished using backhoes, loaders, dozers, and other appropriate earthmoving equipment.

As soon as regrading of an area no longer allows that area to drain to the sedimentation pond, silt fences will be installed along the base of the slopes adjacent to the associated stream to control erosion on an interim basis prior to revegetation success. These silt fences will be installed using a supportive backing and burying the toe of the filter fabric.

On a temporary basis, straw-bale dikes may also be installed as necessary to control localized erosion prior to the establishment of revegetation efforts. If installed, locations of the straw-bale dikes will be selected to reduce sediment contributions to runoff based on field observations. Straw-bale dikes will be installed by keying the bales into the ground.

Roads. All roads within the disturbed area will be reclaimed immediately after they are no longer needed for mining and reclamation operations. These roads will be graded and/or backfilled as indicated above. Topsoil will be applied to the regraded surfaces and the area will be revegetated as discussed in Chapters 3 and 8, respectively.

3.5.2 Soil Removal and Storage

Soil surveys conducted at the mine site have distinguished disturbed lands from undisturbed soil mapping units (see Chapter 8, Plate 8-1). Areas mapped as disturbed land are areas where the soils, vegetation, or both were affected by previous mining operations. Disturbance of the roads and pads occurred prior to regulatory requirements to salvage topsoil from those areas.

All topsoil/growth medium to be generated during future disturbances will be stockpiled. The stockpiles will be contoured, fertilized, vegetated with Seed Mix #1 outlined in Section 3.5.5.2, and mulched as outlined in Section 3.5.5.3. Markers will be placed indicating that the piles contain topsoil. Berms and/or strawbales will be placed around the stockpile to minimize off-pile transport of sediment.

Areas of interim reclamation that will be redisturbed for final reclamation contouring will have the depth topsoil that was placed on those areas removed and placed back on the topsoil stockpile for redistribution onto the newly recontoured area. A qualified person will be present during the removal of the topsoil in these areas. See Plate 3-7 for areas where interim reclamation will be re-disturbed and areas where re-contouring is complete an interim vegetation has been established.

Refer to Section 8.8 for the methods being used in the removal and redistribution of soils.

3.5.3 Final Abandonment

Upon permanent cessation of operations, permanent reclamation will be performed. All surface equipment, structures and facilities (other than sedimentation control) associated with the operation will be removed during reclamation of the affected area.

3.5.3.1 Sealing of Mine Openings

Abandonment of Openings. When no longer needed for mining operations, all portals will be sealed and backfilled by collapsing the concrete canopies over each portal. Prior to the sealing of the mine openings, all combustible materials will be removed from the portal area. All structures that would interfere with sealing of the mine openings will also be removed. The permanent closures will be constructed to prevent access to mine workings by people, livestock, and wildlife. Potential surface drainage will also be kept from entering the sealed entries.

All mine openings will be sealed at least 20 feet inside the mine opening. Prior to installation of the seal, all loose material will be removed from the roof, floor, and rib of the mine within the seal area. The seal will then be constructed using solid concrete blocks with nominal dimensions of 8 inches high, 8 inches wide, and 16 inches long. Mortar will consist of one part cement, three parts sand, and no more than 7 gallons of water per sack of cement.

In the bottom course, each block will be laid with its long axis parallel to the rib. The long axis in succeedingly higher courses will be perpendicular to the long axis of the blocks in the preceding course. The seal will be recessed at least 8 inches deep into each rib and 8 inches deep into the floor. No recess will be made into the roof.

The seals will have a thickness of approximately 16 inches. Following seal construction, the entries will be backfilled from the seal to the outside surface with soil that is sloped at the surface to match the final slope at the entry.

Casing and Sealing of Underground Openings. Each underground opening to the mine will be sealed and backfilled when no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects. This closure method has been designed to prevent access to the mine workings by people, livestock, fish and wildlife, and machinery. The closures have also been designed to keep water from flowing from the mine workings to prevent acid or other toxic drainage from entering ground and surface waters.

Monitoring wells associated with the Horizon Mine will be sealed when no longer needed for monitoring groundwater. Sealing of these wells will occur in accordance with the requirements of the Utah Division of Water Rights (R655-4-12).

Details of the seals are shown on Figures 3-6 and 3-7.

3.5.3.2 Removal of Surface Structures

Following sealing of the portals, all surface structures and facilities associated with the mining operation will be removed. The schedule and cost of removal is detailed in Section 3.5.6 and 3.5.7, respectively.

Building Demolition. Prior to significant regrading activities at the Horizon facility, existing buildings, retaining walls, utilities, coal-handling facilities, and other above-ground structures will be removed from the area. To the extent possible, these structures and facilities will be salvaged. Nonhazardous and nonflammable materials, such as concrete and steel, may be used as backfill

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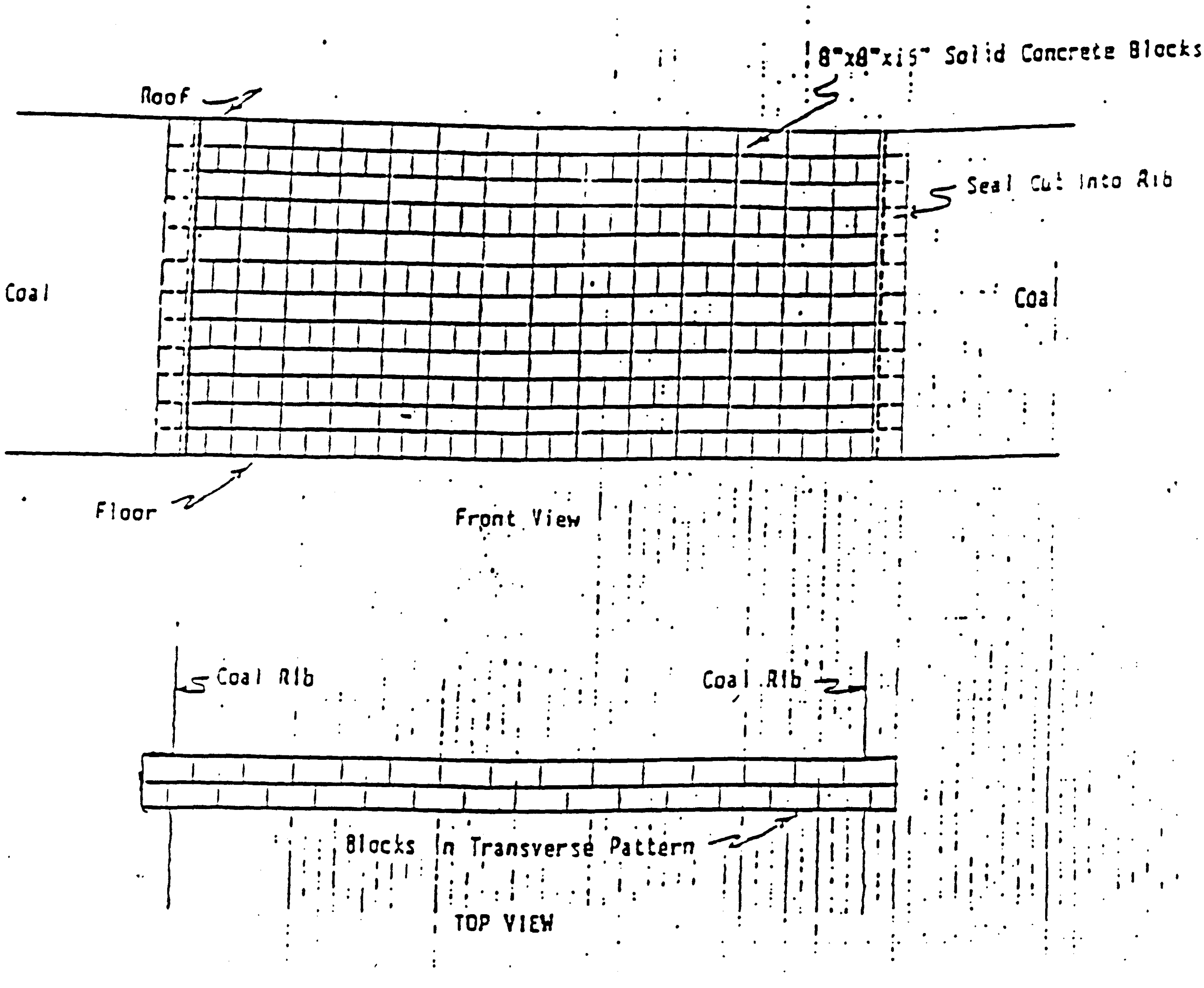
FIGURE 3-6

FIGURE 3-7 TYPICAL PORTAL BLOCK SEAL



in areas such as the sediment pond, portal entrances (slopes), and cut slopes. If thus disposed of, these materials will be incorporated into the backfill under at least 4 feet of soil cover in a manner that will not create voids within the backfill or reduce the effective compaction necessary for backfilling. If foundations will not interfere with regrading activities, they will be left in place for on-site burial under at least 4 feet of soil cover.

During the site regrading, if any of the toxic coal waste that is buried in the mine pad fill is uncovered, the material will be properly placed in the fill areas of the recontouring outside drainage flows so it can be covered beneath four feet of non-toxic fill material and erosion of the drainage over time will not contact these areas. The locations will be mapped at the time of placement and submitted to the Division.

Non-coal wastes found during reclamation, such as garbage, lumber, and other combustible materials generated during previous mining activities, will be segregated and stored in a controlled manner in a temporary storage area in appropriate containers.

Final disposal of all such waste will be in the backfill (as indicated above) or at a State-approved solid waste disposal facility, as appropriate. Notwithstanding any other provision of the R645 Rules, any non-coal mine waste defined as "hazardous" will be handled in accordance with the requirements of Subtitle C of RCRA and any implementing agency.

Mining equipment too large for a container will be placed in a designated temporary storage area as determined at the time of reclamation activities. Final decisions regarding salvage or disposal of structures and equipment will be made just prior to reclamation following an assessment of the salvageability of the structures and equipment.

3.5.3.3 Disposition of Dams, Ponds, and Diversions

Diversions that are not planned for permanent use following reclamation will be removed during the backfilling and regrading operations. The area will be recontoured to drain to the final reclamation channel (Section 7.2.3.2, Reclamation Hydrology Design).

Sediment control following removal of the sedimentation pond will be provided as outlined in Sections 3.5.4.3 and 7.2.3.2.

3.5.4 Backfilling and Grading Plans

Approximate Original Contour. The area of the Horizon surface facilities was disturbed by previous mining activities. No pre-mining topographic maps of the area are known to exist. The reclamation plan has been designed to backfill and grade the site to achieve the assumed approximate original contour (i.e., to blend into the surrounding topography) and eliminate highwalls associated with the Horizon Mine.

Elimination of Highwalls, Spoil Piles, and Depressions. The backfilling and grading plan has been designed to eliminate highwalls at the site that were associated with the Horizon Mine. The access to the coal seam is by three slopes from the surface to the coal seam some 46 feet below the ground elevation of the top of the slopes. The return slope uses the old Blue Blaze No. 1 Mine slope. A 50 foot concrete portal cover was constructed from the mouth of the old slope and was backfilled to eliminate any exposed highwall. The old slope was then widened to accommodate modern mining equipment. The belt slope was excavated a length of 95 feet to solid overburden where the slope could be driven down to the seam. A 95 foot concrete portal cover was constructed for the belt slope. The intake slope was excavated a length of 125 feet to solid overburden. A 125 foot concrete portal cover was constructed for the intake slope. The excavated portions of the portal covers have been covered to eliminate any highwall faces. No highwalls exist on the current disturbed area. The portal accesses to the seam are constructed for easy demolition and use of the material as backfill. No spoil piles exist. With the exception of the small depressions to retain moisture, minimize erosion and to assist in revegetation, no depressions will remain at the site following reclamation. Refer to Plate 3-7 and Figure 3-6.

Slope Stability. According to R645-301-553.130, reclamation slopes shall not exceed the angle of repose and shall have a minimum long-term static safety factor of greater than 1.3. The angle of repose of any soil is a function of the soil gradation, moisture content, plasticity, and degree of compaction of the soil. It is expected that the reclamation fill will be fairly dry and will be placed without the benefit of significant compaction or moisture conditioning. See Appendix 3-3.

Based on information provided in Chapter 8 of this M&RP, soils at the Horizon site consist of low-plasticity, cohesive materials with a wide assortment of grain sizes. The angle of repose in such soil is dependent not only on interparticle friction, but also on cohesion, which is dependent on the density, moisture content, and compaction moisture content of the soil. In general, as long as they do not become saturated or are not fissured, cohesive soils have a greater angle of repose than non-cohesive soils and can maintain vertical or near-vertical slopes under certain conditions. The angle of repose of a loose sand generally varies between 30 and 35 degrees (Holtz and Kovacs, 1981). Therefore, presumably, the angle of repose of a slightly cohesive granular soil will be greater than 30 to 35 degrees. For the purpose of this site, the angle of repose will be assigned a value of 35 degrees, which corresponds to a slope of about 1.5 horizontal to 1 vertical (1.5H:1V).

Backfilled and regraded slopes have been designed to not exceed the angle of repose. Design calculations indicate that the minimum safety factor of emplaced soil, at a slope of 1.5H:1V, is 1.4 under saturated conditions and 1.9 under unsaturated conditions. The static safety factor will increase with decreasing slope. The slopes have thus been designed to prevent slides.

Erosion and Water Pollution. Temporary sediment-control measures will be implemented during and following backfilling and regrading. During redistribution of the topsoil, silt fences will be established at the bottom of fill slopes and along the top bank of the reclamation channel to control possible erosion from newly graded and seeded areas. As vegetation becomes established on the reclaimed surfaces, erosion potentials will be further minimized. By minimizing erosion, water pollution will also be precluded. Additional water-quality concerns do not exist at the site (see Chapter 7).

In order to blend with natural slopes, soil may be replaced during reclamation at slopes of up to 1.5H:1V. The steepness of these slopes will be reduced at their base, providing a concave slope. As noted above, these slopes will be geotechnically stable. Dozers will be used during placement of the topsoil or substitute topsoil on these steep slopes, taking care to achieve a reasonably uniform thickness of the final soil cover.

Post-Mining Land Use. The disturbed area will be backfilled and regraded in a manner that supports the approved post-mining land use.

Exposed Coal Seams. No coal seams are currently exposed in the disturbed area. Should any coal seams be exposed during the recontouring phase of reclamation, the coal outcrops exposed will be covered with a minimum of 4 feet of nontoxic and noncombustible materials during final backfilling and grading. This cover material may consist of material removed during grading of the site, subsoil, and/or topsoil.

Acid- and Toxic-Forming Materials. Buried waste materials from mining operations that used Portal Canyon are shown on Plate 3-7.

Combustible Materials. All combustible materials that are exposed, used, or produced during mining will be disposed of off site.

Cut-and-Fill Terraces. No cut-and-fill terraces occurring from or used by the Horizon operation will be retained at the site following final grading activities.

Highwalls From Previously Mined Areas. Several highwalls exist outside the disturbed area that are the result of previous mining operations. The reclamation plan has been designed to eliminate the faceup area made by Horizon Mine within the disturbed area. The anticipated post-mining contours indicate that the available materials are sufficient to eliminate the face up highwall within the disturbed-area boundary during reclamation.

The schedule for backfilling and grading is detailed in Section 3.5.7.1.

3.5.4.1 Removal or Reduction of Highwalls

No exposed highwalls exit on the current disturbed area. Final reclamation cross sections and contours of the portal accesses show that no new highwall features will be created after the collapse of the portal covers. See Figure 3-6 and Plate 3-7 and refer to Section 3.5.4.

3.5.4.2 Recontouring

All surface reclaimed areas will be protected and stabilized to effectively control erosion.
Final grading, preparation of overburden, and placement of topsoil will be done along the contour to minimize subsequent erosion and instability. Rills and gullies which form in areas that have been regraded and topsoiled and either disrupt the approved post-mining land use or the reestablishment of the vegetative cover, or, cause or contribute to a violation of water quality standards for receiving streams, shall be filled, regraded, or otherwise stabilized; topsoil shall be replaced; and the areas shall be reseeded or replanted. This will be accomplished using the best technology currently available.

3.5.4.3 Fencing and Erosion Control

The sedimentation pond will be retained as discussed in Section 7.2.3.2. Fencing will be placed as required to protect revegetation efforts from livestock grazing. This fencing will be removed prior to requesting final bond release. Refer to Section 3.5.4 for additional information on erosion control.

3.5.4.4 Soil Redistribution and Stabilization

When final reclamation begins, the disturbed areas to be reclaimed will be loosened by ripping to allow easier backfilling and grading operations. During redistribution of soils, care will be taken to prevent excessive compaction.

Soils disturbed during mining, including but not limited to fill material, will be placed within the disturbed area boundary. Refer to Section 8.8 for further information concerning plans for soil redistribution.

3.5.5 Revegetation Plan

The revegetation plan has been designed to assure that all disturbed lands will be returned to productive self-perpetuating plant communities once the mining operation has been completed. The plan calls for temporary revegetation of disturbed areas where possible during the mining operation as well as permanent reclamation of all areas once mining has ceased.

The goal of the plan is to create diverse plant communities which are at least as productive and in comparable amounts to plant cover existing on the site prior to this mining operation.

3.5.5.1 Soil Preparation

After backfilling, grading, recontouring, scarifying, and the redistribution of topsoil, the seed bed will be prepared using the best technology currently available. Prior to seeding, composite soil samples as will be collected and analyzed as discussed in Section 8.9. Based on the results of these analyses, fertilizer will be applied at the time of seeding.

3.5.5.2 Seeding

Areas which have been disturbed during mining operations will be reseeded with either Seed Mix #1 (Table 3-2) or with Seed Mix #2 (Table 3-3), as outlined below. These mixes are composed primarily of native species which either occur on the site or would be expected to grow on the site, especially on reclaimed areas. The mixes have been designed to include species which will provide sufficient cover to prevent soil erosion, and should contain sufficient species diversity to produce a stable self-perpetuating plant community. All seeds will comply with applicable state and federal seed laws.

Temporary Seed Mix

On those sites where revegetation is needed during the operating years, a temporary seed mix will be used. This mix (Table 3-2) is composed primarily of native species and is designed for quick establishment and erosion control. Only one introduced grass species (pubescent wheatgrass - Agropyron trichophorum), is included in the mix. It has been included since it is known to do well on dry sites, and will assist in controlling soil erosion. Cicer milkvetch (Astragalus ciscer) has been included because of its ability to fix nitrogen. No shrubs or forbs are included in the temporary mix, since these areas will be re-disturbed prior to final reclamation. At the actual time of planting, the mix may be altered depending on availability of the listed species and under the approval of the Division prior to substitution.

Permanent Seed Mix

The permanent revegetation mix is composed of a mixture of native grasses, forbs, shrubs and trees (Table 3-3). The grasses, forbs, and some of the shrubs will be planted as seeds. The remaining shrubs and trees will be planted as containerized stock. A variety of species are included in the mix in order to obtain a higher level of diversity on the revegetated surfaces. This will increase habitat diversity as variations in the microenvironments of the reclaimed surface will enhance or inhibit the germination and development of the various species.

The permanent seed mix reflects the composition of the original communities which occurred on the site. It is included because of its ability to fix nitrogen. Approval will be obtained from the Division prior to using any substitution in seed mixtures and on the number of containerized shrubs needed per acre.

The riparian seeding mix is included in Table 3-3.

Seeding Methods

Reclaimed areas will be seeded by broadcasting. Seeds when broadcast will be raked to ensure proper seed/soil contact. See Tables 3-2 and 3-3 for the seeding rates. If the first seeding does not establish, the area will be reseeded. Reclaimed areas will be seeded in the fall. Since the majority of the species in the mix are cool season grasses, fall is a better time to plant. The containerized stock will be planted in late fall or early spring, attempting to avoid undesirable conditions such as overly wet, overly dry, or frozen soils. Should the planting window close prior to completion of seeding, a sterile, quick growing ground cover will be planted to control erosion during the winter months. The final reclamation seed mixture will be planted during the following year. Small depressions will be left in areas where containerized stock is planted to accumulate water during wet periods.

In the riparian disturbed area (see Section 9.4.1.2) the containerized or cuttings of willow stock will be planted in clumps along the banks of Jewkes Creek. Other containerized shrubs and sedges will be planted in clumps within the riparian area. The seed mix (Table 3-3, Riparian Reclamation Seeding Mix) will be planted using the methods described above.

TABLE 3-2

Reclamation Seed Mix #1

Species		Pounds of PLS per acre
PERENNIAL GRASSES		
Streambank Wheatgrass (Agropyron riparium)		8.0
Bluebunch Wheatgrass (Agropyron spicatum)		4.0
Slender Wheatgrass (Agropyron trachycaulum)		8.0
Pubescent Wheatgrass (Agropyron trichophorum)		6.0
Indian Ricegrass (Oryzopsis hymenoides)		4.0
FORBES		
Cicer Milkvetch (Astragalus cicer)		4.0
	TOTAL	34.0

TABLE 3-3

Reclamation Seeding Mix #2

Species	Pounds of PLS Per Acre
SHRUBS	
Serviceberry Amelanchier utahensis	4.0
Big Sagebrush (Vasey) Artemisia tridentata	0.4
Mtn. Mahogany Cercocarpus ledifolius	4.0
Wyoming Big Sagebrush (Gordon Creek Var.) Artemisia tridentata wyomingensis	1.0
FORBS	
Yarrow Achillea millifolium	0.2
Pacific Aster Aster chilensis	0.4
Northern Sweetvetch Hedysarum boreale	3.0
Lewis Flax Linum lewsii	2.0
Palmer's Penstemon Penstemon palmeri	1.0

TABLE 3-3 (Continued)

Reclamation Seeding Mix #2

Species	Pounds of PLS Per Acre
GRASSES	
Gt. Basin Wildrye Elymus cinereus	6.0
Thickspike Wheatgrass Elymus lanceolatus	4.0
Western Wheatgrass Elymus smithii	6.0
Bluebunch Wheatgrass Elymus spicatus	6.0
Indian Ricegrass Stipa hymenoides	4.0
TOTAL	42.0
CONTAINERIZED STOCK	PLANTS/ACRE
Oak Brush Quercus gambelii	400
Aspen Populus tremuloides	300
White Fir Abies concolor	200
Big-tooth Maple Acer grandidentatum	400
Serviceberry Amelanchier alnifolia	300

TABLE 3-3 (Continued)

Reclamation Seeding Mix #2

SPECIES	PLANT/ACRE
Mountain Mahogany Cercocarpus montanus	400
Oregon Grape Mahonia repens	500
TOTAL	2,500

Riparian Reclamation Seeding Mix

SPECIES	PLANT/ACRE
SHRUBS	CONTAINERIZED/ROOT CUTTING STOCK
Snowberry Symphoricarpos oreophilus	300
Wood Rose Rosa woodsii	300
Willow Salix	1,100
Water Birch Betula occidentalis	300
TOTAL	**2,000**

TABLE 3-3 (Continued)

Riparian Reclamation Seeding Mix

SPECIES	POUNDS OF PLS PER ACRE
FORBS	
Yarrow Achillea millifolium	1.0
Pacific Aster Aster chilensis	1.0
Prairie Sage Artemisia ludoviciana	1.0
Marsh Indian Paintbrush Castelleja exilis	1.0
Wild Geranium Geranium viscosissimum	1.0
TOTAL	**5.0**
GRASSES	
Blue Wildrye Elymus glaucus	8.0
Kentucky Bluegrass Poa pratensis	4.0
Gt. Basin Wildrye Elymus cinereus	6.0
Idaho Fescue Festica idahoensis	4.0

TABLE 3-3 (Continued)

Riparian Reclamation Seeding Mix

SPECIES	POUNDS OF PLS PER ACRE
Western Wheatgrass Elymus smithii	6.0
Bluebunch Wheatgrass Elymus spicatus	6.0
Indian Ricegrass Stipa hymenoides	6.0
TOTAL	**40.0**
<u>CONTAINERIZED/ROOT CUTTING STOCK</u>	PLANT/ACRE
Nebraska Sedge Carex nevrascensis	200
Beaked Sedge Carex rostrata	200
TOTAL	**400**

Locations where containerized stock will be planted:

Oakbrush	South & East Slopes
Aspen	North Slopes & Canyon Bottoms
White Fir	North Slopes
Big-tooth Maple	North Slopes & Canyon Bottoms
Serviceberry	South Slopes
Mountain Mahogany	Ridge tops & South Facing Slopes
Oregon Grape	North, East, West Slopes & Canyon Bottom
Willow	Along Creek Banks

3.5.5.3 Mulching

During reclamation mulch will be applied to all newly reseeded areas in order to provide a more equitable environment for seed germination and initial growth. A mulch will be applied at a rate of 2000 pounds per acre. Once applied, the mulch will be incorporated while the surface is being roughened before seeding. Erosion control matting will be placed on all slopes 2 1/2H:1V or steeper.

At the time of reclamation the most beneficial type of mulch to be used will be determined by Horizon and UDOGM, for bonding purposes the price will be assumed to be that for alfalfa.

3.5.5.4 Reclamation Management

The reclaimed and revegetated areas will be closely monitored to determine if any maintenance is necessary (refer to Sections 3.5 and 9.8 for a description of the monitoring program). Problems which may require management include severe erosion, excessive weeds, bare patches of failed planting, and damage by wildlife. Rills and gullies which form in areas that have been regraded and topsoiled and which either disrupt the approved post-mining land use or the reestablishment of the vegetative cover, or, cause or contribute to a violation of water quality standards for receiving streams, shall be filled, regraded, or otherwise stabilized; topsoil replaced; and the areas shall be reseeded or replanted. If weeds occur, a weed control plan will be proposed to UDOGM and implemented upon approval. No weed control will be attempted during the first growing season. It is likely that weed species will form a conspicuous part of the vegetation on the reclaimed areas during the first year but will be replaced by revegetative species thereafter.

3.5.5.5 Revegetation Monitoring

Revegetated areas will be monitored in accordance with Section 9.8 of this permit application.

3.5.5.6 Establishment of Wildlife Habitat

Reclamation is particularly important as a means of controlling erosion and restoring disturbed areas to a productive state. To assist in meeting these desirable ends, the following aspects have been incorporated into the reclamation plan: (1) planting a diverse mixture of native grasses, forbs, and (where appropriate) woody species, (2) using seedling stock rather than relying solely on seeds for trees or shrubs, and (3) planting vegetation to create an edge effect by clumping selected shrub or tree species.

Section 10.5 provides a detailed discussion of the reclamation, mitigation and management plans for terrestrial habitats and wildlife.

Enhancement of the area for wildlife will be accomplished by the installation of rock piles for smaller mammals, the improved revegetation of the area, and planting of Salix cuttings per acre along the creek banks within the disturbed area. Rock piles will be scattered along the perimeter of Jewkes Creek, and through Portal Canyon. Containerized shrub stock will be planted near the rock piles to provide additional cover and as a food source. The appropriate regulatory agencies (i.e., UDOGM, DWR) will be consulted as to the frequency and placement of the rock piles during reclamation.

3.5.6 Reclamation Monitoring

The standards for success in the previously disturbed areas of the site are outlined in section R645-301-356.250 of the regulations. The applicant intends to return the previously disturbed areas to stable plant communities capable of withstanding the intended post-mining land use and controlling erosion (see Section 9.8).

3.5.7 Schedule of Reclamation for Horizon Mine

3.5.7.1 Timetable for Completion of Major Reclamation Processes

The approximate schedule of reclamation activities is outlined in Table 3-4. The graphical schedule has been extended by approximately 10 percent beyond the numerical estimates presented below to account for unanticipated delays. Reclamation is proposed to be initiated within 90 days (weather permitting) of final abandonment of the mining operation. Each listing is for an 8-hour work day.

The Phase I reclamation tasks are therefore proposed to be completed within 24 weeks following the start of reclamation activities, assuming adequate weather conditions. Eight weeks are planned for the completion of Phase II reclamation tasks.

Due to the size and topography of the mine site, the concept of completing reclamation activities in Portal Canyon prior to starting reclamation activities in Jewkes Canyon is not feasible. Potential problems include having to move topsoil twice and not having the fill in Jewkes Canyon to reclaim slopes in Portal Canyon. Horizon commits to begin reclamation activities in Portal Canyon and to leave the sediment pond and UC-1 located in Jewkes Canyon in place as long as possible. Prior to the removal of the sediment pond during reclamation, UDOGM hydrologist will be notified and given the opportunity to inspect and endorse the removal. The timetable and sequence for removal of sediment control structures will depend upon the season of the year and precipitation.

3.5.8 Cost Estimate for Final Reclamation

The estimated cost to reclaim the Horizon Mine surface facilities is provided in Appendix 3-7.

The reclamation costs were evaluated to determine if the 100-foot culvert extension planned for 1997 (Appendix 3-9) would be covered by the estimated amount.

APPENDIX 3-1

ROAD AND HAULAGE LETTERS

APPENDIX 3-2

PILLAR EXTRACTION

APPENDIX 3-3

STATIC SAFETY FACTOR CALCULATIONS

Reclaimed Slope Stability Analysis

A slope stability analysis was performed with the assistance of Wayne Western of the DOGM and David Miller of Lodestar Energy. Two slopes were selected from the reclaimed contour slopes. Slope J-J' was selected because it will be the longest reclaimed slope and Slope S-S' was selected because it would be the steepest reclaimed slope.

The cut/fill slopes were evaluated on site and the conservative determination for the material consisting of sandstones and shales, along with a minor proportion of clayey soils. These areas would have a Rock Mass Bulk Density of 115 lb/cu. ft., a Friction Angle of 37 degrees and a Soil Cohesion of 3.5 psi. The natural material that the cut/fill slopes would rest against consists of sandstone and siltstones. This material would have a Rock Mass Bulk Density of 144 lb/cu. ft., a Friction Angle of 45 degrees and a Soil Cohesion of 1000 psi.

The slope stability calculation were performed on a program made available by the Division through the assistance of Wayne Western. The results of the analysis showed the J-J' slope to have a safety factor of 1.87 and the S-S' slope to have a safety factor of 1.5.

The slope stability profiles for the two slopes are attached.

APPENDIX 3-4

ROCK STRENGTH ANALYSES

APPENDIX 3-5

WATER RIGHTS

APPENDIX 3-6

UPDES PERMIT

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April 24, 2003

CERTIFIED MAIL
(Return Receipt Requested)

Mr. Alexander H. Walker, III
Hidden Splendor Resources, Inc.
Horizon Mine
57 West 200 South, Suite 400
Salt Lake City, UT 84101

Dear Mr. Walker, III:

Subject: UPDES General Coal Mining Permit No. UTG040019, Hidden Splendor Resources, Inc. - Horizon Mine

Enclosed is your copy of the signed general permit. Coverage becomes effective on May 1, 2003 and all the requirements and conditions of the permit are in effect at that time. Preprinted discharge Monitoring Report forms (EPA Form 3320-1), for self-monitoring and reporting requirements as specified in the permit, will be sent to you as soon as possible.

As the agency charged with the administration of issuing UPDES Permits, we are continuously looking for ways to improve our quality of service to you. In an effort to improve the State UPDES permitting process we are asking for your input. Since our customer permittee base is limited, your input is important. Please take a few moments to complete the enclosed questionnaire. The results will be used to improve our quality and responsiveness to our permittees and give us feed back on customer satisfaction. We will address the issues you have identified on an ongoing basis.

A fee schedule was included in the Utah Department of Environmental Quality budget appropriation request at the direction of the Legislature and in accordance with Utah code annotated 19-1-201. The fee schedule, as approved by the Legislature, includes a charge for the issuance of a UPDES permit. Please remit $1,800.00 within 30 days of receipt of this letter to:

Department of Environmental quality
Division of Water Quality
ATTN: Stacy Carroll
P.O. Box 144870
Salt Lake City, Utah 84114-4870

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April 23, 2003

CERTIFIED MAIL
(Return Receipt Requested)

Hidden Splendor Resources, Inc.
Alexander H. Walker, III
57 West 200 South, Suite 400
Salt Lake City, UT 84101

Subject: Transfer of UPDES Permit #UTG040019, Horizon Mine

Dear Mr. Walker:

This correspondence is to acknowledge your April 16th 2003 letter and the completed Statement of Acceptance form informing this office that you are the new owner of a facility that is under the purview of the Utah Pollutant Discharge Elimination System (UPDES). The UPDES permit and our permit files have been changed accordingly. All of the requirements and conditions of the permit are in full force and effect. You should receive a copy of the general permit within 30 days.

If you should have any questions regarding this matter, please call Chris Imbrogno at (801) 538-6628 or myself at (801) 538-6779.

Sincerely,

Gayle Smith

Gayle Smith, P.E., Manager
Permits and Compliance Section

CI:ci

cc: Linda Himmelbauer, U.S. EPA Region VIII

STATE OF UTAH
DIVISION OF WATER QUALITY
DEPARTMENT OF ENVIRONMENTAL QUALITY
SALT LAKE CITY, UTAH

AUTHORIZATION TO DISCHARGE UNDER THE

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM
(UPDES)

GENERAL PERMIT FOR COAL MINING

In compliance with provisions of the Utah *Water Quality Act, Title 19, Chapter 5, Utah Code Annotated ("UCA") 1953, as amended* (the *"Act"*),

Hidden Splender Resources, Inc. – Horizon Mine

as identified in the application No. UTG040019 is authorized to discharge from all outfall(s) to receiving waters named:

Jewkes Creek

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions as set forth herein.

This permit shall become effective on May 1, 2003.

This permit and the authorization to discharge shall expire at midnight, April 30, 2008.

Signed this 28th day of April, 2003.

Don A. Ostler

Don A. Ostler
Executive Secretary
Utah Water Quality Board

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I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Criteria for Inclusion in the General Permit for Coal Mining

This General permit shall apply only to the discharge of treated wastewater from:

Coal mining operations either new or existing in Utah which include or will include in part, or in whole, alkaline mine water drainage, storm water runoff from coal preparation plant associated areas, active mining areas, and post mining areas until the performance bond is released. The total dissolved solids (TDS) is limited to a concentration of 500 mg/L at all discharge points or one ton per day as a sum from all mine water or decant operations.

B. Notice of Intent for a General Permit for Coal Mining)

Any facility which desires coverage under this general permit for coal mining and meets the requirements of Part I.A. can be issued general permit coverage by submitting a notice of intent (NOI) to the Division of Water Quality.

The NOI shall include:

1. A completed Environmental Protection Agency Application (EPA Form 3510-1) oequivalent information.

2. Location and identification number (such as 001, 002, etc.) of each existing discharge and/or proposed discharge point(s). this includes the latitude and longitude to the nearest 15 seconds and the name of the receiving water(s).

3. A description of the source of the wastewater for each discharge point.

4. A description of the treatment given or proposed for the wastewater at each discharge point and if necessary a justification of why no treatment is required.

5. Flow characteristics for each discharge point such as whether flow is or will be continuous or intermittent and indicate projected and/or actual average and maximum flows in gpd.

6. Data for each discharge point for the following parameters:

   a. Biochemical demand (BOD_5).
   b. Chemical oxygen demand (COD).
   c. Total organic carbon (TOC).
   d. Total suspended solids (TSS).
   e. Flow.
   f. Ammonia (as N).
   g. Oil and grease.
   h. Temperature.
   i. pH.
   j. Total dissolved solids (TDS).
   k. Total iron and metals, cyanide, phenols located in Table III UAC R317-8-3.12.
   l. For discharge(s) of mine water or mine water and mine water mixed with surface runoff one acute whole efficiency toxicity test using two species and full dilution series (five dilutions plus a control). Sediment pond discharges which have only surface runoff do not require WET tests.
   m. Date and time of sampling for each parameter.

n. Date and time of analysis for each parameter.
o. Utah certified laboratory which has completed the analysis for each parameter.

For each discharge point the presence or absence of any toxic and/or priority pollutants as listed Table II, UAC R317-8-3.13.

C. Description of Discharge Point(s).

The authorization to discharge provided under this permit is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under a UPDES permit is a violation of the *Act* and may be subject to penalties under the *Act*. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge may be subject to criminal penalties as provided under the *Act*.

Outfall Number	Location of Discharge Point(s)
001	Sediment Pond discharge to Jewkes Creek to North Fork of Gordon Creek to Price River. Latitude 39°41'37, Longitude 111°02'58".
002	Mine discharge to pipe to Jewkes Creek to North Fork of Gordon. Latitude 39°41'39", Longitude 111°02'56".

D. Narrative Standard.

It shall be unlawful, and a violation of this permit, for the permittee to discharge or place any waste or other substance in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum or other nuisances such as color, odor or taste, or cause conditions which produce undesirable aquatic life or which produce objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by bioassay or other tests performed in accordance with standard procedures.

E. Specific Limitations and Self-monitoring Requirements.

1. Effective immediately and lasting the duration of this permit, the permittee is authorized to discharge from Outfall(s) 001, 002. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristics	Discharge Limitations a/ Average 30-Day	7-Day	Daily Maximum	Monitoring Requirements Measurement Frequency	Sample Type
Flow, MGD	N/A	N/A	NA	Monthly	Measured b/
Oil & Grease, mg/L	N/A	N/A	10c/	Monthly	Grab
Total Iron, mg/L	N/A	N/A	1.0	Monthly	Grab e/
Total Suspended Solids, mg/L	25	35	70	Monthly	Grab e/
Total Dissolved Solids, mg/L	500 d/	N/A	NA	Monthly	Grab e/

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units in any sample and shall be monitored monthly by a grab sample.

There shall be no visible sheen or floating solids or visible foam in other than trace amounts.

There shall be no discharge of sanitary wastes or process water from coal preparation plants.

N.A. - Not Applicable.

a/ See Definitions, *Part I.A* for definition of terms.

b/ For intermittent discharge, the duration of the discharge shall be reported.

c/ If a visual sheen for oil and grease is observed then a grab sample must be taken immediately and the results shall not exceed 10 mg/L.

d/ If each outfall cannot achieve a 30-day average of 500 mg/L, then the permittee is limited to one ton (2000 lbs) per day as a sum from all outfalls.

e/ These samples may also be a composite sample

2. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location(s): in the final effluent before mixing with the receiving water.

3. Any discharge or increase in the volume of a discharge caused by precipitation within any 24 hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) at outfall(s) 001 may comply with the following limitations instead of the otherwise applicable limitations for TSS and pH in Part I.E.1:

Effluent Characteristics	Daily Maximum
Settleable Solids	0.5 ml/L
pH	6.5 to 9.0 S.U.

In addition to the monitoring requirements specified under Part I.E.1 all effluent samples collected during storm water discharge events shall also be analyzed for settleable solids. Such analyses shall be conducted monthly by grab samples.

4. Any discharge or increase in the volume of a discharge caused by precipitation within any 24 hour period greater than the 10-year, 24 hour precipitation event (or snowmelt of equivalent volume) at outfall(s) 001 may comply with the following limitations instead of the otherwise applicable limitations:

The pH shall not be less than 6.5 standard units nor greater than 9.0 standard units. However as stated in Part I.E.3, all effluent samples collected during storm-water discharge events shall be analyzed for settleable solids and parameters identified under Part I.E.1.

5. The operator shall have the burden of proof that the discharge or increase in discharge was caused by the applicable precipitation event described in Parts I.E.3 and 4. The alternate limitations in Parts I.E.3 and 4 shall not apply to treatment systems that treat underground mine water only.

F. Storm Water Requirements.. It has been determined that Horizon Mine has a regulated storm water discharge as per UAC R317-8-3.9., therefore, the following permit conditions governing storm water discharges apply.

1. Coverage of This Section.

a. Discharges Covered Under This Section. The requirements listed under this section shall apply to storm water discharges from Horizon Mine, subject to effluent limitations listed in Part I.E. of this permit.

1) Site Coverage. Storm water discharges from the following portions of Horizon Mine may be eligible for this permit: haul roads (nonpublic roads on which coal or coal refuse is conveyed), access roads (nonpublic roads providing light vehicular traffic within the facility property and to public roadways), railroad spurs, sidings, and internal haulage lines (rail lines used for hauling coal within the facility property and to offsite commercial railroad lines or loading areas), conveyor belts, chutes, and aerial tramway haulage areas (areas under and around coal or refuse conveyor areas, including transfer stations), equipment storage and maintenance yards, coal handling buildings and structures, and inactive coal mines and related areas (abandoned and other inactive mines, refuse disposal sites and other mining-related areas on private lands).

2. Prohibition of Non-storm Water Discharges.

a. The following non-storm water discharges may be authorized by this permit provided the non-storm water component of the discharge is in compliance with this section; fire fighting activities; fire hydrant flushings; potable water sources including waterline flushings; drinking fountain water; irrigation drainage, lawn watering; routine external building washdown water where detergents or other compounds have not been used in the process; pavement washwaters where spills or leaks of toxic or hazardous materials (including oils and fuels) have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated compressor condensate; uncontaminated springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

3. Storm Water Pollution Prevention Plan Requirements. Most of the active coal mining-related areas, described in paragraph 1. above, are subject to sediment and erosion control regulations of the U.S. Office of Surface Mining (OSM) that enforces the Surface Mining Control and Reclamation Act (SMCRA). OSM has granted authority to the Utah Division of Oil Gas and Mining (DOGM) to implement SMCRA through State SMCRA regulations. All SMCRA requirements regarding control of erosion, siltation and other pollutants resulting from storm water runoff, including road dust resulting from erosion, shall be primary requirements of the pollution prevention plan and shall be included in the contents of the plan directly, or by reference. Where determined to be appropriate for protection of water quality, additional sedimentation and erosion controls may be warranted.

a. Contents of Plan. The plan shall include at a minimum, the following items:

1) Pollution Prevention Team. Each plan shall identify a specific individual or individuals within the facility organization as members of a storm water Pollution Prevention Team that are responsible for developing the storm water pollution prevention plan and assisting the facility manager in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

2) Description of Potential Pollutant Sources. Each plan shall provide a description of potential sources that may reasonably be expected to add significant amounts

of pollutants to storm water discharges or that may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials that may potentially be significant pollutant sources. Each plan shall include, at a minimum:

a) Deadlines for Plan Preparation and Compliance
Horizon Mine shall prepare and implement a plan in compliance with the provisions of this section within 270 days of the effective date of this permit.

b) Keeping Plans Current

Horizon Mine shall amend the plan whenever there is a change in design, construction, operation, or maintenance, that has a significant effect on the potential for the discharge of pollutants to the waters of the State or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified by the plan, or in otherwise achieving the general objectives of controlling pollutants in storm water discharges associated with the activities at the mine.

c) Drainage.

(1) A site map, such as a drainage map required for SMCRA permit applications, that indicate drainage areas and storm water outfalls. These shall include but not be limited to the following:

(a) Drainage direction and discharge points from all applicable mining-related areas described in paragraph 1.a(1). (Site Coverage) above, including culvert and sump discharges from roads and rail beds and also from equipment and maintenance areas subject to storm runoff of fuel, lubricants and other potentially harmful liquids.

(b) Location of each existing erosion and sedimentation control structure or other control measures for reducing pollutants in storm water runoff.

(c) Receiving streams or other surface water bodies.

(d) Locations exposed to precipitation that contain acidic spoil, refuse or unreclaimed disturbed areas.

(e) Locations where major spills or leaks of toxic or hazardous pollutants have occurred.

(f) Locations where liquid storage tanks containing potential pollutants, such as caustics, hydraulic fluids and lubricants, are exposed to precipitation.

(g) Locations where fueling stations, vehicle and equipment maintenance areas are exposed to precipitation.

(h) Locations of outfalls and the types of discharges contained in the drainage areas of the outfalls.

(2) For each area of the facility that generates storm water discharges associated with the mining-related activity with a reasonable potential for containing significant amounts of pollutants, a prediction of the direction of flow, and an identification of the types of pollutants that are likely to be present in storm water discharges associated with the activity. Factors to consider include the toxicity of the pollutant; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified.

d) Inventory of Exposed Materials. An inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water method and location of onsite storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff a description of existing structural and nonstructural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

e) Spills and Leaks. A list of significant spills and leaks of toxic or hazardous pollutants that occurred at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility beginning 3 years prior to the effective date of this permit. Such list shall be updated as appropriate during the term of the permit.

f) Sampling Data. A summary of any existing discharge sampling data describing pollutants in storm water discharges from the portions of Horizon Mine covered by this permit, including a summary of any sampling data collected during the term of this permit.

g) Risk Identification and Summary of Potential Pollutant Sources. A narrative description of the potential pollutant sources from the following activities: truck traffic on haul roads and resulting generation of sediment subject to runoff and dust generation; fuel or other liquid storage; pressure lines containing slurry, hydraulic fluid or other potential harmful liquids; and loading or temporary storage of acidic refuse or spoil. Specific potential pollutants shall be identified where known.

3) Measures and Controls. Horizon Mine shall develop a description of storm water management controls appropriate for the facility and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at Horizon Mine. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls.

a) <u>Good Housekeeping.</u> Good housekeeping requires the maintenance of areas that may contribute pollutants to storm water discharges in a clean, orderly manner. These are practices that would minimize the generation of pollutants at the source or before it would be necessary to employ sediment ponds or other control measures at the discharge outlets. Where applicable, such measures or other equivalent measures would include the following: sweepers and covered storage to minimize dust generation and storm runoff; conservation of vegetation where possible to minimize erosion; watering of haul roads to minimize dust generation; collection, removal, and proper disposal of waste oils and other fluids resulting from vehicle and equipment maintenance; or other equivalent measures.

b) <u>Preventive Maintenance.</u> A preventive maintenance program shall involve timely inspection and maintenance of storm water management devices as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems. Where applicable, such measures would include the following: removal and proper disposal of settled solids in catch basins to allow sufficient retention capacity; periodic replacement of siltation control measures subject to deterioration such as straw bales; inspections of storage tanks and pressure lines for fuels, lubricants, hydraulic fluid or slurry to prevent leaks due to deterioration or faulty connections; or other equivalent measures.

c) <u>Spill Prevention and Response Procedures.</u> Areas where potential spills that can contribute pollutants to storm water discharges can occur, and their accompanying drainage points shall be identified clearly in the storm water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a clean up shall be available to personnel.

d) <u>Inspections.</u> In addition to or as part of the comprehensive site evaluation required under paragraph 3.a.(4) of this section, qualified facility personnel shall be identified to inspect designated areas of the facility at appropriate intervals specified in the plan. The following shall be included in the plan:

(1) <u>Active Mining-Related Areas and Those Inactive Areas Under SMCRA Bond Authority.</u> The plan shall require quarterly inspections by the facility personnel for areas of the facility covered by pollution prevention plan requirements. This inspection interval corresponds with the quarterly inspections for the entire facility required to be provided by SMCRA authority inspectors for all mining-related areas under SMCRA authority, including sediment and erosion control measures. Inspections by the facility representative may be done at the same time as the mandatory inspections performed by SMCRA inspectors.

Records of inspections of the SMCRA authority facility representative shall be maintained.

(2) Inactive Mining-Related Areas Not Under SMCRA Bond. The plan shall require annual inspections by the facility representative except in situations referred to in paragraph 3.a.(4)(d) below.

(3) Inspection Records. The plan shall require that inspection records of the facility representative and those of the SMCRA authority inspector shall be maintained. A set of tracking or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections.

e) Employee Training. Employee training programs shall inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. The pollution prevention plan shall identify periodic dates for such training.

f) Record keeping and Internal Reporting Procedures. A description of incidents (such as spills, or other discharges) along with other information describing the quality and quantity of storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.

g) Non-storm Water Discharges.

(1) Certification. The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges such as drainage from underground portions of inactive mines or floor drains from maintenance or coal handling buildings. The certification shall include the identification of potential significant sources of non-storm water discharges at the site, a description of the results of any test and/or evaluation, a description of the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the onsite drainage points that were directly observed during the test. Certifications shall be signed in accordance with Part IV.G.4. of this permit.

(2) Exceptions. Except for flows from fire fighting activities, authorized sources of non-storm water listed in Part I.F.2.a. that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

(3) Failure to Certify. If Horizon Mine is unable to provide the certification required (testing or other evaluation for non-storm water discharges), the Executive Secretary must be notified within 180 days after the effective date of this permit. If the failure to certify is caused by the inability to perform adequate tests or evaluations, such notification shall describe: the procedure of any test conducted for the presence of non-storm water discharges; the results of such test or other relevant observations; potential sources of non-storm water to the storm discharge lines; and why adequate tests for such storm discharge lines were not feasible. Non-storm water discharges to waters of the State that are not authorized by a UPDES permit are unlawful, and must be terminated.

h) Sediment and Erosion Control. The plan shall identify areas that, due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion and reduce sediment concentrations in storm water discharges. As indicated in paragraph I.F.3. above, SMCRA requirements regarding sediment and erosion control measures are primary requirements of the pollution prevention plan for mining-related areas subject to SMCRA authority. The following sediment and erosion control measures or other equivalent measures, should be included in the plan where reasonable and appropriate for all areas subject to storm water runoff:

(1) Stabilization Measures. Interim and permanent stabilization measures to minimize erosion and lessen amount of structural sediment control measures needed, including: mature vegetation preservation; temporary seeding; permanent seeding and planting; temporary mulching, matting, and netting; sod stabilization; vegetative buffer strips; temporary chemical mulch, soil binders, and soil palliatives; nonacidic road surfacing material; and protective trees.

(2) Structural Measures. Structural measures to lessen erosion and reduce sediment discharges, including: silt fences; earth dikes; straw dikes; gradient terraces; drainage swales; sediment traps; pipe slope drains; porous rock check dams; sedimentation ponds; riprap channel protection; capping of contaminated sources; and physical/chemical treatment of storm water.

i) Management of Flow. The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (other than those as sediment and erosion control measures listed above) used to manage storm water runoff in a manner that reduces pollutants in storm water runoff from the site. The plan shall provide that the measures, which the permittee determines to be reasonable and appropriate, shall be implemented and maintained. Appropriate measures may include: discharge diversions; drainage/storm water conveyances; runoff dispersion; sediment control and collection; vegetation/soil stabilization; capping of contaminated sources; treatment; or other equivalent measures.

4) Comprehensive Site Compliance Evaluation. Qualified personnel shall conduct site compliance evaluations at intervals specified in the plan, but in no case less than once a year. Such evaluations shall provide:

a) Areas contributing to a storm water discharge associated with coal mining-related areas shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. These areas include haul and access roads; railroad spurs, sidings, and internal haulage lines; conveyor belts, chutes and aerial tramways; equipment storage and maintenance yards; coal handling buildings and structures; and inactive mines and related areas. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures, as indicated in paragraphs 3.a.(3)(h) and 3.a.(3)(i) above and where identified in the plan, shall be observed to ensure that they are operating correctly. A visual evaluation of any equipment needed to implement the plan, such as spill response equipment, shall be made.

b) Based on the results of the evaluation, the description of potential pollutant sources identified in the plan, in accordance with paragraph 3.a.(2) of this section, and pollution prevention measures and controls identified in the plan, in accordance with paragraph 3.a.(3) of this section, shall be revised as appropriate within 2 weeks of such evaluation and shall provide for implementation of any changes to the plan in a timely manner. For inactive mines, such revisions may be extended to a maximum of 12 weeks after the evaluation.

c) A report summarizing the scope of the evaluation, personnel making the evaluation, the date(s) of the evaluation, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph 3.a.(4)(b) above shall be made and retained as part of the storm water pollution prevention plan for at least 3 years after the date of the evaluation. The report shall identify any incidents of noncompliance. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with Part IV.G.4. (Signatory Requirements) of this permit.

d) Where compliance evaluation schedules overlap with inspections required under 3.a.(3)(d), the compliance evaluation may be conducted in place of one such inspection. Where annual site compliance evaluations are shown in the plan to be impractical for inactive mining sites due to the remote location and inaccessibility of the site, site inspections required under this part shall be conducted at appropriate intervals specified in the plan, but, in no case less than once in 3 years.

4. Numeric Effluent Limitations. There are no additional numeric effluent limitations beyond those described in Part I.E. of this permit.

5. Monitoring and Reporting Requirements.

a. Benchmark Analytical Monitoring Requirements. Horizon Mine must monitor their storm water discharges associated with industrial activity at least quarterly (4 times per year) during years 2 and 4 of the permit cycle except as provided in paragraphs 5.a.(3) (Sampling Waiver), 5.a.(4) (Representative Discharge), and 5.a.(5) (Alternative Certification). Horizon Mine is required to monitor their storm water discharges for the pollutants of concern listed in Table E. below. Reports must be made in accordance with 5.b. (Reporting). In addition to the parameters listed in Table E. below, Horizon Mine measurements or estimates (in inches) of the storm event that generated the sampled runoff; the duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event; and an estimate of the total volume (in gallons) of the discharge sampled.

The results of benchmark monitoring are primarily for Horizon Mine's use to determine the overall effectiveness of the SWPPP in controlling the discharge of pollutants to receiving waters. Benchmark values are not viewed as permit limitations. An exceedance of a benchmark value does not, in and of itself, constitute a violation of this permit. While exceedance of a benchmark value does not automatically indicate a violation of a water quality standard has occurred, it does signal that modifications to the SWPPP or more specific pollution prevention controls may be necessary.

Table E.
Monitoring Requirements for Coal Mining Facilities

Pollutants of Concern	Cut-Off Concentration
Total Recoverable Aluminum	0.75 mg/L
Total Recoverable Iron	1.0 mg/L
Total Suspended Solids	100 mg/L

1) Monitoring Periods. Horizon Mine shall monitor samples collected during the sampling periods of: January through March, April through June, July through September, and October through December during the second and fourth years of this permit cycle.

2) Sample Type. A minimum of one grab sample shall be taken. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. The required 72-hour storm event interval is waived where the preceding measurable storm event did not result in a measurable discharge from the facility. The required 72-hour storm event interval may also be waived where Horizon Mine documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted. The grab sample shall be taken during the first 30 minutes of the discharge. If the collection of a grab sample during the first 30 minutes is impracticable, a grab sample can be taken during the first hour of the discharge. and the discharger shall submit with the monitoring report a description of why a grab sample during the first 30 minutes was impracticable. If storm water discharges associated with industrial activity commingle with process or nonprocess water, then where practicable permittees must attempt to sample the storm water discharge before it mixes with the non-storm water discharge.

3) Sampling Waiver.

a) Adverse Conditions. If Horizon Mine is unable to collect samples within a specified sampling period due to adverse climatic conditions, thus a substitute sample shall be collected from a separate qualifying event in the next monitoring period and the data submitted along with the data for the routine sample in that period. Adverse weather conditions that may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricanes, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

b) Low Concentration Waiver. When the average concentration for a pollutant calculated from all monitoring data collected from an outfall during the second year monitoring is less than the corresponding value for that pollutant listed in Table E. under the column Monitoring Cut-Off Concentration, Horizon Mine may waive monitoring and reporting requirements for the fourth year monitoring period. Horizon Mine must submit to the Executive Secretary, in lieu of the monitoring data, a certification that there has not been a significant change in industrial activity or the pollution prevention measures in area of the facility that drains to the outfall for which sampling was waived.

c) Inactive and Unstaffed Site. If Horizon Mine is unable to conduct quarterly chemical storm water sampling at an inactive and unstaffed site, the operator of the facility may exercise a waiver of the monitoring requirements as long as the facility remains inactive and unstaffed. Horizon Mine must submit to the Executive Secretary, in lieu of monitoring data, a certification statement on the Storm Water Discharge Monitoring Report (SWDMR) stating that the site is inactive and unstaffed so that collecting a sample during a qualifying event is not possible.

4) Representative Discharge. If the facility has two or more outfalls that, based on a consideration of industrial activity, significant materials, and management practices and activities within the area drained by the outfall, discharge substantially identical effluents, Horizon Mine may test the effluent of one of such outfalls and report that the quantitative data also applies to the substantially identical outfall(s) provided that Horizon Mine includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that Horizon Mine believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area [e.g., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)] shall be provided in the plan. Horizon Mine shall include the description of the location of the outfalls, explanation of why outfalls are expected to discharge substantially identical effluents, and estimate of the size of the drainage area and runoff coefficient with the SWDMR.

5) Alternative Certification. Horizon Mine is not subject to the monitoring

requirements of this section provided that certification is made for a given outfall or on a pollutant-by-pollutant basis in lieu of monitoring reports required under paragraph b. below, under penalty of law, signed in accordance with Part IV.G.4. (Signatory Requirements). The Certification shall state that material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, industrial machinery or operations, or significant materials from past industrial activity that are located in areas of the facility within the drainage area of the outfall are not presently exposed to storm water and are not expected to be exposed to storm water for the certification period. Such certification must be retained in the storm water pollution prevention plan, and submitted to DWQ in accordance with Part II.D. of this permit. In the case of certifying that a pollutant is not present, Horizon Mine must submit the certification along with the monitoring reports required under paragraph b. below. If Horizon Mine cannot certify for an entire period, they must submit the date exposure was eliminated and any monitoring required up until that date. This certification option is not applicable to compliance monitoring requirements associated with effluent limitations.

b. Reporting. Horizon Mine shall submit monitoring results for each outfall associated with industrial activity [or a certification in accordance with Sections (3), (4), or (5) above] obtained during the second year reporting period, on Storm Water Discharge Monitoring Report (SWDMR) form(s) postmarked no later than the 31st day of the following March. Monitoring results [or a certification in accordance with Sections (3), (4), or (5) above] obtained during the fourth year reporting period shall be submitted on SWDMR form(s) postmarked no later than the 31st day of the following March. For each outfall, one signed SWDMR form must be submitted to the Executive Secretary per storm event sampled. Signed copies of SWDMRs, or said certifications, shall be submitted to the Executive Secretary at the address listed in Part II.D. of the permit.

c. Visual Examination of Storm Water Quality. Horizon Mine shall perform and document a visual examination of a representative storm water discharge at the following frequencies: quarterly for active areas under SMCRA bond located in areas with average annual precipitation over 20 inches; semi-annually for inactive areas under SMCRA bond, and active areas under SMCRA bond located in areas with average annual precipitation of 20 inches or less; visual examinations are not required at inactive areas not under SMCRA bond.

1) Visual Monitoring Periods. Examinations shall be conducted in each of the following periods for the purposes of visually inspecting storm water runoff or snow melt: Quarterly-January through March; April through June; July through September; and October through December. Semi-annually—January through June and July through December.

2) Sample and Data Collection. Examinations shall be made of samples collected within the first 60 minutes (or as soon thereafter as practical, but not to exceed two hours) of when the runoff or snowmelt begins discharging. The examinations shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution. The examination must be conducted in a well-lit area. No analytical tests are required to be performed on the samples. All such samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. Where

practicable, the same individual will carry out the collection and examination of discharges for the life of the permit.

3) Visual Storm Water Discharge Examination Reports. Visual examination reports must be maintained onsite in the pollution prevention plan. The report shall include the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution), and probable sources of any observed storm water contamination.

I. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling. Samples taken in compliance with the monitoring requirements established under *Part I* shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Sludge samples shall be collected at a location representative of the quality of sludge immediately prior to the use-disposal practice.

B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under *Utah Administrative Code ("UAC") R317-2-10*, unless other test procedures have been specified in this permit.

C. Penalties for Tampering. The *Act* provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months per violation, or by both.

D. Reporting of Monitoring Results. Monitoring results obtained during the previous month shall be summarized for each month and reported monthly on a Discharge Monitoring Report Form (EPA No. 3320-1), post-marked no later than the 28th day of the month following the completed reporting period. The first report is due on June 28, 2003. If no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports including whole effluent toxicity (WET) test reports required herein, shall be signed and certified in accordance with the requirements of *Signatory Requirements (see Part IV.G)*, and submitted to the Director, Division of Water Quality:

original to: Department of Environmental Quality
Division of Water Quality
288 North 1460 West
PO Box 144870
Salt Lake City, Utah 84114-4870

E. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee. If the permittee monitors any parameter more frequently than required by this permit, using test procedures approved under *UAC R317-2-10* or as otherwise specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated. Only those parameters required by the permit need to be reported.

G. Records Contents. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements:
2. The individual(s) who performed the sampling or measurements;
3. The date(s) and time(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and.
6. The results of such analyses.

H. Retention of Records. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Executive Secretary at any time. A copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting.

1. The permittee shall (orally) report any noncompliance which may seriously endanger health or environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of circumstances. The report shall be made to the Division of Water Quality, (801) 538-6146, or 24 hour answering service (801) 536-4123.

2. The following occurrences of noncompliance shall be reported by telephone (801) 536-4123 as soon as possible but no later than 24 hours from the time the permittee becomes aware of the circumstances:

   a. Any noncompliance which may endanger health or the environment;

   b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See *Part III.G, Bypass of Treatment Facilities.)*;

   c. Any upset which exceeds any effluent limitation in the permit (See *Part III.H, Upset Conditions.*); or,

   d. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit.

3. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   e. Steps taken, if any, to mitigate the adverse impacts on the environment and human health during the noncompliance period.

4. The Executive Secretary may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Division of Water Quality, (801) 538-6146.

5. Reports shall be submitted to the addresses in *Part II.D, Reporting of Monitoring Results.*

J. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for *Part II.D* are submitted. The reports shall contain the information listed in *Part II.I.3*.

K. Inspection and Entry. The permittee shall allow the Executive Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the *Act*, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBLITIES

A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions. The *Act* provides that any person who violates a permit condition implementing provisions of the *Act* is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions of the Act is subject to a fine not exceeding $25,000 per day of violation; Any person convicted under *UCA 19-5-115(2)* a second time shall be punished by a fine not exceeding $50,000 per day. Except as provided at *Part III.G, Bypass of Treatment Facilities* and *Part III.H, Upset Conditions*, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances. Collected screening, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash shall not directly enter either the final effluent or waters of the state by any other direct route.

G. Bypass of Treatment Facilities.

1. Bypass Not Exceeding Limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to 2. and 3. of this section.

2. Prohibition of Bypass.

a. Bypass is prohibited, and the Executive Secretary may taken enforcement action against a permittee for bypass, unless:

(1) Bypass was unavoidable to prevent loss of human life, personal injury, or severe property damage;

(2) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance, and

(3) The permittee submitted notices as required under section G.3.

b. The executive Secretary may approve an anticipated bypass, after considering its adverse effects, if the Executive Secretary determines that it will meet the three conditions listed in sections G.2a. (1), (2) and (3).

3. Notice.

a. Anticipated bypass. Except as provided above in section G.2. and below in section G. 3.b, if the permittee knows in advance of the need for a bypass, it shall submit prior notice, at least ninety days before the date of bypass. The prior notice shall include the following unless otherwise waived by the Executive Secretary:

(1) Evaluation of alternative to bypass, including cost-benefit analysis containing an assessment of anticipated resource damages:

(2) A specific bypass plan describing the work to be performed including scheduled dates and times. The permittee must notify the Executive Secretary in advance of any changes to the bypass schedule;

(3) Description of specific measures to be taken to minimize environmental and public health impacts;

(4) A notification plan sufficient to alert all downstream users, the public and others reasonably expected to be impacted by the bypass;

(5) A water quality assessment plan to include sufficient monitoring of the receiving water before, during and following the bypass to enable evaluation of public health risks and environmental impacts; and

(6) Any additional information requested by the Executive Secretary.

b. Emergency Bypass. Where ninety days advance notice is not possible, the permittee must notify the Executive Secretary, and the Director of the Department of Natural Resources, as soon as it becomes aware of the need to bypass and provide to the Executive Secretary the information in section G.3.a.(1) through (6i) to the extent practicable.

c. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass to the Executive Secretary as required under Part II.I., Twenty Four Hour Reporting. The permittee shall also immediately notify the Director of the Department of Natural Resources, the public and downstream users and shall implement measures to minimize impacts to public health and environment to the extent practicable.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of paragraph 2. of this section are met. Executive Secretary's administrative determination regarding a claim of upset cannot be judiciously challenged by the permittee until such time as an action is initiated for noncompliance.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

    a. An upset occurred and that the permittee can identify the cause(s) of the upset;

    b. The permitted facility was at the time being properly operated;

    c. The permittee submitted notice of the upset as required under Part II.I, Twenty-four Hour Notice of Noncompliance Reporting; and,

    d. The permittee complied with any remedial measures required under Part III.D, Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of *The Water Quality Act of 1987* for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. Changes in Discharge of Toxic Substances. Notification shall be provided to the Executive Secretary as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

    a. One hundred micrograms per liter (100 ug/L);

    b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

    c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(7)* or (10); or,

    d. The level established by the Executive Secretary in accordance with *UAC R317-8-4.2(6).*

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

a. Five hundred micrograms per liter (500 ug/L);

b. One milligram per liter (1 mg/L) for antimony:

c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(9)*; or,

d. The level established by the Executive Secretary in accordance with *UAC R317-8-4.2(6)*.

K. Industrial Pretreatment. Any wastewaters discharged to the sanitary sewer, either as a direct discharge or as a hauled waste, are subject to Federal, State and local pretreatment regulations. Pursuant to Section 307 of *The Water Quality Act of 1987*, the permittee shall comply with all applicable federal General Pretreatment Regulations promulgated at *40 CFR 403*, the State Pretreatment Requirements at *UAC R317-8-8*, and any specific local discharge limitations developed by the Publicly Owned Treatment Works (POTW) accepting the wastewaters.

In addition, in accordance with *40 CFR 403.12(p)(1)*, the permittee must notify the POTW, the EPA Regional Waste Management Director, and the State hazardous waste authorities, in writing, if they discharge any substance into a POTW which if otherwise disposed of would be considered a hazardous waste under *40 CFR 261*. This notification must include the name of the hazardous waste, the EPA hazardous waste number, and the type of discharge (continuous or batch).

IV. GENERAL REQUIREMENTS

A. Planned Changes. The permittee shall give notice to the Executive Secretary as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit. In addition, if there are any planned substantial changes to the permittee's existing sludge facilities or their manner of operation or to current sludge management practices of storage and disposal, the permittee shall give notice to the Executive Secretary of any planned changes at least 30 days prior to their implementation.

B. Anticipated Noncompliance. The permittee shall give advance notice to the Executive Secretary of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall apply for and obtain a new permit. The application shall be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information. The permittee shall furnish to the Executive Secretary, within a reasonable time, any information which the Executive Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Executive Secretary, upon request, copies of records required to be kept by this permit.

F. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Executive Secretary, it shall promptly submit such facts or information.

G. Signatory Requirements. All applications, reports or information submitted to the Executive Secretary shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official

2. All reports required by the permit and other information requested by the Executive Secretary shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

    a. The authorization is made in writing by a person described above and submitted to the Executive Secretary, and,

    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.G.2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.G.2 must be submitted to the Executive Secretary prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports. The *Act* provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000.00 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports. Except for data determined to be confidential under *UAC R317-8-3.2*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of Executive Secretary. As required by the *Act*, permit applications, permits and effluent data shall not be considered confidential

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the permittee of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the *Act*.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Executive Secretary at least 20 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,

3. The Executive Secretary does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by *UCA 19-5-117*.

O. Water Quality-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:

1. Water Quality Standards for the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.

3. A revision to the current Water Quality Management Plan is approved and adopted which calls for different effluent limitations than contained in this permit.

P. Toxicity Limitation-Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include whole effluent toxicity (WET) testing, a WET limitation, a compliance schedule, a compliance date, additional or modified numerical limitations, or any other conditions related to the control of toxicants if toxicity is detected during the life of this permit.

V. GLOSSARY OF TERMS

A. Definitions.

1. The "30-day (and monthly) average" is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.

2. The "7-day (and weekly) average" is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self- monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains the Saturday.

3. "Daily Maximum" ("Daily Max.") is the maximum value allowable in any single sample or instantaneous measurement.

4. "Composite samples" shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the composite sample period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

   a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

   b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

   c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,

   d. Continuous collection of sample, with sample collection rate proportional to flow rate.

5. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

6. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

7. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

8. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

9. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

10. "Executive Secretary" means Executive Secretary of the Utah Water Quality Board.

11. "EPA" means the United States Environmental Protection Agency.

12. "Act" means the "*Utah Water Quality Act*".

13. "Best Management Practices" ("*BMPs*") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. *BMPs* also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

14. "Coal pile runoff" means the rainfall runoff from or through any coal storage pile.

15. "*CWA*" means *The Federal Water Pollution Control Act*, as amended, by *The Clean Water Act of 1987.*

16. "Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharges. This term does not include return flows from irrigated agriculture or agriculture storm water runoff.

17. "Significant spills" includes, but is not limited to: releases of oil or hazardous substances in excess of reportable quantities under *Section 311* of the *Clean Water Act* (see *40CFR 110.10* and *40 CFR 117.21)* or *Section 102* of the *CERCLA* (see *40 CFR 302.4).*

18. "Storm water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

19. "Waste pile" means any noncontainerized accumulation of solid, nonflowing waste that is used for treatment or storage.

20. "10-year, 24-hour precipitation event" means the maximum 24-hour precipitation event with a probable reoccurrence interval of once in 10 years. This information is available in *Weather Bureau Technical Paper no. 40,* May 1961 and *NOAA Atlas 2,* 1973 for the 11 Western States, and may be obtained from the National Climatic center of the Environmental Data Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

21. The term "coal preparation plant" means a facility where coal is crushed, screened, sized and cleaned, dried, or otherwise prepared and loaded for transit to a consuming facility.

22. The term "coal preparation plant associated areas" means the coal preparation plant yards, immediate access roads, coal refuse piles, and coal storage piles and facilities.

APPENDIX 3-7

RECLAMATION BOND ESTIMATE

APPENDIX 3-8

BURIED WASTE LOCATIONS

APPENDIX 3-10

ASTM COAL CLASSIFICATIONS

APPENDIX 3-10
ASTM COAL CLASSIFICATIONS

ASTM Classification	ASTM Group	Carbon (%)	Oxygen (%)	Moisture(%)	Volatiles (%)	R (vitrinite)	Btu/lb	MJ/kg	kcal/kg
	Peat	50 - 60	30 - 42	50 - 95	62 - 72	0.2 - 0.4	3000 - 4000	7.0 - 9.3	4000
Lignite	B	55 - 73	23 - 35	45 - 60	40 - 65	0.2 - 0.4	< 6300	< 14.6	5500
	A	55 - 73	23 - 35	31 - 50	40 - 65	0.2 - 0.4	6300 - 8300	14.6 - 19.3	5500
Subbituminous	C	60 - 80	15 - 28	25 - 38	35 - 55	0.3 - 0.7	8300 - 9500	19.3 - 22.1	7000
	B	60 - 80	15 - 28	20 - 30	35 - 55	0.3 - 0.7	9500 - 10500	22.1 - 24.4	7000
	A	60 - 80	15 - 28	18 - 25	35 - 55	0.3 - 0.7	10500 - 11500	24.4 - 26.7	7000
Bituminous	HV C	76 - 83	8 - 18	10 - 25	35 - 55	0.4 - 0.7	10500 - 13000	26.7 - 30.2	-
	HV B	80 - 84	7 - 12	5 - 12	35 - 50	0.5 - 0.8	13000 - 14000	30.2 - 32.5	-
	HV A	78 - 88	6 - 10	1 - 7	31 - 45	0.6 - 1.2	> 14000	> 32.5	8650
	MV	84 - 91	4 - 9	< 1.5	22 - 31	1.0 - 1.7	> 14000	> 32.5	8650
	LV	87 - 92	3 - 5	< 1.5	14 - 22	1.5 - 2.0	> 14000	> 32.5	8650
Anthracite	Semi.	89 - 93	3.5	< 1.5	8 - 14	1.8 - 2.6	> 14000	> 32.5	8650
	Anth.	90 - 97	2 - 4	0.5 - 2	2 - 8	2.2 - 5.0	> 14000	> 32.5	8650
	Meta.	> 94	1 - 2	1 - 3	< 2	> 4.5	> 14000	> 32.5	8650

HV - High ~~Volitale~~Volatile MV - Medium ~~Volitale~~Volatile LV - Low ~~Volitale~~Volatile
Semi. - Semianthracite Anth. - Anthracite Meta. - Metanthracite

Source: University of Illinois, Geology Lecture 837556753

CHAPTER 4
LAND STATUS, LAND USE AND POST-MINING LAND USE

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CHAPTER 4

LAND STATUS, LAND USE AND POST MINING LAND USE

4.1 Scope

This section details surface and mineral ownership as well as lease holders or easement holders, or other pending options or interests in lands which are contiguous to or within the area to be covered by the permit.

The existing regional and site specific land use as well as the possible impacts which may occur during and after mining to the land-use and socioeconomy are considered.

4.2 Methodology

All information documenting land status has been acquired from information on file with various governmental agencies, and also through independent land checks completed by Utah Coal and Chemical Corp.

4.3 Land Status

4.3.1 Surface Land Status

Plate 4-2 shows surface ownership of the area. Surface land owners will be notified by letter of the applicants intent to mine six months prior to mining. Table 4-1 contains addresses for the surface owners. The letter will state the mine's name and address, company contact, purpose of notification, possible impacts to their land due to mining, and request of access to surface for monitoring. A copy of the letters has been forwarded to UDOGM.

4.3.2 Mineral Status

Plate 4-3 shows the ownership and location of the mineral tracts. Table 4-1 list the names and addresses of the mineral ownership.

4.3.3 Legal Right to Enter

Plate 1-1 shows the boundaries of the land within the proposed permit area upon which the applicant has the legal right to enter and conduct coal mining activities. See Chapter 2 of this permit for further information concerning the permit boundary.

Leased Property

Lease documentation, description, and right-to-enter information are located in Chapter 2.

TABLE 4-1

Names and Addresses
Record Holders of Legal Interests

1. U P & L
P.O. Box 899
Salt Lake City, Utah 84110

2. Hidden Splendor Resources
50 West Liberty Street, Suite 880
Reno, NV 89501

3. J. Mark & James Jacobs
734 S. Cherry Drive
Orem, Utah 84057

4. Agnes and Eldred E. Peirce, Jr.
3432 South 500 East
Price, Utah 84501

5. Steve and Pete (Jr.) Stamatakis
1111 South 450 West
Price, Utah 84501

6. United States of America
Bureau of Land Management
2370 South 2300 West
West Valley City, Utah 84084

7. R. L. Bird
1840 East Bryan Avenue
Salt Lake City, Utah 84108

8. Nielson Ltd.
P.O. Box 620
Huntington, Utah 84528

9. Roy M. and Tessie K. Farley
5240 So. Highland Drive
Salt Lake City, Utah 84117

10. Robert and Linda N. Jewkes
Wellington, Utah 84542

11. Luke G. and Gene S. Pappas
    2030 S. Cave Hollow Way
    Bountiful, Utah 84010

12. Milton A. Oman
    1714 E. Millcreek Way
    Salt Lake City, Utah 84106

13. Utah Division of Wildlife Resources
    455 West Railroad Avenue
    Price, Utah 84501

14. K.C. Jensen and Tonda Hampton
    P.O. Box 957
    Price, Utah 84501

15. Carbon County
    Courthouse Building
    Price, Utah 84501

16. Arthur J. Anderson, Et al
    4190 Fortuna Way
    Salt Lake City, Utah 84117

17. Utah State Fish and Game
    1095 West Motor Avenue
    Salt Lake City, Utah 84116

4.3.3.1 Road Usage Agreements

In a letter dated May 13, 1996 Carbon County agreed to allow Horizon to use their County Road 290 to access the Horizon No. 1 mining project. Carbon County also agreed to continue the maintenance of county road 290 (Appendix 3-1).

4.3.4 Associated Surface Mining

The surface operations associated with underground coal mining activities do not involve the surface mining of coal. The private mineral lease to be mined (coal) has not been severed from the private surface lands.

4.4 Existing Land Use

4.4.1 Regional Land Use

Agricultural/Livestock

Historically, the livestock industry has played an important part of the region's economy. Early settlers depended on range land for grazing sheep, cattle, and horses. Presently, the trend is towards more cattle grazing and fewer sheep. The lands in the area used for grazing are outlined on Plate 4-1.

Forestry

Timber operations were once closely tied to ranch operations in the area. Early settlers needed the timber for fences, corrals, mine timber, railroad ties, etc. In more recent years, the majority of the sawmills have closed due to less demand for wood products.

During 1995 a logging operation opened on privately owned land above the Horizon proposed permit area. The logging operation uses County Road 290 and the county road (Consumer/Clear Creek) which runs through the proposed disturbed area.

Recreation

A large variety of wildlife zones are present ranging from cold desert to high mountain forest. Mule deer are the most abundant big game in the region. Mule deer and elk are popular big game hunting species. Lakes, streams, and rivers of this region provide habitat for a variety of fishes.

In addition to hunting and fishing, USFS and BLM provide lands for a variety of recreational activities in this region. They include camping, hiking, snowmobiling, etc.

4.4.2 Mine Plan Area Land Use - Past and Present

The land on which the Horizon No. 1 Mine is located has long been used for coal mining. Other than coal mining, this area has been used for hunting, hiking, and grazing. There are no developed campgrounds or paved public roads within the area and none are planned for the future.

The land use within and adjacent to the permit boundary at the time of this application is the monitoring of previous mining operations, mining reclamation activities, wildlife habitat, and grazing. The lands within the permit boundary are monitored to gather data necessary in permitting a mining operation. Horizon is unaware as to the owners intended use for all lands in the area, therefore Plate 4-1 outlines areas with specific or specialized land uses.

Private landowners presently administer the lands in this area for limited livestock forage. Cattle and sheep are herded through the proposed mine site area in spring and back through in the fall. Wildlife habitat, watershed, dispersed recreation, and coal mining are also land uses in the area. There are no range improvements in the area. Access to the grazing lands is limited to jeep trails into the higher elevations leading to Beaver Creek above the proposed mine sites. There are no plans to alter this access situation. The mine area has been classified as M & G by Carbon County. Supportive and descriptive documentation is located in Appendix 4-1.

Carbon County owns and maintains two roads, one runs parallel to the permit boundary on the south (290), the second runs through the disturbed area (for approximately 1250') enabling access to higher elevations for grazing and recreational activities (Consumers/Clear Creek).

4.4.3 Affect of Operations on Land Use and Mitigation Measures

The surface disturbance at the No. 1 Mine will consist of access/haul roads and surface facilities that will service the mining operations; some wildlife will be displaced due to coal hauling and facility operation. There will be little impact on range land as the mine disturbed area is below areas used for grazing by private landowners.

There are no public roads or public parks in or near the proposed mining operations that would suffer any impacts from mining operations. The Gordon Creek State Wildlife Management Unit lies southeast of the permit area.

The sedimentation pond will be constructed below the disturbed area to prevent sediment from entering the North Fork Gordon Creek. Refer to Chapter 7 for the location of runoff and diversion structures.

It is not projected that the mining operation will affect the land use within and adjacent to the permit boundary.

4.5 Post Mining Land Use

Once mining has ceased, the disturbed areas will be reclaimed to a degree acceptable to UDOGM and the land will once again support its principle pre-mining use: i.e., undeveloped land. Private landowners will continue to graze sheep and cattle on areas near Beaver Creek, which is above the mine site.

The restoration of the area will be achieved by regrading the yards, reclaiming the roads and portal areas to a practical degree, planting all disturbed areas and monitoring the revegetation effort.

4.6 Socioeconomic Consideration

The coal mining industry within Emery and Carbon Counties has shown several erratic periods of renewed growth and sudden decline. During the 1950 -1960 census period, the population of Emery County declined 8.79 percent. From 1960 to 1970, Emery County's population declined .74 percent per year. From 1970 to 1975, the population increased from 5,137 to an estimated 6,700 persons, a 23 percent increase.

Carbon and Emery Counties are economically dependent upon conditions in the coal market. This is evident by the slump in population of these counties that occurred between 1950 - 1970. The recent increase in coal mining has centered in Emery County where mining employment has increased over 210 percent from 1969 to 1980. The increase has been more modest in Carbon (40 to 50 percent).

APPENDIX 4-1a
LANDOWNER LETTERS

Hidden Splendor Resources

Horizon Mine
P.O. Box 32
Helper, Utah 84526
Phone: 435-472-1313 Fax: 435-472-1314

January 13, 2004

Roy M. Farley
Tess Farley
C/O Farley Management
4807 South Wallace Lane
Holiday, Utah 84117

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Re: Horizon Mine
DOGM Permit # C/007/0020

Dear Mr. and Mrs. Farley:

Hidden Splendor Resources, Inc. acquired the Horizon Mine from Lodestar Energy, Inc. on July 1, 2003. As part of the Utah Division of Oil, Gas & Mining permit transfer, Hidden Splendor Resources, Inc. is required under Regulation R645-301-114.200 to have written consent from surface landowners within the permit area.

Hidden Splendor Resources, Inc. is currently the leaseholder of Federal Coal Lease #U-74804 and is currently operating the Horizon underground mine in the above-mentioned lease.

Hidden Splendor Resources, Inc. does not anticipate any adverse effects to your property, nor plans any surface disturbance to your property because of its underground mining operation.

The description of your surface property within the permit area is as follows:

SW1/4 SW1/4 Section 8, Township 13 South, Range 8 East, SLBM
NW1/4 NW1/4 Section 17, Township 13 South, Range 8 East, SLBM

Hidden Splendor Resources, Inc. respectfully requests written consent from you as landowners of the aforementioned property allowing the Horizon Mine to continue its underground mining operations.

Should you have any questions or comments, please feel free to contact Mark Wayment, Mine Manager or Kit Pappas, Environmental Coordinator, at 435-472-1313.

Thank you, in advance, for your consideration and prompt response in this matter.

Mark Wayment
Mine Manager

Cc: File

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

ROY M. FARLEY
TESS FARLEY
c/o FARLEY MANAGEMENT
4807 S. WALLACE LANE
HOLLADAY, UT 84117

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Melissa Farley ☐ Agent ☐ Addressee

B. Received by (*Printed Name*) Melissa Farley
C. Date of Delivery 1/21/04

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

HOLLADAY BR SALT LAKE CITY UT 84117 JAN 21 2004 USPS-3

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (*Extra Fee*) ☐ Yes

2. Article Number
(*Transfer from service label*) 7002 2410 0006 2522 3833

PS Form 3811, August 2001 Domestic Return Receipt 102595-02-M-1540

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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Sent To ROY M. FARLEY, TESS FARLEY
Street, Apt. No.; or PO Box No. 4807 S. WALLACE LANE
City, State, ZIP+4 HOLLADAY, UT 84117

PS Form 3800, June 2002 See Reverse for Instructions

Hidden Splendor Resources

Horizon Mine
P.O. Box 32
Helper, Utah 84526
Phone: 435-472-1313 Fax: 435-472-1314

January 13, 2004

James C. Jacob
J. Mark Jacob
914 East 300 North
Orem, Utah 84097-5096

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Re: Horizon Mine
DOGM Permit # C/007/0020

Dear Mr. Jacob:

Hidden Splendor Resources, Inc. acquired the Horizon Mine from Lodestar Energy, Inc. on July 1, 2003. As part of the Utah Division of Oil, Gas & Mining permit transfer, Hidden Splendor Resources, Inc. is required under Regulation R645-301-114.200 to have written consent from surface landowners within the permit area.

Hidden Splendor Resources, Inc. is currently the leaseholder of Federal Coal Lease #U-74804 and is currently operating the Horizon underground mine in the above-mentioned lease.

Hidden Splendor Resources, Inc. does not anticipate any adverse effects to your property, nor plans any surface disturbance to your property because of its underground mining operation.

The description of your surface property within the permit area is as follows:

SW1/4 NW1/4 Section 17, Township 13 South, Range 8 East, SLBM
NW1/4 NE1/4 Section 17, Township 13 South, Range 8 East, SLBM
NE1/4 NE1/4 Section 18, Township 13 South, Range 8 East, SLBM

Hidden Splendor Resources, Inc. respectfully requests written consent from you as landowners of the aforementioned property allowing the Horizon Mine to continue its underground mining operations.

Should you have any questions or comments, please feel free to contact Mark Wayment, Mine Manager or Kit Pappas, Environmental Coordinator, at 435-472-1313.

Thank you, in advance, for your consideration and prompt response in this matter.

Mark Wayment
Mine Manager

Cc: File

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

JAMES C JACOB
J. MARK JACOB
914 E. 300 N
OREM, UT 84097-5098

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Terri Jacob ☒ Agent ☐ Address

B. Received by (Printed Name) Terri Jacob

C. Date of Deliv 1-13-04

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandi
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number
(Transfer from service label) 7002 2410 0006 2522 3840

PS Form 3811, August 2001 Domestic Return Receipt 102595-02-M-15

7002 2410 0006 2522 3840

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PRICE UT 84501
JAN 13 2004
USPS

Sent To
JAMES C. JACOB, J. MARK JACOB
Street, Apt. No.; or PO Box No. 914 E. 300 N
City, State, ZIP+4 OREM, UT 84097-5098

PS Form 3800, June 2002 See Reverse for Instructions

CHAPTER 5

CULTURAL AND PALEONTOLOGICAL RESOURCES

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CHAPTER 5

CULTURAL AND HISTORICAL RESOURCES

5.1 Scope

The historical, cultural and paleontological resources inventory and Class I literature search for Horizon Coal Corporation were completed by Baseline Data, Inc. (BDI) in 1995. The field work was completed during the week of August 1, 1995 and the literature search done in July, August and September of 1995. A copy of the data collected by BDI can be found in Appendix 5-1.

The area surveyed lies approximately 14 miles northwest of Price, Utah in Township 13 South, Range 8 East, Section 17. The BDI inventory consisted of a 100% examination of the proposed mine disturbed area.

Coal mines were opened in the area in the 1920s. Among the larger mines in the area were Sweet in 1925, Consumers in 1922, and National in 1908. Mining camps sprang up at the mines and for a short time Coal City (Dempseyville), located 2 miles east of the mines served as the business and residential center of the mining district. Remains of the major mining camps and coal mining operations can still be seen, including remains of cabins and work areas constructed by National Coal Company.

To the best of the applicants knowledge the permit area does not contain any public parks, cemeteries, archeological sites, units of the National System of Trails or of the Wild and Scenic River System.

The archaeological survey of the area recorded no historic archaeological sites. A search of the site files at the Utah Division of State History turned up no previously recorded sites in or near the permit area (see Appendix 5-1).

During 1985 Desert West Research completed an inventory and cultural history review of the Blue Blaze/Consumers Mine area for UDOGM. Desert West determined that the Blue Blaze/Consumers Mine was eligible for nomination to the National Register of Historic Places. Due to the access, mining reclamation efforts, and continued disturbance by the public, the area has undergone significant impacts since its nomination in 1985. According to a conversation with James L. Dykmann of the Utah State Historical Preservation Office (SHPO) on January 19, 1996 he is "unaware of the Blue Blaze\Consumer Mine being listed at this time".

Letters from the Utah State Historical Preservation Office on May 30, 1995 and October 24, 1995 both recommend that there would be **"No Effect"** upon cultural resources by the Horizon Mine project. The letters from James L. Dykmann (SHPO) are located in Appendix 5-1.

5.2 Cultural and Historic Resources

Hidden Splendor Resources is unaware of any site within the permit boundary which qualify as being of cultural or historical value. Should cultural or historical artifacts be discovered, the appropriate regulatory agencies will be notified and the site will be protected from further disturbance until it can be examined by authorized personnel.

The information in Appendix 5-1 may conflict with other reports prepared by qualified consultants, therefore the information presented by BDI should only be considered relevant when it discusses historical, cultural, and paleontological data.

APPENDIX 5-1

HISTORICAL, CULTURAL, AND PALEONTOLOGICAL RESOURCES STUDY
SHPO CORRESPONDENCE

CHAPTER 6

GEOLOGY

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CHAPTER 6

GEOLOGY

6.1 Scope

This chapter includes the geologic information for the Horizon Mine area in accordance with the requirements set forth in R645-301-600.

6.2 Methodology

Previously assembled geologic data obtained from Beaver Creek Coal Co. has been used as a basis for this chapter. The data from Beaver Creek Coal Co. included drill logs generated during their mining efforts. This chapter also includes information from more recent drilling and mining operations in the Horizon Mine area. Information from recent geologic publications and in-house reports is also included to supplement the information obtained from Beaver Creek Coal Co.

6.3 Regional Geologic Framework

The Horizon No. 1 Mine is located in the northern portion of the Wasatch Plateau (Figure 6-1). The Wasatch Plateau is the northwestern outlier of the eroded San Rafael Swell. The plateau dips westward producing a great monoclinal fold that is interrupted by faults in the borderlands of the Great Basin. Superimposed over the region are numerous structural features including anticlines, synclines, faults and igneous intrusions.

The Wasatch Plateau is comprised primarily of Cretaceous to Tertiary age sedimentary rocks. These rocks are principally siliciclastic of both continental and marine origin. Coal seams of economic significance occur in the Cretaceous sediment (Table 6-1).

The Upper Cretaceous Rocks of the Wasatch Plateau were deposited along the western margin of the Western Interior Basin. The dynamic depositional sequence of the Mesaverde Group is the result of deltaic sedimentation. During the Upper Cretaceous, the area now occupied by the Wasatch Plateau was a trough, gradually subsiding, attracting drainage and receiving terrigenous clastics from the tectonically active Sevier highlands. Wave-dominated delta complexes prograded easterly into this epicontinental sea. The Sevier orogenic belt was tectonically active during the entire Cretaceous Period. Near the end of the Cretaceous Period, rocks that were deposited in the marginal marine environments were deformed as the result of the Laramide Orogeny.

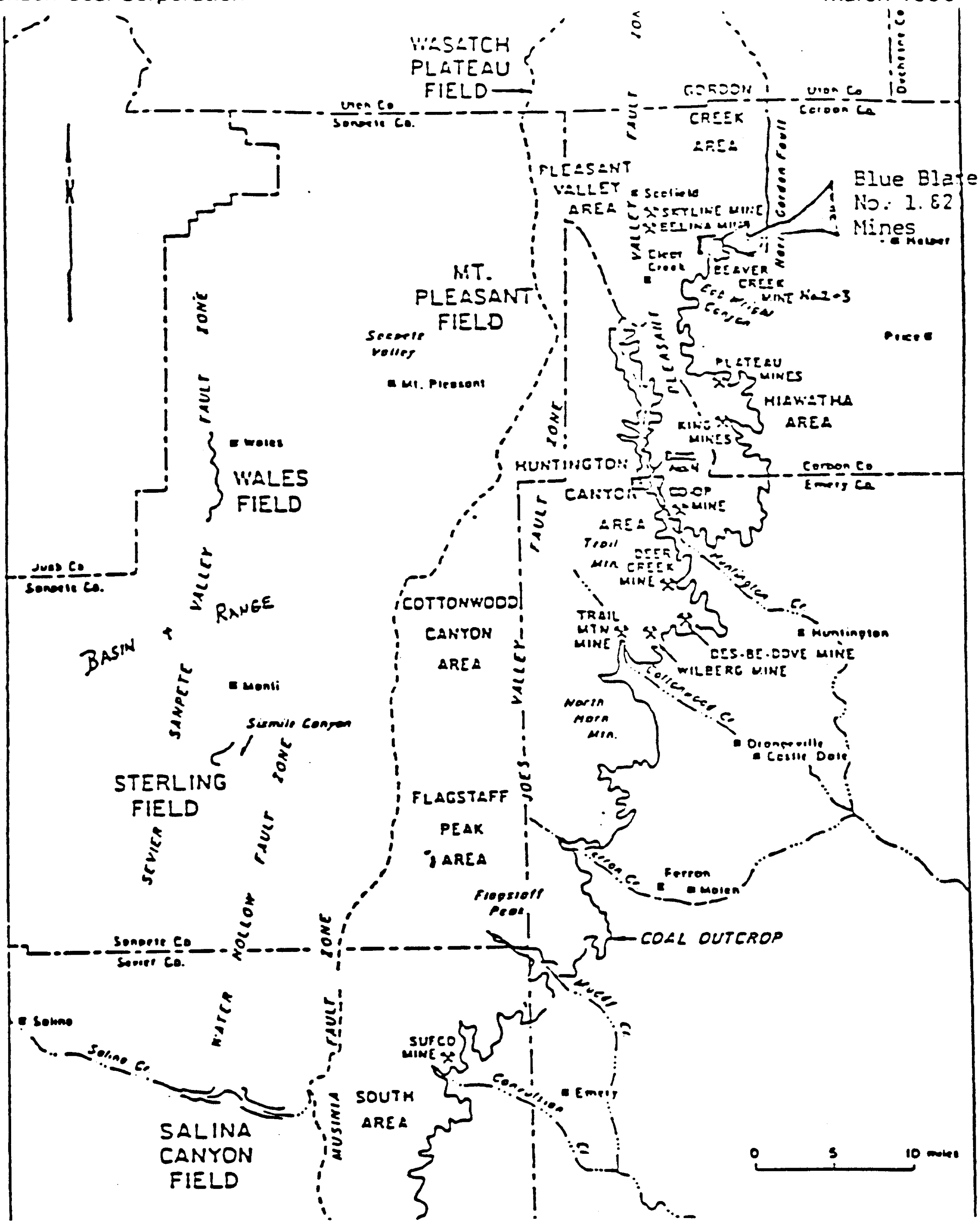

Figure 6-1. Location Map.

TABLE 6-1
CENTRALIZED STRATIGRAPHIC SECTION - NORTHERN WASATCH PLATEAU

SYSTEM	STRATIGRAPHIC UNIT		THICKNESS (feet)	DESCRIPTION
TERTIARY	WASATCH	North Horn Formation	500-2,500	Variegated shales with subordinate sandstone, conglomerate and freshwater limestone, slope former; sandstone and limestone units may supply limited quantities of groundwater.
CRETACEOUS	MESA VERDE GROUP	Price River Formation	600-1,000	Gray to white gritty sandstone interbedded with subordinate shale and conglomerate, ledge and slope former, little potential for groundwater.
		Castlegate Sandstone	150-500	White to gray, coarse-grained often conglomeratic sandstone, cliff former, weathers to shades of brown, good aquifer material, groundwater not present if outcrops occur nearby.
		Blackhawk Formation (Major Coal Seams)	700-1,000	Yellow to gray, fine to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick coal seams; perched groundwater may occur in sandstone units.
		Star Point Sandstone	90-1,000	Yellow-gray massive cliff-forming sandstone, often in several tongues separated by Masuk Shale.
	MANCOS SHALE	Masuk Shale	300-1,300	Yellow to blue-gray sandy shale, slope former.
		Emery Sandstone (Coal)	50-800	Yellow-gray friable sandstone tongue cliff former. Coal present in subsurface; major regional aquifer.
		Blue Gate Member	1,500-2,400	Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into rolling hills and badlands.
		Ferron Sandstone Member (Major Coal Seams)	50-950	Alternating yellow-gray sandstone, sandy shale and gray shale with important coal beds of Emery coal field, resistant cliff former; major regional aquifer.
		Tununk Shale Member	400-650	Blue-gray to black sandy marine shale slope forming mudstone.

(Modified from Doelling, 1972)

6.4 Geology of Project Vicinity

6.4.1 Stratigraphy

The coal beds of interest lie within the Upper Cretaceous Mesaverde Group. This group is divided into four stratigraphic units and include in ascending order: The Star Point Sandstone, the Blackhawk Formation, the Castlegate Sandstone, and the Price River Formation. The minable seams are found in the lower 350 feet of the Blackhawk Formation. Plates 6-2 and 6-3 are geologic cross sections that illustrate the stratigraphic relationships of the Blackhawk and Star Point Formations and the mappable coal beds present in the Horizon No. 1 Mine area.

Star Point Sandstone

The Star Point Sandstone is the oldest stratigraphic unit exposed in the lease areas. It is the basal unit of the Mesaverde Group and is approximately 440 feet thick. The formation contains the Panther, Storrs, and Spring Canyon Sandstone Members which consist of coarsening upward littoral sequences of white to light gray, fine to medium grained, tight, quartzose sandstone (Blanchard 1981). The Star Point Formation overlies and intertongues with the marine Mancos Shale. The Star Point is the lowest cliff-forming unit over most of the east side of the Wasatch Plateau.

Blackhawk Formation

The Blackhawk Formation measures approximately 900 feet thick in the Gordon Creek area and consists of interbedded fluvial and marine sandstone, siltstone, and shale. The Blackhawk Formation conformably overlies the Star Point Sandstone and the boundary between the two formations is sharp; the massive Spring Canyon Sandstone member of the Star Point Sandstone is overlain by an easily erodible, shaley sandstone.

A total of eight coal seams can be identified in the Gordon Creek region. Four of the eight seams are present in the mine area and outcrop on the walls of the North Fork of Gordon Creek Canyon, Coal Canyon, and Bryner Canyon. Weathering, burning and vegetation obscures the majority of coal outcrops of the Hiawatha, Gordon, Castlegate "A", and Bob Wright seams. Only the Hiawatha and Castlegate "A" seams have been economically mined in the area. The Hiawatha seam marks the base of the Blackhawk Formation. The Castlegate "A" seam overlies the Aberdeen Sandstone. The Aberdeen is a marine sandstone sequence that coarsens upward, and is similar in character to the Star Point Sandstone. The Aberdeen measures over 120 feet at Price Canyon (Sec. 12, T13S, R9E) and thins to the west. In the vicinity of the Horizon No. 1 Mine and the National Mine (Sec. 17, T13S, R8E), the Aberdeen Sandstone is apparently discontinuous and not easily recognizable on outcrop. The westward pinch-out of the Aberdeen Sandstone is illustrated on the west-east stratigraphic section between drill hole LMC-4 and the Arco measured section near the National Mine as illustrated on Plate 6-3.

In the lease area, the Blackhawk Formation is the principal surficial bedrock unit. The Blackhawk is disconformably overlain by the massive, coarse grained, fluvial Castlegate Sandstone.

Castlegate Sandstone

The Castlegate Sandstone is exposed in the central and northeastern portion of the lease block (Plate 6-1) The formations consists of a white to gray, coarse grained to conglomeratic fluvial sandstone. Exposures of the Castlegate Sandstone typically form cliffs to steep slopes. The Castlegate Sandstone is approximately 300 feet thick in the Gordon Creek area.

Price River Formation

The Price River Formation occurs in the northeastern portion of the lease block (Plate 6-1). The Price River is also a fluvial deposit and contains gray to white silty sandstones with interbedded subordinate shale and conglomerate. The formation typically forms ledges and slopes. The Price River formation ranges from 600 to 1,000 feet in thickness.

Unconsolidated Deposits

Unconsolidated deposits composed of silt and fine grained sand, alluvial sediments and talus debris occur along valley floors and at the base of steep slopes. The thickness of these sediments is variable. In the Horizon No. 1 Mine area, the thickest alluvial deposits occur along Beaver Creek. Based on field observations, the alluvial sediments appear to exceed 10 feet in thickness.

Igneous Dikes

Several igneous dikes have been reported in area mines including the Beaver Creek Coal Mines #2 and #3. The dikes are reported to be Miocene age and are a mica peridotite (Tingey, 1986). The dikes are typically associated with faults that bisect the area and trend east-west to northwest-southeast.

6.4.2 Structure

The area of the permit is heavily faulted (Plate 6-1). Two major fault zones affect the lease block: the North Gordon and Fish Creek fault zones (Figure 6-2). The North Gordon fault zone measures three miles wide and five miles in length and is located east of the lease. The Fish Creek fault zone averages two miles wide and enters the lease from the northwest.

The permit area contain essentially two major fault trends. They are the N60 degree west trending faults (Range N50-75W) associated with the Fish Creek fault zone, and the N-S trending faults associated with the North Gordon fault zone. Sympathetic faulting also occurs within the mine area. Displacements of the faults in the mine area are variable ranging from a few feet to as much as 200 feet.

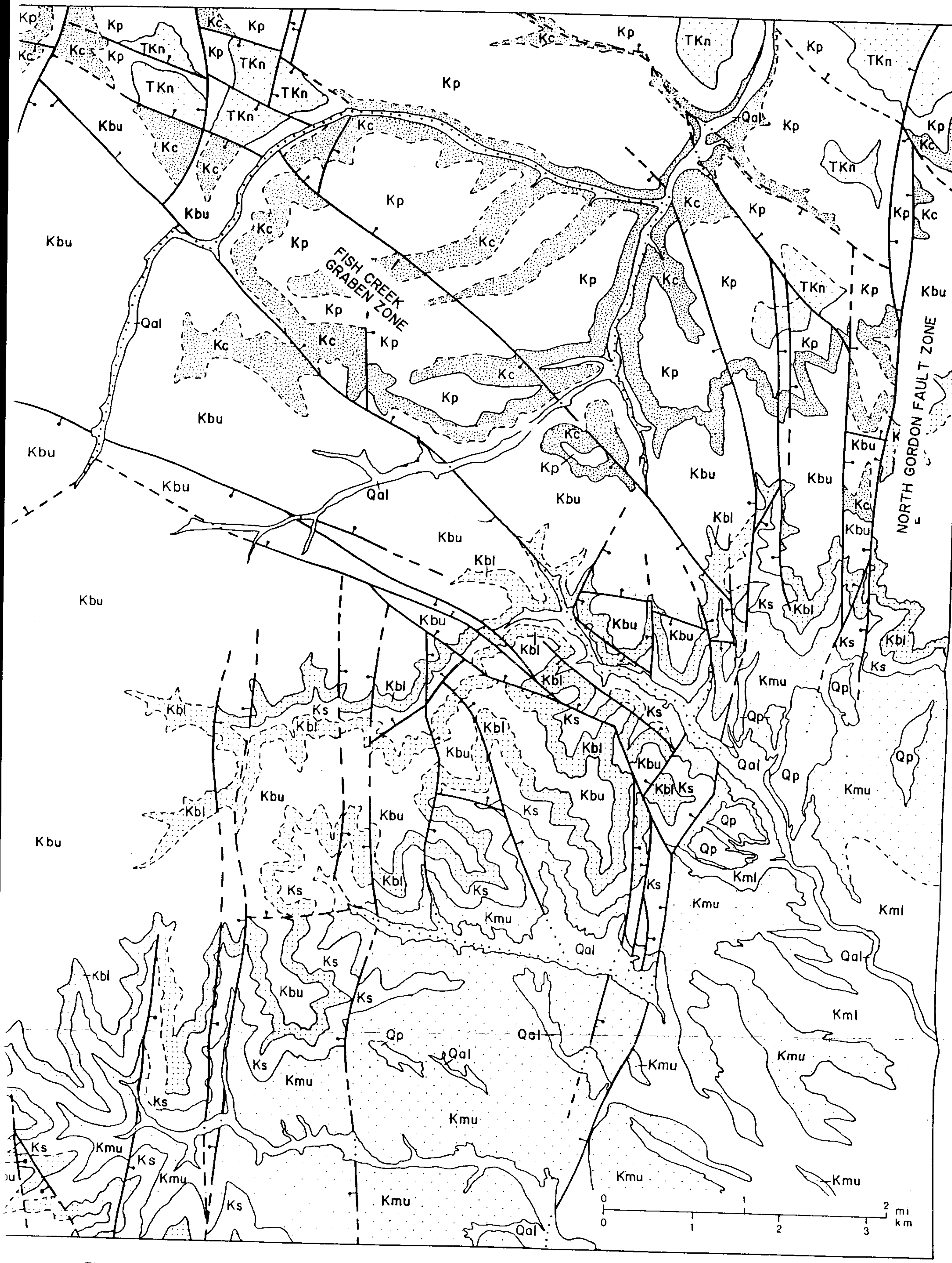

FIGURE 6-2. REGIONAL GEOLOGY MAP OF THE BLUE BLAZE NO. 1 & 2 MINE PERMIT AREA (HANSEN, 1988).

The faulting in the mine area appears to have influenced the development of stream courses. For example, the North Fork of Gordon Creek drainage appears to have formed subsequent or contemporaneously with the movement along the Gordon Creek Fault Zone (Plate 6-1).

Faulting may also effect the locations of springs and seeps in the mine area. The faulting and fracturing of the bedrock in the mine area may provide open conduits for surface water to enter into the subsurface or allow groundwater movement between aquifers. A series of springs at the head of the North Fork of Gordon Creek in the northwest corner of Section 18 T13S R8E may be related to the faults bisecting the area. Immediately east of the permit area, groundwater associated with faulting was encountered in the Beaver Creek #3 mine. The effects of faulting on the groundwater system in mine area is discussed further in Section 7.1.2.

Another major structural feature which influences the lease is the Beaver Creek Syncline (Figure 6-3). The synclinal axis trends NE-SW and actually crosses the southern portion of the lease. The strata dip toward this axis at approximately 3.5 degrees.

The igneous dikes of the area generally trend parallel to the Fish Creek fault trend. The dikes range from 0.1 to 14.0 feet in thickness.

6.5 Geology of Coal Beds and Adjacent Strata

6.5.1 Exploration and Drilling

Numerous surface exploration and surface development holes have been drilled by various energy companies and government agencies in the area surrounding the Horizon No. 1 and 2 Mine lease areas. Many of these drill holes were drilled under the direction of the Beaver Creek Coal Company during exploration and evaluation projects for their Gordon Creek mines. Four holes, LMC 1 - 4, were drilled within the lease boundaries under the direction of LMC Resources. The LMC drill hole geophysical logs were interpreted and lithologic logs were constructed by the Bureau of Land Management (BLM). The location of LMC holes are shown on Plate 7-1. Table 6-2 provides the date and depth drilled, the measured depth (February 1992), depth to the top of the Castlegate and Hiawatha seams for the LMC drill holes. Copies of the LMC drill hole logs are included in Appendix 6-1 and the HZ logs are included in Appendix 7-5.

A re-interpretation of the geophysical and lithologic log of LMC-2 was made by after discovering that the previous interpretation of the LMC-2 logs did not correlate with the lithologic interpretation of other drill holes in the area. Initially, the Castlegate "A" seam was identified at approximately 370 feet below ground surface (elevation 7880) and the Hiawatha seam at 518 feet below ground surface (elevation 7732). In drill hole LMC-3, which is located less than 2000 feet west of LMC-2, the same seams were identified at approximately 630 feet (elevation 7590) and 791 feet (elevation 7429) respectively. No faults have been

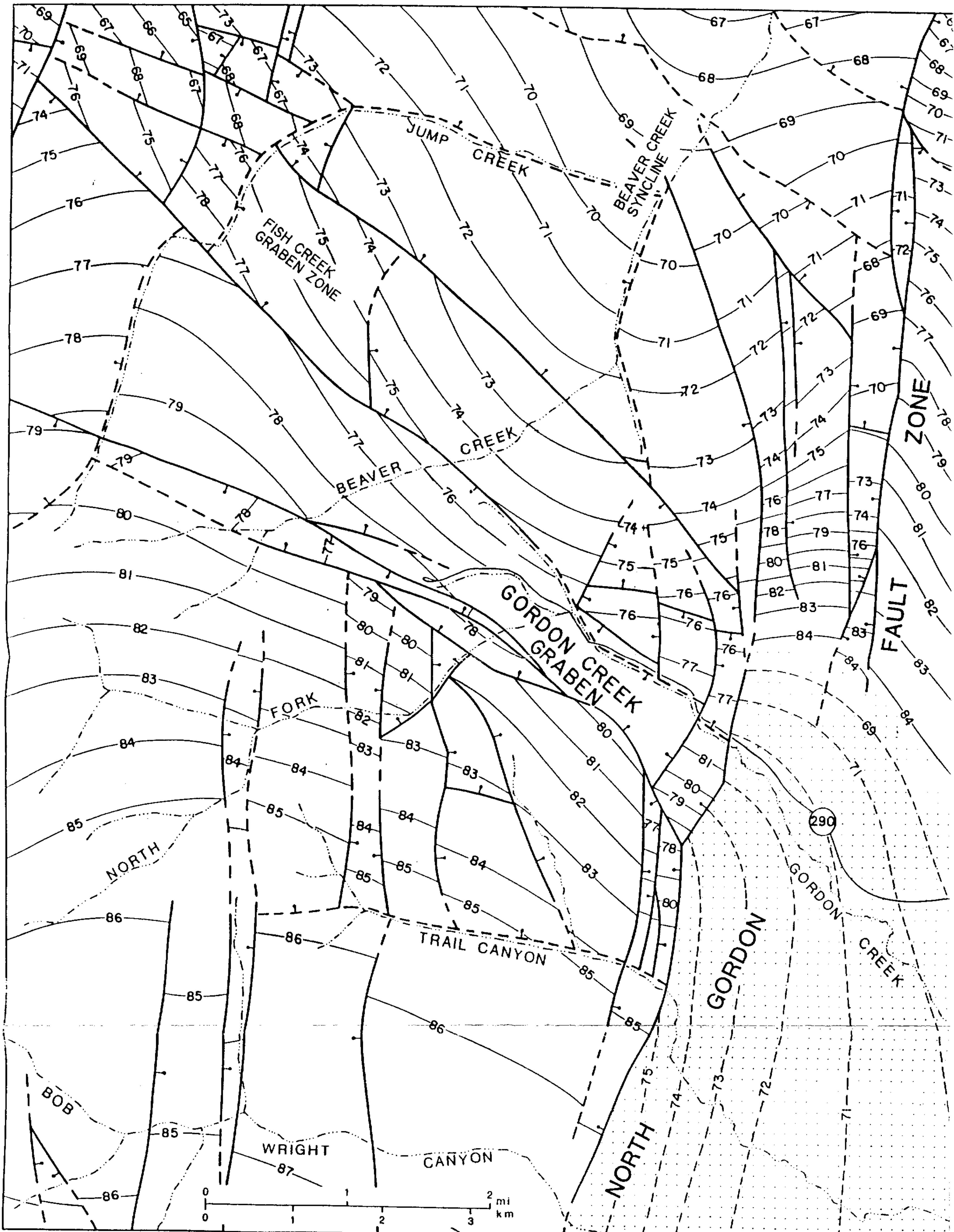

FIGURE 6-3. REGIONAL STRUCTURAL CONTOUR MAP.

DATUM IS TOP OF SPRING CANYON MEMBER OF STARPOINT FORMATION EXCEPT IN SHADED AREAS. IN SHADED AREAS, DATUM IS TOP OF EMERY SANDSTONE MEMBER OF MANCOS SHALE. (HANSEN, 1988).

TABLE 6-2

DRILL HOLE EVALUATION

Hole ID	Date Drilled	Depth Drilled	Measured Depth (Feb. 1992)	Depth to Top of Castlegate (ft)	Depth to Top of Hiawatha (ft)
LMC-1	Sep 1976	900 ft	599 ft	793	*
LMC-2	Oct 1976	568 ft	None	518	*
LMC-3	Nov 1976	836 ft	664 ft	630	791
LMC-4	Jan 1980	430 ft	217 ft	105.2	215.3
HZ-95-1	10/8/95	1075 ft	-	857	1012
HZ-95-2	10/15/95	1195 ft	-	1025	1149
HZ-95-3	10/28/95	465 ft	-	225	413

* Drilling completed before reaching the Hiawatha seam.

mapped in the area that would offset the formations encountered in the two drill holes. Assuming the current interpretation by the BLM is not correct, a better stratigraphic and structural fit is achieved if the coal seam initially identified as the Hiawatha is re-interpreted as the Castlegate "A" seam and the overlying coal seams initially identified as the Castlegate "A" are reclassified as local coal beds. Personnel at the Salt Lake Office of the BLM were contacted and questioned about the accuracy of their interpretation of the LMC boreholes. The BLM personnel feel that many of the interpretations of the logs are suspect.

A north to south geologic cross-section and an east to west geologic cross-section were generated from the logs of several of the drill holes advanced under the direction of Beaver Creek Coal Company, LMC, and the U.S.G.S. The cross sections are shown on Plates 6-2 and 6-3 respectively. The locations of the drill holes from which the logs were used to construct the cross sections are shown on an index map included on the plates. The cross sections provide a graphic illustration of the stratigraphic and structural relationships of the coal seams in the lease area.

6.5.1.1 Casing and Sealing

Drill holes LMC 1, 2, 3, and 4 will be plugged and abandoned following State approved methods. Three new holes have been (HZ-1, HZ-2, and HZ-3) drilled and completed as monitoring wells within the uppermost saturated zone beneath the Hiawatha seam to better predict the potential of inflow into the mine.

When no longer needed for monitoring or other use approved by the UDOGM and upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well, each well or boring will be capped, sealed, backfilled, or otherwise properly managed, as required by UDOGM. Permanent closure measures will be designed to prevent access to the borings or monitoring wells by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering the groundwater system.

6.5.2 Stratigraphy - Coal Seams

The commercial coal beds on the tract occur in the Blackhawk Formation. Only the Castlegate "A" and Hiawatha Seams are minable.

6.5.2.1 Hiawatha Seam

The Hiawatha Seam is the lowest stratigraphic coal in the Horizon mining lease. It directly overlies the Star Point Sandstone and is the most laterally persistent seam in the area. It can be correlated with the Kinney or Upper O'Connor seams mined in the Pleasant Valley area in the western part of the plateau (Plate 6-3). The Hiawatha seam ranges in thickness from 6.0 to 11.0 feet, averaging 7.0 feet within the lease block. A thin rider seam overlies the Hiawatha in the southwestern part of the lease.

The floor rock of the Hiawatha seam ranges from the competent littoral Spring Canyon of the Star Point Sandstone to fluvial overbank shales and siltstone and channel sandstones.

6.5.2.2 Gordon Coal Zone

The Gordon seam is stratigraphically located about 80 feet above the Hiawatha. It is very lenticular and generally less than 5.0 feet in thickness with multiple splits. It is not economically mineable in the Gordon Creek area. The roof and floor consist essentially of shale and because of this, the outcrop is often covered by slump and soil.

6.5.2.3 Castlegate "A" Seam

The Castlegate "A" seam is stratigraphically located 150 to 230 feet above the Hiawatha seam. The seam ranges 4.0 to 14.0 feet in thickness. The average thickness in this area is 8.3 feet. The Castlegate "A" seam nearly pinches out and becomes unmineable in areas near the southwestern boundary.

The floor of this seam appears to vary from a carbonaceous silty shale to a fine grained fluvial sandstone. Water production from this floor strata has not been observed in other mining operations in the area.

The roof consists essentially of overbank carbonaceous silty shales (approximately 80%). In the northeastern part of the lease a persistent rider seam is present. The remainder of the mine roof consists of fluvial channel sandstones. The frequency of channeling increases to the west. Local scouring of the seam occurs in some of the channels. The general channel trend is NE-SW and range 100 to 500 feet in width. During mining, some channels may initially produce water which will, more than likely, dry within weeks. However, if sustained flows are encountered during mining operations, the water will be managed as described in Chapter 7.

Poor top conditions generally are located adjacent to channel margins due to differential compaction of the adjacent shale units. This is indicated by the abundance of slickenside features in the shale.

6.5.2.4 Bob Wright Seam

The Bob Wright seam lies about 120 feet above the Castlegate "A" seam. It is very lenticular and contains abundant partings. It does not achieve minable thickness (4.0 ft.) within the Gordon Creek area. However, the seam does thicken above 4.0 feet southwest of the lease. Within the Horizon mining leases, the seam contains a shale roof and floor. Locally, sandstone occurs in the roof.

6.5.3 Oil and Gas Wells

No oil and gas exploration or production wells are located in the permit area.

6.5.4 Detailed Cross Sections

Plates 6-2 and 6-3 are geologic cross sections which show the general stratigraphic relations through the Horizon Mine area. The stratigraphic relationships of the Castlegate "A" and Hiawatha seams are illustrated in these sections. Tables 6-3 and 6-4 list the borings and their locations used to construct the cross sections.

6.5.5 Coal Reserves

For coal reserve calculations see Section 3.3.3.1.

6.5.6 Coal Quality and Characteristics

Table 6-5 summarizes the quality of the Hiawatha coal seam. The analyses were performed on core samples from drill hole LMC-4 as well as the HZ drill holes. Supporting laboratory data sheets are provided in Appendix 6-2.

According to data provided in Table 6-5, the average moisture content of the Hiawatha coal seam is 7.99 percent. The pyritic sulfur content of the coal is low, with a maximum of 0.07 percent and an average of 0.05 percent.

Data presented in Appendix 6-2 and summarized in Table 6-6 indicate that the Hiawatha coal seam does not possess toxic-forming characteristics. Boron and selenium concentrations, as well as sodium adsorption ratios, are all within a range classified as "good" by Leatherwood and Duce (1988). However, the acid-base potential of each of the three coal samples which were collected from the HZ-series holes suggests that the coal has a potential to be acid-forming.

The acid-forming potential of the coal will be tempered by its slightly alkaline nature (with a pH that varies from 7.3 to 7.8, according to Appendix 6-2). Furthermore, impacts to the environment of the permit and adjacent areas resulting from this acid-forming potential will be minimized by two factors. First, coal will be stored on the surface for only short periods of time before being shipped off site, thus reducing the potential for weathering, oxidation, and generation of acid drainage. Second, runoff from the coal stockpile will be routed through the facility sedimentation pond, where it will mix with more-alkaline runoff from additional areas, thus neutralizing any acidic drainage which might form.

6.5.7 Adjacent Units (Overburden and Underburden)

6.5.7.1 Rock Characteristics, Acid-toxic, Pyrite, Clay and Alkalinity

Table 6-6 lists the analytical results of tests performed to determine the acid- and toxic-forming potential of floor and roof samples collected adjacent to the Hiawatha coal seam from LMC-4 and from the HZ holes. Comparing the data in Table 6-6 with the guidelines presented by Leatherwood and Duce (1988) indicate that the roof and floor materials should be neither

TABLE 6-3

CROSS SECTION BORING LOCATIONS
NORTH-SOUTH CROSS SECTION

Boring	Location (BY SECTION)	Location (BY U.S. CADASTRAL SYSTEM)
BCCC MC-2-2	T13S R8E SW NE sec. 18	(D-13-8) 18ac
ARCO (1980) GC-8	T13S R8E NW SW sec. 8	(D-13-8) 8cb
Blue Blaze Coal Co. Consumers (1927) DH-3	T13S R8E NW NE sec. 8	(D-13-8) 8ab
USGS (1976) W-BC-4-S	T13S R8E NE NE sec. 8	(D-13-8) 8aa
ARCO (1980) GC-7	T13S R8E SE SE sec. 5	(D-13-8) 5dd
ARCO (1980) GC-6	T13S R8E NE SE sec. 6	(D-13-8) 6da
USGS (1976) W-BC-5-S	T12S R8E SW SW sec. 32	(D-12-8) 32cc

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TABLE 6-4

CROSS SECTION BORING/MEASURED SECTION LOCATIONS
EAST-WEST CROSS SECTION

Boring/Measured Section	Location (Section)	Location (U.S. Cadastral System)
ARCO Measured Section No. 3 & No. 6 Mines at Portals	T13S R8E NE SW Sec. 16	(D-13-8) 18ac
Beaver Creek Coal Co. Mine Core MC-3-1	T13S R8E NW SW Sec. 16	(D-13-8) 8cb
Beaver Creek Coal Co. No. 3 Mine Workings MW-3-2 (1976)	T13S R8E SW SW Sec. 16	(D-13-8) 8ab
LMC Resources (1976) C & W Coal Co. Submittal LMC-4	T13S R8E SW NE Sec. 17	(D-13-8) 8aa
ARCO (1980) Measured Section Near National Mine	T13S R8E SE SW Sec. 17	(D-13-8) 5dd
Beaver Creek Coal Co. (1976) Certified Point OC-2-1	T13S R8E SE SE Sec. 18	(D-13-8) 6da
Beaver Creek Coal Co. (1976) No. 2 Mine Core MC-2-2	T12S R8E SW NE Sec. 18	(D-12-8) 32cc
Beaver Creek Coal Co. (1976) Certified Point OC-2-2	T13S R8E SE SW Sec. 18	(D-13-8) 18cd
USGS (1976) W-BC-3-S	T13S R7E SE SW Sec. 12	(D-13-7) 12cd
ARCO (1980) GC-3	T13S R7E NW SW Sec. 13	(D-13-7) 13cb
ARCO Measured Section N. Fork Gordon Creek	T13S R7E NE NE Sec. 23	(D-13-7) 23aa
Arco (1980) GC-2A	T13S R7E SW SE Sec. 15	(D-13-7) 15dc
USGS (1980) UGC-3	T13S R7E SE SE Sec. 16	(D-13-7) 16dd
USGS (1980) UGC-5	T13S R7E NE NE Sec. 16	(D-13-7) 16aa

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TABLE 6-5

QUALITY OF HIAWATHA COAL SEAM[a]

Hole Number	Interval Sampled (ft)	Moisture Content (%)	Ash Content (%)	Volatile Matter (%)	Fixed Carbon (%)	Heat Energy (Btu/lb)	Total Sulfur (%)	Pyritic Sulfur (%)
LMC-4	224.0-227.5	5.38	7.63	42.51	44.48	12,448	0.47	0.04
HZ-95-1	1012.4-1012.8	8.06	6.10	40.57	45.27	12,230	0.58	0.02
HZ-95-1	1013.3-1015.4	9.17	5.26	40.51	45.06	12,450	0.57	0.07
HZ-95-1	1015.4-1015.8	8.81	19.00	36.31	35.88	10,287	0.45	0.04
HZ-95-1	1015.8-1017.6	8.94	5.24	40.20	45.62	12,533	0.45	0.05
HZ-95-1	1017.6-1019.0	10.49	13.27	35.10	41.14	10,957	0.38	0.03
HZ-95-2	1147.3-1148.4	9.11	5.68	40.10	45.11	12,306	0.49	0.05
HZ-95-2	1148.4-1149.7	7.63	17.38	37.44	37.55	10,665	0.38	0.04
HZ-95-3	412.6-414.0	7.41	4.22	41.11	47.26	12,768	0.59	0.05
HZ-95-3	415.5-417.05	6.87	4.26	42.24	46.63	12,940	0.61	0.07
HZ-95-3	417.05-418.2	7.57	4.64	41.03	46.76	12,672	0.58	0.06
HZ-95-3	418.2-419.2	7.53	14.10	36.40	41.97	11,187	0.53	0.06
HZ-95-3	419.2-420.1	6.84	11.89	38.33	42.94	11,846	0.56	0.04

(a) On an "as-received" basis. Laboratory reports provided in Appendix 6-2.

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TABLE 6-6

ACID- AND TOXIC-FORMING POTENTIAL OF
HIAWATHA COAL, ROOF, AND FLOOR SAMPLES[a]

Hole Number	Interval Sampled (ft)	Unit Sampled	Boron Conc. (ppm)	Selenium Conc. (ppm)	Sodium Adsorp. Ratio	pH	Acid/Base Pot.[b]	Total Sulfur (%)	Pyritic Sulfur (%)
LMC-4	214.0-217.0	Roof	1.61	<0.1	1.98	7.12	--	--	0.24
LMC-4	224.0-227.5	Coal	--	--	--	--	--	0.47	0.04
LMC-4	227.3-230.5	Floor	<0.1	<0.1	1.04	8.09	--	--	0.05
HZ-95-1	1011.2-1012.4	Roof	--	--	0.35	7.96	20.3	--	--
HZ-95-1	1012.4-1012.8	Coal	0.13	<0.01	0.40	7.32	-13.6	0.58	0.02
HZ-95-2	1146.2-1147.3	Roof	0.22	0.05	1.36	7.94	64.0	--	--
HZ-95-2	1147.3-1148.4	Coal	0.17	<0.01	0.91	7.77	-9.1	0.49	0.05
HZ-95-2	1158.2-1159.3	Floor	0.21	0.07	1.29	8.53	30.1	--	--
HZ-95-3	411.9-412.6	Roof	0.29	0.05	0.68	7.89	22.3	--	--
HZ-95-3	412.6-414.0	Coal	0.17	<0.01	0.41	7.31	-15.8	0.59	0.05
HZ-95-3	420.3-421.0	Floor	0.05	0.01	0.55	7.21	29.0	--	--

(a) Analyses performed in accordance with Leatherwood and Duce (1988). Laboratory reports provided in Appendix 6-2.

(b) In tons of $CaCO_3$ per 1000 tons of material

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acid-generating nor toxic-forming. One sample (LMC-4 roof material) did contain an anomalously-high pyritic sulfur content of 0.24 percent. However, comparison with other samples collected in the area indicates that this high pyritic sulfur content is likely of limited areal extent. This is further verified by the high neutralization potential of the remaining roof and floor materials (with acid/base potentials varying from 20.3 to 64.0 tons of $CaCO_3$ per 1000 tons of material).

To monitor conditions of the overburden and underburden, samples will be taken at 2,000 ft intervals throughout the mine and will be tested according to the Divisions requirements.

6.5.7.2 Roof and Floor Properties

As discussed in Section 6.5.2, the roof and floor rock of the Castlegate "A" and Hiawatha seams varies from shale to competent sandstone. Information obtained from the LMC drill holes and selected drill holes from the Beaver Creek Coal Company permit application for their mines in the area have been utilized to determine roof and floor conditions that can be anticipated while mining the Hiawatha seam. The location of the of the Beaver Creek drill holes are included on Plate 3-3. Logs of the wells used to determine the properties of the roof and floor rock are included in Appendix 6-1.

The logs of drill hole LMC-3 and LMC-4 indicate the floor rock of the Hiawatha consists of five feet of carbonaceous silty shale and silty sandstone overlying the massive sandstone of the Spring Canyon Member of the Star Point Formation. No cores were obtained from LMC-3 and LMC-4 to determine the geotechnical properties of roof or floor rock. However, uniaxial strength tests were performed by Beaver Creek Coal Company on samples of shales and sandstones obtained from drill holes GCD-4, 7, and 10. These drill holes are located approximately one mile west-southwest of the Horizon Mine portals. The results of the tests are provided in Table 6-7.

The logs from drill hole LMC 1 indicate the roof of the uppermost split of the Castlegate "A" seam is approximately 35 feet of sandstone. The floor of the seam consists of four feet of shale overlying approximately 30 feet of sandstone. In LMC-2, the upper split roof rock consists of 42 feet of carbonaceous shale and the floor consists of 38 feet of shaley silty sandstone. In LMC-3, the upper split roof rock consists of 4.5 feet of shale overlain by 19 feet of silty sandstone and the floor rock consists of four feet of shale overlying 8.5 feet of sandstone. In LMC-4, the roof rock consists of 15 feet of sandstone and the floor rock is five feet of siltstone overlying 26 feet of sandstone. Information from Beaver Creek Coal Company GCD-4 indicates that the roof rock of the Castlegate"A" seam in the area of the drill hole consists of sandstones interbedded with shales and the floor consists of shale. The results of uniaxial strength tests for samples obtained from the roof and floor rock of the Castlegate "A" seam in drill hole GCD-4 is provided in Table 6-7.

TABLE 6-7

UNIAXIAL STRENGTH TEST RESULTS
BEAVER CREEK COAL COMPANY, DRILL HOLES GCD-10, 4, AND 7

Sample I.D.	Depth Interval (feet)	Diameter (inches)	Length (inches)	Description	Compressive Strength (psi)	Young's Module (psi x 10^6)
GCD-10	80.0 - 85.0	1.85	3.86	Shale	14327	1.0994
GCD-10	76.2 - 76.8	1.85	3.74	Shaly sandstone	8448	2.9047
GCD-10	20.0 - 20.5	1.86	3.64	Shaly sandstone	16874	2.4769
GCD-10	29.7 - 30.2	1.86	3.75	Shaly sandstone	N/A	5.0169
GCD-10	35.8 - 36.9	1.85	3.75	Shaly sandstone	15977	2.0718
GCD-10A	26.4 - 27.6	1.85	3.67	Shale	7772	1.1189
GCD-10B	26.4 - 27.6	1.85	3.71	Shale	16601	1.753
GCD-4	364.0 - 366.0	2.87	5.20	Roof rock, sandstone interbedded w/shale	9130	1.1977
GCD-4	366.0 - 368.0	2.58	4.73	Roof rock, sandstone interbedded w/shale	5860	1.0791
GCD-4	369.0 - 370.0	2.41	4.91	Roof rock, sandstone interbedded w/shale	10606	1.9149
GCD-4	381.0 - 382.0	2.40	4.93	Floor rock, shale	10616	1.7017
GCD-7	122.0 - 122.5	1.85	3.80	Sandstone interbedded w/shale	11257	1.6076

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6.6 Geologic Effects of Mining

6.6.1 Mining Hazards

The types of mining hazards which have been encountered at other mines in the immediate area and within the Wasatch Plateau are anticipated to be encountered while mining in the Horizon No. 1 Mine. Roof conditions vary from excellent to poor depending upon the type of rock overlying the coal. Methane has never been detected in the mine workings in this area. The maximum thickness of overburden is not excessive: therefore, explosive rock bursts and "rib rolls" are not expected to occur.

6.6.2 Surface Hazards

Rockfalls occur naturally, but can be more frequent with activities associated with mining such as increased men, machinery, noise, and bulk movement of soil using tractors and mining equipment. This is a relatively minor problem and nothing of any more concern is expected to occur.

6.6.3 Impacts of Mining

There will be no geologic effects other than the possible disturbance of the groundwater and surface subsidence. These potential problems have been discussed in Chapter 7 and Section 3.4.8.

6.6.4 Subsidence

Subsidence of the sediments overlying the mining area will be monitored. A detailed description of the subsidence monitoring plan, including a map illustrating the location of monitoring stations, is presented in Section 3.4.8.

6.7 Post Mining Reclamation

Reclamation of the mine site following completion of the mining operations as required by state regulations R645-301 and R645-302 will be accomplished. The reclamation plan is discussed in detail in Section 3.5 of this permit application.

6.8 References

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APPENDIX 6-1

DRILL HOLE LOGS

DRILL HOLE LOGS

REGISTERED PROFESSIONAL ENGINEER
5/21/92
No. 7102
RICHARD B. WHITE
Richard B. White
STATE OF UTAH

The information contained in this appendix is true and correct to the best of my knowledge. RBW

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured -- --	Boring Depth (Ft): 899' Well Depth (Ft) -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		0 - 100' SANDSTONE, SILTSTONE, SHALE (interbedded) No lithology log	
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L. -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		0 - 200' SANDSTONE, SILTSTONE, SHALE (interbedded) No lithology log	BLACKHAWK FORMATION
110			
120			
130			
140			
150			
160			
170			
180			
190			
200			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: -- Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 899' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		0 - 279' SANDSTONE, SILTSTONE, SHALE (interbedded) No lithology log	BLACKHAWK FORMATION
210			
220			
230			
240			
250			
260			
270			
280		279 - 280.5' COAL No lithology log 280.5 - 300' SANDSTONE, SILTSTONE, SHALE No Lithology log	
290			
300			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300–400		280.5 - 400': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-1
Owner/Client: ROGER SKAGGS	Boring/Well Location: —
Project Number: UC-244	Reference Elevation: —
	Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976	Drilling Contractor: HOLLANDER
Logged By: —	Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: —	Boring Depth (Ft): 899' Well Depth (Ft): —
Dates Measured: — —	Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400		280.5 - 500': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
410			
420			
430			
440			
450			
460			
470			
480			
490			
500			

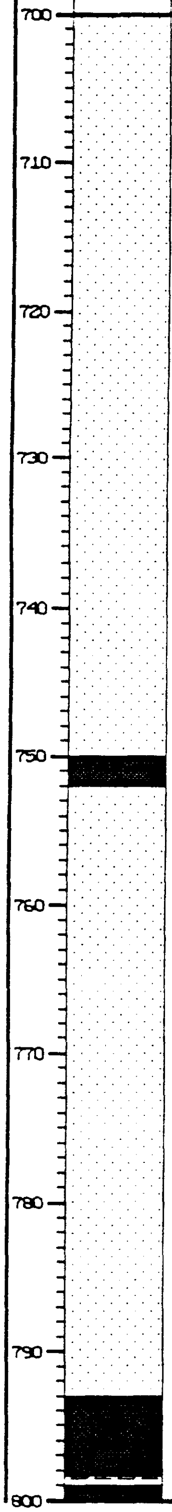
Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
500		280.5 - 600': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
510			
520			
530			
540			
550			
560			
570			
580			
590			
600			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

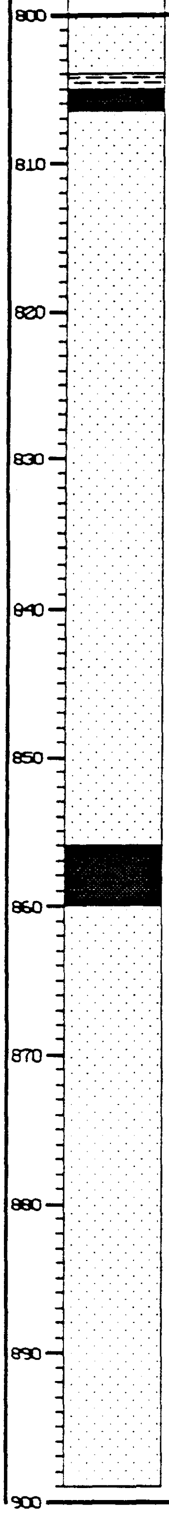
DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
600		280.5 - 700': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
610			
620			
630			
640			
650			
660			
670			
680			
690			
700			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
700–800		280.5 - 750': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
		750 - 752': COAL:	
		752 - 793: SANDSTONE, SILTSTONE, SHALE: No lithology log.	
		793 - 798.4': COAL: No lithology log.	Castlegate "A" Upper Split
		798.4 - 799': SHALE:	
		799 - 800': COAL: No lithology log	

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-1 Boring/Well Location: —
Project Number: UC-244	Reference Elevation: — Reference Point: GROUND SURFACE
Date Drilled: SEPT 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 899' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
800		800 - 804' : COAL: No lithology log.	
		804 - 805' : SHALE: No lithology log.	
		805 - 806.5 : COAL: No lithology log.	Castlegate "A" Lower Split
		806.5 - 856': SANDSTONE, SILTSTONE, SHALE: No lithology log.	
		856 - 860': COAL:	Gordon Coal Seam
		860 - 899': SANDSTONE, SILTSTONE, SHALE: No lithology log.	



Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-2 Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250' Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 568' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0		SANDSTONE, SILTSTONE, SHALE (interbedded) No lithology log	BLACKHAWK FORMATION
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			

EARTHFAX ENGINEERING, INC.

DRILLING LOG

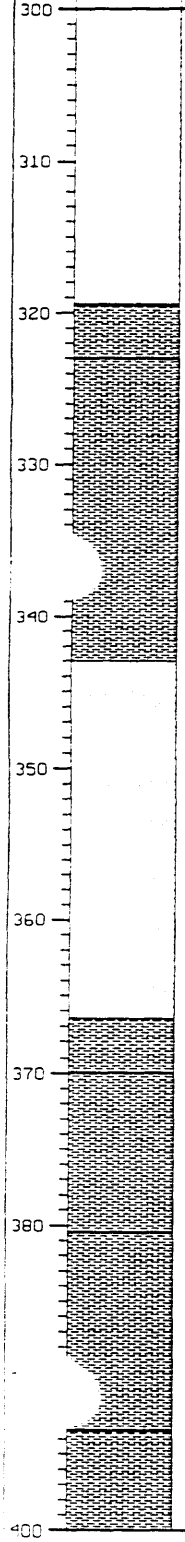
Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-2
Owner/Client: ROGER SKAGGS	Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250'
	Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976	Drilling Contractor: HOLLANDER
Logged By: --	Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: --	Boring Depth (Ft): 568' Well Depth (Ft): --
Dates Measured: -- --	Boring Diameter (In): 4 3/4"

DEPTH (FT)	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100	0 - 169': SANDSTONE, SILTSTONE, SHALE (interbedded): No lithology log.	BLACKHAWK FORMATION
169	169 - 170': COAL: Possibly shaley.	Local Coal Group
170	170 - 172.5': SHALE: Carbonaceous, silty.	Local Coal Group
172.5	172.5 - 173': COAL: Shaley.	Local Coal Group
173	173 - 194.9': SANDSTONE: Massive.	Local Coal Group
194.9	194.9 - 195': COAL:	Local Coal Group
195	195 - 319': SANDSTONE: Shaley.	

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-2
Owner/Client: ROGER SKAGGS	Boring/Well Location: --
Project Number: UC-244	Reference Elevation: 8250′
	Reference Point: GROUND SURFACE
Date Drilled: 13 OCT 1976	Drilling Contractor: HOLLANDER
Logged By: --	Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: --	Boring Depth (Ft): 568′ Well Depth (Ft): --
Dates Measured: -- --	Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		195 - 319.4′ SANDSTONE Shaley	BLACKHAWK FORMATION
210			
220			
230		Interbedded massive sandstone at 231 - 244′	
240			
250			
260			
270			
280		Interbedded massive sandstone at 288 - 312′	
300			

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-2
Owner/Client: ROGER SKAGGS	Boring/Well Location: --
P ect Number: UC-244	Reference Elevation: 8250'
	Reference Point: GROUND SURFACE
Drilled: 13 OCT 1976	Drilling Contractor: HOLLANDER
Logged By: --	Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: --	Boring Depth (Ft): 568' Well Depth (Ft): --
Dates Measured: -- --	Boring Diameter (in): 4 3/4"

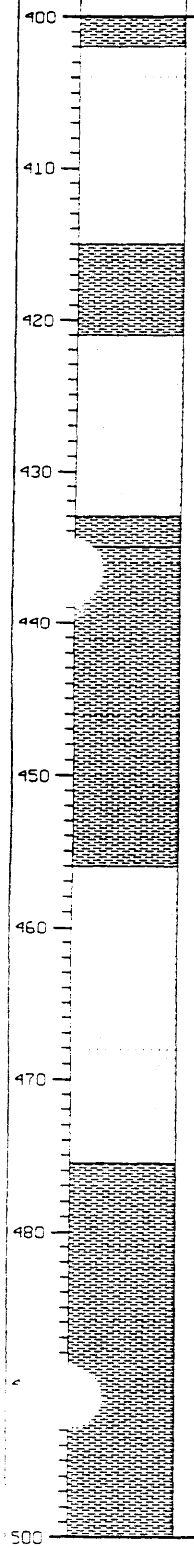


DEPTH (FT)	LITHOLOGIC DESCRIPTION AND OBSERVATIONS			FORMATION/REGIONAL GROUP
	195 - 319 4'	SANDSTONE	Shaley Interbedded massive sandstone at 288 - 312'	BLACKHAWK FORMATION
	319 4 - 319 5'	COAL	Possibly <0 5% shaley coal present	Local Coal Group
	319 5 - 322 9'	SHALE	Carbonaceous, silty	Local Coal Group
	322 9 - 323'	COAL	Possibly <0 5% shaley coal present	Local Coal Group
	323 - 343'	SHALE	Sandy	
	343 - 366 5'	SANDSTONE	Massive	
	366 5 - 369 9'	SHALE	Carbonaceous, silty	
	369 9 - 370'	COAL	Castlegate Coals replaced with channel deposit	Local Coal Group
	370 - 380 4'	SHALE	Carbonaceous, silty Castlegate Coals replaced with channel deposit	Local Coal Group
	380 4 - 380 5'	COAL	Castlegate Coals replaced with channel deposit	Local Coal Group
	380 5 - 393 4'	SHALE	Carbonaceous, silty Castlegate Coals replaced with channel deposit	Local Coal Group
	393 4 - 393 5'	COAL	Castlegate coals replaced with channel deposit	Local Coal Group
	393 5 - 402'	SHALE	Carbonaceous, sandy Channel deposit?	

Project Name: BLUE BLAZE COAL
Owner/Client: ROGER SKAGGS
Project Number: UC-244
Drilled: 13 OCT 1976
Logged By: --

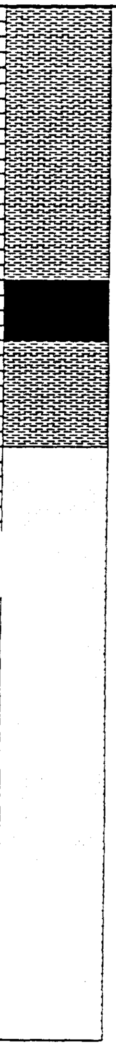
Boring/Well Number: LMC-2
Boring/Well Location: --
Reference Elevation: 8250'
Reference Point: GROUND SURFACE
Drilling Contractor: HOLLANDER
Drilling Method: -- Rig Type: --

First occurrence of G.W.: -- Static W.L.: --
Dates Measured: -- --
Boring Depth (Ft): 568' Well Depth (Ft): --
Boring Diameter (in): 4 3/4"



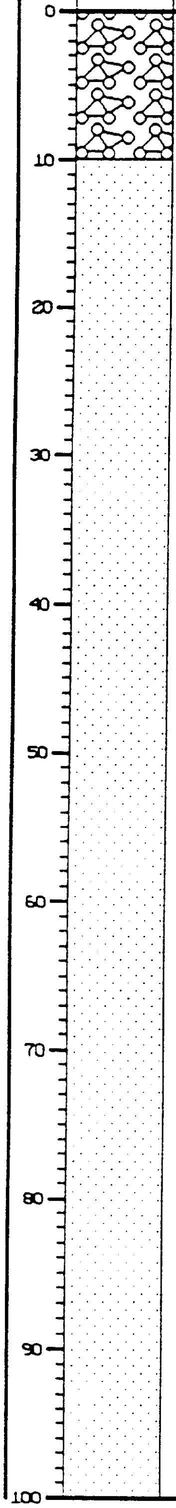
LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
393 - 402' SHALE Carbonaceous, sandy Channel deposit?	BLACKHAWK FORMATION
402 - 415' SANDSTONE Shaley	
415 - 421' SHALE Carbonaceous	
421 - 433' SANDSTONE Shaley Remnant of Aberdeen Deposit?	
433 - 435' SHALE Carbonaceous	
435 - 535 1' COAL	
435 1 - 456' SHALE Sandy	
456 - 475 5' SANDSTONE Silty	
Shaley zone 467 - 470'	
475 5 - 518' SHALE Sandy	

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-2
Owner/Client: ROGER SKAGGS	Boring/Well Location: --
[illegible]ect Number: UC-244	Reference Elevation: 8250′
	Reference Point: GROUND SURFACE
Drilled: 13 OCT 1976	Drilling Contractor: HOLLANDER
Logged By: --	Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: --	Boring Depth (Ft): 568′ Well Depth (Ft): --
Dates Measured: -- --	Boring Diameter (in): 4 3/4"



DEPTH (FT)	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
500	475.5 - 518′ SHALE Sandy	BLACKHAWK FORMATION
510	Sandstone roof rock at 510.5 - 518′	
520	518 - 522′ COAL 4.0′ on geophysical log	Castlegate "A"?
	522 - 529.5′ SHALE Carbonaceous, silty •Floor unit	
530	529 - 568′ SANDSTONE Shaley, silty Lithofacies equivalent of the massive Spring Canyon Sandstone?	Aberdeen Sandstone?
540		
550		
560		
570		
580		
[illegible]00		

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (ft): 836' Well Depth (ft): — Boring Diameter (in): —



DEPTH (FT) / GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0	0 - 10': SOIL: No lithology log available.	QUATERNARY
10	10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
47	Massive sandstone at 47 - 53'.	

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKABBB	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
110			
120			
130		Massive sandstone at 131 - 143'.	
140			
150			
160			
170			
180			
190			
200			

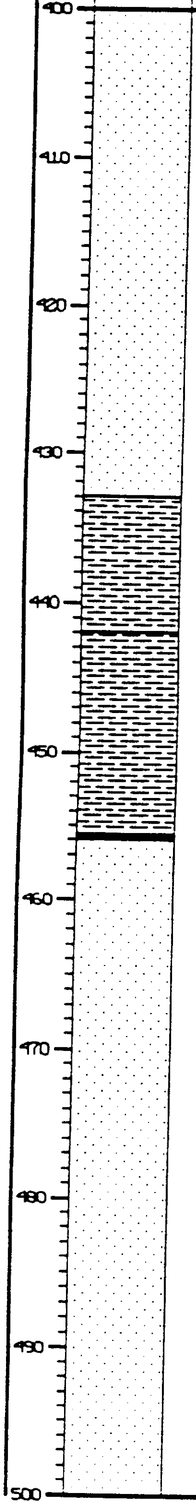
Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
200		10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
210		Massive sandstone at 214 - 226'.	
220			
230			
240			
250			
260			
270			
280			
290			
300			

Project Name: BLUE BLAZE COAL Owner/Client: ROBER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
300		10 - 432.9' SANDSTONE, SILTSTONE, SHALE (interbedded):	
310			
320			
330			
340			
350			
360			
370		Massive sandstone at 370 - 396'.	
380			
390			
400			

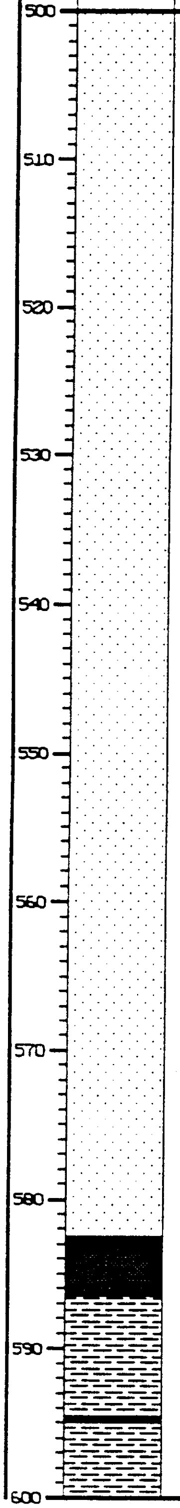
Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —



DEPTH (FT)	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400	10 - 432.9': SANDSTONE, SILTSTONE, SHALE (interbedded):	BLACKHAWK FORMATION
410	Massive sandstone at 412 - 426'.	
430	432.9 - 433': COAL:	Local Coal Group
	433 - 441.9': SHALE: Carbonaceous, sandy.	Local Coal Group
440	441.9 - 442': COAL:	Local Coal Group
	442 - 455.5': SHALE: Carbonaceous, sandy.	Local Coal Group
450	455.5 - 456': COAL: Shaley.	Local Coal Group
	456 - 582.5': SANDSTONE: Shaley.	

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-3
Owner/Client: ROGER SKABBB	Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): —

DEPTH (FT) | GRAPHICAL LOG

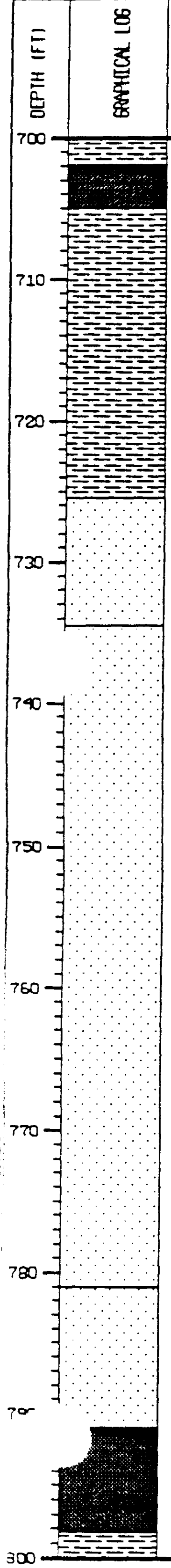


LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
456 - 582.5': SANDSTONE: Shaley.	BLACKHAWK FORMATION
Massive sandstone at 539 - 557'.	
582.5 - 586.5': COAL:	Bob Wright Group
586.5 - 594.5': SHALE: Carbonaceous, sandy.	Bob Wright Group
594.5 - 595': COAL: Shaley.	Bob Wright Group
595 - 606': SHALE: Carbonaceous, silty.	

Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-3
Owner/Client: ROGER SKAGGS	Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290'
	Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976	Drilling Contractor: HOLLANDER
Logged By: —	Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: —	Boring Depth (Ft): 836' Well Depth (Ft): —
Dates Measured: — —	Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
600		595 - 606': SHALE: Carbonaceous, silty.	BLACKHAWK FORMATION
		606 - 625.5': SANDSTONE: Silty.	
610			
620			
		625.5 - 630': SHALE: Carbonaceous, silty. carbonaceous silty shale, next 5.5'=silty sandstone.	
630		630 - 635.5': COAL:	Castlegate A
		635.5 - 642': SHALE: Carbonaceous, silty.	
640		642 - 648.2': COAL:	Castlegate A
		648.2 - 651.4': SHALE: Carbonaceous, silty. IM FLR=3.2' carbonaceous silty shale, next 3.0'=coal.	
650		651.4 - 654.4': COAL:	Castlegate A
		654.4 - 658.5': SHALE: Carbonaceous, sandy.	
660		658.5 - 667': SANDSTONE: Shaley. Remnant of channel sandstone?	
		667 - 668.2': COAL: Local coal seams of limited extent.	
		668.2 - 671': SHALE: Carbonaceous.	
670		671 - 676.9': COAL: Shaley. Shale parting 673.0 - 674.4'. Shaley coal 674 - 675.5'.	
		676.9 - 691': SANDSTONE: Shaley, silty. Top 3' shaley remnant of channel. Sandstone = Aberdeen Sandstone?	Aberdeen Sandstone
680			
690		691 - 701.9': SHALE: Sandy.	
700			

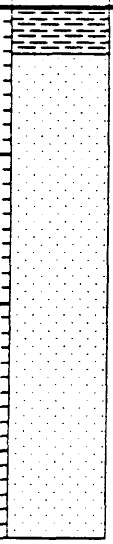
Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-3
Owner/Client: ROGER SKAGGS	Boring/Well Location: 4,394,410 N 495,640 E
P[illegible]ject Number: UC-244	Reference Elevation: 8290'
	Reference Point: GROUND SURFACE
Drilled: 5 NOV 1976	Drilling Contractor: HOLLANDER
Logged By: —	Drilling Method: — Rig Type: --
First occurrence of G.W.: — Static W.L.: --	Boring Depth (Ft): 836' Well Depth (Ft): —
Dates Measured: — --	Boring Diameter (in): 4 3/4"



LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
691 - 701.9': SHALE: Sandy.	BLACKHAWK FORMATION
701.9 - 705': COAL:	Gordon Coal
705 - 725.5': SHALE: Sandy.	
725.5 - 734.5': SANDSTONE: Massive.	
734.5 - 781': SANDSTONE: Shaley.	
781 - 791': SANDSTONE: Shaley. IM RF = 3.0' carbonaceous shale, next 2.0' = shaley sandstone, next 5.0' = silty sandstone.	
791 - 798.2': COAL:	Hiawatha coal seam
798.2 - 803.2': SHALE: Carbonaceous, silty.	BLACKHAWK-STAR POINT GROUP

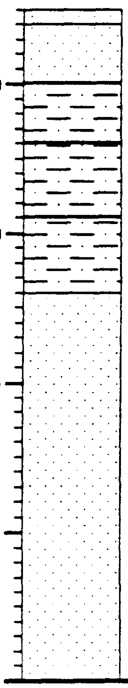
5/19/92

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-3 Boring/Well Location: 4,394,410 N 495,640 E
Project Number: UC-244	Reference Elevation: 8290' Reference Point: GROUND SURFACE
Date Drilled: 5 NOV 1976 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 836' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

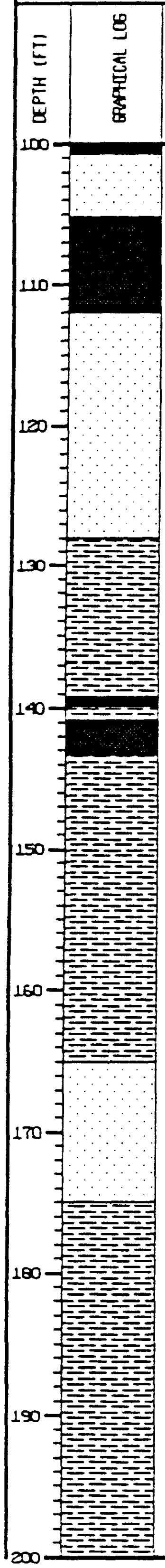
DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
800		798.2 - 803.2': SHALE: Carbonaceous, silty.	BLACKHAWK-STAR POINT GROUP
		803.2 - 836': SANDSTONE: Massive.	Upper Spring Canyon Sandstone
810			
820			
830			
840			
850			
860			
870			
880			
890			
900			

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 430' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
0–55		NO LITHOLOGICAL LOG 0 - 55'	
? - 56'		SANDSTONE: Massive. Channel sandstone remnant?	BLACKHAWK FORMATION
56 - 59.9'		SANDSTONE: Carbonaceous, shaley. Uncertain.	
59.9 - 60'		COAL: Castlegate Coals replaced with channel dep.	Castlegate A
60 - 63.9'		SILTSTONE: Carbonaceous, sandy. Castlegate Coals replaced with channel deposit.	Castlegate A
63.9 - 64'		COAL: Castlegate Coals replaced with channel deposit.	Castlegate A
64 - 68.9'		SILTSTONE: Carbonaceous, sandy. Castlegate Coals replaced with channel deposit.	Castlegate A
68.9 - 69'		COAL: Castlegate Coals replaced with channel deposit.	Castlegate A
69 - 74'		SILTSTONE: Carbonaceous, sandy. Red color in log = baked? By what coal?	
74 - 100'		SANDSTONE: Remnant of channel sandstone? BTM 5' = sandy siltstone	

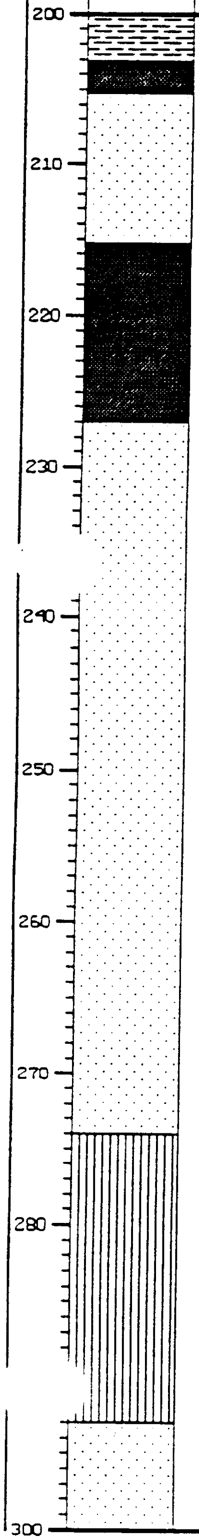


Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 430' Well Depth (Ft): — Boring Diameter (in): 4 3/4"



LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
100 - 100.7': COAL: Shaley.	BLACKHAWK FORMATION
100.7 - 105.2': SANDSTONE: Carbonaceous, shaley, coal seams of limited extent.	
105.2 - 112': COAL: Shaley. Shale partings 108.2 - 109.6'.	Castlegate A
112 - 128': SANDSTONE: Shaley, silty. Shaley 112 - 119'. Remnant of Aberdeen Sandstone?	Aberdeen Sandstone
128 - 139.2': SHALE: Carbonaceous, silty.	
139.2 - 139.9': COAL:	Gordon Coal
139.9 - 140.9': SHALE: Carbonaceous, sandy.	Gordon Coal
140.9 - 143.3': COAL:	Gordon Coal
143.3 - 165': SHALE: Carbonaceous, coaly, sandy. Coals at 146.4 - 147'.	
Coals at 151.4 - 152.5'.	
Coals at 159 - 159.7'.	
Coals at 162.6 - 163.3'.	
165 - 175': SANDSTONE: Carbonaceous.	
175 - 203.1': SHALE: Sandy.	

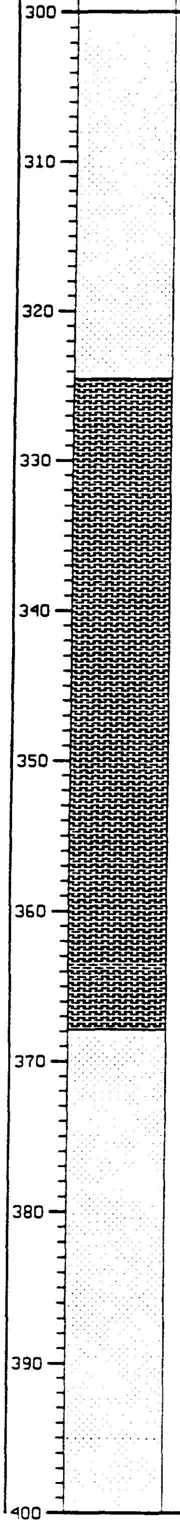
Project Name: BLUE BLAZE COAL	Boring/Well Number: LMC-4
Owner/Client: ROGER SKAGGS	Boring/Well Location: 4,393,760 N 495,860 E
·ect Number: UC-244	Reference Elevation: 7800'
	Reference Point: GROUND SURFACE
... Drilled: 1 JAN 1980	Drilling Contractor: HOLLANDER
Logged By: —	Drilling Method: — Rig Type: --
First occurrence of G.W.: — Static W.L.: --	Boring Depth (Ft): 430' Well Depth (Ft): —
Dates Measured: — --	Boring Diameter (in): 4 3/4"

DEPTH (FT) / GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
	175 - 203.1': SHALE: Sandy.	BLACKHAWK FORMATION
	203.1 - 205.3': COAL: No gamma response on geophysical log.	Hiawatha coal seam
	205.3 - 215.3': SANDSTONE: Shaley. IM RF = 5.5' massive	Hiawatha coal seam
	215.3 - 227': COAL: Old works--top 6.0 - 6.5' mined out ? rubble (old National Mine workings).	Hiawatha coal seam
	227 - 232': SANDSTONE: Carbonaceous, silty. IM Floor = 5'	
	232 - 233+': SANDSTONE: Massive.	Upper Spring Canyon Sandstone
	LITHOLOGY (CORE) DESCRIPTION ENDS AT 233.0'.	
	274 - 293': SILTSTONE: Shaley.	
	293 - 324.5': SANDSTONE: Massive	Lower Spring Canyon Sandstone

5/19/92

EARTHFAX ENGINEERING, INC. — DRILLING LOG

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: --	Drilling Contractor: HOLLANDER Drilling Method: -- Rig Type: --
First occurrence of G.W.: -- Static W.L.: -- Dates Measured: -- --	Boring Depth (Ft): 430' Well Depth (Ft): -- Boring Diameter (in): 4 3/4"

DEPTH (FT) / GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
		
	324.5 - 367.9' SHALE Silty	
	367.9 - 368' COAL	Lower O'Conner
	368 - 420' SANDSTONE Silty Massive	Storrs Sandstone

Project Name: BLUE BLAZE COAL Owner/Client: ROGER SKAGGS	Boring/Well Number: LMC-4 Boring/Well Location: 4,393,760 N 495,860 E
Project Number: UC-244	Reference Elevation: 7800' Reference Point: GROUND SURFACE
Date Drilled: 1 JAN 1980 Logged By: —	Drilling Contractor: HOLLANDER Drilling Method: — Rig Type: —
First occurrence of G.W.: — Static W.L.: — Dates Measured: — —	Boring Depth (Ft): 430' Well Depth (Ft): — Boring Diameter (in): 4 3/4"

DEPTH (FT)	GRAPHICAL LOG	LITHOLOGIC DESCRIPTION AND OBSERVATIONS	FORMATION/REGIONAL GROUP
400–430		400 - 430': SANDSTONE: Silty. Massive.	Storrs Sandstone

Depth scale: 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500

APPENDIX 6-2

LABORATORY DATA SHEETS

CHAPTER 7
HYDROLOGY

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CHAPTER 7

HYDROLOGY

The purpose of this chapter is to present a review of hydrologic information relevant to the Horizon No. 1 Mine. A plan of action is presented to ensure that underground coal mining operations are in compliance with Office of Surface Mining (OSM) and UDOGM hydrology regulations.

This chapter includes a description of hydrologic conditions in the permit and adjacent areas and a determination of the probable hydrologic consequences of mining activity.

7.1 Ground Water Hydrology

7.1.1 Method of Study

To assist in this investigation, a field reconnaissance of the area was made with the aid of the Division of Oil, Gas and Mining (Darin Worden 1988-1990). Hydrologic data collected from wells and springs in the area were evaluated. Data evaluated also include drill hole logs, mine maps from the permit and adjacent areas, published and open file reports from the U.S. Geological Survey, Utah Geological Survey, Bureau of Land Management, and the U.S. Forest Service. Beaver Creek Coal Company records were also used to study the hydrology of the area.

Field reconnaissance of the mine area permitted observation of the geologic setting of springs and seeps, and confirmation of the geologic observations made from aerial photo reconnaissance. In addition, information on hydrologic conditions encountered, in the adjacent Beaver Creek Mines, were reviewed.

Furthermore, at the request of UDOGM, a reconnaissance of the permit area and surrounding areas was performed for seeps and springs. Areas evaluated included Sand Gulch, Coal Canyon and several unnamed drainages which contribute to Jump Creek. The seeps and springs thus located are presented on Plate 7-1. The flow and temperature for each of the seep or spring are summarized in Appendix 7-2. These data were gathered to provide baseline information in anticipation of future mining.

7.1.2 Existing Ground Water Resources

7.1.2.1 Regional Ground Water Hydrology

The lithologic nature of the Upper Cretaceous strata generally render these units unsuitable as significant aquifers. Price and Arnow (1974) do not identify Gordon Creek area as a region for potential large scale ground water development. In general, all the upper Cretaceous sediments of the area have low hydraulic conductivities and low specific yields (0.2 to 0.7 percent) (Price and Arnow, 1974). Much of the precipitation that falls in the Wasatch Plateau exits the area by overland flow and evaporation. Much of the water that does enter the ground moves only short distances before discharging as springs and seeps (field observations made by Darin Worden -

UDOGM and Roger Skaggs - Blue Blaze Coal Company). Detailed descriptions of the formations discussed below are presented in Chapter 6.

The lowest principal water-bearing formations of the Wasatch Plateau are the sandstone units of the Mancos Shale Group. These include the Emery and Ferron Sandstones (Price and Arnow, 1974). These sandstone units occur in the southern portions of Emery County, and probably do not extend into the in the Gordon Creek area (Fisher et al., 1960).

The Star Point Formation overlies the Mancos Shale. It is composed of littoral sandstones interbedded with tongues of the Mancos Shale. The Star Point Formation contains the Panther, Storrs, and Spring Canyon sandstone members. Lines (1985) identified the Blackhawk Formation and Star Point Sandstone as an aquifer in the region. The majority of the water contained in the Blackhawk-Star Point aquifer resides in the sandstone tongues of the Star Point Formation. It is likely that the Star Point Sandstone is the only formation within the permit and adjacent areas that contains groundwater on an areally-extensive basis.

The Blackhawk Formation overlies the Star Point Sandstone and contains the principal coal beds mined in the area. The Blackhawk is comprised of several hundred feet of interbedded sandstone, shale, siltstone, and coal. The Aberdeen Sandstone is a marine sandstone unit of the Blackhawk Formation. Sandstone units of the Blackhawk are generally very-fine grained, and have a significant clay content. Ground water that occurs in this formation generally occurs in laterally discontinuous perched aquifers. As a result, the Blackhawk is not a significant regional aquifer, and little work has been done to determine its hydraulic characteristics.

Two pump tests conducted in the basal part of the Blackhawk in Eccles Canyon show that this formation is a very poor aquifer (Vaughn Hansen Associates, 1979). Transmissivities determined from these pump tests were 21.0 and 16.3 gallons per day per foot (gpd/ft). Recovery tests on these same two wells resulted in transmissivities of 16.6 and 17.9 gpd/ft.

Minor seeps and springs occur along valley flanks where water infiltrates from the surface above the valley floor, moves a short distance, and discharges at a point lower on valley flanks. More substantial springs occur where the surface recharge area is more significant and the water moves through the subsurface a greater distance before discharging near the valley floors. These two types of springs are dependant upon the amount of precipitation available for recharge and frequently exhibit seasonal flow variations.

A third type of spring occurs when a relatively extensive aquifer containing large quantities of water in storage discharges to the surface. The discharge rate from this type of spring is not as affected by short term fluctuations in recharge as the two types of springs described in the preceding paragraph.

Geologic conditions play an important role in the occurrence of springs. Water that percolates into the ground moves down gradient through the permeable sediments, until an impermeable unit is encountered. Ground water flow is then redirected along the impermeable interface until the ground surface is intersected and spring discharge occurs or the impermeable unit pinches-out and the ground water again moves vertically.

The Castlegate Sandstone, which overlies the Blackhawk Formation, is principally composed of massive sandstones with minor amounts of shale, siltstone, and conglomerate (local occurrence). Within the Wasatch Plateau, the Castlegate Sandstone typically erodes to form very steep cliffs that are commonly deeply incised by steep-walled canyons.

The Price River Formation overlies the Castlegate Sandstone and consists of interbedded sandstone, shale, and siltstone. Groundwater contained within the Price River Formation occurs within perched aquifers. Laboratory tests on sandstone from the Price River show that it has generally high porosity (21%) but apparently a low permeability (Cordova, 1964).

7.1.2.2 Mine Plan Area Aquifers

This section contains groundwater information pertinent to the mine area. Included herein are the following: 1) a description of the potential aquifers in the mine area; 2) depth to water measured in wells within the permit area; and 3) approximate rates of discharge or usage.

Geologic Occurrence

Formations which outcrop within the proposed Horizon permit and adjacent areas include quaternary alluvium, the Price River Formation, the Castlegate Sandstone, the Blackhawk Formation, the Star Point Sandstone, and the Mancos Shale. A regionally extensive groundwater system has not been identified in the permit area (Engineering Science, 1984). Characteristics of these formations, and their potential to serve as aquifers in the permit and adjacent areas, is presented below.

Price River Formation. The Price River Formation consists of interbedded sandstone, shale, and claystone. Due to its limited outcrop extent within the permit and adjacent areas, the presence of claystone and shale within the formation, and drainage of the formation by deeply incised canyons, the Price River Formation is not considered to be a significant aquifer within the permit and adjacent areas. According to the Cumulative Hydrologic Impact Assessment, completed by UDOGM (1989) for the Upper Gordon Creek Area, "groundwater associated with the Price River Formation may be characterized as occurring within a 'perched' aquifer and represents a relatively insignificant hydrologic resource."

Castlegate Sandstone. The Castlegate Sandstone consists of 150 to 500 feet of white to gray, coarse-grained often conglomeratic sandstone with a few thin interbedded mudstones or shales near the base. Cliffs often form along outcrops of the Castlegate Sandstone. Based on the limited area of exposure for surface recharge (due to the steep slopes), the limited potential for recharge from the overlying perched aquifers of the Price River Formation, and drainage of the sandstone into the deeply incised canyons of the area, water contained within the Castlegate is insignificant. Consequently, this formation is not considered to be a significant aquifer.

Blackhawk Formation. The Blackhawk Formation underlies the Castlegate Sandstone and consists of several hundred feet of interbedded sandstone, siltstone, shale, and coal. The Hiawatha coal seam is located near the base of the Blackhawk Formation. The Blackhawk Formation has a mixed lithology of sandstones, shales, and coals which produce alternating perched aquifers and impermeable beds (Doelling, 1972). Four springs were identified in the area by the 1989 Cumulative Hydrologic Impact Assessment with "all springs discharging from the Blackhawk Formation". Figure 7-1 shows an example of perched aquifer flow in the Blackhawk Formation.

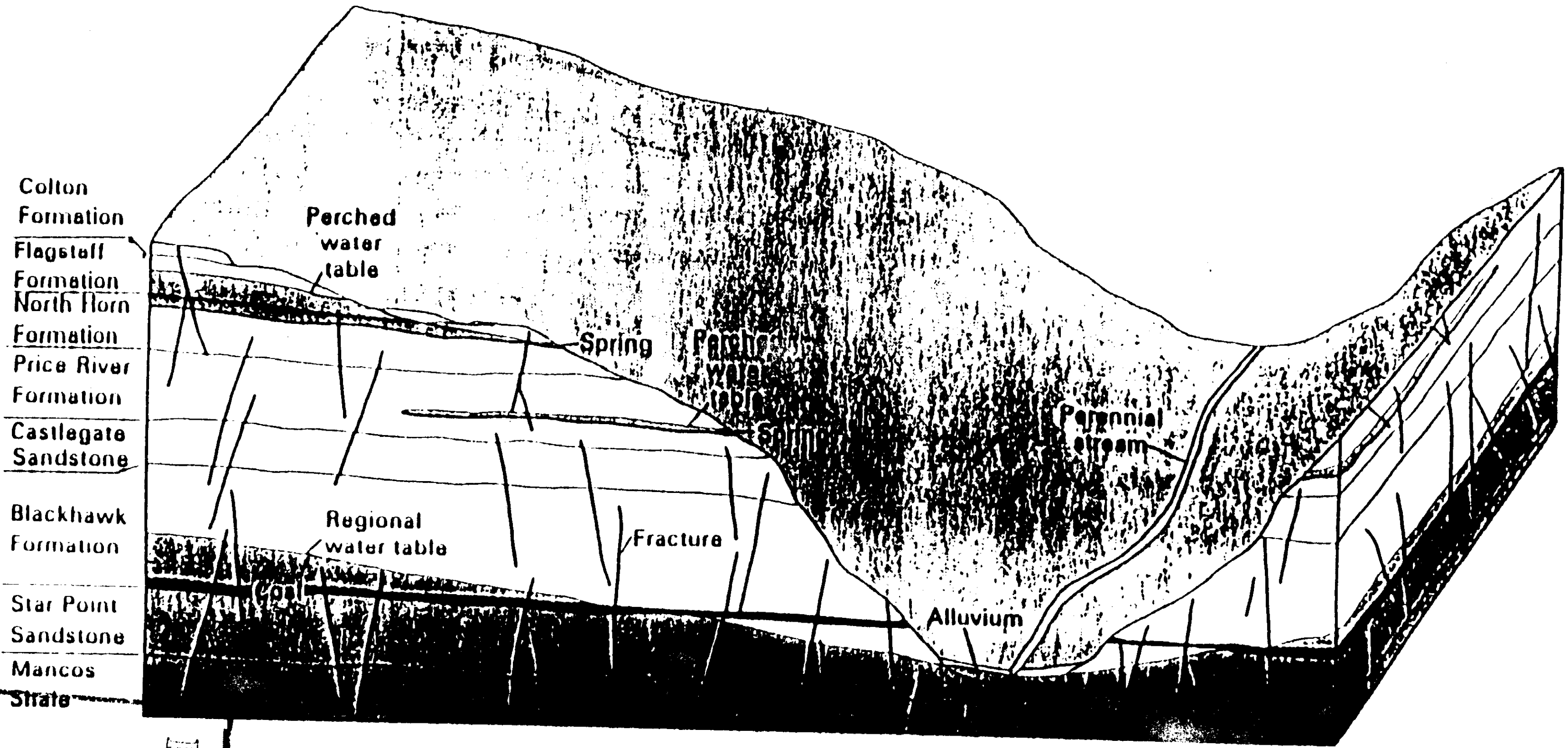
The above-mentioned springs are associated with fractures and/or channel sands that are of limited areal extent, which contain water perched over shale beds and have limited recharge areas. This type of spring commonly has considerable variation in flow because of the limited recharge area and the limited amount of storage in the aquifer (Engineering Science, 1984).

According to UDOGM (1989), mine inflows into mines in the area of the Horizon No. 1 Mine are insignificant. Since mining in the area occurs within the Blackhawk Formation, this indicates that extensive aquifers are not present within the Blackhawk Formation in the permit and adjacent areas.

The areal extent of the Aberdeen Sandstone has been mapped in the mine area using data from drill hole logs and surface exposures. It has been found to be thin (only several feet in thickness) and it undergoes a facies change within the mine area where sandstone beds grade into finer-grained sediments (Hansen, 1988). As a result, the Aberdeen is present as a very thin fine-grained sandstone, interbedded with siltstones and shales in the Horizon No. 1 Mine area. Due to this lithologic condition, the Aberdeen Sandstone is not anticipated to be a significant aquifer in the permit area. This conclusion is supported by the fact that, although a few springs within the permit or adjacent areas issue from the Blackhawk Formation, none of these issue from the Aberdeen Sandstone.

Selected springs within the permit and adjacent areas have been monitored by Horizon Coal Company and others in the past. These springs are labeled as sampling points SP-1, SP-2, SP-4, and SP-6 on Plate 7-1. These sampling points, which all issue from the Blackhawk Formation, have been monitored during accessible periods from 1989 to the present, with the resulting monitoring data presented in Appendix 7-2. Previous sampling efforts have referred to these springs as Station No. 1, Station No. 2, and Station No. 3, respectively. The change in terminology referencing the springs has been made solely to enable easier identification and discussion in this permit application.

SP-1 is located on a hillside and flows to Jewkes Creek. This spring discharges at an elevation of approximately 8195 feet above mean sea level from the Blackhawk Formation. SP-2 discharges from the Blackhawk Formation at an elevation of approximately 8005 feet above mean sea level. Water issuing from this seep does not flow far enough to enter the main stream channel of Jewkes Creek. Usually, this seep can not be seen flowing on the surface more than approximately 100 feet from its origin.



Modified from Lines (1985)

FIGURE 7-1. GENERAL HYDROSTRATIGRAPHIC CROSS SECTION

SP-4 is also located in the Jewkes Creek drainage. This spring discharges from the Blackhawk Formation at an elevation of approximately 8102 feet above mean sea level and flows along the road until it empties into Jewkes Creek.

SP-6 was identified by Darin Worden of UDOGM during an initial site reconnaissance as a desirable sampling point. This site, which is located in the Blackhawk Formation, is situated in an area east of and upstream from the proposed mine portals. However, this "spring" has been consistently dry during the years of sampling (1989 through 1995). It is presumed that the location was initially designated by Mr. Worden during a period of ephemeral runoff and that it does not, in fact, represent a spring. Therefore, this location will not be included in future hydrologic monitoring efforts.

Flow measurements collected at the time of sampling for the springs have been plotted as indicated in Appendix 7-2. The flow of springs within the permit and adjacent areas is typical of springs in the region, with the highest flow rates in the late spring, followed by lower flow rates in the late summer and early fall. Spring SP-1 generally flows at approximately 10 to 15 gallons per minute (gpm) during late spring, with a high of 45 gpm occurring in May 1989. The flow then tapers off to approximately 5 to 6 gpm in late summer and early fall. The gradual tapering off of flow is probably the result of a decrease in recharge to the aquifer during the dry summer months.

Spring SP-2 typically discharges at a rate of 1 to 2.5 gpm in late spring and then tapers off to approximately 1 gpm or less. Records indicate that the spring was dry in July and August 1991 and July through at least December 1992. Flow conditions at SP-4 have been very similar to those encountered at SP-2 during the 6.5-year period of record.

Also noted on Plate 7-1 is a sample point identified as SP-9 (referred to locally as Jewkes Spring). This spring, which will be monitored in the future by Horizon Coal Company, was monitored by the U.S. Geological Survey during the period of 1979 through 1983 and by Beaver Creek Coal Company from 1985 through 1995. During its period of record, Beaver Creek Coal Company referred to the spring as station 2-5-W.

SP-9 (Jewkes Spring) issues from the Blackhawk Formation at an elevation of approximately 8550 feet above mean sea level. Typical flow rates vary from 20 to 60 gpm in the late spring, decreasing during the late summer and early fall. The maximum flow rate listed in Appendix 7-2 for SP-9 (Jewkes Spring) was 1372 gpm in July 1985. However, since this flow is a factor of 7.4 higher than the next highest flow rate, and since flow rates measured in June and August of that year were 36 and 39 gpm, respectively, this flow rate is considered inaccurate and spurious.

Springs CC-5 and MC-4 issue from the Storrs Unit of the Star Point Formation. These springs are located approximately one mile southeast of the permit area and are accessed from County Road 290 (see Plate 7-1).

Star Point Sandstone. The Star Point Sandstone consists of fine to medium grained sandstone that decreases in grain size with depth. This unit consists of several littoral sandstone tongues separated by Mancos shales (Doelling, 1972). Regionally, recharge to the Star Point occurs primarily from vertical movement of water through the overlying Blackhawk Formation. Due to the low vertical permeability of the Blackhawk Formation, the magnitude of this recharge is limited. This formation is monitored via monitoring wells HZ-95-1, HZ-95-2, and HZ-95-3, which have been installed into the uppermost Spring Canyon tongue at the locations noted on Plate 7-1.

Mancos Shale. Underlying the Star Point Sandstone is the Masuk member of the Mancos Shale. The Masuk Shale consists of blue-gray fissile claystone or silty claystone which weathers light blue-gray to light tan. Although the Masuk Member of the Mancos Shale may be locally saturated beneath the Star Point Sandstone, it is not considered to be an aquifer. Except where extensively fractured, the low-permeability shales in the Masuk will transmit only relatively small quantities of water (Lines, 1985).

Quaternary Alluvium. Unconsolidated Quaternary deposits are present in the floors of drainages and generally consist of silts, sands, and gravels. The alluvial deposits receive water from the adjacent bedrock in some of the deeply incised canyons. Water is probably supplied to the alluvium by seepage from the Blackhawk and Star Point Formations. Discharge from the Quaternary alluvium is to the surface water system. Due to the limited areal extent of alluvium in the area, this unit is not considered to be a significant aquifer.

Homestead Spring (2-6-W), which discharges from alluvial deposits and was monitored previously by Beaver Creek Coal Company, was added to the Horizon's monitoring program in 1996. Although Homestead Spring is outside of the permit and adjacent area and will not be effected by the proposed mining operation, the spring will supply valuable baseline flow data because of it's contribution to Beaver Creek. Care will be taken during sampling since the landowner requested that trespass be limited due to previous vandalism on the property.

Depth to Water

Four exploratory holes (LMC-1 through LMC-4) were drilled within the permit boundary in the late 1970's and early 1980's. Drill hole locations are shown on Plate 7-1. Three wells (LMC-1, LMC-3, and LMC-4) were retained as open holes. Water-level data have been collected from these holes. Table 6-2 contains drill hole data pertinent to the hydrologic resources of the area. Drill hole logs are found in Appendix 6-1.

Water-level measurements collected from the three open holes (LMC-1, LMC-3 and LMC-4) are provided in Table 7-1. Water level and depth measurements were collected by means of a 1500-foot electric water-level indicator manufactured by Solinst. All three wells were found to be dry during the period of February 1992 through October 1995.

TABLE 7-1

WATER-LEVEL DATA OBTAINED FROM
LOCAL MONITORING WELLS

Date	LMC-1		LMC-3		LMC-4	
	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)
2/27/92	>599	<7852	>664	<7556	>217	<7587
3/28/92	>599	<7852	>664	<7556	>217	<7587
4/25/92	>599	<7852	>664	<7556	>217	<7587
5/17/92	>599	<7852	>664	<7556	>217	<7587
6/25/92	>599	<7852	>664	<7556	>217	<7587
7/25/92	>599	<7852	>664	<7556	>217	<7587
8/24/92	>599	<7852	>664	<7556	>217	<7587
9/29/92	>599	<7852	>664	<7556	>217	<7587
10/25/92	>599	<7852	>664	<7556	>217	<7587
11/22/92	>599	<7852	>664	<7556	>217	<7587
12/28/92	>599	<7852	>664	<7556	>217	<7587
5/30/93	>599	<7852	>664	<7556	>217	<7587
6/25/93	>599	<7852	>664	<7556	>217	<7587
7/25/93	>599	<7852	>664	<7556	>217	<7587
8/20/93	>599	<7852	>664	<7556	>217	<7587
9/27/93	>599	<7852	>664	<7556	>217	<7587
10/22/93	>599	<7852	>664	<7556	>217	<7587
11/6/93	>599	<7852	>664	<7556	>217	<7587

TABLE 7-1 (Continued)

WATER-LEVEL DATA OBTAINED FROM
LOCAL MONITORING WELLS

Date	LMC-1		LMC-3		LMC-4	
	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)
6/24/94	>599	<7852	>664	<7556	>217	<7587
7/24/94	>599	<7852	>664	<7556	>217	<7587
8/25/94	>599	<7852	>664	<7556	>217	<7587
9/24/94	>599	<7852	>664	<7556	>217	<7587
10/22/94	>599	<7852	>664	<7556	>217	<7587
11/2/94	>599	<7852	>664	<7556	>217	<7587
12/6/94	>599	<7852	>664	<7556	>217	<7587
5/26/95	>599	<7852	>664	<7556	>217	<7587
8/8/95	>599	<7852	>664	<7556	>217	<7587
10/27/95	>599	<7852	>664	<7556	>217	<7587

TABLE 7-1 (Continued)

WATER-LEVEL DATA OBTAINED FROM
LOCAL MONITORING WELLS

Date	HZ-95-1		HZ-95-1S		HZ-95-2		HZ-95-3	
	Depth (ft) *	Elev. (ft)	Depth (ft) *	Elev. (ft)	Depth (ft) *	Elev. (ft)	Depth (ft) *	Elev. (ft)
12/5/95	--	--	135.0	8221.5	828.0	7519.6	--	--
12/13/95	786.0	7570.7	--	--	--	--	--	--
12/21/95	--	--	--	--	--	--	378.8	7522.7
7/9-10/96	771.3	7585.4	133.8	8222.7	830.0	7517.6	380.8	7520.7
8/5/96	770.8	7585.9	133.5	8223.0	829.4	7518.2	387.8	7513.7
9/11/96	769.4	7587.3	132.5	8224.0	829.4	7518.2	387.7	7513.8
10/23/96	776.4	7580.3	132.5	8224.0	829.2	7518.4	380.7	7520.8
11/1/96	776.4	7580.3	132.5	8224.0	829.2	7518.4	380.8	7520.7
12/13/96	#		#		829.5	7518.1	379.5	7522.0
1/6/97	771.05	7584.75	133.0	8223.5				
2/10/97	+		+		+		+	
3/25/97	+		+		+		+	
4/28/97	+		+		+		+	
5/28/97	770.95	7584.85	131.45	8225.05	828.05	7519.45	379.9	7521.6
6/15/97	770.95	7584.85	131.5	8225	828.0	7519.40	379.95	7521.55
7/6/97	770.95	7584.85	131.5	8225	828.0	7519.40	379.95	7521.55

* Depth measured from top of 2" tubing
\# Well site inaccessible 12/16/96, access attempted with Bill Malencik, UDOGM
\+ Mine site declared inaccessible by Bill Malencik

Hole LMC-1 was drilled to a depth of 900 feet below ground surface in September 1976. A log of this hole is provided in Appendix 6-1. LMC-1 was drilled into the Blackhawk Formation through the Castlegate A coal seam with the bottom subsequently being sealed to a depth of approximately 600 feet below ground surface and remaining open above that depth. Hole depth was determined to be 599 feet below ground surface on February 27, 1992 and the hole has been dry during all monitoring visits. Personal communication with Mr. Joseph A. Harvey (1992) indicates that LMC-1 was dry to 900 feet below ground surface during drilling.

In October 1976, hole LMC-2 was drilled to a depth of 568 feet below ground surface. The hole was advanced through the Castlegate A coal seam. A log of this hole is provided in Appendix 6-1. The hole was subsequently sealed to a depth of 50 feet below ground surface. Due to its shallow remaining depth, no groundwater measurements have been collected from this hole. Mr. Harvey (1992) indicated that the hole was dry to a depth of 568 feet below ground surface during drilling.

Hole LMC-3 was drilled to a depth of 836 feet below ground surface in November 1976. This hole was subsequently sealed to a depth of about 665 feet below ground surface, remaining open above that depth. A log of this hole is provided in Appendix 6-1. On February 27, 1992, LMC-3 was probed and found to be dry to a total hole depth of 664 feet below ground surface. Subsequent measurements in this hole have also indicated a dry condition (see Table 7-1). Mr. Harvey (1992) indicated that the hole was dry to a depth of 836 feet below ground surface during drilling.

In January 1980, hole LMC-4 was drilled through the Blackhawk Formation to a depth of 430 feet below ground surface. The hole was advanced through the Castlegate A coal seam and into the Hiawatha coal seam. This hole was subsequently sealed to a depth of approximately 220 feet below ground surface, remaining open above that depth. A log of this hole is provided in Appendix 6-1. On February 27, 1992, LMC-4 was probed to a depth of 217 feet below ground surface and water was not detected. Subsequent measurements have indicated that this hole has remained dry (see Table 7-1). Mr. Harvey (1992) indicated that this hole was also dry to total depth during drilling.

Each of the LMC drill holes is open (i.e., uncased) from the surface to total depth. Thus, the measured dry conditions indicate that the strata exposed by the holes are dry in each of the holes. In addition to the above measurements, data were collected from wells LMC-1 and LMC-3 by Mr. Roger Skaggs of Blue Blaze Coal Company in December 1991. These measurements were collected by attaching two test tubes to the end of a steel cable, lowering the cable into the drill hole until the bottom of the hole was reached, and allowing the test tubes to rest on the bottom for several minutes before retrieving the cable. The length of the cable was measured at the surface while the cable was extracted. Using this method, drill hole LMC-1 was found to be dry at a depth of 600 feet. Well LMC-3 was found to be dry at a depth of 650 feet. Although non-standard methods were used, the December 1991 data corroborate the subsequent data by indicating that holes LMC-1 and LMC-3 are dry.

Discussions with Mr. Joseph A. Harvey (1992), who was present at the time the holes were drilled, further corroborate the absence of groundwater within the LMC holes. According to Mr. Harvey, who was under contract with C & W Coal Producers Corp. at the time the holes were drilled, each hole was dry during drilling and upon completion. Completion dates were September 1976 for LMC-1, November 1976 for LMC-3, and January 1980 for LMC-4. Hole LMC-2 (completed in October 1976) was also reported to be dry during drilling. Appendix 7-1 contains a notarized letter from Mr. Joseph A. Harvey outlining his responsibilities and observations regarding ground water at these drill holes.

It is important to note that two exploration drill holes were drilled in the Beaver Creek valley north of the permit area by Beaver Creek Coal Company in the late 1970's. Both of these drill holes are located very near the Beaver Creek channel and both have artesian flow. The first of the two wells, here named BC-1, is located in the SW 1/4 of the SE 1/4 of Section 5, T. 13 S., R. 8 E. The second hole, here named BC-2, is located in the NW 1/4 of the NW 1/4 of Section 4, T. 13 S., R. 8 E. These wells are assumed to produce water from approximately 80 to 100 feet below ground surface. BC-1 was spud in the top of the Blackhawk Formation while BC-2 was spud approximately 60 to 80 feet above the Castlegate Sandstone and Blackhawk Formation contact. This suggests that water is contained in some of the upper sandstone units of the Blackhawk Formation north of the permit area. Since these are artesian wells, this also suggests that the bedrock units producing water rest upon aquitards and are overlain by confining units. A more detailed description of the wells and their relationship to the local ground water system is included in Appendix 7-11.

In October 1995, Horizon Coal Company completed four additional monitoring wells within the permit and adjacent areas at the locations noted on Plate 7-1. Three of the monitoring wells (HZ-95-1, HZ-95-2, and HZ-95-3) were completed in the Spring Canyon tongue of the Star Point Sandstone (i.e., immediately below the Hiawatha coal seam - the coal seam to be mined at this location). The remaining well (HZ-95-1S) was completed in a local perched saturated zone within the Blackhawk Formation.

Logs of the HZ holes are provided in Appendix 7-5. Each monitoring well was completed with 2-inch diameter steel casing and 10 feet of 20-slot wire-wound stainless-steel screen. A filter pack was placed in the annulus of each hole adjacent to the screen. The annulus of each hole was grouted with a cement/bentonite mixture above the filter pack.

Water-level data obtained from the HZ monitoring wells are provided in Table 7-1. The data collected from the HZ wells in December 1995 (with the exception of HZ-95-1S, which is completed in a localized perched aquifer), together with the information obtained from the LMC holes, were utilized to prepare the potentiometric surface map contained in Figure 7-2. Subsequent data collected from the HZ wells in 1996 verify the December 1995 data and do not indicate a substantial difference in the potentiometric surface presented in Figure 7-2 (see Figure 7-2a and Table 7-1). Further discussion of the HZ wells can be found under the subheading "Hydraulic Conditions" in this section.

POTENTIOMETRIC SURFACE IN SPRING CANYON SANDSTONE
DECEMBER 1995

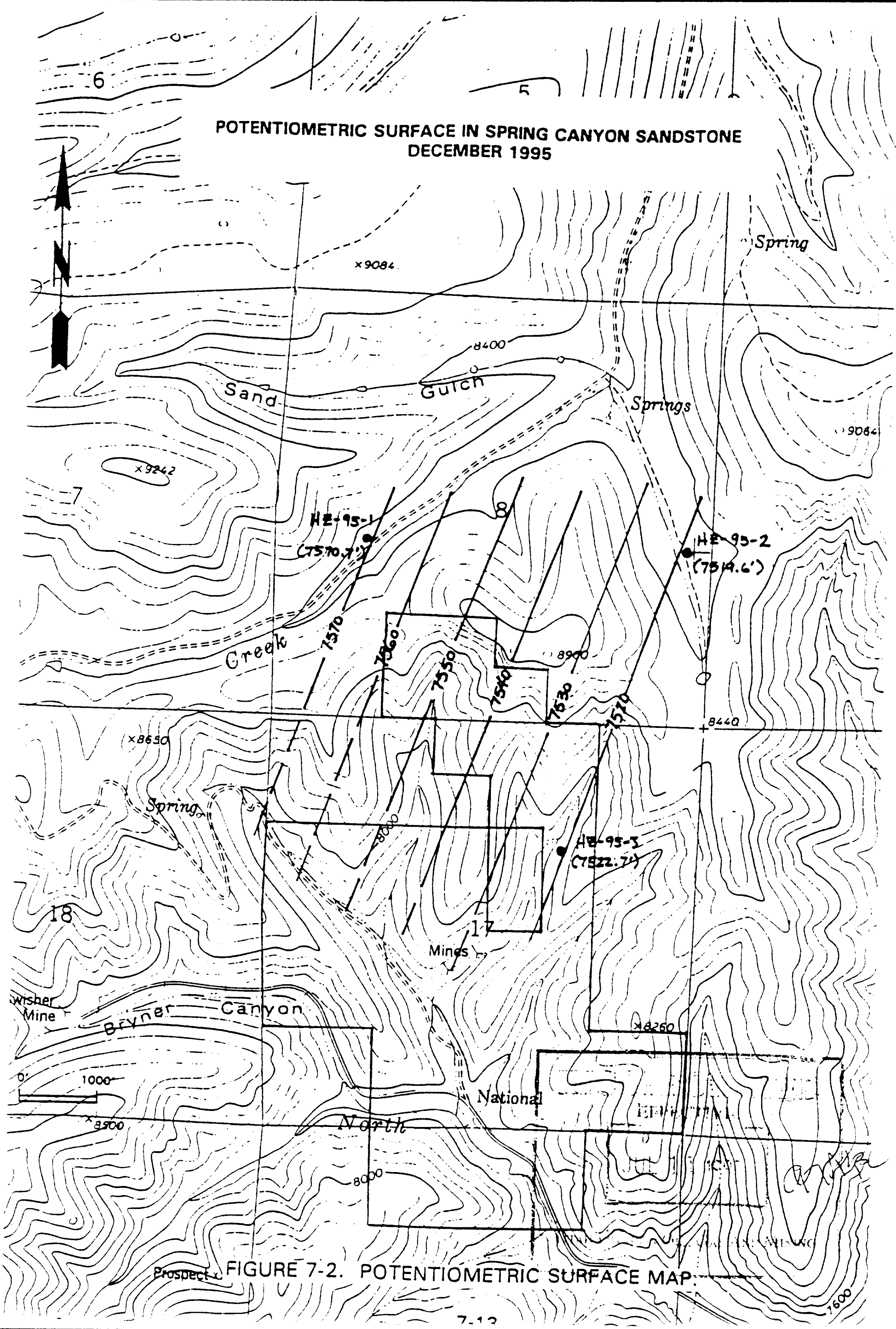


FIGURE 7-2. POTENTIOMETRIC SURFACE MAP.

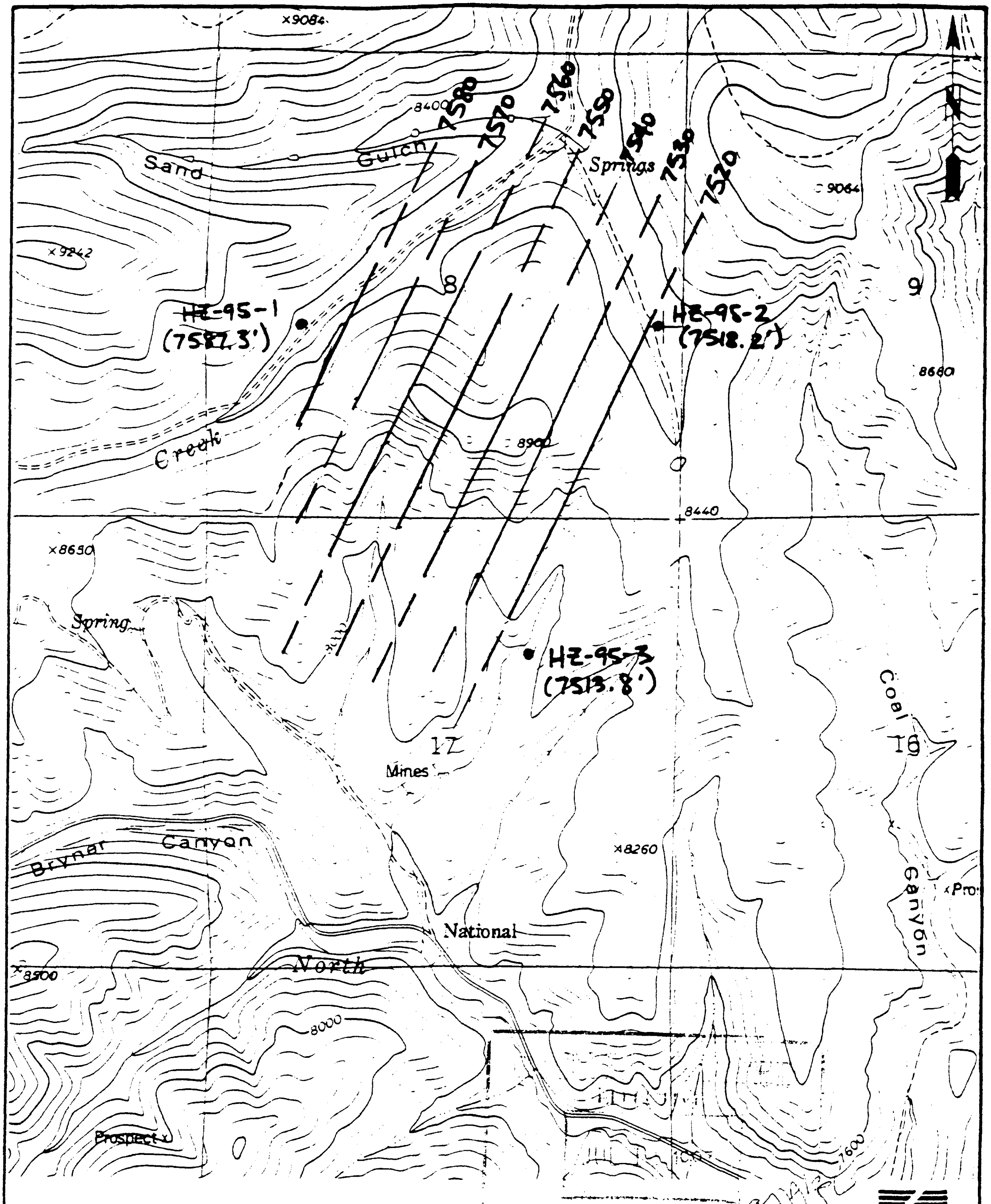


FIGURE 7-2A. SEPTEMBER 1996 POTENTIOMETRIC SURFACE IN SPRING CANYON SANDSTONE.

The data presented in Table 7-1 indicate that the water level in well HZ-95-1 rose approximately 15 feet between the December 1995 measurement and the July 1996 measurement. Notes provided in Appendix 7-11 indicate that this well was sampled 8 days prior to the December 1995 water-level measurement. Prior to collection of the sample, the well had been pumped periodically over a period of approximately 3 weeks in an attempt to purge the well and obtain a representative water sample. Each time the well was pumped, only 1 to 10 gallons of water could be evacuated from the hole prior to the well going dry. The sampler would then wait for a period of a few days, pump the well dry again (after only a few gallons), and repeat the cycle. This information indicates that the well recharges very slowly. Hence, it is reasonable to conclude that the water-level in December 1995 had not fully stabilized prior to measurement. Thus, the July 1996 and subsequent data are considered more representative of local conditions.

The data for HZ-95-3 presented in Table 7-1 also indicate a 7-foot decrease in the water level in that well between the July and August 1996 measurements. This change in water levels was verified by the September 1996 measurement, thus indicating that measurement error was probably not the source of the change. Until additional data are collected, the source of this change cannot be determined.

As indicated in Figures 7-2 and 7-2a, the flow of groundwater within the permit and adjacent areas is to the east-southeast, essentially following the strike of the predominant fracture system. The pre-mining hydraulic gradient, based on the December 1995 data presented in Figure 7-2, is 0.014 ft/ft. The pre-mining hydraulic gradient was 0.019 ft/ft using the September 1996 data (Figure 7-2a).

The potentiometric surface contained in Figure 7-2 was overlain on a map showing the elevation of the top of the Spring Canyon tongue of the Star Point Sandstone as developed by Hansen (1988). Since the Hiawatha coal seam directly overlies the Spring Canyon tongue, a comparison of the elevation of the potentiometric surface and the elevation of the top of the Spring Canyon tongue would indicate the areas where the Hiawatha coal seam may be expected to be saturated within the permit and adjacent areas.

Figure 7-3 presents the results of the above evaluation. This figure presents lines of saturation based not only on the December 1995 water-level data but also based on an assumed maximum water-level fluctuation of $\pm$30 feet. This assumed maximum water-level fluctuation was derived following a review of water-level monitoring records from nearby mining operations. The longest period of water-level record in the region is at the Skyline Mine, located approximately 7 miles west of the Horizon No. 1 permit area, where water-level data have been collected from monitoring wells during the period of 1982 to the present. During this period, the maximum water-level fluctuation has been 58 feet (as recorded at Skyline well 79-35-1A). The assumed water-level fluctuation presented in Figure 7-3 totals 60 feet, thereby encompassing the maximum fluctuation measured in the region.

Data presented previously in this section indicate that hole LMC-4 (which was drilled near the proposed portal for the Horizon No. 1 Mine) was dry when it was drilled into the Hiawatha

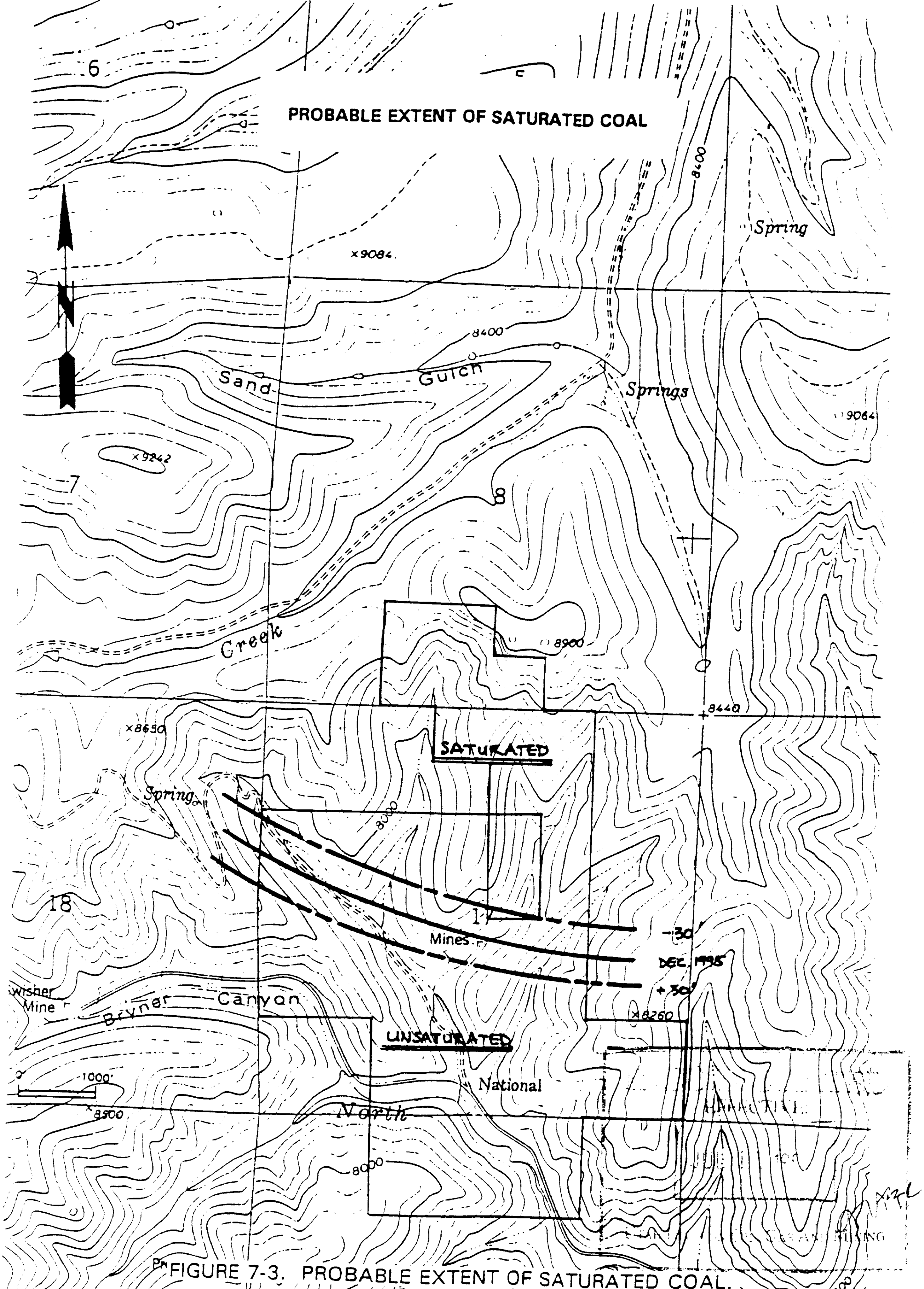


FIGURE 7-3. PROBABLE EXTENT OF SATURATED COAL.

coal seam. However, a comparison of Figure 7-3 and Plate 3-3 indicates that the Hiawatha coal seam can be expected to be saturated very soon into mining operations. Anticipated maximum fluctuations in water levels will not significantly influence this conclusion.

A review of records on file with UDOGM, as well as discussions with former Beaver Creek Coal Company mining personnel, indicate that the Gordon Creek No. 2 Mine (operated by Beaver Creek Coal Company in the Castlegate A seam) immediately southwest of the proposed permit area, was a dry mine with only sporadic occurrences of groundwater inflow that dried up within a short time. The Gordon Creek No. 3 Mine (operated by Beaver Creek Coal Company in the Hiawatha seam immediately east and downgradient of the proposed permit area) was dry until a 12-foot graben was encountered in the northeast portion of the mine. This occurrence is consistent with the above conclusion since the Hiawatha coal seam is anticipated to become increasingly saturated with distance to the north. Groundwater from the graben was produced from the floor of the mine at a peak rate of approximately 400 gallons per minute. During retreat mining, the same faulted zone was dry, either as a result of previous dewatering, or as a result of elevation differences. It is possible that groundwater was stored in the fault zone, and when the fault zone was dewatered, there was insufficient recharge from overlying strata to maintain the groundwater discharge.

After removal of the Castlegate "A" coal seam in mines adjacent to the permit area, water occasionally seeped into these stratigraphically-higher mines from the roof or, more rarely, from the floor. Generally, minor amounts of water were encountered when mining took place beneath a fluvial sandstone channel. The channels behave as perched aquifers that are confined by associated flanking shales. Such a condition, enhanced by local fracturing, appears to occur at the shallow monitoring well completed by Horizon Coal Company in the Blackhawk Formation (HZ-95-1S).

Based on the water level measurements collected from the permit and adjacent areas and information gathered from mines in the region, it is concluded that the Hiawatha coal seam, as well as the immediately underlying and overlying strata, will be saturated in the Horizon No. 1 Mine essentially from the beginning of mining operations. The rate of inflow of groundwater while mining in the Hiawatha coal seam will depend primarily on whether a faulted zone is encountered that contains groundwater in storage or that is hydraulically connected with an overlying perched zone. Based on the dry nature of previous mine workings in the area, as well as observations and measurements obtained from the LMC and HZ drill holes, the probability of significant sustained inflows to the Horizon No. 1 Mine is considered minimal. This conclusion is in agreement with Cumulative Hydrologic Impact Assessments prepared for the area by Engineering Science (1984) and UDOGM (1989). Additional information regarding potential inflows to the Horizon No. 1 Mine is presented in Section 7.3 of this document.

Hydraulic Conditions

The hydraulic conductivity of the Spring Canyon Tongue of the Star Point Sandstone was estimated by performing slug tests in monitoring wells HZ-95-1, HZ-95-1S, HZ-95-2, and HZ-95-3. A slug test is conducted by rapidly changing the water level in a well or borehole by means of the injection or withdrawal of a body of known volume (a "slug") into or from the water column, and monitoring the rate of water level recovery to the static, pre-test level. When the slug is rapidly lowered into the water column, the water level rises abruptly. Rapid withdrawal of the slug after the water level has fully recovered causes the water level to drop abruptly. The slug used in this investigation consisted of a 6-foot length of 1-inch diameter 316-stainless steel rod attached to stainless steel cable.

It is recognized that the radius of influence of a slug test is smaller than that of a long-term pumping test. However, slug tests are considered adequate when studies are not aimed at designing an exploitation program of the aquifer (Freeze and Cherry, 1979). EarthFax Engineering has found that slug tests produce similar results to pumping tests if performed under similar field conditions.

Prior to performance of the slug test, an electric water level indicator was used to measure the static water level in each completed monitoring well. The measurements were made relative to the top of the well casing. Together with the well completion information, these data were used to determine the degree to which each well penetrates the Spring Canyon Tongue. An average saturated thickness for the Spring Canyon Tongue of 75 feet was assumed based on multiple observations in the area by Hansen (1988).

A pressure transducer with a maximum operating pressure of 15 pounds per square inch was used to measure water-level changes during the slug tests. After pre-test water-level measurements, the pressure transducer was lowered into the water to a depth that was below the lowest point to which the slug would be injected, but within the depth range of the transducer. The slug was then rapidly lowered into the water column in the monitoring well. Data derived from the transducer were recorded using a model 21X Micrologger manufactured by Campbell Scientific. The data logger was programmed to record water-level changes to within 0.001 foot at half-second intervals.

Data recorded on the data-storage module in the field were transferred to diskette by means of either a model PC201 tape and serial I/O card and associated software or a PC208 software package and serial cable with adapter, both developed by Campbell Scientific. These data sets are stored as comma-delineated ASCII data files. The contents of each data file were subsequently transferred to an analytical program (AQTESOLV™), which allows rapid, graphical representation and log-linear regression analysis of test data.

The software AQTESOLV™ (Duffield and Rumbaugh, 1989) was used to evaluate the slug test data. The method of Bouwer and Rice (1976), which determines hydraulic conductivity for wells which partially or fully penetrate unconfined aquifers, is available in the AQTESOLV™ software, and was used to estimate the hydraulic conductivities of aquifer tested for this study. This method is applicable to both unconfined and confined aquifers, since both types of aquifers behave similarly during short-term tests (Neumann, 1974).

To evaluate the slug-test data, values of time and actual water-level displacement due to injection of the slug are displayed on a semi-logarithmic plot (i.e., water-level displacement is represented on a logarithmic y-axis and time is represented on an arithmetic x-axis). The hydraulic conductivity ("K") is estimated from the equations:

$$= \underline{\qquad\qquad} \qquad (11)$$

where:

y_o	=	initial drawdown or residual drawdown in well due to instantaneous removal or injection of the slug from the well (ft)
y_t	=	drawdown in well at time t (ft)
L	=	length of well screen (ft)
r_c	=	radius of well casing (ft)
R_e	=	equivalent radius over which head loss occurs (ft)
r_w	=	radius of well, including gravel pack (ft)
H	=	static height of water in well (ft)
t	=	time (min)

and

$$= \underline{\qquad\qquad} + \underline{\qquad} - \qquad (12)$$

where:

C = dimensionless parameter which is a function of L/r_w

and other parameters are as previously defined.

According to Bouwer and Rice (1976), Equation (1) allows the hydraulic conductivity to be calculated from the water-level change in the well. Because the hydraulic conductivity, casing radius, well radius, the radius over which head loss occurs, and the screen length are constants, (1/t) ln y_o/y_t must also be a constant. Thus, the time/drawdown data should approximate a straight line if plotted in terms of ln y_o versus t. The quantity (1/t) ln y_o/y_t in Equation (1) is obtained from the first straight-line segment drawn through the field data.

The AQTESOLV™ software program prompts the user to supply values of well casing radius, drill hole radius, saturated aquifer thickness, well screen length, and static height of water in the well. Time and water-level data are read into the software program in the form of ASCII data files, which are down-loaded from the data logger.

Once the field data and constants are entered, the AQTESOLV™ software generates semi-log plots of the data and automatically fits a straight line to the data according to user-defined weighting. If the entire range of field data do not approximate a straight line, only those early data which form a valid straight-line segment are weighted by the user such that the software produces the desired straight line approximation through the valid part of the data set.

The straight-line fit produced by AQTESOLV™ automatically determines the value of y_o (y-intercept) and an arbitrary value of y_t at time t to solve Equation (1). Based on user-defined values of screen length and drill hole radius, the software determines the value of C to evaluate R_e in Equation (2).

The AQTESOLV™ software generates the straight line approximation by means of a nonlinear weighted least-squares parameter estimation technique known as the Gauss-Newton linearization method (Duffield and Rumbaugh, 1989). The estimation technique minimizes the difference between observed and estimated values through iterative solution of the system of linearized equations until convergence is achieved. To ensure the fit of the straight line, the software prints out the values of actual water levels, calculated water levels, and residual values (the difference between the actual and calculated water levels) derived by the parameter estimation technique. Additionally, the statistical values of mean, standard deviation, and variance are provided for the weighted residuals. These statistics indicate the goodness-of-fit of the straight line generated by the estimation technique.

Slug test plots for the wells tested are presented in Appendix 7-8. Included with the time/drawdown plots are printouts of well constants used to estimate values of hydraulic conductivity. Statistical values of mean, standard deviation, and variance also are provided for the weighted residuals. From the analyses presented in Appendix 7-8, the following hydraulic conductivities were determined for the tested monitoring wells:

Well	Hydraulic Conductivity (ft/day)
HZ-95-1	16.1
HZ-95-1S	20.7
HZ-95-2	0.25
HZ-95-3	0.20

The average hydraulic conductivity of the Spring Canyon Tongue at wells HZ-95-2 and HZ-95-3 is 0.23 ft/day, while the hydraulic conductivity at HZ-95-1 and HZ-95-1S is 18.4 ft/day (nearly two orders of magnitude higher). Conditions at HZ-95-1 and HZ-95-1S are apparently affected by local fracturing, as suggested not only by the difference in hydraulic conductivity but also the presence of a northwest-trending fault adjacent to HZ-95-1 as indicated on Plate 6-1. Although no fracturing was noted by Hansen (1988) along the alignment of Beaver Creek near HZ-95-1, a short northeast-trending fracture just north of HZ-95-1 may have also locally enhanced fracturing of the bedrock encountered by the monitoring well (see Plate 6-1). The lack of noted fracturing along the alignment of Beaver Creek, together with the continuity of the potentiometric surface presented in Figure 7-2, indicates that the increased hydraulic conductivity at HZ-95-1 should not be interpreted as being representative of a separate groundwater system. Rather, localized fracturing appears to have enhanced the local hydraulic conductivity, without significantly affecting the direction of groundwater flow.

It is of note that the Horizon monitoring wells are completed in the Spring Canyon Tongue (i.e., the aquifer immediately below the coal seam), rather than in the Blackhawk Formation wherein the coal occurs. Because the Blackhawk Formation consists of interbedded sandstone, siltstone, shale, and coal, the hydraulic conductivity of this formation is generally considered to be lower than that of the Spring Canyon Tongue. For the purpose of this assessment and in keeping with the convention of Lines (1985), the hydraulic conductivity of the unfractured Blackhawk Formation is estimated to be one-half that of the Spring Canyon Tongue (i.e. 0.11 ft/day). Where fractured, the hydraulic conductivity of the Spring Canyon Tongue and the Blackhawk Formation are estimated to be 18.4 and 9.2 ft/day, respectively, based on data collected from HZ-95-1 and HZ-95-1S.

Recharge

Snowmelt and rain are the main sources of recharge to the groundwater system in the permit and adjacent areas. Normal annual precipitation in the area is approximately 20 inches per year (Waddell et al., 1981). Approximately 65 percent of this precipitation normally falls during the months of October through April (Waddell et al., 1981), mostly as snowfall.

Groundwater recharge primarily occurs where permeable lithologies are exposed at the surface. Vertical migration of groundwater occurs through permeable rock units and/or along zones of faulting and fracturing. Lateral migration initiates when groundwater encounters impermeable rocks and continues until either the land surface is intersected (and spring discharge occurs) or other permeable lithologies or zones are encountered that allow further vertical flow (UDOGM, 1989). This condition creates the perched aquifers in the Price River and Blackhawk Formations discussed previously.

In areas that are capped by the Price River Formation and the Blackhawk Formation (such as occurs within the proposed permit and adjacent areas), Danielson et al. (1981) indicated that "steep slopes promote rapid snowmelt runoff and reduce recharge to the groundwater system." This condition is intensified by the relatively low permeability of the Price River and Blackhawk Formations. The limited amount of recharge in the area is reflected by the small number of springs as well as the dry conditions encountered by previous mine workings in the permit and adjacent areas and the LMC drill holes.

Figure 7-4 is a map of potential recharge areas in the mine vicinity. Areas identified as "very limited recharge potential" are underlain by the Blackhawk Formation (limited by its steep

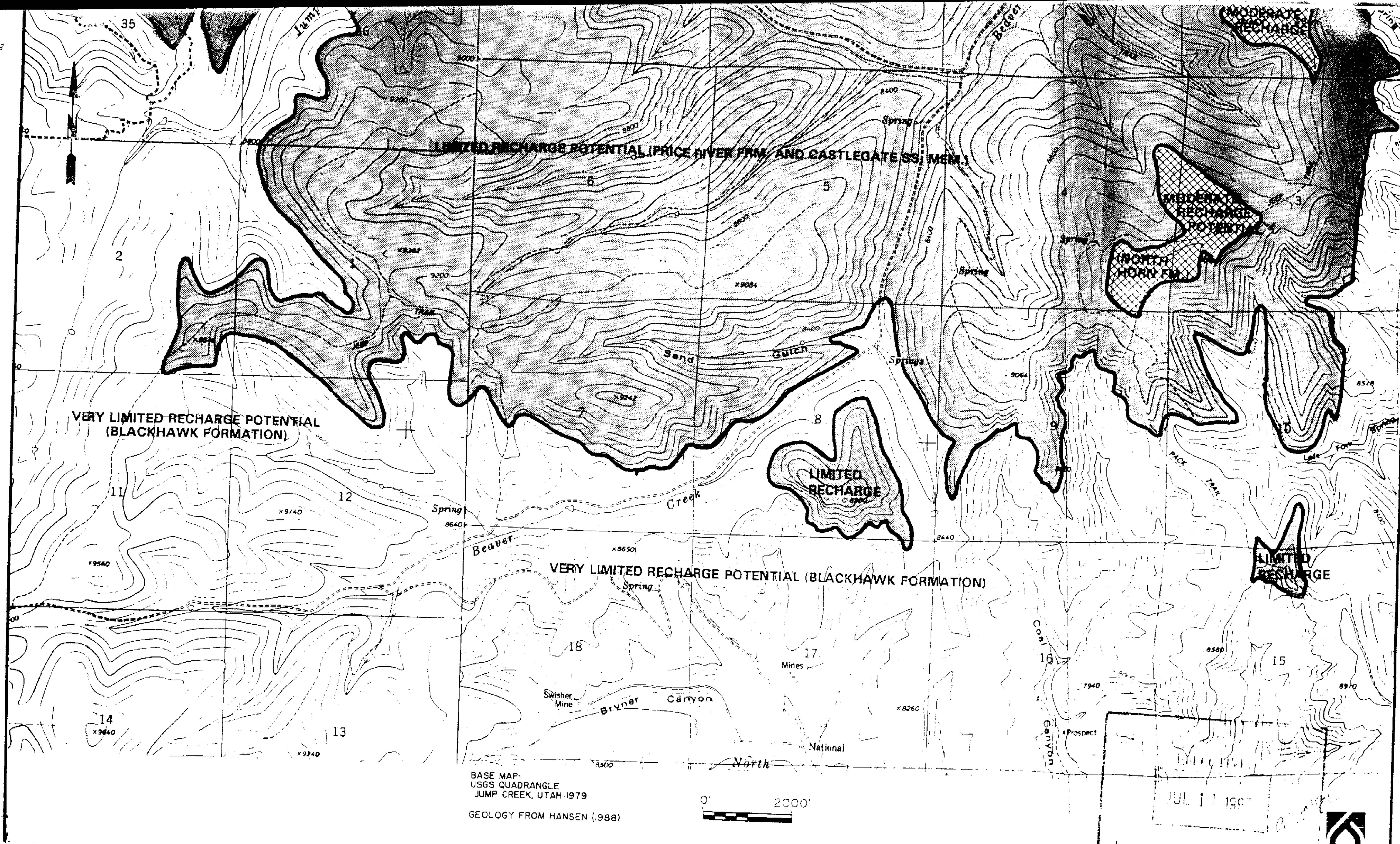


FIGURE 7-4. POTENTIAL RECHARGE AREAS.

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slope and its shale content). Areas identified as "limited recharge potential" are underlain by the Price River Formation, Castlegate Sandstone, the Star Point Sandstone, and thin alluvium (limited either by their steep slope, their shale content, or their limited thickness). Areas identified as "moderate recharge potential" are underlain by the North Horn Formation (moderately permeable strait on moderate slopes). Note that, with the exception of the extreme northern portion of the permit area and the canyon bottom downstream from the proposed surface facilities, all of the permit and adjacent areas are in a zone of very limited recharge potential.

Groundwater occurrence and availability may also be controlled by faults and fractures. The control of faulting on the direction of groundwater flow can be seen by comparing the potentiometric surface map on Figure 7-2 with the geologic structure data provided on Plate 6-1. However, due to the low permeability of the formations surrounding the Hiawatha coal seam, and the plan to avoid mining into faulted zones, inflow to the mining operations from faulted zones is projected to be minimal (see Section 7.3 of this document).

Springs CC-1, CC-5, CC-6, SP-1, SP-4, SP-9, CV-1, CV-2, CV-3, CV-8, GV-25, and GV-70 (see Plate 7-1) appear to be fault related. To assess the extent of the influence of faulting on the hydrogeologic system and evaluate the potential for recharge of coal zones by seepage from the surface through fractures, a seepage evaluation was conducted along Beaver Creek on September 11, 1996. This evaluation was conducted by measuring the flow of Beaver Creek and its inflow points at the locations indicated on Figure 7-4a. All measurements were collected using portable cutthroat flumes which were installed in accordance with accepted procedures (Skogerboe et al., 1973).

Results of flow measurements collected during the Beaver Creek seepage evaluation are presented in Table 7-1a. These data are summarized in Table 7-1b and Figure 7-4b. In evaluating the seepage data, it should be noted that Reaches 2 and 3 contain several abandoned beaver ponds. An abnormal quantity of alluvium has deposited behind the abandoned beaver dams, creating broad areas across which the stream flows. Although the data indicate that a net gain occurs through these reaches, it is likely that some streamflow is lost into the alluvial deposits as the stream braids and the bottom gradient becomes less steep.

The data indicate a net gain of streamflow in Reach 4 of 38.0 gpm. Although this reach crosses the primary fault which will serve as the southwest boundary of the proposed mine workings, it is doubtful that this gain results from inflow along the fault. Rather, because the alluvium in the canyon bottom narrows significantly in Reach 4, the gain is likely the result of streamflow being measured which was lost into the alluvial deposits behind the upstream abandoned beaver dams.

Reach 5 crosses the fracture zone which was encountered by wells HZ-95-1 and HZ-95-1S. The loss in this zone was measured at 6.8 gpm. The loss in Reach 6, which crosses the northeast boundary fault, was 6.6 gpm. Although these losses occur in areas where fractures have been mapped, it is unlikely that a significant quantity of this water is flowing from the

TABLE 7-1a

RESULTS OF BEAVER CREEK SEEPAGE EVALUATION

Station	Description	Throat Width[a] (in)	Flow Depth (ft)	Flow Rate (cfs)	Flow Rate (gpm)
HZ-1	Beaver Creek	1	0.20	0.02	9.0
HZ-2	Unnamed tributary	1	0.17	0.01	6.5
HZ-3	Beaver Creek	1	0.44	0.10	43.4
HZ-4	Unnamed spring	1	0.39	0.08	34.1
HZ-5	Unnamed spring	1	--	--	1[b]
HZ-6	SP-9 tributary	1	0.41	0.08	37.7
HZ-7	Beaver Cr. at SS-7	1	0.61	0.19	83.5
HZ-8	Beaver Cr. - south split	1	0.16	0.01	5.7
HZ-9	Beaver Cr. - north split	4	0.30	0.19	84.0
HZ-10	Beaver Cr. by LMC-1	4	0.37	0.28	127.7
HZ-11	Beaver Cr. by HZ-95-1	4	0.36	0.27	120.9
HZ-12	Beaver Cr. at SS-8	4	0.35	0.25	114.3
HZ-13	Beaver Cr. at road crossing	4	0.29	0.17	78.5

(a) All measurements collected on September 11, 1996 using a portable cutthroat flume.

(b) Estimate based on visual observation

TABLE 7-1b

SUMMARY OF BEAVER CREEK GAIN/LOSS MEASUREMENTS

Reach No.[a]	Upstream Station(s)	Upstream Flow (gpm)	Downstream Station	Downstream Flow (gpm)	Gain/Loss (gpm)	Distance (ft)	Unit Gain/Loss (gpm/100 ft)	Remarks
1	HZ-1, HZ-2, HZ-4, HZ-5	50.6	HZ-3	43.4	-7.2	2300	-0.3	
2	HZ-3, HZ-6	81.1	HZ-7	83.5	+2.4	2850	+0.1	Approx. 1.5 gpm est. inflow observed on surface
3	HZ-7	83.5	HZ-8, HZ-9	89.7	+6.2	1850	+0.3	Downstream from extensive area of abandoned beaver ponds. Broad area of alluvium.
4	HZ-8, HZ-9	89.7	HZ-10	127.7	+38.0	2300	+1.7	Canyon bottom narrows significantly. Limited alluvium.
5	HZ-10	127.7	HZ-11	120.9	-6.8	2100	-0.3	Up- and downstream from HZ-95-1 fracture area.
6	HZ-11	120.9	HZ-12	114.3	-6.6	1750	-0.4	Approx. 0.5 gpm est. inflow observed on surface
7	HZ-12	114.3	HZ-13	78.5	-35.8	1650	-2.2	Colluvium from Castlegate Sandstone more prevalent.

[a] See Figure 7-4b

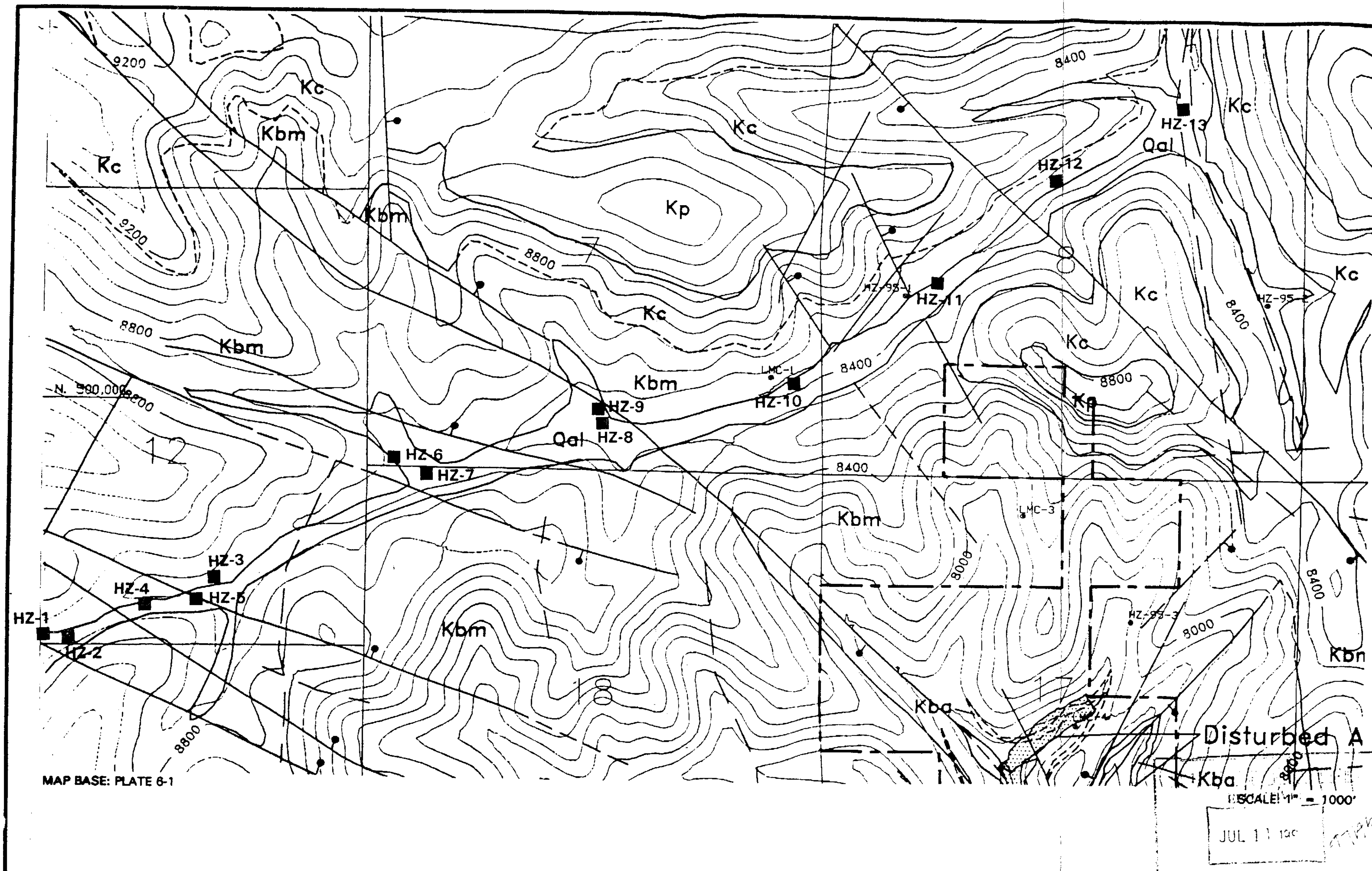


FIGURE 7-4A. LOCATIONS OF SEEPAGE MEASUREMENTS.

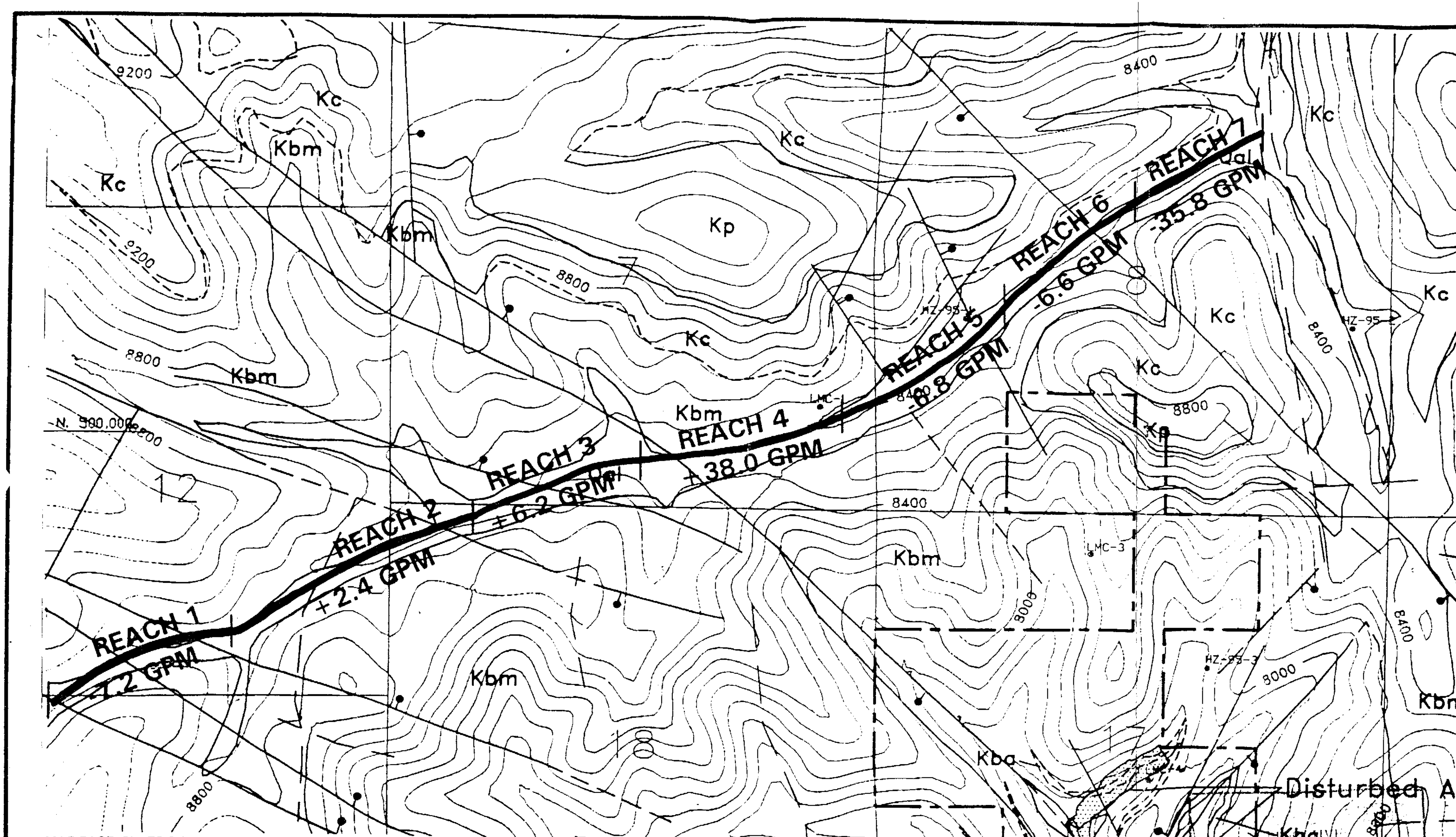


FIGURE 7-4B. SUMMARY OF SEEPAGE MEASUREMENTS.

surface into the fractures. The head difference in the flumes at the stations marking the up-and downstream ends of Reaches 5 and 6 was only 0.01 foot (see Table 7-1a). These insignificant decreases in head could easily have resulted from measurement error as opposed to actual streamflow losses. Hence, losses into the fractures in these reaches are considered insignificant.

The loss in Reach 7 was measured at 35.8 gpm. The Castlegate Sandstone outcrops in the stream bottom a short distance downstream from this reach. Alluvium in the stream bottom within Reach 7 appears to have been influenced by erosion of the nearby Castlegate Sandstone. Hence, it is likely that the loss in Reach 7 is a result of seepage into the coarser alluvium that typifies that reach.

Upstream from Reach 7 (where stratigraphic changes have likely affected the characteristics of the alluvium), the net seepage within the Beaver Creek system is a gain of 26.0 gpm. Together with the insignificant changes in streamflow noted in Reach 5 (where the shallow and deeper bedrock is known to be fractured as demonstrated by data collected from monitoring wells HZ-95-1 and HZ-95-1S), these data indicate that Beaver Creek is not hydraulically connected to bedrock aquifers that underlie the creek.

7.1.3 Water Quality

Groundwater from the Upper Cretaceous sediments in the Wasatch Plateau is characterized by total dissolved solids (TDS) contents of less than 1,000 milligrams per liter (mg/1) (Waddell et al., 1981). The following range of TDS concentrations have been measured in springs, wells, and mines issuing from or completed in formations found in the permit and adjacent areas, as reported for the Wasatch Plateau and the Book Cliffs areas by Waddell et al. (1981):

o	Price River Formation	122-792 mg/l
o	Castlegate Sandstone	315-806 mg/l
o	Blackhawk Formation	63-796 mg/l
o	Star Point Sandstone	335-391 mg/l

Groundwater quality data have been collected from the permit and adjacent areas since 1989 when sample sites were accessible. Prior to 1996, these data were generally collected in accordance with UDOGM guidelines published in 1986. Beginning in 1996, data have been collected, where feasible, in accordance with UDOGM guidelines published in April 1995. The data collected from the monitored sites, together with tables outlining the parameters which have been monitored, are presented in Appendix 7-2.

Data contained in Appendix 7-2 indicate that the TDS concentration of water issuing from spring SP-1 has typically varied from about 230 to 330 mg/l. At SP-2, these concentrations have generally varied from about 480 to 540 mg/l. The TDS concentrations of water issuing from SP-4 has typically varied from approximately 350 to 480 mg/l. The pH of water issuing from these spring is generally slightly alkaline (typical pH range of 7.5 to 8.5). Each of these springs issue from the Blackhawk Formation.

Results of chemical analyses of water collected from springs SP-1, 2, and 4 indicate that the groundwater in the area is a calcium bicarbonate type as illustrated in the Stiff diagrams included Appendix 7-2. Concentrations of the major cations and anions as well as TDS concentrations in the water discharged from these springs appears to have shown a general negative correlation with flow rate (i.e., lower concentrations at higher flows) since monitoring began in 1989.

Data collected by others from SP-9 (Jewkes Spring - see Appendix 7-2) indicate that water issuing from this spring typically has a TDS concentrations which varies from 240 to 300 mg/l. As with the other springs monitored in the permit area which issue from the Blackhawk Formation, this water is a calcium bicarbonate type. Concentrations of TDS and major ions tend to vary inversely with flow rate. Similar to other springs in the permit area issuing from the Blackhawk Formation, the pH of water issuing from SP-9 is generally slightly alkaline (typical pH range of 7.5 to 8.5)

Two samples (one in May 1992 and one in November 1995) have been collected of water standing on the floor of the old Blue Blaze No. 1 Mine approximately 440 feet into the old mine workings. Results of chemical analyses of these water samples are provided in Appendix 7-2. The total dissolved solids concentrations of these samples ranged from 414 to 452 mg/l (i.e., within the range noted for springs issuing from the Blackhawk Formation in the permit and adjacent areas). Similar to springs in the area, this water is a calcium bicarbonate type. The pH of this water has varied from 6.80 to 7.66.

Also included in Appendix 7-2 are the results of analyses of water-quality samples collected from monitoring wells HZ-95-1, HZ-95-2, and HZ-95-3 in December 1995, November 1995, and January 1996, respectively. Although these samples may still have been somewhat affected by the foam drilling fluid used during installation of the holes, the data indicate that the TDS concentration of water encountered in the monitoring wells ranges from 380 to 680 mg/l. Water quality data from the LMC wells have not been collected since these holes have been dry during the period of monitoring.

During the monitoring of wells HZ-95-2 and HZ-95-3 in September through December of 1996, HZ-95-2 fluctuated 0.3 feet and HZ-95-3 raised from 7513.8 to 7522.0 feet. HZ-95-1 and HZ-95-1S were monitored in September, October, November of 1996 and January of 1997. HZ-95-1's water level dropped 7 feet between September and November and rose approximately 5 feet between November 1996 and January 1997. HZ-95-1S remained constant September through November, but dropped 0.5 feet between November and January. These readings are more closely related to the seasonal fluctuation than the measurement taken directly after the completion of the wells.

7.1.4 Water Rights

The use of water in the Gordon Creek area is almost exclusively for stock watering. No groundwater rights have been filed by Horizon; however, water is leased (see Appendix 3-5). This lease involves water right 91-330 (underground water from the former Sweet Coal Mine) as well as water rights 91-94 and 91-353 (covering different time periods from the same unnamed spring). A change-in-point-of-diversion application has been filed with the Division of Water Rights for use of this water within the permit area (see Appendix 3-5). A right for the evaporative loss of water from Sweet's Pond (91-4956) has also been assigned to Horizon Coal by agreement (see Appendix 3-5). The applications for change-in-point-of-diversion were approved on November 20, 1996 by Robert L. Morgan, P.E., Utah State Engineer for water rights 91-330, 91-94 and 91-353. Horizon will inform UDOGM if the change in point of diversion is altered in the future.

It should be noted that the change-in-point-of-diversion which has been filed on water right 91-330 would permit use of the water where it is encountered within the proposed Horizon No. 1 Mine workings. This water will not be diverted from the former Sweet Coal Mine workings into the Horizon No. 1 Mine.

Locations of water rights within the permit and surrounding areas are shown on Plate 7-3. Data contained in Appendix 3-5 indicate that water rights have been filed on a limited number of springs in the permit and adjacent areas. Legal rates of usage of spring water are all less than 0.25 cfs.

No water rights exist within the permit and adjacent areas for water wells. However, rights exist for the use of water from several springs in the permit and adjacent areas. Typically, these rights are for the use of less than 5 gallons per minute of water from springs issuing from the Blackhawk Formation. As noted above, this formation is not considered to be an extensive aquifer within the permit and adjacent areas. Water in this formation issues from perched aquifers of limited areal extent. This accounts for the low flow and usage rates of the springs.

One right exists within the adjacent area for the use of water encountered in underground coal mining operations (File No. 91-330 in the name of Florence A. Sweet). Horizon has leased this water right from Florence A. Sweet and requested change of diversion to water anticipated within the Horizon No. 1 Mine.

7.1.5 Groundwater Monitoring Plan

Monitoring points SP-1, 2, and 4, as shown on Plate 7-1, have been monitored for baseline information since 1989. SP-9 (Jewkes Spring) was monitored by the U.S. Geological Survey during the period of 1979 through 1983 and by Beaver Creek Coal Company from 1985 through 1995.

Groundwater monitoring during operation of the mine will be conducted in accordance with UDOGM regulation R645-301-723 and will consist of the following: collection of flow and water-quality data from springs SP-1, 2, 4, 9, 2-6-W (Homestead Spring) and GV-70; collection of flow and water-quality data from sustained inflows to the mine and mine water discharge quantities (temporary or permanent); and collection of water-level data from the HZ monitoring wells. Temporary mine discharge quantities will be reported monthly and submitted to UDOGM with quarterly monitoring data. Reports will contain the period of pumping (i.e. 6:15 a.m. to 7:30 p.m.) and the daily flow rate, until a continuous flow meter/guage is installed. Refer to Section 7.2.3.2 for a discussion of temporary mine water discharge monitoring.

Each of the springs to be monitored issue from portions of the Blackhawk Formation which are stratigraphically higher than the Hiawatha coal seam. Therefore, data collected from the springs will allow quantification of potential impacts to perched aquifers within the permit and adjacent areas of both the initial permit term and future permit terms. Spring SP-2 is within approximately 400 feet of the initial planned workings and in an area which overlies future workings (see Plate 3-3). Springs SP-1, SP-4, and GV-70 are in an area which lies within 200 to 700 feet of proposed future workings. These distances are all within the zone of potential subsidence as defined in Section 3.4.8.5. Hence, data collected from these springs will assist in determining the impacts of subsidence on the groundwater resources of the Blackhawk Formation.

Springs SP-9 and 2-6-W lie approximately 1800 feet and 4900 feet southwest of the proposed future mine workings. As a result, they are in areas which will not likely be impacted by subsidence effects (see Section 3.4.8.5). Hence, these springs will be monitored to provide background data on groundwater conditions within the Blackhawk Formation in areas that will not likely be impacted by mining.

During the operational and reclamation phases of the mine, the above-noted springs will be monitored once each calendar quarter when the springs are accessible. The data to be collected from these springs are listed in Table 7-2. Monitoring data will be reported to the Division on a quarterly basis.

Sampling of springs CC-5 and MC-4 will begin in 1997 and continue through 1999. If requested by UDOGM the sampling may continue beyond 1999. CC-5 and MC-4 will be sampled quarterly and analyzed for calcium, magnesium, sodium, potassium, carbonate, TDS, sulfate, and chloride. Flow, pH and conductivity data will also be collect for springs CC-5 and MC-4. The data from the analyses will be included in Appendix 7-2.

Data collected from mine inflows will allow impacts to be quantified to all hydrologic resources that are affected my mine dewatering. Changes in the quantity and quality of mine inflows will be evaluated with the additional groundwater data to assess the overall hydrologic impacts of the mining operation.

Data collected from the HZ wells will allow quantification of potential impacts to the regional groundwater system. Specifically, data collected from wells HZ-95-1 and HZ-95-1S will assist in evaluating the impacts of mine dewatering on the quantity of groundwater in the Blackhawk Formation and the underlying Spring Canyon tongue. This will be particularly helpful in estimating potential future impacts as the mining operation expands to the northwest beneath Beaver Creek.

Data collected from HZ-95-2 will allow quantification of impacts to groundwater in the Spring Canyon tongue outside of the assumed adjacent area. Furthermore, if impacts are noted to water levels at the location of HZ-95-2, these data may provide information regarding the extent of the hydraulic connection across the northeast boundary fault. Finally, since HZ-95-3 is located near the initial mine workings, data collected from this location will allow early assessments of mining impacts to be made.

Representative points of inflow will then be selected based on the source or the areal zone, and samples will be collected from those representative points for analyses in accordance with Table 7-2. The sampling will continue once each quarter as long as the inflow point remains accessible during mining operations or until the flow diminishes. Data will be collected as close to the point of issuance as possible to prevent contamination by mining operations.

Sampling information for in-mine water flow was collected at the locations noted on Plate A, Appendix 7-2, Attachment A and Plate 7-1. The analyzes associated with the samples are included in Appendix 7-2, Attachment A. Additional sampling for TSS was requested by Utah Division of Water Quality, these analyzes are also included in Attachment A.

The in-mine water pumped and discharged to the surface was measured daily when personnel were at the mine (Appendix 7-2, Attachment A, Horizon In-Mine Water Log, 1998 - 1999). Other days, such as weekends and holidays the flow was estimated. The flow was measured as the water exited through a pipe or a weir and collected in a bucket.

The Horizon In-Mine Water Log, 1998 - 1999 shows the flow in gallons per minute. Empty boxes in the chart signify no discharge of in-mine water.

Discharge water from the mine will be treated in underground sumps, to meet effluent limitations. Discharged water will be monitored as described above and in accordance with the discharge permit issued by the Division of Water Quality (Appendix 3-6).

While sampling the HZ wells immediately after drilling, each well was pumped for a period of 2 to 4 weeks, during which time the wells were repeatedly pumped dry and allowed to recover. The samples were collected at the end of the above periods. Given the fact that the wells still appeared to be influenced by foam drilling fluids when sampled (based on pH, discoloration, etc) and the fact that sampling required an extended period of time due to the low yield of the wells, future sampling of the wells for water-quality analyses is not proposed. Rather, data collected from the wells in the future will consist solely of water-level information. Springs and mine-water inflows will be used to monitor changes in water quality within the permit and adjacent areas.

Water-level data will be collected during the operational and reclamation phases from the HZ wells once each quarter when accessible. All water-level measurements will be corrected to depth from top of 2" casing to permit correlation with previous measurements. Horizon commits to discuss with UDOGM a more stringent monitoring program for well HZ-95-1 prior to entering the northernmost mining block in Section 8.

Data collected from the springs to be monitored (SP-1, SP-2, SP-4, SP-9, 2-6-W, and GV-70) will provide information on the potential impacts of mining activities on localized aquifers. Similar information will be obtained by monitoring sustained inflows to the mine workings. Data obtained from the HZ monitoring wells will assist in evaluating potential losses of groundwater from the Blackhawk/Star Point aquifer system.

TABLE 7-2

OPERATIONAL AND RECLAMATION PERIOD
GROUNDWATER MONITORING PARAMETERS

Field Parameters	
Flow (gpm) or Depth to Water (ft)	pH (standard units)
Specific Cond. (μmhos/cm @ 25 °C)	Temperature (°C)
Laboratory Parameters (mg/l)	
Total Dissolved Solids	Total Hardness (as $CaCO_3$)
Total Alkalinity	Bicarbonate
Carbonate	Calcium (dissolved)
Chloride	Iron (dissolved)
Iron (total)	Magnesium (dissolved)
Manganese (dissolved)	Manganese (total)
Potassium (dissolved)	Sodium (dissolved)
Sulfate	Cations (meq/l)
Anions (meq/l)	

Once every five years, during the low-flow season of the year (i.e., late summer or early autumn), each monitored spring and mine-inflow point will be sampled for baseline parameters. This list of parameters is the same as that provided in Table 7-2 plus the following:

Acidity	Molybdenum (dissolved)
Aluminum (dissolved)	Ammonia
Arsenic (dissolved)	Nitrate
Boron (dissolved)	Nitrite
Cadmium (dissolved)	Phosphate (ortho)
Copper (dissolved)	Selenium (dissolved)
Lead (dissolved)	Zinc (dissolved)

By the end of each month following each calendar quarter (i.e., April 30, August 31, October 31, and January 31), a report will be submitted to the Division summarizing monitoring activities during the previous quarter. Annual reports summarizing monitoring activity will also be submitted to the UDOGM. Quarterly reports will include field measurements, observations, and analytical results received during the previous quarter. Annual reports will include field measurements, observations, and analytical results received during the entire year. If any data indicate non-compliance with permit conditions, Horizon Coal Company will promptly notify the Division and take appropriate actions as provided for in R645-300-145 and R645-301-731.

7.1.6 Mitigation and Control Plan

As noted in Section 7.3 of this permit application, Horizon does not foresee any significant impacts to groundwater as a result of mining in the permit area. Inflows to the mine are anticipated to be small. A more complete discussion of potential groundwater impacts and mitigation measures is provided in Sections 7.3 and 3.4.8.2. Should a perennial or intermittent water resource be impacted by mining activities, both UDOGM and Water Rights will be contacted. Approval for a site-specific mitigation plan will be received from UDOGM and Water Rights prior to implementation of the plan.

7.2 Surface Water Hydrology

Scope

Surface water hydrology information has been assembled to satisfy regulations set forth by UDOGM for the Horizon No. 1 Mine. A description of the baseline information for the existing resources, as well as a discussion of the runoff control plans for operations and reclamation, are provided below.

For the purpose of clarification, the following creek and drainage names will be used in this permit application. The confusion was prompted by the previous applicant's use of names familiar to the populous of the area and not the names of waterways used by the USGS on their 7.5 minute Quads. The new names will be used on all plates in the current submittal.

PREVIOUS NAME	NEW NAME
Gordon Creek	North Fork Gordon Creek
North Fork Gordon Creek	Jewkes Creek
Right Fork North Fork Gordon Creek	Portal Canyon Creek
Right Middle Fork North Fork Gordon Creek	Spring Two Canyon Creek

7.2.1 Methodology

The baseline hydrologic study was based on review of literature and available data obtained from the U.S. Geological Survey, the U.S. Forest Service, the State of Utah, Beaver Creek Coal Company, Blue Blaze Coal Company, and mine permit applications for the surrounding mines. A field reconnaissance was performed to confirm the location and characteristics of surface water courses, springs, and seeps.

7.2.2 Existing Surface Water Resources

7.2.2.1 Regional Surface Water Hydrology

Most of the regional area is drained by tributaries to the Green and Colorado Rivers. The principal tributaries in the region are the Price and San Rafael Rivers and Muddy Creek. The Green River flows through the eastern edge of the Central Utah region.

The U.S. Geological Survey completed a report entitled "Hydrologic Reconnaissance of the Wasatch Plateau - Book Cliffs Coal Field Area, Utah" which considers the development of coal resources in central Utah (Waddell et al., 1981). The Horizon No. 1 Mine lies within the study area near the headwaters of tributaries to the Price River.

Approximately 50 to 70 percent of the stream flow in the region occurs during the May-July snowmelt runoff period (Waddell et al., 1981). Summer precipitation usually results in minor amounts of runoff. Intense convective rainfall during the summer period may cause short duration, high intensity runoff in localized areas.

Water quality in the Price River and its tributaries can be classified as good at the higher elevations, with TDS concentrations of 250 mg/1 and below. As is the case with springs in the area, these surface waters tend to be a calcium bicarbonate type. At lower elevations below diversions, the water changes to a sodium sulfate type with dissolved solids ranging from 2,500 to more than 6,000 mg/1 (Waddell et al., 1981). These changes are caused by leaching of salts from irrigation return flows and natural runoff from areas underlain by Mancos Shale.

7.2.2.2 Mine Plan Area Surface Water Hydrology

Stream Flow

The three principal surface water courses found within and adjacent to the mine permit area are Beaver Creek to the north of the permit area, Jewkes Creek through the center of the property, and North Fork Gordon Creek to the south of the property (Plate 7-2).

Beaver Creek is a perennial stream that flows immediately north of the permit area. Perennial flow is maintained by small seeps and springs. One of the contributing springs, the Homestead Spring (labeled as 2-6-W on Plate 7-1), is an area of seeps located in a small tributary to Beaver Creek in the SW¼ NE¼ Sec. 13, T. 13 S., R. 7 E. (approximately 1.5 miles west of the permit area). Past measurements collected by Beaver Creek Coal Company personnel have indicated that this spring discharges from 3 to 136 gallons per minute, with the higher flow rates in June including surface runoff from snowmelt conditions.

Jewkes Spring (noted above in Section 7.1.2.2 as monitoring station SP-9) is located near the Beaver Creek stream channel in the SW¼ SW¼ Sec. 7, T. 13 S., R. 8 E., approximately 1 mile west of the permit area (see Plate 7-1). With the exception of a spurious measurement in July 1985 (see Section 7.1.2.2), discharges from this spring have generally varied during the period of record from about 1 to 40 gpm, with no observable flow during drought periods.

The general flow direction of Beaver Creek is to the northeast toward the Price River. The drainage pattern in the upper portions of the Beaver Creek basin near the permit area is dendritic. This drainage pattern is detailed on Plate 7-2. The valley profile is not as steep as the North Fork of Gordon Creek.

The USGS formerly maintained a gauging station near the mouth of Beaver Creek (Station No. 09312700) approximately 9 miles northeast of the permit area. During the 29-year period of record from October 1960 to October 1989, the minimum annual discharge of 254 acre-feet occurred during water year 1981. The maximum annual discharge of 9,950 acre-feet occurred two years later in water year 1983 (Appendix 7-7). The average annual discharge of Beaver Creek at the USGS monitoring station during the 29-year period of record has been 3,310 acre-feet.

The annual variability of flow in Beaver Creek can be seen by the fact that the annual maximum and the annual minimum during a 29-year period of record were separated by only two years. This variability is also evident in the high coefficient of variation for the station (74 percent).

Stream flow at the Beaver Creek USGS station was typically highest in the spring and early summer (April through June, as a result of snow melt) and lowest during the autumn and winter months. Occasional late summer rapid increases in flow were also observed, probably as a result of summer thunderstorms. Several days of no flow were also reported during the period of record (mostly in the winter and late summer).

Jewkes Creek, an intermittent stream, drains a small basin with a drainage area slightly greater than 1 square mile. This watershed drains much of the permit area. Jewkes Creek empties into North Fork of Gordon Creek in the SE¼ SW¼ Sec. 17, T. 13 S., R. 8 E. The channel gradient of Jewkes Creek is relatively uniform across the coal lease property. The canyon sides are steep and rocky. The characteristics of the channel and valley are indicative of a stream in a youthful stage of development.

The flow data presented in Appendix 7-3 indicate that Jewkes Creek occasionally ceases flowing at station SS-3 even though it continues to flow (albeit at low rates) at the upstream station (SS-5). Although no observations have been made in the field regarding the re-emergence of this water, it likely continues to contribute to the baseflow of North Fork of Gordon Creek, given the fact that the Mancos Shale outcrops a short distance downstream from the permit area, which outcrop should force baseflow in the alluvium to the surface.

A small drainage discharges into Jewkes Creek from the northeast in SE¼ SW¼ Sec. 17, T. 13 S., R. 8 E. In this report this drainage is referred to as Portal Canyon Creek (Plate 7-2). This canyon will contain the mine facilities and surface operations.

North Fork Gordon Creek flows along County Road 290 southeast of the permit area. The elevation of the creek is lower than the Hiawatha coal seam, the lowest minable seam in the area. Proposed mining operations will occur north of the creek and should not significantly affect the quantity or quality of the flow in North Fork Gordon Creek (see Section 7.3 of this permit application).

Stream locations from which samples have been collected within the permit and adjacent areas are noted on Plate 7-1. Stations SS-3 and SS-5, located on Jewkes Creek down- and upstream from the proposed surface facilities, respectively, have been monitored from 1989 through the present. Stations SS-7 and SS-8, located on Beaver Creek north of the permit area, have been monitored from 1991 through the present. Stations SS-10 (Unnamed Tributary) and SS-11 (Sand Gulch) were monitored beginning in May of 1996. Data collected from these stations are provided in Appendix 7-3.

It should be noted that previous sampling efforts have referred to the surface-water sampling stations within the permit and adjacent areas as Station No. 3, Station No. 5, Station No. 7, and Station No. 8. These locations are now referred to as SS-3, SS-5, SS-7, and SS-8. The change in terminology for these stations has been made solely to enable easier identification and discussion in this permit application.

Stream flow within the permit and adjacent areas is typical of the region, with maximum stream flows typically occurring the late spring and early summer as a result of snow melt runoff. Flows decrease significantly during the autumn and winter months, with Jewkes Creek and Beaver Creek both having experienced no flow during the period of record (primarily in the winter and late summer months).

The flow of Jewkes Creek diminishes in a downstream direction, as measured at sample points SS-3 and SS-5 in September 1990, August and September 1991, and August through December

1992. After passing sampling point SS-5, the channel become less defined and meanders though a 50-foot wide area, where the flow infiltrates into the alluvium. This flow does not apparently reappear immediately downstream from SS-3. However, given the presence of the impermeable Mancos Shale in the stream bed of North Fork Gordon Creek approximately one-half mile downstream from the proposed surface facilities (Hansen, 1988), it is likely that the stream flow reappears within North Fork Gordon Creek. Graphs illustrating the flows measured at the monitoring stations within the permit and adjacent areas are included in Appendix 7-3.

Downstream decreases in flow have also been observed in Beaver Creek between monitoring stations SS-7 and SS-8. This situation is most prevalent during the low-flow season. However, during periods of high flow, discharge rates have been observed to be occasionally higher at the upstream station (SS-7) as compared with the downstream station (SS-8). The reasons for these variations are not yet clear.

Surface Water Quality

Surface-water quality data have been collected from the permit and adjacent areas since 1989 when sample sites were accessible. Prior to 1996, these data were generally collected in accordance with UDOGM guidelines published in 1986. Beginning in 1996, data have been collected, where feasible, in accordance with UDOGM guidelines published in April 1995. The data collected from the monitored sites, together with tables outlining the parameters which have been monitored, are presented in Appendix 7-3.

The Price River and its tributaries from the confluence with Green River to Castle Gate, are classified 3C and 4. This reach includes the flows from Gordon Creek and its tributaries. Class 3C means that the particular stream is protected for non-game fish and other aquatic life, and Class 4 means that the stream is protected for agricultural use. Tables 7-3 and 7-4 list numerical standards for both of these classes.

Beaver Creek is included in the classifications for the Price River and tributaries from Castle Gate to it's headwaters. These are 1C (protected for domestic use with prior treatment), 3A (agricultural). Tables 7-3 and 7-4 list numerical standards for classes 1C and 3A.

Baseline sampling point locations are shown on Plate 7-1. Station SS-3 is located upstream of the intersection of Jewkes Creek and North Fork of Gordon Creek and below the proposed surface facilities. Sampling point SS-5 is located immediately upstream from the proposed surface facilities, just downstream from the confluence of Spring Two Canyon and Jewkes Creek. Station SS-7 is located on Beaver Creek upstream from potential future expansions of the permit area. Sampling point SS-8 is also located on Beaver Creek but downstream of potential future expansions of the permit area. The water quality data that have been collected at these sites is included in Appendix 7-3.

TABLE 7-3

NUMERIC CRITERIA FOR AQUATIC WILDLIFE

Parameter	Aquatic Wildlife 3A	3B	3C	3D
PHYSICAL				
Total Dissolved Gases	(1)	(1)		
Dissolved Oxygen (mg/l) (2)				
30 Day Average	6.5	5.5	5.0	5.0
7 Day Average	9.5/5.0	6.0/4.0		
1 Day Average	8.0/4.0	5.0/3.0	3.0	3.0
Max Temperature °C	20	27	27	
Max Temperature Change °C	2	4	4	
pH (Range)	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
Turbidity Increase NTU	10	10	15	15
Metals (3) Dissolved (ug/l) (4)				
Arsenic (Trivalent)				
4 Day Average	190	190	190	190
1 Hour Average	360	360	360	360
Cadmium (5)				
4 Day Average	1.1	1.1	1.1	1.1
1 Hour Average	3.9	3.9	3.9	3.9
Chromium (Hexavalent)				
4 Day Average	11	11	11	11
1 Hour Average	16	16	16	16
Chromium (Trivalent (5)				
4 Day Average	210	210	210	210
1 Hour Average	1700	1700	1700	1700
Copper (5)				
4 Day Average	12	12	12	
1 Hour Average	18	18	18	18
Cyanide (Free)				
4 Day Average	5.2	5.2	5.2	
1 Hour Average	22	22	22	22
Iron (Maximum)	1000	1000	1000	1000
Lead (5)				
4 Day Average	3.2	3.2	3.2	3.2
1 Hour Average	82	82	82	82
Mercury				
4 Day Average	0.012	0.012	0.012	0.012
1 Hour Average	2.4	2.4	2.4	2.4

TABLE 7-3 (Continued)

NUMERIC CRITERIA FOR AQUATIC WILDLIFE

Parameter	Aquatic Wildlife 3A	3B	3C	3D
Nickel (5)				
4 Day Average	160	160	160	160
1 Hour Average	1400	1400	1400	1400
Selenium				
4 Day Average	5.0	5.0	5.0	5.0
1 Hour Average	20	20	20	20
Silver				
4 Day Average	0.12	0.12	0.12	0.12
1 Hour Average	4.1	4.1	4.1	4.1
Zinc (5)				
4 Day Average	110	110	110	110
1 Hour Average	120	120	120	120
INORGANICS (mg/l) (3)				

TABLE 7-4

NUMERIC CRITERIA FOR DOMESTIC, RECREATION, AND AGRICULTURAL USES

Parameter	Domestic Source	Recreation and Aesthetics		Agriculture
	1C	2A	2B	4
BACTERIOLOGICAL (30 DAY GEOMETRIC MEAN) (#/100 ml)				
Max Total Coliforms	5000	1000	5000	
Max. Fecal Coliforms	2000	200	200	
PHYSICAL				
Min. Dissolved Oxygen (mg/l)	5.5	5.5	5.5	
pH (Range)	6.5 - 9	6.5 - 9	6.5-9	6.5-9
METALS (ACID SOLUBLE) MAX. (mg/l)(2)				
Arsenic	0.05			0.1
Barium	1.0			
Cadmium	0.01			0.01
Chromium	0.05			0.10
Copper				0.2
Lead	0.05			0.1
Mercury	0.002			
Selenium	0.01			0.05
Silver	0.05			
INORGANICS (MAX.) (mg/l)				
Boron				0.75
Fluoride	1.4 - 2.4			
Nitrates as N	10			
Total Dissolved Solids (4)				1200
RADIOLOGICAL (MAX. pCi/L)				
Gross Alpha	15			15
Radium 226, 228 (combined)	5			
Strontium 90	8			
Tritium	20000			
ORGANICS (MAX. ug/l)				
Chlorophenoxy Herbicides				
2,4-D	100			
2,4,5-TP	10			
Endrin	0.2			
Hexachlorocyclohexane	4			
Methoxychlor	100			
Toxaphene	5			

TABLE 7-4 (Continued)

NUMERIC CRITERIA FOR DOMESTIC, RECREATION, AND AGRICULTURAL USES

Parameter	Domestic Source	Recreation and Aesthetics		Agriculture
	1C	2A	2B	4
POLLUTION INDICATORS (5)				
Gross Beta (pCi/L)	50			50
BOD (mg/l)		5	5	5
Nitrate as N (mg/l)		4	4	
Phosphate as P (mg/l)(6)		0.05	0.05	

The data contained in Appendix 7-3 indicate that the TDS concentration of water in Jewkes Creek is typically 300 to 500 mg/l. Iron concentrations are generally less than 1 mg/l, while manganese concentrations are typically less than 0.1 mg/l. Total suspended solids concentrations have varied from <1 to 245 mg/l during the period of record. The pH of water in Jewkes Creek generally varies from 8.0 to 8.6.

The water in Jewkes Creek is typically a calcium bicarbonate type. In general, the concentrations of dissolved constituents are inversely proportional to flow, while the concentrations of total constituents are directly proportional to flow. Hence, the concentrations of total dissolved solids tend to be lowest in the late spring and highest in the autumn and winter months, while total suspended solids concentrations tend to be highest in the late spring and lowest in the autumn and winter months.

Water in Beaver Creek tends to have a low TDS concentrations than in Jewkes Creek. Data contained in Appendix 7-3 indicate that the TDS concentration of Beaver Creek near the permit area typically varies from about 200 to 350 mg/l. Similar to Jewkes Creek, iron and manganese concentrations in Beaver Creek are generally less than 1 mg/l and 0.1 mg/l, respectively. Total suspended solids concentrations in Beaver Creek have varied from <1 to 297 mg/l. The pH of water in Beaver Creek typically varies from 7.5 to 8.5.

As with Jewkes Creek, the water in Beaver Creek is typically a calcium bicarbonate type. As also noted at Jewkes Creek, the concentrations of dissolved constituents tend to be inversely proportional to flow, while the concentrations of total constituents tend to be directly proportional to flow.

7.2.2.3 Surface Water Monitoring Plan

In the Horizon No. 1 Mine area, Beaver Creek and North Fork Gordon Creek are perennial streams. Jewkes Creek is an intermittent stream. Both Portal Canyon and Spring Two Canyon are ephemeral streams, flowing primarily in response to snow-melt and runoff from thunderstorms. Since these ephemeral streams are usually dry, no monitoring points have been established thereon.

Surface-water monitoring within the permit and adjacent areas will be performed in accordance with R645-301-723. As noted in Section 7.2.3.2, Horizon will install silt fences (see Figure 7-5), containment berms, and straw-bale dikes during construction to minimize the potential for sediment to be discharged to local stream channels. To assist in monitoring the effectiveness of these sediment-control measures, samples will be collected on a weekly basis during construction from Jewkes Creek up- and downstream from the construction area (at the approximate locations of stations SS-5 and SS-3, respectively). These samples will be analyzed in the field for turbidity.

Stations SS-3, SS-5, SS-7, SS-8, SS-10, and SS-11 will be monitored once each calendar quarter (as access conditions permit) during the operational and reclamation periods. Data will be collected from these stations in accordance with Table 7-5. Stations SS-3 and SS-5 are

TABLE 7-5

OPERATIONAL AND RECLAMATION PERIOD
SURFACE WATER MONITORING PARAMETERS

Field Parameters	
Flow (gpm)	pH (standard units)
Specific Cond. (µmhos/cm @ 25 °C)	Temperature (°C)
Dissolved Oxygen (mg/l)	
Laboratory Parameters (mg/l)	
Total Dissolved Solids	Total Settleable Solids
Total Suspended Solids	Total Hardness (as $CaCO_3$)
Bicarbonate	Carbonate
Calcium (dissolved)	Chloride
Iron (dissolved)	Iron (total)
Magnesium (dissolved)	Manganese (dissolved)
Manganese (total)	Potassium (dissolved)
Sodium (dissolved)	Sulfate
Oil & Grease	Cations (meq/l)
Anions (meq/l)	Alkalinity (total)

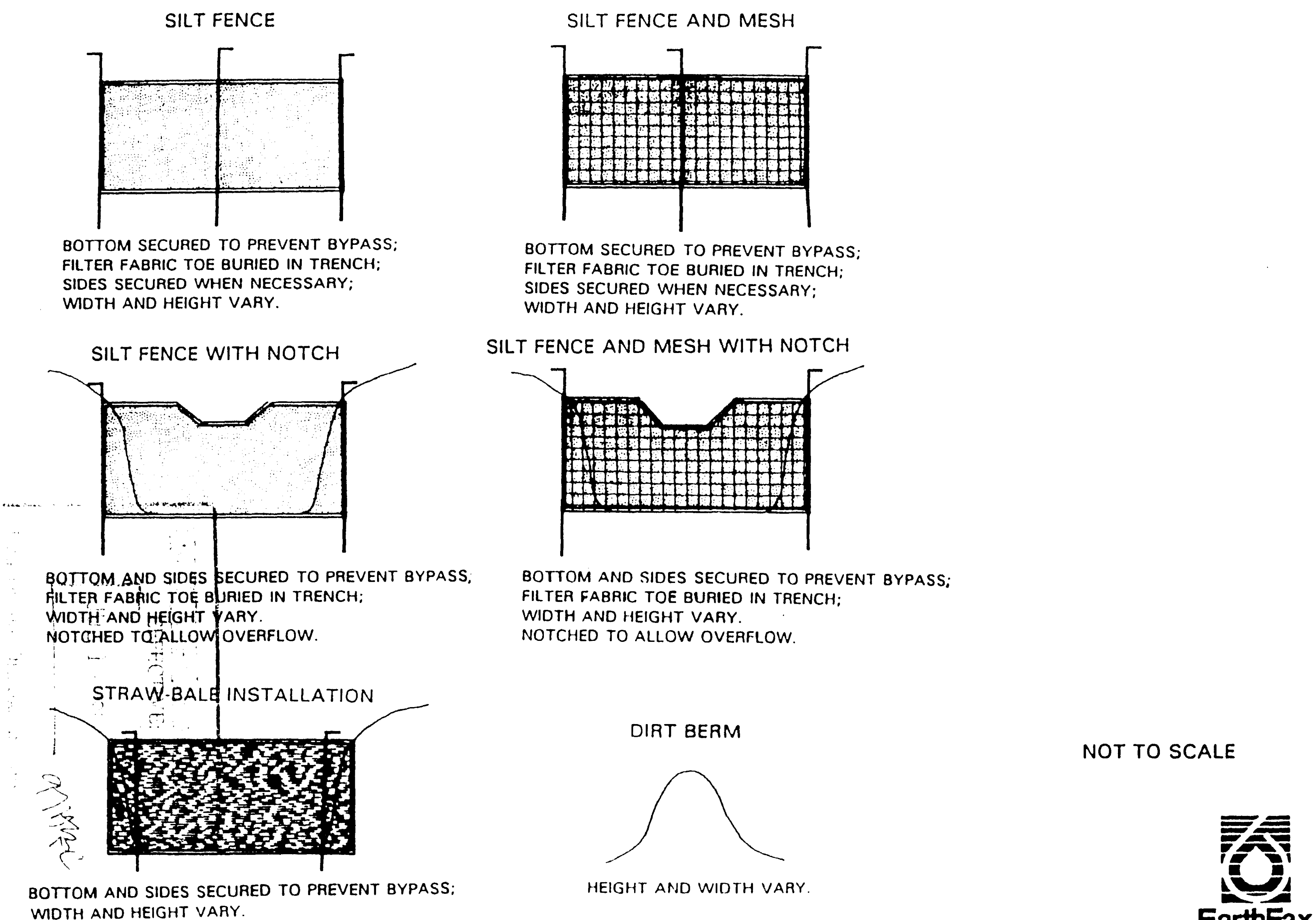


FIGURE 7-5. TYPICAL ALTERNATIVE SEDIMENT CONTROL STRUCTURES.

located on Jewkes Creek down- and upstream from the proposed surface facilities, respectively, and will provide information regarding the impacts of surface disturbances. Stations SS-7 and SS-8 are located on Beaver Creek up- and downstream from potential future expansions of the mine. Similarly, stations SS-10 and SS-11 are located in tributaries to Jump Creek and Beaver Creek, respectively, downstream from potential future expansions of the mine. Through the collection of flow and water-quality data up- and downstream from underground mining activities, these latter four stations will provide information on the potential impacts of underground mining activities (e.g. increases or decreases in flow and water quality due to subsidence and other potential interruptions to the hydrologic regime) on surface hydrologic conditions.

Flow data collected from stations SS-7 and SS-8 will be compared to determine variations in flows up- and downstream from the proposed workings. It should be noted that wide variations have been noted historically between these stations, with flows increasing and decreasing in the downstream direction. If the data suggest that abnormal variations in flow are occurring between stations SS-7 and SS-8, additional seepage evaluations will be conducted along Beaver Creek, similar to those described above in Section 7.1.2.

In addition to the above monitoring program and in accordance with a request by UDOGM, North Fork of Gordon Creek will be monitored for flow below Coal Canyon (see Plate 7-1) on a quarterly basis when the site is accessible. Data collected from this site will serve as a basis for evaluating the potential overall hydrologic impacts of mining within the permit area. Furthermore, station SS-12 (Plate 7-1) will be established for the collection of flow data from Beaver Creek to further evaluate flow conditions in the creek as mining progresses to the northwest. These flow data will be collected on a quarterly basis during normal monitoring periods.

Once every five years, during the low-flow season of the year (i.e., late summer or early autumn), each stream station will be sampled during the low-flow season for baseline parameters. This list of parameters is the same as that provided in Table 7-5 plus the following:

Acidity	Molybdenum (dissolved)
Aluminum (dissolved)	Ammonia
Arsenic (dissolved)	Nitrate
Boron (dissolved)	Nitrite
Cadmium (dissolved)	Phosphate (ortho)
Copper (dissolved)	Selenium (dissolved)
Lead (dissolved)	Zinc (dissolved)

During field reclamation activities following mining, samples will again be collected from Jewkes Creek above and below the disturbed area on a weekly basis. These samples will be analyzed in the field for turbidity as a measure of the effectiveness of the sediment-control measures that will be implemented during reclamation construction.

By the end of each month following each calendar quarter (i.e., April 30, August 31, October 31, and January 31), a report will be submitted to the Division summarizing monitoring activities during the previous quarter. Annual reports summarizing monitoring activity will also be submitted to the UDOGM. Quarterly reports will include field measurements, observations, and analytical results received during the previous quarter. Annual reports will include field measurements, observations, and analytical results received during the entire year. If any data indicate non-compliance with permit conditions, Horizon Coal Company will promptly notify the Division and take appropriate actions as provided for in R645-300-145 and R645-301-731.

7.2.3 Surface Water Development, Control and Diversions

7.2.3.1 Water Supply (Surface)

Locations of surface water rights within the permit and surrounding areas are shown on Plate 7-3. Data contained in Appendix 3-3 indicate that water rights have been filed on a limited number of streams in the permit and adjacent areas. These rights are primarily for stock watering. As such, they typically have no usage rate associated with them. Rather, they are for watering of stock along a length of stream.

The water supply for use underground will be pumped from the North Fork Gordon Creek to the mine. The pump house will be located as noted on Plate 3-1. The leasing of water rights for this use is discussed in Section 3.4.3 of this permit application.

7.2.3.2 Sedimentation Control Structures and Diversions

General Description

The runoff and sediment control plan for the facility area during operations is shown on Plates 7-4 and 7-6. The undisturbed runoff from above the site area on the Portal Canyon and Jewkes Creek drainages will be diverted beneath the disturbed area and drainage from the disturbed and small, contiguous undisturbed areas will be collected and routed to the sedimentation pond. The drainage network was developed with several objectives in mind:

1. To divert undisturbed area runoff around the facilities area where feasible;
2. To route all runoff from disturbed areas through a sedimentation pond;
3. To provide adequate drainage of roads and parking areas;
4. To create channels, culverts, and diversions which are stable; and
5. To satisfy UDOGM design standards.

During the initial stages of site development and prior to installation of the sedimentation pond, Horizon Coal Corporation will install a combination of containment berms, straw-bale dikes, and silt fences to contain sediment. The selection of the actual sediment-control technology will depend upon site conditions. However, in each case, these sediment-control structures will be located between the stream channels and the areas being disturbed by site construction.

Sedimentation control structures and diversions will be installed using the best technology currently available. Silt fence fabric and wire mesh (when used) will be buried in a trench on the upstream side of the silt fence. The depth of trench will vary, however an attempt will be made to use 6" as a standard depth. When silt fence is installed in a channel the silt fence will be installed flush with the sides and top of the channel to prevent seepage from occurring around the fence. The fence will be constructed parallel to the contours of the slope, with the ends bent upslope. The type, height, and width will be analyzed on a case by case basis to determine the best technology to be used for each situation.

Straw-bales will be installed in a trench the width of the bale (when weather conditions permit) and the length of the proposed sediment structure. The soil from the excavated trench will be placed against the bales. Straw-bales will be secured with a minimum of two stakes inserted into the bales and extending a depth sufficient to securely anchor the straw-bale into the ground. The structure will be constructed parallel to the contours of the slope, with the ends bent upslope. Loose straw will be wedged into gap spaces.

Installation of the culverts will proceed from the lower end of the pad area in an upstream direction. To the extent possible, Horizon Coal Corporation will limit construction activities associated with culvert installation to those periods when the stream is not flowing. Alternatively, stream flow will be bypassed around construction activities within the channels. The sedimentation pond will be constructed as soon as practical following installation of the culvert.

Methodology

The following methods were used to determine runoff volumes and peak flows for design of diversions, culverts, and the sedimentation pond:

Determination of Precipitation Depth. Precipitation depths were determined for the 10-year, 6-hour; 10-year, 24-hour; 25-year, 6-hour; and 100-year, 6-hour storms using data developed by Miller, et al. (1973). The precipitation depths for these events are 1.5 inches, 1.8 inches, 1.6 inches, and 1.8 inches, respectively.

Determination of Runoff Volume. The SCS curve number method was used to determine the runoff volume resulting from the design precipitation events. According to this method (U.S. Soil Conservation Service, 1972), the algebraic and hydrologic relations between storm rainfall, soil moisture storage, and runoff can be expressed by the equations:

and $$= \frac{-}{+} \qquad (3)$$

$$= \frac{\quad}{\quad} - \qquad (4)$$

where Q = Direct runoff volume (inches)
S = Watershed storage factor (inches)
P = Rainfall depth (inches)

CN = Runoff the curve number (dimensionless)

It should be noted that (a) Equation (3) is valid only for P >= 0.2S (otherwise Q = 0), (b) Equation (4), as stated, is in inches, with the values of 1000 and 10 carrying the dimensions of inches, although metric conversions are possible, and (c) CN is only a convenient transformation of S to establish a scale of 0 to 100 and has no intrinsic meaning.

Curve numbers for the watersheds of concern were obtained by evaluating the watershed surface characteristics based on soils, vegetative type, and other characteristics. This determination was based on maps and field reconnaissance of the site. The curve numbers for undisturbed areas were determined using the estimated cover density of the vegetative community and tabulated values provided by the U.S. Soil Conservation Service (1986), assuming hydrologic soil groups B and C (as is typical of much of the region). For the disturbed areas, curve numbers were chosen from professional judgement and tabulated values presented by the U.S. Soil Conservation Service (1972).

Weighted-average curve numbers were determined based on the percentage of each watershed occupied by a given land type. Antecedent Moisture Condition II was used for all runoff estimates.

<u>Hydrograph Synthesis</u>. Runoff hydrographs were developed, for the storm events, using the SCSHYDRO computer program, originally developed by Hawkins and Marshall (1980), modified to add additional rainfall distributions and allow batch file processing. The SCSHYDRO program was designed to simulate the surface runoff response of a drainage to precipitation, using the SCS triangular hydrograph method.

The SCS method yields a total rainfall excess, the difference between rainfall depth and precipitation loss. For a given storm, the incremental excess for a given time period of a storm can be computed as the difference between the accumulated excess at the end of the current time period and the accumulated excess at the end of the previous period (U.S. Soil Conservation Service, 1972). The computer program calculates the incremental volume using:

$$\Delta \;=\; \left(\frac{+\ \Delta\quad -}{+\ \Delta\quad +}\right) - \left(\frac{-}{+}\right) \qquad (5)$$

where S is as previously defined and values for P(t+Δt) and P(t) are determined from the rainfall mass curve.

This rainfall excess is then translated to an outflow hydrograph using the SCS triangular dimensionless unit hydrograph (U.S. Soil Conservation Service, 1972). The unit hydrograph shown in Figure 7-6 is a typical curvilinear hydrograph. It is characterized by its time to peak (T_p), recession time (T_r), time of base (T_b), and the relations between these parameters (i.e., $T_r = 1.67T_p$; $T_b = 2.67T_p$). Thus, from the geometry of a triangle, the incremental runoff (ΔQ can be defined by the equation:

$$= \frac{\Delta}{\quad} \qquad \textbf{(6)}$$

where q_p = Peak flow rate (in/hr, if Q is in inches and T_p in hours)

and other parameters previously defined.

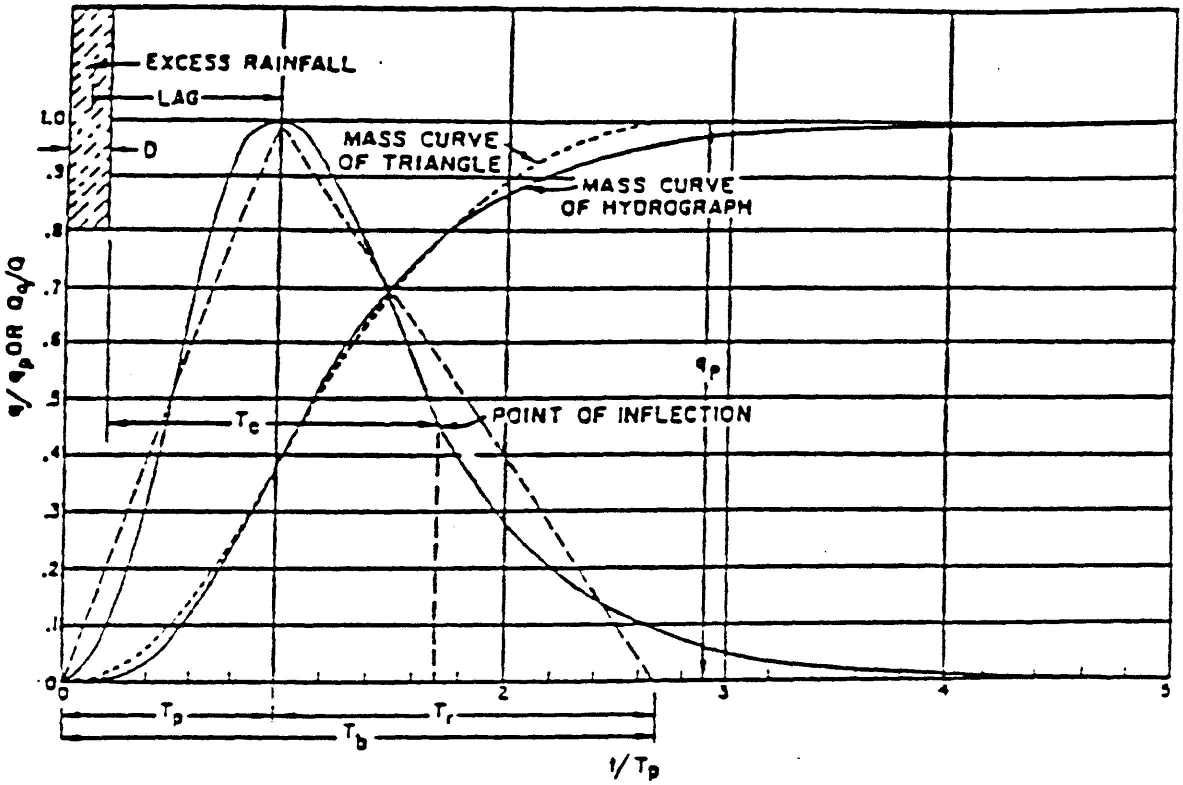
The flow at any time $0 < t < T_r$ may be determined by simple linear proportioning of the triangular unit hydrograph. The time to peak is related to the familiar expression "time of concentration" (T_c) by the equation:

$$+ \Delta = \qquad \textbf{(7)}$$

in which the factor 1.7 is an empirical finding cited by the U.S. Soil Conservation Service (1972).

The time of concentration may be estimated by several formulas. For this document, T_c was determined from the following equations (U.S. Soil Conservation Service, 1972):

FIGURE 7-6



DIMENSIONLESS UNIT HYDROGRAPH AND MASS-CURVE.

and $= \frac{\lambda \quad +}{\quad}$ **(8)**

$=$ **(9)**

where L = Watershed lag time (hours)
λ = Hydraulic length of the watershed, or distance along the main channel to the watershed divide (feet)
S = Watershed storage factor defined in Equation (4)
Y = Average watershed slope (percent)
T_c = Time of concentration (hours)

The U.S. Soil Conservation Service (1972) shows that Δt must equal $0.2T_p$. Hence, the computer code uses only T_c, and from this value computes Δt, T_p, T_r, and interim unit hydrograph ordinates. To convert the unit hydrograph ordinates to cubic feet per second, the following relation is used:

$= \frac{}{} * \quad *$ **(10)**

where Area =Drainage area (square miles)
q = Discharge (cubic feet per second)

Channel Hydraulics. The capacity of the undisturbed and disturbed area diversion channels, at the design flow rate, was determined using the FlowMaster I™ program developed by Haestad Methods (1990). This program solves for prismatic channel capacity using the Manning equation:

and the continuity equation:

= * (11)

where V = Velocity (feet per second)
R = Hydraulic radius (feet)
S = Hydraulic slope (feet per foot)
n = Manning's roughness coefficient
Q = Discharge (cubic feet per second)
A = Flow area (square feet)

= ——— * * (12)

Channel parameters required for the solution of Equations (11) and (12) were obtained from design cross sections and the proposed longitudinal profile of the various channels. Values of the roughness coefficient were obtained by comparing proposed conditions with tabulated values provided by Chow (1959) and the U.S. Soil Conservation Service (1956).

For the design of the undisturbed area diversions and the reclaimed channels, a maximum permissible velocity of 5 feet per second was determined to be non-erosive. This was determined from Barfield, et. al. (1981) based on a graded loam soil with gravel for sediment laden flows.

Undisturbed Area Runoff Control

General. Runoff from the undisturbed area upstream of the surface facilities in Portal Canyon and Jewkes Creek will be diverted beneath the mine facilities via three culverts. The culverts are designed as temporary structures for the life of the facility and will be removed following the operations. The undisturbed-area culverts are sized to pass the peak flow resulting from the 100-year, 6-hour precipitation event. Calculations supporting these designs are presented in Appendix 7-4. A copy of the stream alteration permit from the Utah Division of Water Rights required for installation of the undisturbed-area culverts is included in Appendix 7-12.

Diversions. The bypass culverts are sized to safely pass the peak flow resulting from the 100-year, 6-hour precipitation event. Plate 7-5 shows the location of the culverts and the drainage area to each structure, respectively.

Undisturbed area culvert UC-1 will bypass drainage runoff from culverts UC-2 and UC-3 (i.e., Portal Canyon and Jewkes Creek, respectively). The combined 100-year, 6-hour peak flow from these drainages is 27.9 cfs. The culvert to be installed in this section of the drainage will have a diameter of 36 inches, based on the minimum slope section and open-channel flow conditions for the culvert.

Culvert UC-2 will receive runoff from Portal Canyon. The 100-year, 6-hour peak flow for this culvert is 8.3 cfs. A 24-inch diameter culvert is planned to be installed at this location. This size is based on inlet control and a headwater to depth ratio of one or less. A trash rack will be installed on the inlet to this culvert, as indicated in Figure 7-8.

Culvert UC-3 will receive runoff from Jewkes Creek. The 100-year, 6-hour peak flow to this culvert is 19.6 cfs. This flow can adequately be handled by a 30-inch diameter culvert, based on inlet control and a headwater to depth ration of one or less. An extension of UC-3 is discussed in Appendix 3-9.

Discharge at the outlet of culvert UC-1 will have an exit velocity of approximately 10.4 fps (see Appendix 7-4). This will be controlled by installing an outlet channel and impact pool. The outlet channel will have graded riprap on the bottom and along the sides of the channel for an approximate distance of 30 feet downstream from the culvert outlet to a transition to a compound channel with a riprapped low flow channel and vegetated flood plain, as proposed for the final reclamation channel (see Plates 7-4 & 7-6). The riprap in the outlet channel and the low flow channel will have a median diameter of 0.5 foot and will be placed at a thickness of 12 inches. The gradation of the riprap is presented in Table 7-6. A geotextile material will be installed beneath the outlet channel riprap as a filter blanket. A sand filter will be installed beneath the low flow channel riprap.

The outlet channel will act as an impact pool for flows from the culvert or emergency spillway. The impact pool will be created by the transition to the compound channel, due to the shallower depth of the low flow channel versus outlet channel. Under flow conditions, the water will fill the outlet channel and spill to the low flow channel until its capacity is exceeded and then spread out into the flood plain. This will ensure that low flows can be conveyed through the area, while high flows will spread over the flood plain. Additionally, the shallow depth of the low flow channel will ensure the capability of sub-irrigation and seepage into the surrounding flood plain.

By constructing these channels during operations, the area will not need to be disturbed again during reclamation. The riparian area will already be established around the channels and the area will be stabilized. If these channels are not included in the initial disturbance, then the area will be redisturbed upon reclamation.

Calculations contained in Appendix 7-4 indicate that the flow capacity of the unaltered Jewkes Creek upstream from culvert UC-3 is 27.7 cfs. The flow capacity of the unaltered Jewkes Creek downstream from culvert UC-1 is 38.7 cfs. Culverts UC-1 and UC-3 have design capacities of 59 cfs and 40 cfs, respectively. Hence, the capacities of these culverts exceed the capacity of Jewkes Creek in its unaltered state.

As indicated in Appendix 7-4, the capacity of the unaltered Portal Canyon Creek upstream from culvert UC-2 is 13.1 cfs. All of the downstream portion of this creek will be subject to the culverted diversion. Culvert UC-2 has a capacity of 22 cfs. Hence, the capacity of this culvert exceeds that of Portal Canyon Creek in its unaltered state.

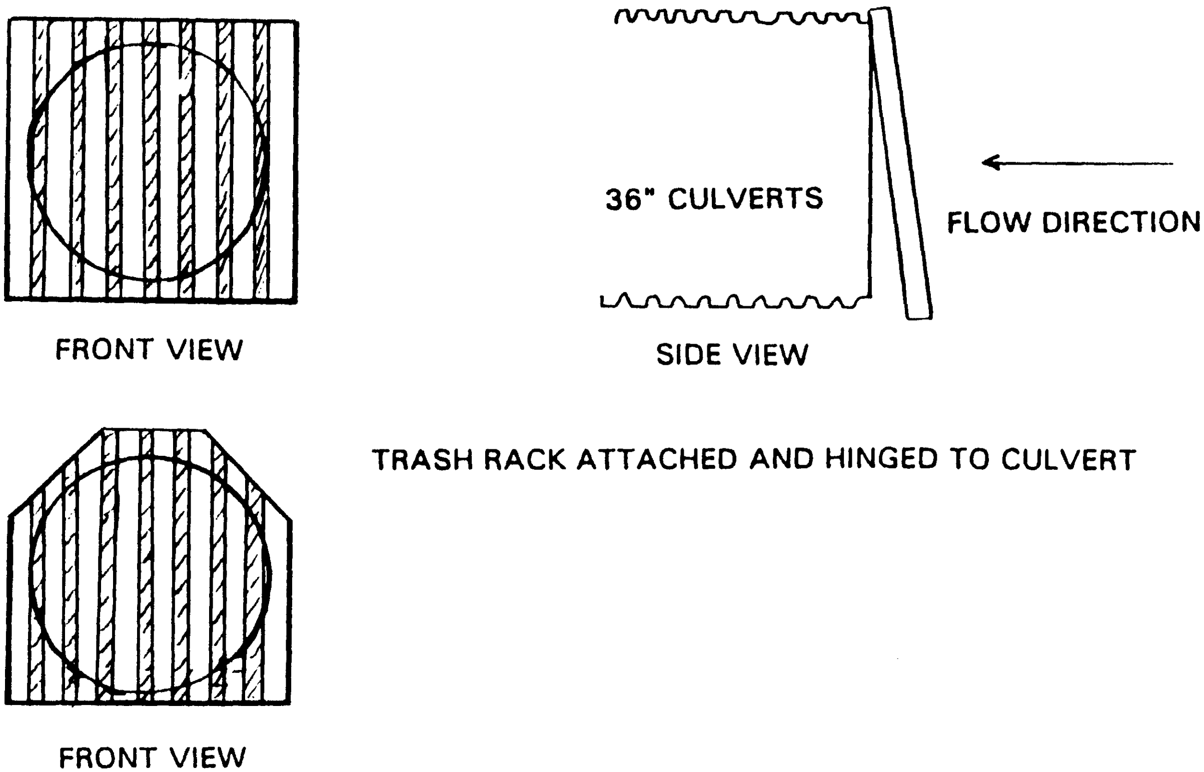


FIGURE 7-8. TYPICAL VIEW TRASH RACKS.

EarthFax

TABLE 7-6

RIPRAP GRADATIONS

Diameter Gradation	Diameter Size
4-inch Riprap	
D_{100}	0.66 foot
D_{85}	0.5 foot
D_{50}	0.33 foot
D_{15}	0.03 foot
6-inch Riprap	
D_{100}	1.0 foot
D_{85}	0.75 foot
D_{50}	0.5 foot
D_{15}	0.05 foot
8-inch Riprap	
D_{100}	1.5 feet
D_{85}	1.1 feet
D_{50}	0.6 foot
D_{15}	0.06 foot
12-inch Riprap	
D_{100}	2.0 feet
D_{85}	1.5 feet
D_{50}	1.0 foot
D_{15}	0.1 foot

Disturbed Area Runoff and Sediment Control

General. The runoff from the majority of the disturbed areas will be collected in a sedimentation pond and treated prior to discharge (see Plate 7-6). Areas being treated by alternative sediment controls and not reporting to the sediment pond are discussed below. The sedimentation pond has been designed to contain runoff from the 10-year, 24-hour storm event. Calculations supporting the design of the sedimentation pond are presented in Appendix 7-4.

Two areas within the disturbed area boundary do not flow to the sediment pond and are, therefore, treated by alternative sediment controls. The first such area is at the upstream end of the Topsoil Stockpile in Portal Canyon, adjacent to the inlet of culvert UC-2. This area slopes towards the culvert and is treated with straw bales and berms directing any flow through the straw bales prior to leaving the disturbed area and reporting to the undisturbed drainage culvert. During November 1996, the area was revegetated with Seed Mix #1 in accordance with the procedures outlined in Section 3.5.5. The straw bales and berms will be maintained at least until the vegetative cover is sufficient to control erosion.

The second area requiring alternative sediment control includes the exterior embankment slopes of the sedimentation pond. This area is treated with a combination of straw bales and a silt fence. During November 1996, this area was revegetated with Seed Mix #1 in accordance with the procedures outlined in Section 3.5.5. The straw bales and silt fence will be maintained at least until the vegetative cover is sufficient to control erosion.

Disturbed Area Diversions. The major portion of the disturbed area will be collected by disturbed-area diversion ditch DD-1 (see Plate 7-4). This diversion will consist of two segments. The upper segment will consist of a small ditch on each side of the canyon. Both ditch segments will drain to the lower portion of DD-1 which will flow directly to the sedimentation pond. To be triangular in shape, this diversion will be constructed with 2H:1V sideslopes and a channel slope ranging from 0.033 to 0.143 foot/foot. The channel will be constructed in pad fill materials. The 25-year, 6-hour peak flow for the drainage is 1.28 cfs (see Appendix 7-4). To handle this event, the upper channel will have a maximum flow depth of 0.45 foot and a maximum velocity of 4.8 fps. The channel depth is planned to be 1 foot deep, resulting in a free board of 0.55 foot (see Plate 7-4). For diversion slopes less than 11.7 percent, the peak design velocity is less than 5.0 fps. Hence, no riprap protection is required for these reaches. For the diversion reaches greater than 11.7 percent, riprap is required. Based on the maximum channel slope with a 0.5 foot D_{50}, the peak design velocity is 4.8 fps.

The lower reach of DD-1 will have a peak flow of 1.32 cfs. The design is based on the same channel configuration as the upper section. The channel will have a maximum flow depth of 0.46 foot and a maximum velocity of 4.83 fps. The channel depth is planned to be 1 foot deep, resulting in a free board of 0.54 foot (see Plate 7-4). For diversion slopes less than 11.5 percent, the peak design velocity is less than 5.0 fps. Hence, no riprap protection is required for these reaches. For the diversion reaches greater than 11.5 percent, riprap is required. Based on the maximum channel slope with a 0.5 foot D_{50}, the peak design velocity is 4.83 fps.

Disturbed-area culverts will be installed to convey runoff beneath roadways on the facility pad. Culvert DC-1 will be installed to carry runoff from the fan-portal access road beneath the main pad roadway into diversion DD-1. The peak discharge to this culvert from the 25-year, 6-hour precipitation event will be 0.60 cfs. An 18-inch diameter culvert is planned to be installed at this location, based on inlet control conditions with a headwater to depth ratio of one or less. This culvert will be extended to facilitate the installation of a transformer adjacent to the conveyor. The culvert is shown on Plate 7-4.

Culvert DC-2 was installed to convey runoff from the coal loadout area beneath the main facility roadway and into the sediment pond. The peak discharge to this culvert from the 25-year, 6-hour precipitation event will be 0.59 cfs. Culvert DC-2 will consist of an 18-inch diameter culvert, based on inlet control conditions for the culvert with a headwater to depth ratio of one or less.

Culvert DC-3 was installed to convey runoff from the hillside on the north side of Portal Canyon and below culvert DC-1. Waters discharging to DC-3 will run beneath the roadway and into diversion DD-1. The peak discharge to this culvert from the 25-year, 6-hour precipitation event will be 0.04 cfs. Culvert DC-3 consists of an 18-inch diameter culvert, based on inlet control conditions for the culvert with a headwater to depth ratio of one or less.

Drainage from the ancillary roads will be controlled by the use of water bars and berms. Plate 7-4 shows the location of the water bars on the ancillary roads to the fan portal and the monitoring well. Plate 3-4a shows the details of the water bars. Each of the water bars has been sized to handle the drainage from the 10 year - 6 hour event for the largest area reporting to a water bar. The worst case peak flow is estimated to be 0.24 cfs (maximum discharge). Based on the water bar details, the anticipated flow depth for this peak flow is 0.2 foot with a flow velocity of 1.48 feet per second. Appendix 7-4 presents the design calculations and a diagram outlining the largest drainage area reporting to a water bar on either ancillary road. The design depth of the water bar is 1 foot, thence the freeboard is 0.8 foot. The velocity is not erosive as it is less than 5 feet per second. Therefore, the proposed design for water bars on the ancillary roads, as indicated on Plate 3-4a, is adequate.

The water diverted by the water bars will be collected in a half-round culvert and conveyed over the downslope into a gravel lined basin. The water will then travel overland into the diversion channel and into the sediment pond.

In two places the ancillary road will need to cross the DD-1 ditch. In both locations, the cross-section of ditch DD-1 will transition to a 1 foot deep, 5H:1V sideslope, triangular shaped ditch. The channel slope through the transition section will be limited to 0.05 foot per foot. Based on the calculations presented in Appendix 7-4, the flow depth through these transition section will be 0.29 foot deep and the design velocity will be 3.02 fps.

<u>Sedimentation Pond Design</u>. Runoff from the disturbed area and adjacent undisturbed areas will be directed to the sedimentation pond as indicated above. The areas around all surface facilities, including buildings, trash containers, coal storage, and the topsoil stockpile, will be sloped so that the drainage from these facilities will be directed to the sedimentation pond.

facilities, including buildings, trash containers, coal storage, and the topsoil stockpile, will be sloped so that the drainage from these facilities will be directed to the sediment pond.

A direct discharge of in-mine water has been applied for however while approval is pending mine water discharge will be routed to the sediment pond and decanted through the currently approved UPDES discharge point. Waters decanting through the point will be monitored in accordance with the parameter\s of the UPDES permit.

During the period of discharge three monitoring points will be sampled: upstream of Culvert UC-3, at the discharge of the decant pipe from the sediment pond, and in the mixing zone below the UC-1 Culvert. The three samples points will be monitored for TDS, sulfate, and selenium by the laboratory. Field parameters will include pH, conductivity and flow. Sampling will begin when the first discharge occurs from the decant and a sample will be collected within each two wekk period thereafter. Sampling will be discontinued once the additional UPDES discharge point (Outfall 002) has been approved or when UDOGM otherwise approved the discontinuance of these monitoring points.

The sedimentation pond will be constructed at the location presented on Plate 7-4 as soon as possible following construction of the downstream sections of the undisturbed-area bypass culvert. All runoff from disturbed areas will be directed to the sedimentation pond.

The required storage volume for runoff from a 10-year, 24-hour precipitation event for all areas draining to the sedimentation pond is 0.56 acre-foot (see Appendix 7-4). Based on a disturbed area of 9.2 acres draining to the pond and a sediment storage volume of 0.1 acre-foot per acre of disturbed area, a total sediment storage volume of 0.92 acre-foot has been designed into the pond, resulting in a minimum pond storage requirement of 1.48 acre-feet.

To account for possible future changes in pad design and to provide a safety factor in the sedimentation capacity of the pond, the sedimentation pond has been designed with a total capacity of 2.6 acre-feet (see Appendix 7-4). At this total capacity, the quantity of runoff storage is 0.7 acre-foot and the quantity of sediment storage is 1.9 acre-feet. Based on the stage-capacity curve presented in Appendix 7-4, the pond will have a spillway crest elevation of 7585.0 feet, with a maximum sediment storage elevation of 7582.0 feet, and a sediment cleanout elevation (at 60% of maximum sediment storage) of 7580.6 feet). Plate 7-6 presents the plan view and cross-sections of the pond.

As indicated in Appendix 7-4, the peak inflow to the sedimentation pond resulting from the 25-year, 6-hour storm is 1.40 cfs. The spillway on the pond has been designed as an armored, open channel over the southeast corner of the embankment, as presented in Plate 7-6. A cross section drawing of the spillway is provided in Plate 7-6. The spillway will have a depth of 1.5 feet and a crest width of 10 feet, with a slope of 5 percent for the crest section through the embankment. The flow depth above the crest of the spillway at the design flow will be 0.08 foot (assuming no routing of the hydrograph through the pond). This will provide 1.42 feet of freeboard between the water surface in the spillway at the design flow and the top of the pond embankment at 7586.5 feet. The flow down the steep section of the spillway will have a maximum velocity of 3.5 fps (see Appendix 7-4).

The spillway crest and outlet will be riprapped (see Plate 7-6). The riprap will have a median diameter of 6 inches with a gradation as presented in Table 7-6. The riprap will be placed in a layer with a minimum thickness of 12 inches and will be underlain by a geotextile filter fabric. The riprap will consist of angular riprap placed to the point where it intersects the UC-1 outlet channel. The angle of entrance of the spillway channel into the UC-1 outlet channel will be no greater than 45° from the alignment of the outlet channel.

Riprap will also be placed on the slope of the inlet channel (DD-1) to the pond (see Appendix 7-4 and Plate 7-6). This will consist of 15-inch riprap with a minimum thickness of 30 inches. This will minimize erosion and potential structure stability problems to the impoundment.

The runoff storage volume will be maintained by the use of a 2-inch diameter dewatering/decant line. As indicated on Plate 7-6, the inlet of the decant will be located at the top of the sediment storage pool. The discharge from this decant will be controlled by a locking valve located on the outslope of the sediment pond embankment at the pipe outlet. This valve will used to drain the excess water from the sedimentation pond after allowing for settling of the sediment in the pond. Samples of the pond water will be collected as appropriate prior to decanting the pond to ensure that the requirements of R645-301-751 will be met. The decant invert will be 2.5 feet above the 60% sediment clean out level (see decant/dewatering design on Plate 7-6).

The decant/dewatering system acts as a baffle to oils and scum that may collect on the surface of the sediment pond. During operation the intake end of the baffle remains below the water's surface, therefore it is also below the oil/scum layer. The inlet will only draw water from below the water's surface, therefore having limited contact with the layer of oil/scum.

A sediment marker will be placed at the edge of the pond to indicate the depth and volume of sediment in the pond. The marker will have designations which will indicate when cleaning of the pond is necessary.

A percolation test was performed in the area of the proposed sedimentation pond. Results of this test are provided in Figure 7-11. The site is situated in seismic zone 2B which, under the Utah Building Code, indicates that the area is safe for the construction of the sedimentation pond. The Static Safety Factor calculations are located in Appendix 3-1. A report of construction and inspection on the sediment pond, by a registered professional engineer, will be provided to the Division at the end of construction.

<u>Runoff Control Maintenance and Monitoring</u>. The sedimentation pond will be inspected after each major storm to determine if water needs to be discharged and to check the sediment level. The pond will be cleaned when sediment builds to 60 percent of the maximum sediment storage level. Sediment removed from the pond will be handled in a manner consistent with the waste rock.The sedimentation pond will also be inspected quarterly by a registered professional engineer. Any weakness or defect in the structure which is noted during this inspection will be corrected as quickly as possible. The pond discharge will be monitored in accordance with the requirements of the UPDES Permit until bond release or until the pond is removed. An application for an additional UPDES discharge point at the mine portal was denied (August 14, 1996) until the water within the mine could be sampled and submitted for analysis. Horizon commits to obtaining a UPDES discharge permit for the mine water prior to discharge of water from the mine portal.

Ditches, culverts, and other drainage controls will be inspected after each major storm, and repaired as necessary. The pond embankments will be revegetated with the temporary seed mix described in Section 3.5.5.2 following construction of the pond. Any areas where revegetation is not successful or where rills and gullies develop will be repaired and revegetated accordingly.

FIGURE 7-11

UTAH STATE DEPARTMENT OF HEALTH

PERCOLATION TEST CERTIFICATE

I certify that percolation tests have been conducted on property located at future mine site lying in the SE¼, NE¼, SW¼ of Section 17, T13S, R8E, SLB&M.

in accordance with requirements specified in the Code of Waste Disposal Regulations, Parts IV and V, adopted by the Utah State Board of Health and the Utah Water Pollution Control Board, and that percolation rates, calculated as specified by said regulations, are as follows:

Test Hole No.	Test Hole Depth	Inches Drop Final 30 Minute Period	Percolation rate Minutes per inch
1	36"	7/8"	34min/"

Statement of soil and ground water conditions to a depth of 10 feet, or at least for a minimum of 4 feet, below the bottom of the proposed absorption system:

0 - 18" Sandy Loam
18-- 20" coal mixture
20 - 36" sandy Loam (some rock)

no groond water was encountered.

EFFECTIVE: JUL 1 1 1997

UTAH DIVISION OF OIL, GAS AND MINING

Signed John Hawkins P.E.

Address 905 N 600 East
Price, Ut 84501

Date 8 Oct '90

Reclamation Hydrology Design

General. Following the completion of mining operations, the mine site area will be reclaimed as discussed in Chapter 3 of this application. As part of the reclamation activities, Horizon will reestablish the natural drainage patterns and reconstruct the drainage channels.

The channels to be reestablished are Portal Canyon Creek and Jewkes Creek. These channels will need to be reestablished within the canyon bottom. Due to the proposed reclamation site configuration and the location of the sedimentation pond embankment, it is not practical to retain the operations sedimentation pond through the entire reclamation period. Prior to the removal of the sedimentation pond during reclamation, a UDOGM hydrologist will be notified and given the opportunity to inspect and endorse the removal. Several options are available to handle the reclamation drainage. For one pond to handle the total runoff from the entire 551 acres, a pond larger than the disturbed area would be needed. If the undisturbed runoff were past through the site using open channels, a minimum of three ponds, one at the bottom of the wedge formed by the junction of Portal Canyon Creek and Jewkes Creek and two ponds, one on each side of Jewkes Creek, at the lower end of the disturbed area boundary, would be required to contain the runoff, due to the presents of the open channels.

Also, each of these ponds would require a series of disturbed and undisturbed diversion ditches to bypass the undisturbed water above the reclaimed areas and to collect the reclaimed area drainage and convey it to the ponds. Additionally, once the portions of the site draining to the ponds were revegetated and the ponds and disturbed and undisturbed diversion ditches were ready to be removed, almost half of the revegetated area draining to the ponds would need to be disturbed again, due to the limited area between the open channel and the disturbed area boundary. As a result, the use of sedimentation ponds during the entire reclamation period would lengthen the time necessary to establish permanent vegetation throughout the permit area. Therefore, Horizon proposes to retain the sedimentation pond for as long as practical during regrading of the site area and removal of the bypass culverts. Once it is no longer practical to retain the sedimentation pond, it will be removed and the area will be reclaimed. Based on calculations presented in Appendix 7-4, the use of alternative sediment control measures (such as mulching, deep gouging, and reseeding) will produce less sediment than undisturbed watersheds at the same site.

If feasible, efforts will be made to minimize reclamation activities during periods of wet weather. During short periods when reclamation construction activities will be suspended (i.e., evenings and weekends), the construction site will be left in a condition which would minimize the impact on the hydrologic system if a precipitation event were to occur. Since conditions will vary between each area to be protected and each event, various siltation structures will be used. Horizon commits to establish and maintain sediment control using the best technology available at the time of reclamation. Refer to Section 7.2.3.2, Sediment Control for various possible structures.

Reclamation Channel Design. Reclamation channels have been designed to convey the peak flow from the 100-year, 6-hour precipitation event. Plate 7-7 presents the drainage areas of the proposed drainages following reclamation activities. Appendix 7-4 presents the calculations for the peak flows for these drainages. As indicated in Appendix 7-4, the design capacities of the reclamation channels exceed the capacities of the natural stream channels up- and downstream from the proposed reclamation channels. Specifically, as indicated in Appendix 7-4, the natural and reclaimed capacities of Portal Canyon Creek and Jewkes Creek are as follows:

Creek	Upstream Capacity (cfs)	Downstream Capacity (cfs)	Reclamation Capacity (cfs)
Portal Canyon (RD-1)	13.1	—	56.7
Jewkes (RD-2)	27.6	38.7	143.5
Jewkes (RD-3)	27.6	38.7	150.6

Drainage from the 181.2-acre Portal Canyon watershed will flow through the reclaimed stream channel RD-1. As indicated in Appendix 7-4, the peak flow for the 100-year, 6-hour event for this drainage is 9.95 cfs. The reclaimed channel will be trapezoidal in shape and will be constructed with an 8-foot bottom width, 2H:1V sideslopes, and a channel slope ranging from 0.038 to 0.167 foot/foot (see Figure 7-12 and Plate 3-7). The channel will be constructed in regraded materials and will be riprapped to provide a stable stream section. To handle this event, the channel will have a maximum flow depth of 0.36 feet and a maximum velocity of 5.79 fps. The channel depth is planned to be a minimum of 1 foot, resulting in a freeboard of 0.68 feet. Riprap with a median diameter of 0.5 foot will be installed to enhance long-term erosion protection. Material gradation for this riprap is presented in Table 7-6. A sand filter blanket will be installed beneath the riprap as indicated in Appendix 7-4 and Figure 7-12.

Reclamation channel RD-2 will receive flow from the 358.2 acre Upper Jewkes Creek drainage. The reclaimed channel will be a compound channel to provide channel stability and assist in establishment of the riparian/wet meadow vegetative community which currently exists along portions of Jewkes Creek. The base channel will be trapezoidal in shape and will be constructed with an 8-foot bottom width, 2H:1V sideslopes, and a channel slope of 0.013 to 0.087 foot/foot (see Figure 7-12 and Plate 3-7). Peak flow for this low flow channel, based on the 100-year, 6-hour event, is 19.75 cfs. The channel will be constructed in regraded materials and will be riprapped to provide a stable stream section. To handle this event, the channel will have a maximum flow depth of 0.65 foot and a maximum velocity of 6.06 fps. The channel depth is planned to be 2.0 feet deep, resulting in a freeboard of 1.35 feet. According to Appendix 7-4, the channel will be lined with riprap which will have a median diameter of 0.5 foot, with a material gradation as presented in Table 7-6. A sand filter blanket will be installed beneath the riprap as indicated in Appendix 7-4 and Figure 7-12.

Two procedures will be implemented during reclamation to assist in the re-establishment of riparian/wet meadow vegetation along Jewkes Creek. First, following installation of the filter blanket and the riprap, soil will be worked into the voids of the riprap using the bucket of a backhoe. The purpose of this soil will be to provide a growth medium for the seeds and seedlings that are planted in the channel during revegetation.

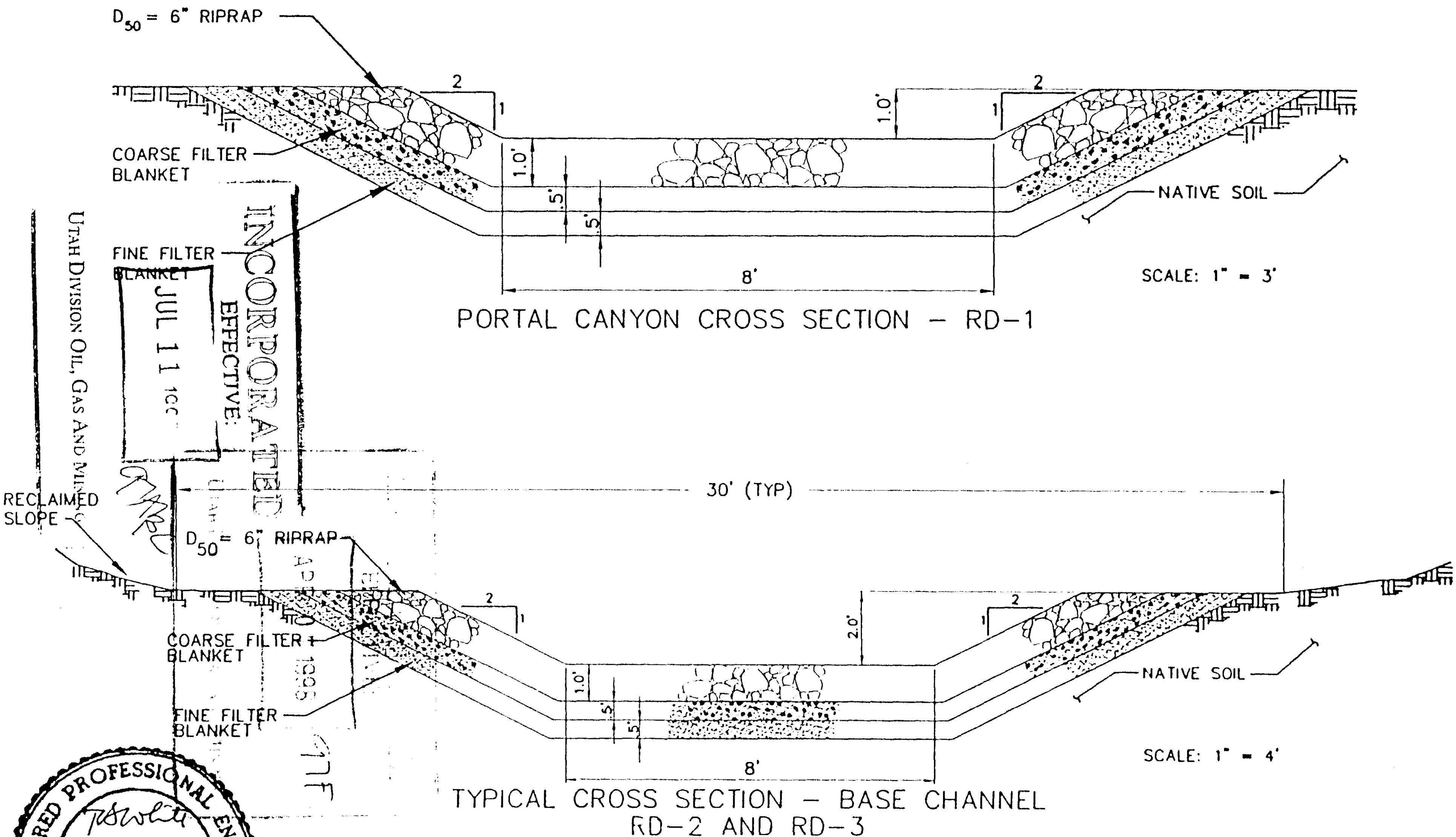


FIGURE 7-12. TYPICAL CROSS SECTIONS FOR RECLAIMED CHANNELS

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Second, loose-rock check dams will be installed at the locations indicated on Plate 3-7 in accordance with Figure 7-12a. These check dams have been designed in accordance with the procedures outlined by Heede (1976) as indicated in Appendix 7-4 and will cause naturally-occurring sediment in the stream to be deposited in the reclaimed channel. As noted in Appendix 7-4, the rock used in the check dams will have a median diameter of 9 inches, which size has been found by Heede (1976) to be stable under conditions similar to those at the Horizon site. This deposited sediment will provide an additional soil base for re-establishment of the riparian/wet meadow vegetation and will also provide a cross section which is more typical of that which currently exists. Nonetheless, should a major storm event occur, the underlying base channel will provide long-term protection against excessive erosion.

The check dams have been designed with a spillway that is capable of passing the peak flow resulting from the 10-year, 6-hour precipitation event. Discharge in excess of that event will flow onto the adjacent flood plain. By spreading this flow, moisture will be provided to the riparian/wet meadow vegetation to assist in its re-establishment. Data included in Appendix 7-4 indicate that the soil in the flood plain will be erosionally stable during runoff resulting from the 100-year, 6-hour rainfall event.

The width of the reclaimed flood plain will be at least equal to that of the current riparian/wet meadow vegetation community, as defined on Figure 2 of Appendix 9-2. The planned width of the reclamation flood plain is indicated on Plate 3-7. Check dams will be installed within the flood-plain sections as indicated on Plate 3-7. Even though the calculations provided in Appendix 7-4 indicate that the flood plain soils will be erosionally stable, a temporary jute matting will be installed in these flood plain areas to provide additional protection for the seeds until vegetation is established.

The flood plain of channel RD-2 will also be trapezoidal in shape and will be constructed with a typical bottom width of 30 feet, 2H:1V sideslopes, and a channel slope ranging from approximately 0.013 to 0.087 foot/foot (see Figure 7-12 and Plate 3-7). Peak flow for this flood plain channel, based on the 100-year, 6-hour event, is 19.75 cfs. Allowing for the capacity of the low flow channel, the flood plain will only be required to handle 10.29 cfs. The channel will be constructed in regraded materials and will be stabilized using a temporary jute mesh erosion control blanket. This blanket will be in place only until the vegetation planting for the flood plain mature and provide natural protection. To handle this event, the flood plain channel will have a maximum flow depth of 0.19 foot and a maximum velocity of 3.24 fps. The velocity is less than the 5.5 fps allowed for jute mesh.

Reclamation channel RD-3 will receive flow from the 551.0 acre Lower Jewkes Creek drainage, below the confluence of Jewkes Creek and Portal Canyon. The reclaimed channel will also be a compound channel. It will consist of a base channel and a flood plain, with loose-rock check dams. The base channel will be trapezoidal in shape and will be constructed with an 8-foot bottom width, 2H:1V sideslopes, and a channel slope ranging from approximately 0.022 to 0.100 foot/foot (see Figure 7-12 and Plate 3-7). Peak flow for this base channel, based on the 100-year, 6-hour event, is 30.21 cfs. The channel will be constructed in regraded materials and will be riprapped to provide a stable stream section. To handle this event, the base channel will have a maximum flow depth of 0.71 foot and a maximum velocity of 7.38 fps. The channel depth is planned to be 2.0 feet, resulting in a

FIG7-12A.DWG UC372-02 8-13-97

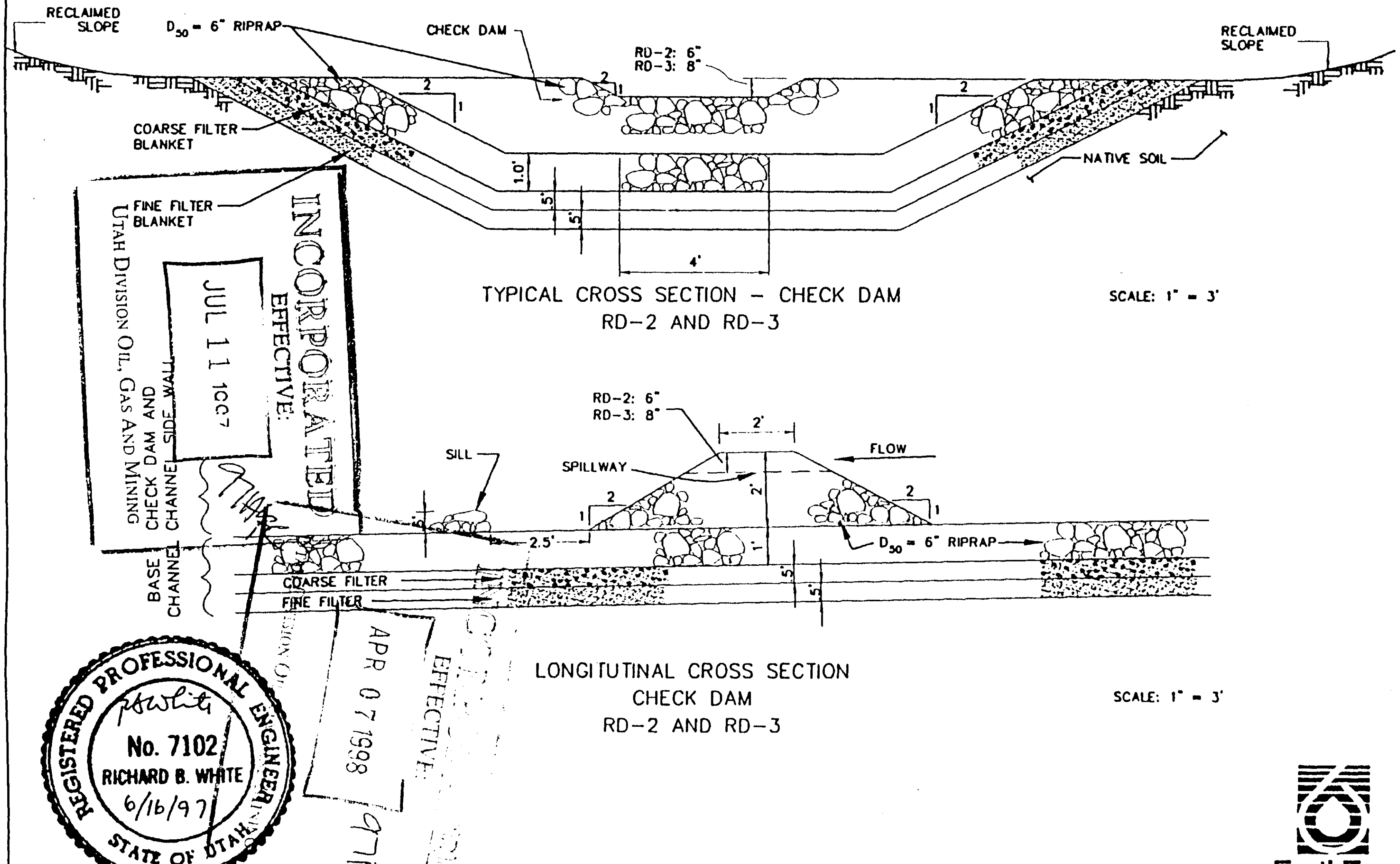


FIGURE 7-12A. TYPICAL CHECK DAM CROSS SECTIONS freeboard of 1.29 feet. The velocity is greater than 5 fps, requiring riprap protection. According to Appendix 7-4, this riprap will have a median diameter of 0.5 foot, with a material gradation as presented in Table 7-6. A sand filter blanket will be installed beneath the riprap as indicated in Appendix 7-4 and Figure 7-12.

Soil will be worked into the channel riprap and loose-rock check dams will be installed in channel RD-3 as indicated above. The flood plain will also be trapezoidal in shape and will be constructed with a typical bottom width of 30 feet (but at least equal to the extent of the pre-mining riparian/wet meadow vegetation community as defined on Figure 2 of Appendix 9-2), 2H:1V sideslopes, and a channel slope ranging from approximately 0.022 to 0.100 foot/foot (see Figure 7-12 and Plate 3-7). Peak flow for this flood plain channel, based on the 100-year, 6-hour event, is 30.21 cfs. Allowing for the capacity of the low flow channel, the flood plain will only be required to handle 15.66 cfs. The channel will be constructed in regraded materials and will be stabilized using a temporary jute mesh erosion control blanket. This blanket will be in place only until the vegetation planting for the flood plain mature and provide natural protection. To handle this event, the flood plain channel will have a maximum flow depth of 0.20 foot and a maximum velocity of 3.99 fps. The velocity is less than the 5.5 fps allowed for jute mesh.

As indicated on Plate 3-7, no check dams will be installed in the middle portion of the channel RD-3. This section is currently narrow and the reclamation plan seeks to re-establish the riparian/wet meadow vegetation in this area at a width which is indicative of current conditions. Only the base channel will exist in this section, wherein the establishment of riparian/wet meadow vegetation will be enhanced by working soil into the riprap as indicated above.

Sediment Control. To minimize the hydrologic impacts of the reclamation work, Horizon commits to construct the reclaimed stream channels commencing at the upstream end of each channel. Horizon Coal Corporation proposes to employ the following alternative methods during reclamation to control sediment:

1. Silt fences
2. Surface ripping, pocking, and deep gouging
3. Mulching
4. Straw-bale dikes
5. Seeding
6. Reseeding areas that do not exhibit successful germination

The approximate locations of silt fences to be installed during the reclamation period are indicated on Plate 7-7a. The fences will be installed parallel to the contours with the ends of the fences turned up perpendicular to the contours to contain the sediment. Silt fences will be installed in accordance with Figure 7-5. The filter fabric will be installed against a supportive backing. To prevent sediment runoff from passing under the fence, the fabric will be secured by burying the bottom edge in a small trench along the length of the fence. In addition silt fences or straw-bale dikes will be installed in roadside ditches immediately downstream from the disturbed area.

Upon completion of the redistribution of the soil (Section 8.8), the reclaimed area will be seeded as outlined in Chapter 3.

Erosion control during and following reclamation will be assisted by the addition of a vegetative mulch and erosion-control matting, as indicated in Section 3.5.5 of this permit application. Erosion-control matting will be installed on all slope steeper than 2 1/2H:1V (see Plate 7-7a). The mulch or matting significantly reduces the amount of sediment yield from an area (Simons, et. al., 1983) The mulch or matting also helps retain moisture to allow for seed germination.

Prior to commencing with reclamation, specifications regarding the specific erosion control matting which is proposed for installation will be submitted to UDOGM for approval as one of the Best Technologies Currently Available. Horizon will install all erosion control matting in accordance with manufacturer's instructions.

An evaluation of the effectiveness of the reclamation sediment-control measures outlined above is provided in Appendix 7-4. This evaluation compared the sediment production from the reclaimed surface assuming:

- Bare Surface
- Bare, Ripped Surface
- Ripped and Mulched Surface
- Ripped and Mulched Surface with Silt Fences

The sediment production from these surfaces was compared to the sediment production expected from the reclaimed surface with an established vegetative cover required for bond release. The Universal Soil Loss Equation was used to make these comparisons. According to this comparison, the proposed alternative sediment control measures will actually provide better erosion control than the control planned for the Phase II reclaimed/revegetated surface. This level of protection justifies removal of the sediment pond. Once the sediment pond is removed and the low flow channel constructed, the riparian habitat/vegetation can be established. Therefore, the alternative measures are considered to an be adequate replacement for the sedimentation pond.

<u>Sediment Control Monitoring and Maintenance</u>. The alternative sediment controls constructed during reclamation will be inspected monthly and after every major storm event. Required repairs will be implemented immediately to prevent future sediment contributions to the main stream channel.

Corrective action will consist of repairing, replacing, or adding silt fences as necessary, replacing straw bales, localized regrading of the ground surface as necessary to fill in gullies caused by erosion, and reseeding and mulching to reestablish vegetation. Soil material trapped by sediment control measures that is not used in repairing the site will be removed and disposed of in an approved area.

7.3 Probable Hydrologic Consequences

The Probable Hydrologic Consequences (PHC) of the proposed Horizon No. 1 Mine are herein determined as per Utah Coal Mining Regulation R645-301-728.100 and R645-301-728.200. Baseline geologic information is presented in Chapter 6. Baseline hydrologic information is presented in Sections 7.1 and 7.2.

7.3.1 Potential Impacts to Surface and Groundwater

Potential impacts of coal mining on the quantity and quality of surface and groundwater flow may include:

- Increased sediment yield from disturbed areas;
- Diminution of springs in perched aquifers overlying the mine area;
- Decreased availability of groundwater in the regional aquifer system;
- Impacts on surface and groundwater availability due to subsidence;
- Hydrocarbon contamination due to spills or leaks;
- Contamination of surface and groundwater from road salting;
- Impacts to the chemical quality of surface and groundwater;
- Impacts to public water supplies; and
- Flooding or stream flow alteration.

These potential impacts are discussed in the following sections of this permit application.

7.3.2 PHC Determination

Sediment Yield. In accordance with State and Federal regulations, a runoff conveyance and sedimentation control plan has been developed which mitigates the impacts of mining operations. Surface runoff originating upon or traveling across disturbed areas will be diverted into a sedimentation pond which will improve water quality and decrease peak flows.

Although some surface waters are temporarily diverted out of their original channels, they shortly thereafter re-enter the main channel and continue their course downstream having experienced little overall modification. Disturbed waters exiting the sedimentation pond will re-enter the natural downstream drainage system.

The potential impact of construction, mining, and reclamation on sediment yield is an increase in suspended sediment in the surface waters downstream from the disturbed area. However, sediment-control measures (such as sedimentation pond, diversions, silt fences, straw-bale dikes, etc.) will be utilized during construction, operation, and reclamation phases (Section 7.2) to minimize the impact that could result from elevated TSS concentrations. These facilities will be regularly inspected (see Section 7.2) and maintained as outlined in the permit and UDOGM regulations.

Impacts to the Perched Aquifer System. The hydrologic data presented in Section 7.1 indicate an absence of significant perched aquifers within the Blackhawk Formation overlying the coal to be mined. The geology of the area and the occurrence of springs in the Blackhawk Formation (Section 7.1) indicate the presence of small, laterally discontinuous perched aquifers in the Blackhawk. These small perched aquifers within or adjacent to the mine plan area may be impacted as a result of mining related subsidence. These water sources will be monitored as discussed in Section 7.1.

The perched aquifers of the Blackhawk Formation characteristically produce water from channel sandstones bounded by impervious shale beds at their bases. If subsidence fractures do intersect these perched aquifers, clay minerals contained within these shale beds will likely seal the fracture planes. Sealing of the fracture planes may allow spring discharge to continue uninterrupted.

According to the Cumulative Hydrologic Impact Assessment prepared for the area by UDOGM (1989), "Subsidence impacts are largely related to extension and expansion of the existing fracture system and upward propagation of new fractures." Vertical and lateral migration of water is partially controlled by fracture conduits. Potential changes include increased flow rates along fractures and diverting flow along new fractures or within permeable lithologies. Subsurface flow diversion may result in diminution and/or loss of flow to springs that are undermined.

Retreat mining also results in uniform downwarping and lowering of strata above the mined interval. This uniform downward movement is generally not accompanied by a significant degree of fracturing. As a result, the original attitude and integrity of the strata are maintained. Little impact on the perched aquifers of the overburden are expected to result from downwarping.

The probable consequences of mining on the hydrologic resources associated with perched aquifers are considered minimal due to: 1) small number of springs, 2) low and/or erratic spring flow, 3) absence of municipal water use rights, 4) water loss experienced at one location may be accompanied in an increased flow at another location, and 5) possible sealing of subsidence fractures by clay minerals.

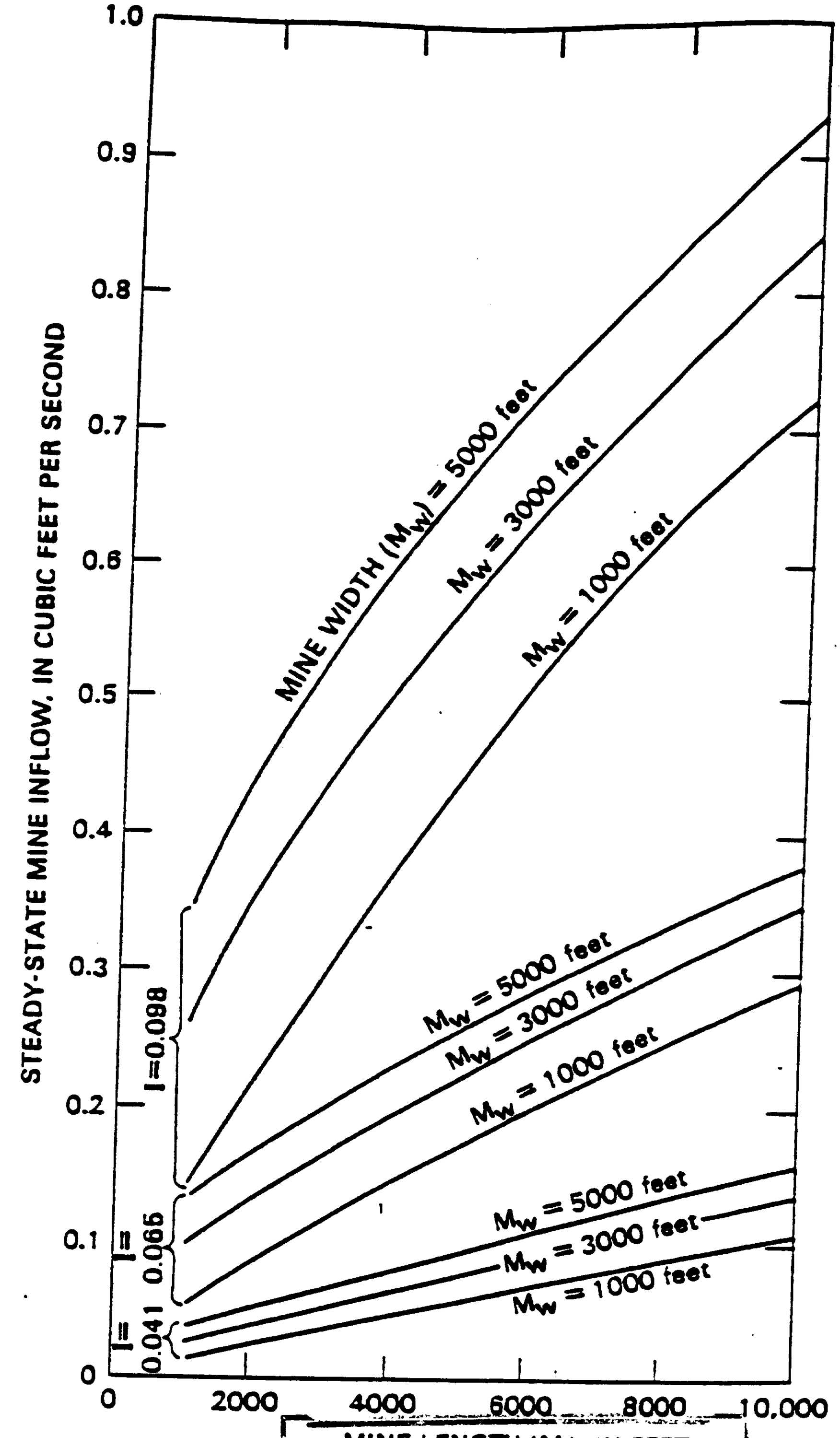
Impacts to the Regional Aquifer System. As previously discussed (Section 7.1), it is anticipated that the coal in the Horizon No. 1 Mine will be saturated essentially from the beginning of mining. The potential inflow to the Horizon No. 1 Mine workings was estimated using methods presented by Lines (1985), who modeled the impacts of coal mining on groundwater conditions in the Trail Mountain area located in the Wasatch Plateau approximately 20 miles south-southwest of the proposed Horizon No. 1 permit area. From this modeling effort, Lines (1985) presented estimates of mine inflow for various lengths and widths of mine workings as well as various hydraulic gradients. These estimates are presented in Figure 7-13.

Currently, the proposed workings within the permit area are anticipated to have a width of approximately 1,500 feet and a length of about 4,000 feet. The maximum future potential mine workings may extend over a width of 4,000 feet and a length of 8,000 feet.

The pre-mining hydraulic gradient in the permit and adjacent areas is 0.014 ft/ft, based on the data presented in Figure 7-2. This hydraulic gradient is lower than the lowest values presented in the analysis of Lines (1985) on Figure 7-13. Hence, the data presented in Figure 7-13 were utilized to prepare curves of inflow versus hydraulic gradient, based on the mine dimensions anticipated at the Horizon No. 1 Mine. These curves are presented in Figure 7-14.
The curves presented in Figures 7-13 and 7-14 are based on assumed hydraulic conductivities of 0.01 ft/day for the Blackhawk Formation and 0.02 ft/day for the Star Point Sandstone, which values are approximately one order of magnitude lower than that for unfractured bedrock within the permit area (see Section 7.1.2.2). According to Lines (1985), if the hydraulic conductivity is one order of magnitude higher than the values assumed for Figure 7-13, the estimated steady-state inflow to the mine will be one-order of magnitude larger than that predicted by Figure 7-13 (and Figure 7-14). Hence, utilizing average hydraulic conductivities of 0.2 ft/day for the Star Point Sandstone and 0.1 ft/day for the Blackhawk Formation, the potential groundwater inflow to the Horizon No. 1 Mine was estimated to be 0.08 cfs (10 times the value predicted by Figure 7-14, or 36 gpm) under current plans. Potential future expansion of the mine workings may increase this inflow to 0.20 cfs (90 gpm). Hence, inflow to the mine workings during the initial and future permit terms can be expected to be in the range of 36 to 90 gpm.

As indicated in Appendix 7-9, average water usage for the mining operation (underground and surface) will be approximately 30,888 gallons per day (21 gpm). Of this, 21,256 gallons per day (15 gpm) will be used underground and the remainder (6 gpm) will be used in surface operations (road watering, shop use, bathhouse, etc.). The water which is used underground is not considered a consumptive use, since it will remain with the coal or seep back into the ground. Therefore, of the 21 gpm water use requirement for mining operations, only 6 gpm is considered a consumptive use. Additional consumptive use beyond that accounted for in Appendix 7-9 will occur with water that is removed from the mine as moisture in the coal and that which is lost to evaporation in the mine ventilation system.

Based on an average moisture content of 7.99 percent in the Hiawatha coal seam (as noted in Section 6.5.6) and a maximum production of 700,000 tons per year (as noted in Section 3.3.6.1), approximately 41 acre-feet per year (25 gpm) of groundwater will be removed in the coal. Data presented in Appendix 7-9 indicate that the net loss of water by evaporation due to mine ventilation will be approximately 6 gpm (10 acre-feet per year). Hence, the total consumptive loss to the hydrologic system will be 37 gpm (6 gpm for surface consumptive uses, 25 gpm as moisture in the coal, and 6 gpm as evaporative loss in the mine ventilation system - a total of 60 acre-feet per year).
With an average inflow of 36 gpm and an average consumptive use of 37 gpm during the initial permit term, it is likely that only a minimal amount of groundwater will be discharged from mine during the initial permit term (recognizing that 25 of the 37 gpm of consumptive use is bound moisture in the coal rather than free water, with this excess being balanced by peak demands for additional underground water). However, under the expanded conditions anticipated in the future, up to approximately 50 gpm of water may be discharged from the mine during average operating periods. During peak operating periods when additional water is required, it is unlikely that water would be discharged from the mine.



Source: Lines (1985)

FIGURE 7-13. PREDICTED MINE-WATER INFLOW AS A FUNCTION OF MINE LENGTH.

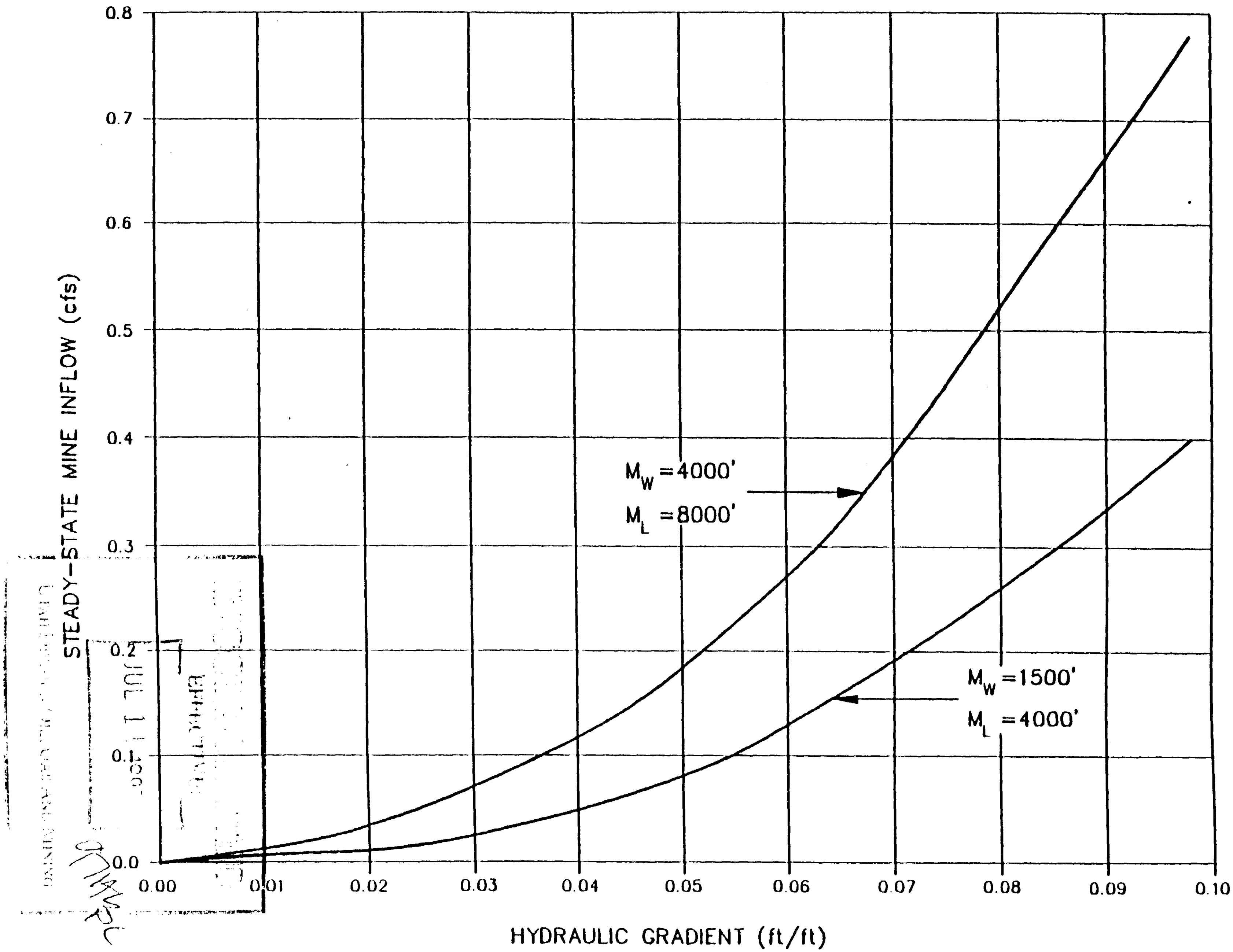


FIGURE 7-14. STEADY-STATE MINE INFLOW AS A FUNCTION OF HYDRAULIC GRADIENT

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During early 1998 quantities of water greater than previously expected were encountered while mining. Due to a delay in issuance of a discharge permit for Outfall 002, in-mine water will be discharged to the sediment pond. Flow quantities and potential hydrologic impacts will be assessed as additional data is collected.

It should be noted that the above estimates assume that groundwater inflow to the mine workings will occur primarily as a result of porous-medium flow rather than fracture flow. Historically, large amounts of the Hiawatha Coal seam have been mined out to the southwest of the proposed permit area by Sweet Coal Company's Sweet Mine, Blue Blaze Company's No. 1 Mine, National Coal Company's No. 1 Mine, and Beaver Creek Coal Company's No. 3 Mine. Based on a review of mine records (Skaggs, 1992), many faults have been mined through in the Hiawatha seam with only insignificant/minor amounts of water being encountered.

Only one fault has produced significant quantities of water when mined through. This fault lies in the east portion of the permit area and was intersected in mining of the Beaver Creek Coal Company No. 3 Mine. Inflows of approximately 400 gpm occurred when this fault was encountered (Skaggs, 1992). This fault will be located and avoided when mining the proposed Horizon No. 1 Mine by evaluating mine maps from the Beaver Creek No. 3 Mine and, if necessary, by periodically drilling horizontally from the Horizon No. 1 workings into the fault zone.

Surface mapping and mining experience in the overlying Castlegate "A" seam within the permit area indicate that fracturing within the permit area is not significant. Therefore, the previous estimates of potential groundwater inflow rates to the mine workings are considered adequate.

Based on a consumptive use of 37 gpm and assuming an inflow to the mine of 36 gpm, significant water which will be pumped into the mine only during initial operations. Thereafter, during the initial permit term, it is anticipated that water will be pumped into the mine only to meet the demands of peak operating conditions.

As noted in Section 7.1.4 of this permit application, groundwater which is encountered underground and consumed in the mining operation will be used in accordance with water right number 91-330. Water needed to operate the mine equipment will be derived from a spring which is covered by water rights 91-94 and 91-353. These rights have been leased by Horizon Coal Company.

<u>Impacts to the Hydrologic System Resulting From Subsidence</u>. As noted in Section 3.3.2.2, stream buffer zones will be maintained for a distance of 100 feet on either side of Beaver Creek, within which second mining will not occur. According to Gentry and Abel (1978), topographic lows (e.g., stream channels) tend to be protected by upwarping of adjacent slopes during subsidence. Therefore, mining-induced surface fracturing should be very limited (or nonexistent) within the Beaver Creek stream channel area. Any fracturing that does occur in the stream channel is likely to fill rapidly as a result of sedimentation.

It is also not anticipated that subsidence will significantly affect springs within the permit and adjacent areas. Von Schonfeldt et al. (1980) found that uniform subsidence "rarely causes problems to renewable resources such as aquifers, streams, and ranch lands." Since second mining will occur uniformly across the permit area except in buffer zones, the resulting subsidence should also be uniform, minimizing the potential impacts to overlying springs.

As noted in the Cumulative Hydrologic Impact Assessment, mining in the area adjacent to the proposed Horizon permit area has not resulted in hydrologic impacts due to subsidence. Given the lack of extensive aquifer systems in lithologic units that overlie the coal within the permit and adjacent areas, it is not anticipated that groundwater will be significantly affected by subsidence. Thus, subsidence caused as a result of mining by Horizon Coal Corporation should not cause significant surface or groundwater impacts within the permit or adjacent areas.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbons products will be stored at the mine site. Diesel fuel will be contained in above-ground tanks. Diesel fuel may spill during filling of the storage tank, leakage of the tank, and filling of vehicle tanks. Hydrocarbons may be spilled during use in surface and underground activities.

The extent of contamination by spillage of hydrocarbons will likely be small since storage tanks will be located above-ground and thus leakage can be readily detected and abated. Furthermore, and spillage of hydrocarbons during filling of the tank and mine vehicles will be minimized to avoid loss of an economically valuable product, and the fuel storage area will be surrounded by a concrete enclosure of sufficient size to contain a fuel spill if the tanks were to rupture. In the event of a fuel or hydrocarbon leak or spill, Horizon Coal Corporation will abate the problem in accordance with the Spill Prevention, Control, and Countermeasure Plan (see Appendix 7-10). Absorbent materials will be kept within easy access for the purpose of spill clean up and control.

Road Salting. The access road to the mine is a gravel road maintained by the county. Paving of the road is not expected. Since the road is to remain gravel, the likelihood of road salting is extremely small. As a result, the likelihood of road salting impacting water quality is very remote.

Impacts to Water Quality. Data presented in Appendix 7-3 indicate that the average TDS concentration of the surface water measured at station SS-3 (immediately downstream from the proposed surface facilities) is 427 mg/l, with a standard deviation of 122 mg/l. The calculated 95-percent confidence interval for the average concentration is 407 to 447 mg/l, based on the historical record.

As noted in Section 7.1.3, water standing in the old mine workings of the Blue Blaze No. 1 Mine has a TDS concentration which has been measured at 414 to 452 mg/l. These values are approximately within the 95-percent confidence interval range of the mean calculated for station SS-3. Hence, assuming that water must be discharged from the mine workings, the salinity of the surface water should not be adversely impacted by the salinity of the underground water.

It is currently anticipated that a calcium-carbonate rock dust will be used in mining operations rather than a calcium-sulfate rock dust. Since surface and groundwater within the permit and adjacent areas is characterized as a calcium bicarbonate type, changes in the general chemical characteristics of water in the area should not occur if water from the mine seeps into the adjacent groundwater or under the condition that water is discharged from the mine to surface water resources.

North Fork Gordon Creek flows across the Mancos Shale immediately downstream from the mine area. Since the Mancos Shale is a gypsiferous formation, sulfate and TDS concentrations naturally increase as the surface water contacts this formation (Waddell et. al., 1981). Thus, increases in TDS concentrations downstream from the surface facilities, if they occur, will more likely result from natural conditions rather than mining impacts.

It is anticipated that water will be discharged from the mine workings to the surface during the initial permit term. As mining progresses during future permit terms, additional water will likely be pumped from the mine. As also noted above, the mine water is anticipated to have a TDS concentration which approximates that of the surface water immediately downstream from the proposed surface facilities.

If the excess groundwater encountered in the mining operation was allowed to flow naturally rather than being discharged from the mine, this water would flow naturally downgradient and eventually discharge into the North Fork of Gordon Creek (see the potentiometric surface map presented in Figure 7-2). As it flows downgradient, the water would come increasingly into contact with the underlying Mancos Shale, dissolving additional salts in the process. Hence, water which is discharged from the mine should have a lower TDS concentration than that which would seep naturally into the local surface-water system. As a result, the TDS concentration of surface water downstream from the proposed surface facilities will be improved (i.e., decreased) if water is discharged from the mining operation.

Information regarding the acid- and toxic-forming potential of the coal, as well as the roof and floor materials, is presented in Section 6.5.6 of this document. As indicated therein, the roof and floor materials (i.e., that which may become waste rock) is neither acid nor toxic forming, suggesting that the material which comprises coal parting would also not be acid- or toxic-forming. However, the coal has a potential to be acid forming. The acid-forming potential of the coal will be tempered by its slightly alkaline nature (with a pH that varies from 7.3 to 7.8, according to Appendix 6-2). Furthermore, impacts to the environment of the permit and adjacent areas resulting from this acid-forming potential will be minimized by three factors. First, coal will be stored on the surface for only short periods of time before being shipped off site, thus reducing the potential for weathering, oxidation, and generation of acid drainage. Second, runoff from the coal stockpile will be routed through the facility sedimentation pond, where it will mix with more-alkaline runoff from additional areas, thus neutralizing any acidic drainage which might form. Finally, acidic leachate which is generated from coal which is left underground and exposed to the mine air will be buffered by the naturally alkaline environment in which the coal occurs. Hence, impacts to the acidity of the local hydrologic system are not anticipated.

Public Water Supplies. The water located in the Gordon Creek Drainage system is not a culinary water supply. The water in this drainage is used for agricultural, livestock, wildlife and industrial use (see Appendix 3-3).

Water derived from the spring associated with water rights 91-94 and 91-353 will be piped to Sweet's Pond and pumped from there to the mine for surface and underground use. As noted previously, it is not anticipated that large quantities of groundwater will be discharged from the mine during the initial permit term. Water that may be encountered underground during mining operations will be used in conjunction with dust abatement.

Flooding Potential of Downstream Areas. Runoff from all disturbed areas will flow through a sedimentation pond or other sediment-control device (Section 7.2). Three factors indicate that these sediment-control devices will minimize or preclude potential flooding impacts to downstream areas as a result of mining operations:

1. The sediment-control facilities have been designed to be geotechnically stable. Thus, the potential is minimized for breaches of the sediment-control devices to occur that could cause downstream flooding.

2. By retaining sediment on-site in the sediment-control devices, the bottom elevations of stream channels downstream from the disturbed areas are not artificially raised. Thus, the hydraulic capacity of the stream channels is not altered.

3. The flow routing that occurs through the sediment control devices reduces peak flows from the disturbed areas. This precludes flooding impacts to downstream areas.

Following reclamation, stream channels will be returned to a stable state, thus minimizing detrimental effects that may result from flooding.

7.4 Alluvial Valley Floor Determination

A reconnaissance investigation of the permit and adjacent areas was conducted to delineate alluvial deposits which might be considered to be alluvial valley floors. Identification of locations where unconsolidated stream-laid deposits occur was performed using surficial geology and soils maps of the area. Further, field reconnaissance and an analysis of aerial photographs of the mine permit and adjacent areas were conducted. Locations of stream-laid deposits thus identified are the same as those identified on Plate 6-1 as Qal (Recent Alluvium and Qoa (Older Alluvium).

From a geomorphic standpoint, the rugged mountainous terrain of the permit and adjacent areas has resulted in drainages still in a youthful stage of development. The streams are confined in narrow, steep-sided, V-shaped valleys with steep channel gradients. Meanders normally associated with AVF development are absent except in a few isolated locations.

Information presented on Plate 6-1 indicates that alluvial deposits exist in the permit and adjacent areas along Beaver Creek, North Fork Gordon Creek, and Jewkes Creek, as well as short distances into tributaries of the above drainages. Alluvial deposits along Beaver Creek exhibit minor stream meandering and contain numerous beaver ponds. Some of the stream-laid deposits along Beaver Creek, particularly at the mouths of small tributary canyons, appear to be debris flows. Soils in the valley exhibit localize signs of being flooded or water logged during a field visit to the site.

Alluvial deposits were also identified at the mouth of Jewkes Creek and along North Fork Gordon Creek. The alluvial deposits at these locations are below the coal outcrop and thus, could not be directly impacted by mine subsidence. The soils investigation showed the upper reaches of the alluvial deposit along Jewkes Creek and North Fork Gordon Creek to be disturbed and consisting of about 90 percent fill material (i.e., from road cuts and coal waste). Included in the area are small areas of Patmos and Podo soils as well as areas of rock outcrops. Even before disturbance, this area had limited range and wildlife capability. The valley floor is quite narrow along these reaches.

Agricultural developments are not found along North Fork Gordon Creek, Beaver Creek, or their tributaries in the permit and adjacent areas. The agricultural potential of the valley floors in the area is limited by the soil capability and the short growing season. The narrow valleys are occupied by the stream and the road and both break up the narrow valley so that development of hay meadows or improved pasture is impractical.

The valley floor along Beaver Creek, North Fork Gordon Creek, and their tributaries would be incapable of supporting agricultural activities without proper drainage. Even with adequate drainage, agricultural development would be restricted to grasses and pasture because of the high elevations and short growing seasons. Hence, given the extensive prior disturbance in the proposed disturbed area, the narrowness of the valleys, and climactic conditions in the area, the stream-laid deposits in the permit and adjacent areas are not considered to be alluvial valley floors. This conclusion is supported by the opinion of Mr. T.B. Hutchings, State Soil Scientist with the U.S. Soil Conservation Service (see Appendix 7-6).

7.5 References

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APPENDIX 7-1

JOSEPH A. HARVEY LETTER

APPENDIX 7-2

GROUNDWATER BASELINE DATA

Add to back of existing data

GROUNDWATER BASELINE MONITORING PARAMETERS
1989 - 1995 SAMPLINGS

Field Parameters	
Flow (gpm) or Depth to Water (ft)	pH (standard units)
Specific Cond. (µmhos/cm @ 25 °C)	Temperature (°C)
Laboratory Parameters (mg/l)	
Aluminum, Total	Arsenic, Total
Barium, Total	Bicarbonate
Boron, Total	Cadmium, Total
Calcium	Carbonate
Chloride	Chromium, Total
Copper, Total	Fluoride
Hardness, Total	Iron, Total
Lead, Total	Magnesium
Manganese, Total	Mercury, Total
Molybdenum, Total	Nickel, Total
Nitrogen, Ammonia	Nitrogen, Nitrate
Nitrogen, Nitrite	Phosphate
Potassium	Selenium, Total
Sodium	Sulfate
Sulfide	Total Dissolved Solids
Total Suspended Solids	Zinc
Quality Assurance Checks	
Total Anions (meq/l)	Total Anions (meq/l)
Cation/Anion Difference	Calculated TDS

Note: Data to be collected once each calendar quarter.

APPENDIX 7-2

ADDENDUM A

IN-MINE WATER DATA

Spring No.: CC-5
Location: Coal Canyon along County Road 290

Date	Flow (gpm)	Temperature (c)	pH	Spec. Cond. (ohms)
7/96	2	5	7.69	782
9/96	2	8	7.58	813
10/96	2	11	7.97	1099

Spring No.: MC-4
Location: Canyon along County Road 290

Date	Flow (gpm)	Temperature (c)	pH	Spec. Cond. (ohms)
8/96	4	12	7.70	803
9/96	6	10	7.81	747
10/96	4	7	7.92	1068

APPENDIX 7-3

SURFACE WATER BASELINE DATA

SURFACE WATER BASELINE MONITORING PARAMETERS
1989 - 1995 SAMPLINGS

Field Parameters	
Flow (gpm) or Depth to Water (ft)	pH (standard units)
Specific Cond. (μmhos/cm @ 25 °C)	Temperature (°C)
Dissolved Oxygen (ppm) - perennial streams only	
Laboratory Parameters (mg/l)	
Aluminum, Total	Arsenic, Total
Barium, Total	Bicarbonate
Boron, Total	Cadmium, Total
Calcium	Carbonate
Chloride	Chromium, Total
Copper, Total	Fluoride
Hardness, Total	Iron, Total
Lead, Total	Magnesium
Manganese, Total	Mercury, Total
Molybdenum, Total	Nickel, Total
Nitrogen, Ammonia	Nitrogen, Nitrate
Nitrogen, Nitrite	Oil and Grease
Phosphate	Potassium
Selenium, Total	Sulfate
Sodium	Total Dissolved Solids
Sulfide	Total Settleable Solids
Total Suspended Solids	Zinc
Quality Assurance Checks	
Total Anions (meq/l)	Total Anions (meq/l)
Cation/Anion Difference	Calculated TDS

Note: Data to be collected once each calendar quarter.

TABLE 7-5

OPERATIONAL AND RECLAMATION PERIOD
SURFACE WATER MONITORING PARAMETERS

Field Parameters	
Flow (gpm)	pH (standard units)
Specific Cond. (μmhos/cm @ 25 °C)	Temperature (°C)
Dissolved Oxygen (mg/l)	
Laboratory Parameters (mg/l)	
Total Dissolved Solids	Total Settleable Solids
Total Suspended Solids	Total Hardness (as $CaCO_3$)
Bicarbonate	Carbonate
Calcium (dissolved)	Chloride
Iron (dissolved)	Iron (total)
Magnesium (dissolved)	Manganese (dissolved)
Manganese (total)	Potassium (dissolved)
Sodium (dissolved)	Sulfate
Oil & Grease	Cations (meq/l)
Anions (meq/l)	Alkalinity (total)

APPENDIX 7-4

DESIGN CALCULATIONS

TABLE 7-6

RIPRAP GRADATIONS

Diameter Gradation	Diameter Size
4-inch Riprap	
D_{100}	0.66 foot
D_{85}	0.5 foot
D_{50}	0.33 foot
D_{15}	0.03 foot
6-inch Riprap	
D_{100}	1.0 foot
D_{85}	0.75 foot
D_{50}	0.5 foot
D_{15}	0.05 foot
8-inch Riprap	
D_{100}	1.5 feet
D_{85}	1.1 feet
D_{50}	0.6 foot
D_{15}	0.06 foot
12-inch Riprap	
D_{100}	2.0 feet
D_{85}	1.5 feet
D_{50}	1.0 foot
D_{15}	0.1 foot

APPENDIX 7-5

LOGS OF HZ MONITORING WELLS

TABLE 7-1

WATER-LEVEL DATA OBTAINED FROM
LOCAL MONITORING WELLS

Date	LMC-1		LMC-3		LMC-4	
	Depth(ft)	Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)
2/27/92	>599	<7852	>664	<7556	>217	<7587
3/28/92	>599	<7852	>664	<7556	>217	<7587
4/25/92	>599	<7852	>664	<7556	>217	<7587
5/17/92	>599	<7852	>664	<7556	>217	<7587
6/25/92	>599	<7852	>664	<7556	>217	<7587
7/25/92	>599	<7852	>664	<7556	>217	<7587
8/24/92	>599	<7852	>664	<7556	>217	<7587
9/29/92	>599	<7852	>664	<7556	>217	<7587
10/25/92	>599	<7852	>664	<7556	>217	<7587
11/22/92	>599	<7852	>664	<7556	>217	<7587
12/28/92	>599	<7852	>664	<7556	>217	<7587
5/30/93	>599	<7852	>664	<7556	>217	<7587
6/25/93	>599	<7852	>664	<7556	>217	<7587
7/25/93	>599	<7852	>664	<7556	>217	<7587
8/20/93	>599	<7852	>664	<7556	>217	<7587
9/27/93	>599	<7852	>664	<7556	>217	<7587
10/22/93	>599	<7852	>664	<7556	>217	<7587
11/6/93	>599	<7852	>664	<7556	>217	<7587

TABLE 7-1 (Continued)

WATER-LEVEL DATA OBTAINED FROM
LOCAL MONITORING WELLS

Date	LMC-1		LMC-3		LMC-4	
	Depth(ft)	Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)	Elev. (ft)
6/24/94	>599	<7852	>664	<7556	>217	<7587
7/24/94	>599	<7852	>664	<7556	>217	<7587
8/25/94	>599	<7852	>664	<7556	>217	<7587
9/24/94	>599	<7852	>664	<7556	>217	<7587
10/22/94	>599	<7852	>664	<7556	>217	<7587
11/2/94	>599	<7852	>664	<7556	>217	<7587
12/6/94	>599	<7852	>664	<7556	>217	<7587
5/26/95	>599	<7852	>664	<7556	>217	<7587
8/8/95	>599	<7852	>664	<7556	>217	<7587
10/27/95	>599	<7852	>664	<7556	>217	<7587

TABLE 7-1 (Continued)

WATER-LEVEL DATA OBTAINED FROM LOCAL MONITORING WELLS

Date	HZ-95-1		HZ-95-1S		HZ-95-2		HZ-95-3	
	Depth (ft)*	Elev. (ft)	Depth (ft)*	Elev. (ft)	Depth (ft)*	Elev. (ft)	Depth (ft)*	Elev. (ft)
12/5/95	--	--	135.0	8221.5	828.0	7519.6	--	--
12/13/95	786.0	7570.7	--	--	--	--	--	--
12/21/95	--	--	--	--	--	--	378.8	7522.7
7/9-10/96	771.3	7585.4	133.8	8222.7	830.0	7517.6	380.8	7520.7
8/5/96	770.8	7585.9	133.5	8223.0	829.4	7518.2	387.8	7513.7
9/11/96	769.4	7587.3	132.5	8224.0	829.4	7518.2	387.7	7513.8
10/23/96	776.4	7580.3	132.5	8224.0	829.2	7518.4	380.7	7520.8
11/1/96	776.4	7580.3	132.5	8224.0	829.2	7518.4	380.8	7520.7
12/13/96	#		#		829.5	7518.1	379.5	7522.0
1/6/97	771.05	7584.75	133.0	8223.5				
2/10/97	+		+		+		+	
3/25/97	+		+		+		+	
4/28/97	+		+		+		+	
5/28/97	770.95	7584.85	131.45	8225.05	828.05	7519.45	379.9	7521.6
6/15/97	770.95	7584.85	131.5	8225	828.0	7519.40	379.95	7521.55
7/6/97	770.95	7584.85	131.5	8225	828.0	7519.40	379.95	7521.55

* Depth measured from top of 2" tubing
# Well site inaccessible 12/16/96, access attempted with Bill Malencik, UDOGM
\+ Mine site declared inaccessible by Bill Malencik

TABLE 7-1 (Continued)

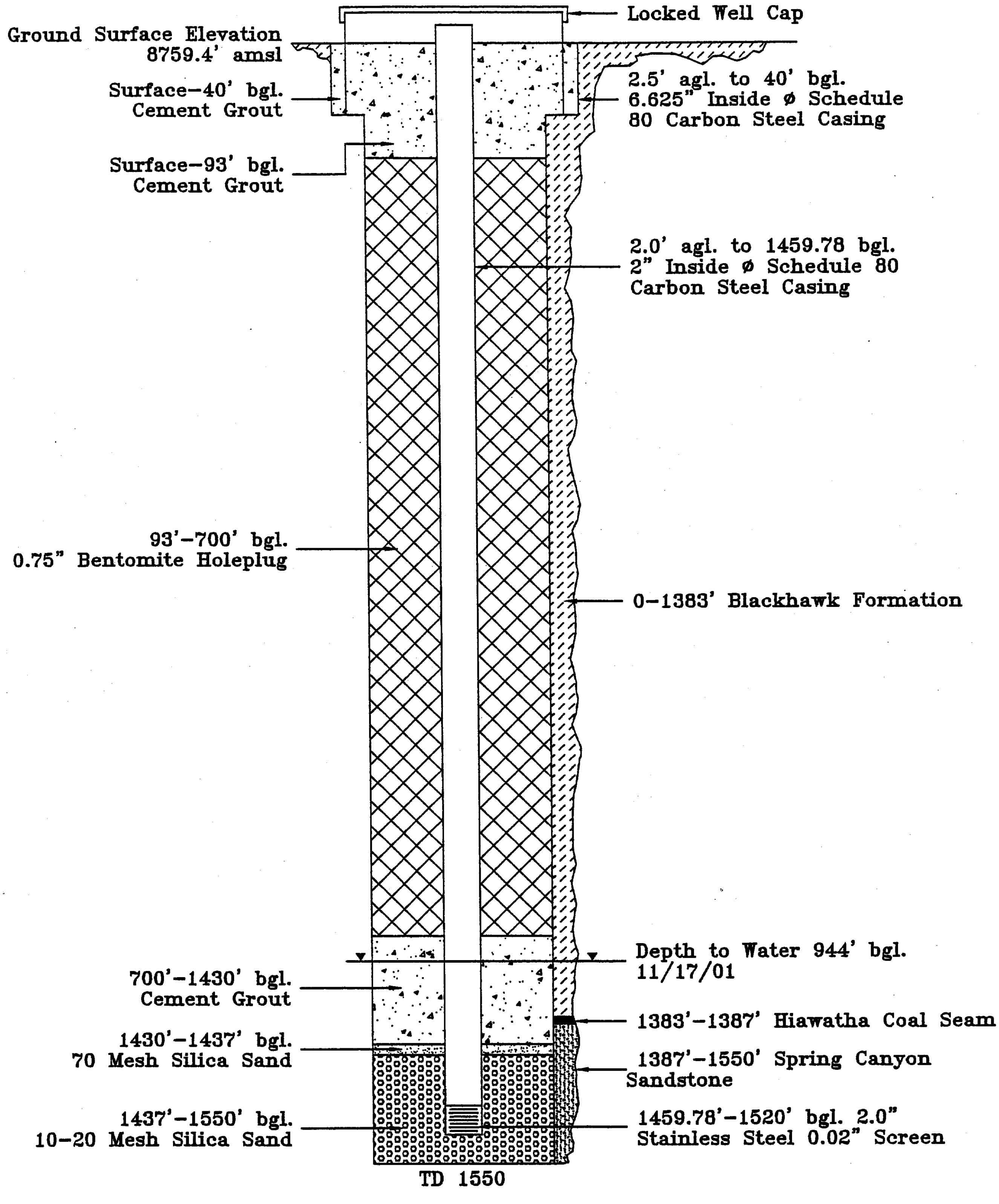
WATER-LEVEL DATA OBTAINED FROM LOCAL MONITORING WELLS

Date	HZ-95-1		HZ-95-1S		HZ-95-2		HZ-95-3		HZ-01-06-1	
	Depth (ft)*	Elevation (ft)	Depth (ft)*	Elevation (ft)	Depth (ft)*	Elevation (ft)	Depth (ft)*	Elevation (ft)	Depth (ft)*	Elevation (ft)
12/5/95	--	--	135.0	8221.5	828.0	7519.6	--	--		
12/13/95	786.00	7570.70	--	--	--	--	--	--		
12/21/95	--	--	--	--	--	--	378.80	7522.70		
7/9-10/96	711.30	7585.40	133.80	8222.70	830.00	7517.60	380.80	7520.70		
8/5/96	770.80	7585.90	133.50	8223.00	829.40	7518.20	387.80	7513.70		
9/11/96	769.40	7587.30	132.50	8224.00	829.40	7518.20	387.70	7513.80		
10/23/96	776.40	7580.30	132.50	8224.00	829.20	7518.40	380.70	7520.80		
11/1/96	776.40	7580.30	132.50	8224.00	829.20	7518.40	380.80	7520.70		
12/13/96	#		#		829.50	7518.10	379.50	7522.00		
1/6/97	771.05	7584.75	133.00	8223.50						
2/10/97	+		+		+		+			
3/25/97	+		+		+		+			
4/1/97	+		+		+		+			
5/28/97	770.95	7584.90	131.50	8225.10	828.05	7519.55	379.90	7522.40		
6/30/97	770.20	7585.60	132.14	8224.36	827.72	7519.88	379.90	7522.40		
9/16/97	773.50	7583.90	132.50	8224.00	827.20	7520.40	379.90	7522.40		
10/17/97	773.70	7583.70	132.50	8224.00	827.20	7520.40	379.90	7522.40		
6/30/98	817.80	7538.90	133.10	8223.40	836.60	7511.00	395.10	7506.40		
9/1/98	745.00	7611.70	134.50	8222.00	840.90	7506.70	398.00	7503.50		
6/1/99	758.80	7597.90	133.70	8222.80	847.80	7499.80	399.50	7502.00		
7/1/99	758.10	7598.60	134.40	8222.10	845.90	7501.70				
11/1/99	+		+		+		397.00	7504.50		
5/20/00	862.70	7494.00	132.80	8223.70	849.80	7497.80	401.50	7500.00		
9/8/00							402.10	7499.40		
9/26/00	875.00	7481.70	134.40	8222.10	863.80	7483.80				
10-12/31/00	$		$		$		$			
12/12/00	+		+		+		+			
3/23/01	+		+		+		+			
5/31-6/1/01	870.55	7486.15	133.75	8222.75	856.75	7490.85	414.17	7487.33		
9/20/01	876.85	7479.85	134.50	8222.00	862.40	7485.20	416.10	7485.40		
10/19/01	873.36	7483.34	134.65	8221.85	858.71	7488.89	415.70	7485.80		
11/17/01									944.20	7817.20
2/18/02	@		@		@		@		@	
3/25/02	@		@		@		@		@	
6/12/02	876.68	7480.02	135.08	8221.42	867.38	7480.22	458.12	7443.38	1029.6	7731.82
9/4/02	876.85	7479.85	136.37	8220.13	869.28	7478.32	%465.1	%7436.4	1036.9	7724.55
10/8/02	876.55	7480.15	136.00	8220.50	869.65	7477.95	%465.1	%7436.4	1037.5	7723.95
5/14/03	@		@		@		%465.1	%7436.4	@	
5/28/03	875.12	7481.38	135.35	8221.15	872.00	7475.60	%465.1	%7436.4	1036.6	7724.80
9/5/03	876.22	7480.48	135.51	8220.99	871.73	7475.87	%465.1	%7436.4	1036.7	7724.66

* Depth measured from top of 2" tubing
# Well site inaccessible 12/16/96, access attempted with Bill Malencik, UDOGM
+ Mine site declared inaccessible by Bill Malencik
$ Landowner refused access until pending agreement was completed.
@ Inaccessible due to snow cover
% Dry

Surface Elevations

	Top of 6 Casing	Top of 2" Tubing	Ground Elevation
HZ-95-1	8357.1	8356.7	8352.6
HZ-95-1S	8357.6	8356.5	8352.6
HZ-95-2	8348.1	8347.6	8346.3
HZ-95-3	7902.2	7901.5	7897.6
HZ-01-06-1		8761.4	8759.4



Lodestar Energy Inc.		Figure 2. Well Completion Diagram for HZ01-6-1
North American Mine Services, Inc.	Date: December, 2001 Scale: NTS	

WLI

WELL DRILLER'S REPORT

State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

HZ-01-6-1

Owner Note any changes

Lodestar Energy - HC-35 Box 370 Helper, UT 84526

Contact Person/Engineer: John Files

Well Location Note any changes

North 1500', west 2420' from the Southeast corner of section 6, township 13 south, Range 8 East. Elevation - 8759.4 ft. amsl

Location Description: (address, proximity to buildings, landmarks, ground elevation, local well #) HZ-01-6-1

Drillers Activity Start Date: 11-8-01 Completion Date: 11-17-01

Check all that apply:

☒ New ☐ Repair ☐ Deepen ☐ Abandon ☐ Replace ☐ Public Nature of Use: monitor

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0'	40'	8 3/4"	mud rotary	Bentonite + Polymer
40'	1550'	6 1/8"	mud rotary	Bentonite, LCM + Polymer

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	ROCK TYPE	COLOR	DESCRIPTIONS AND REMARKS (include comments on water quality if known.)
0'	~~1383~~ 20'		✓					✓				Blackhawk formation	Tan	Alluvium
20'	160'			✓							✓	" "	Tan	Sandstone
160'	400'										✓	" "	Brown	Sandstone
400'	415'													Lost circulation (no sample)
415'	718'										✓	" "	Tan	Sandstone
718'	740'													No circ (no sample)
740'	820'										✓	" "	Gray	Sandstone
820'	1123'										✓		Dk/Gray	Sandstone
1123'	~~1400~~ 1383'													no circulation no (sample)
1383'	1387'										✓	Hiawatha Coal Seam	Blk	coal
1387'	1550'											Spring Canyon Sandstone	Gray	sandstone

~~Static Water Level~~

Date 11-17-01 Water Level 944 feet Flowing? ☐ Yes ☒ No

Method of Water Level Measurement Sounder If Flowing, Capped Pressure ______ PSI

Point to Which Water Level Measurement was Referenced Ground level

Height of Water Level reference point above ground surface 0' feet Temperature ______ ☐ °C ☐ °F

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)	DEPTH (feet) FROM	TO	SCREEN ☒ PERFORATIONS ☒: SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
1460'	0'	EUE F-25	1.901	2.375	1520'	1460'	.02	2.375	wire wrap
0'	2.5	" "	"	"					

Well Head Configuration: 5ft - 7" casing with locking cap Access Port Provided? ☒ Yes ☐ No

Casing Joint Type: EUE Perforator Used:

DEPTH (feet) FROM	TO	FILTER PACK / GROUT / PACKER / ABANDONMENT MATERIAL: ANNULAR MATERIAL, ABANDONMENT MATERIAL and/or PACKER DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
1550'	1445'	10/20 sand	73 50# bags	
1445'	1427'	10/20 transition sand	2-100# bags	
1427'	0'	Class C cement 5% bentonite	200-94# Bags	15 LB 6.3 gals/sack

Well Development / Pump or Bail Tests

Date	Method	Yield	Units (Check One) GPM	CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
	None					

Pump (Permanent)

Pump Description: Horsepower: Pump Intake Depth: feet

Approximate maximum pumping rate: Well disinfected upon completion? ☐ Yes ☐ No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary circumstances, abandonment / procedures. *Use additional well data form for more space.*

Trimmied sand + cement

Well Driller Statement

This well was drilled or abandoned under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name ~~Sheridan~~ Stewart Bros Drlg Co. License No. 589

(Person, Firm, or Corporation – Print or Type)

Signature Sheridan [signature] Date 11-28-01

(Licensed Well Driller)

BOREHOLE LOG | **LODESTAR ENERGY INC.** |

Location Description: | **Well ID:** HZ-01-6-1

Coordinates | **Northing:** | **Easting:**

Elevations: | **Natural Ground:** 8763 | **Top of Steel Casing:** | **Top of PVC Casing:**

Drilling Methods: MUD Rotary

Depth Drilled: 1550 | **Start Date:** 11-8-01 | **Completion Date:** | **Drilling Company:** Stuart Brothers

Logged By: | **Driller:**

Protective Surface Casing: **Type:** Steel | **Diameter:** 6 5/8" | **Depth:** **From:** 0' | **To:** 40'

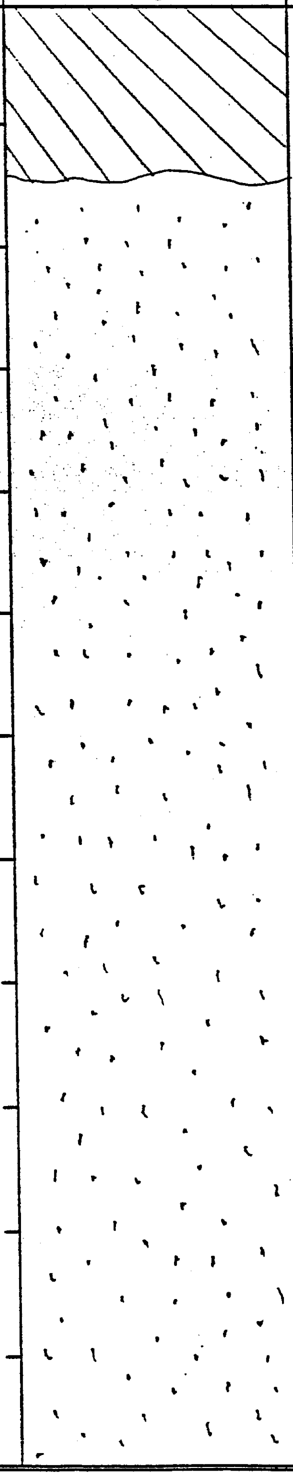
Well Casing and Screen Intervals: | **Well Total Depth:** 1550

Casing Type: Steel | **Diameter:** 2.0" I.D.

Casing Interval: **From:** 0 | **To:** 1460

Screen Type: Stainless Steel | **Diameter:** 2" | **Slot Size:** .020

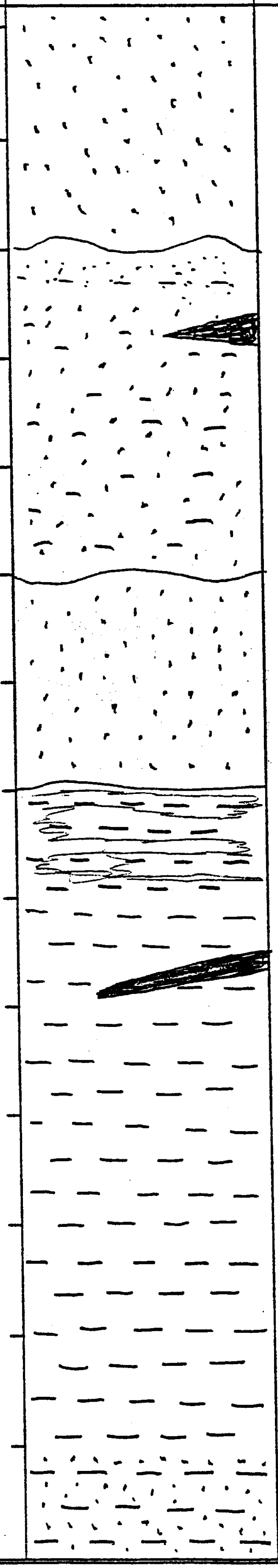
Screen Interval: **From:** 1520 | **To:** 1460 | **Static Water Level:** | **Date:**



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
0–5			0-40' 9 7/8" hole w/ 6 5/8" casing	0-7 Top soil med. Dusky Br. Sandy Silt.
5–15				7-15 Sa. St. Lt. Tannish Br - Lt orangish Br. Soft, crumbly.
15–25				15-25 SaSt Lt Tannish Br. Soft, Crumbly
25–40				25-40 SaSt Lt Tannish Br. - greyish Br. Soft, crumbly med - Fine grained.
40–60			Penetration Rate ≈ 50'/hour	40-60 SaSt LT Grey, Soft, crumbly. Fine - V. Fine Grained.

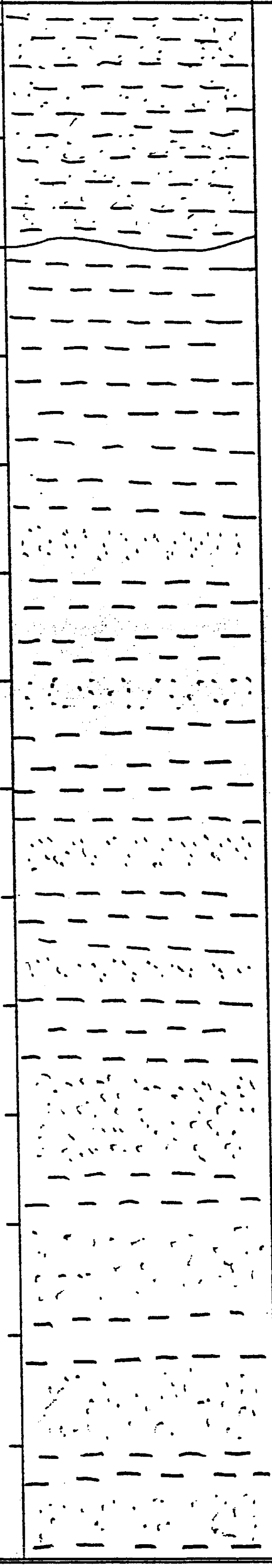
BOREHOLE LOG
Logged by: J.C. YANKER

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
60				60-70 SaSt - LT Tannish Br. Soft, crumbly, med → Fine grained.
65				
70				70-85 Silty SaSt Lt. grey Soft crumbly. Fine → very fine graind. Some Carb. frags.
75				
80				
85				85-95 Sa St LT. Tannish Br. Soft → Firm, crumbly Fine → V. Fine grained.
90				
95				95-100 Carby SlSt, DK Br. Soft
100				100-115 SlSt med grey Firm, Coal Frags. Thickness of coal unknown
105				
110				
115				115-125 SlSt med grey Soft → Firm, Coal Frags still Present, prob. from wash.
120				
125				125-140 Sandy SlSt med grey Soft, v. Fine grained SA

BOREHOLE LOG
Logged by: J.C. YANKER

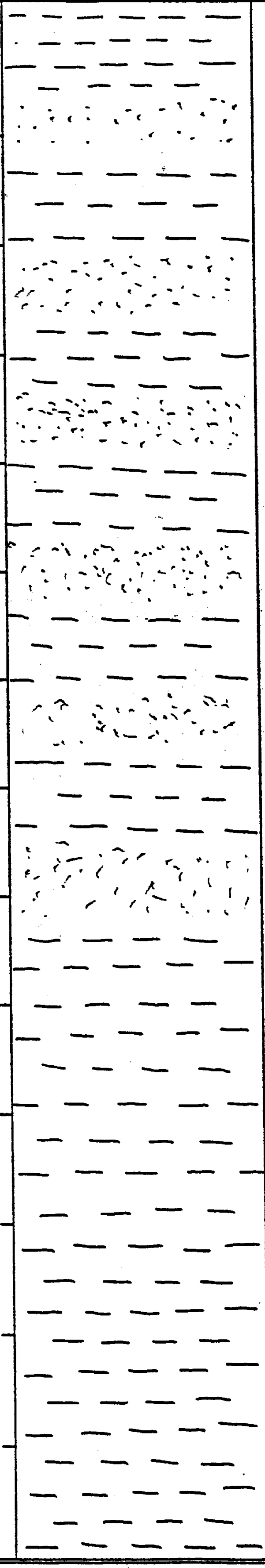
Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
130				
135				
140				140-150 Sl St, Lt grey
145				
150				150-175 Sl St Lt grey & Fine graind Lt Br SaSt. Interval must be interbedded. 75% SlSt 25% SAST
155				
160				
165				
170				
175				175-200 SaSt V. Fine grained LT. Br. → Yellowish Br. Interbedded w/ DK Grey SlSt 60% SaSt 40% SlSt
180				
185				
190				
195				

BOREHOLE LOG
Logged by: J.C. YANKER

Well ID HZ-01-6-1

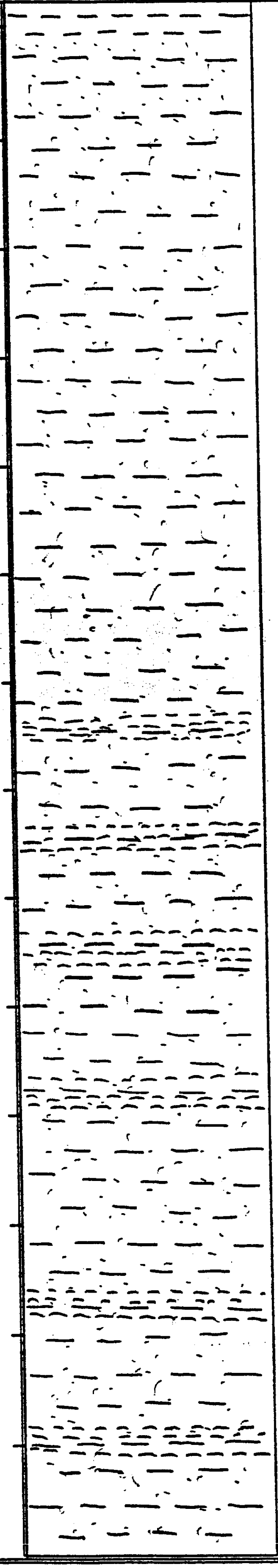
Graphic Log (depth 200–265 feet):



Depth (feet)	Well Construction	Drilling and Well Construction Comments	Lithologic Description
200			200 - 225 Sample continue to show Interbedded SISt & SAST SIST DK Grey Soft SAST LT. Br → Yellowish Br Fine grained.
205			
210			
215			
220			
225			225 - 245 SISt Light grey Firm interbedded w/ LT Br med grained SAST.
230			
235			
240		- Penatration Rate Slowed To ≈ 40'/hour	
245			245 - 270 SISt Light → med grey Firm - Hard
250			
255			
260			
265			

BOREHOLE LOG
Logged by: J.C. YANKER

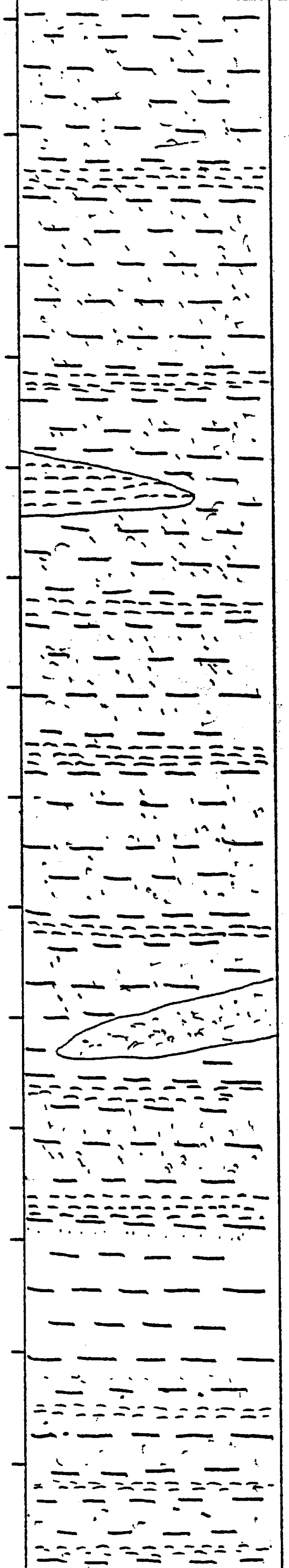
Well ID H2-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
270				270-300 LT Grey Sandy SlSt Beginning at 270 samples Starting to show traces of calicum under Hydrocloric acid.
275				
280				
285				
290				
295				
300				300-340 LT grey Sandy SlSt interbedded w/ DK Grey Shaley mud stone. Slightly calcitic
305				
310				Note: Drillers mud contains Soda Ash which if not washed completely off samples could give a False positive test for calcitic material.
315				
320				
325				
330				
335				

BOREHOLE LOG
Logged by: J.C. YANKER

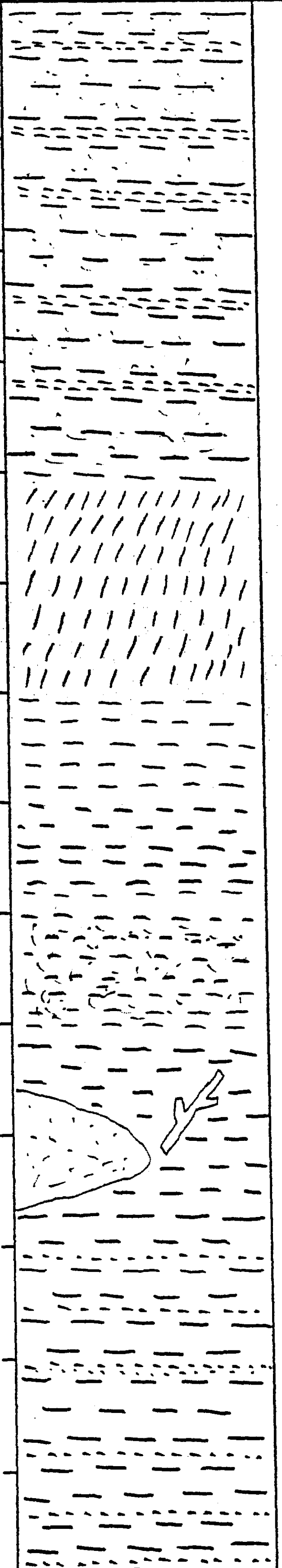
Well ID H2-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
340				340-395 LT Grey Sandy S1St interbedded w/ Dark grey mud stone shale. Firm. continue to see reaction to acid but now beleive due to mud.
345				
350				
355				
360				360 - Trace of med Brown Soft mud stone
365				
370				
375				
380				
385				385 - Trace of Lt. Br. Sa St V. Fine grained
390				
395				395-400 Very Lt. grey S1st Firm to hard
400				400-430 Lt grey Sandy S1st interbedded w/ Dark grey Shale.
405				Carb. Frags. present Throughout.

BOREHOLE LOG
Logged by: J.C. YANKER

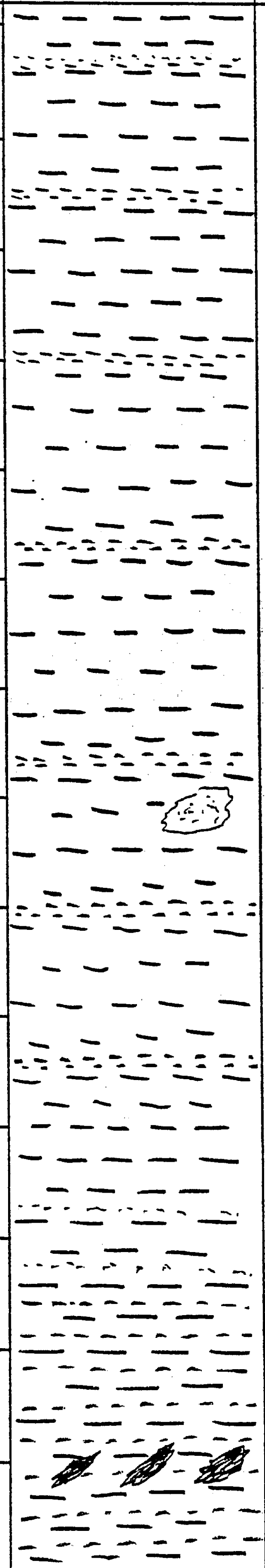
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
410				
415				
420				
425				
430				430-440 LT Grey Clay St Very SoFt.
435				
440				440-450 DK. Br. Carb. SlSt Soft → Firm
445				
450				450-455 Sandy Silt St. grey, SoFt
455			Drillers lost circ. @ 455' add LCM ceder Fibers, paper & celaphane.	455-465 Conglomeration of material Red br. SaSt, LT. Grey SlSt and Red Br petrified wood
460				
465				465-530 LT. Grey SlSt with Dark grey Shale Traces of petrified wood & LT Br SaSt and wood fibers From The LCM.
470				
475				

BOREHOLE LOG
Logged by: J.C. YANKER

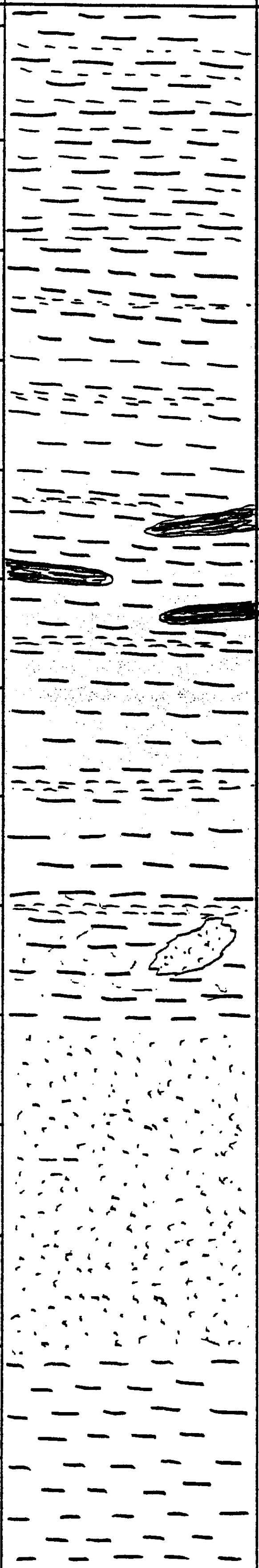
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
480				The Lt grey SlSt is the dominate rock w/ the shale as secondary
485				
490				
495				
500				
505				
510				
515				515 Trace of med Br. Fine grained SaSt
520				
525				
530				530-560 The dark Grey. Shale becomes the primary rock w/ the Lt Grey Slst as Secondary, Firm
535				
540				
545				545 Trace of carby Frags.

BOREHOLE LOG
Logged by: J. C. YANKER

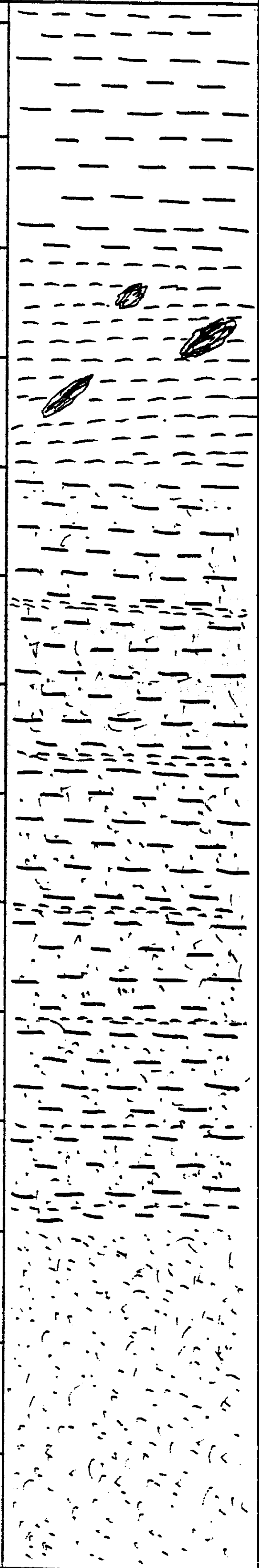
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
550				
555				
560				560-595 Slst becomes primary and grades into a Sandy Slst, DK Gray Shale becomes secondary Firm
565				
570				
575				570-580 coal Frags plentiful don't know how Thick.
580				
585				
590				590 Trace of med Br. Sa St.
595				595-610 Sa St Lt grey, Hard Very Fine grained
600				
605				
610				610-630 LT Grey Slst Firm
615				

BOREHOLE LOG
Logged by: J.C. YANKER

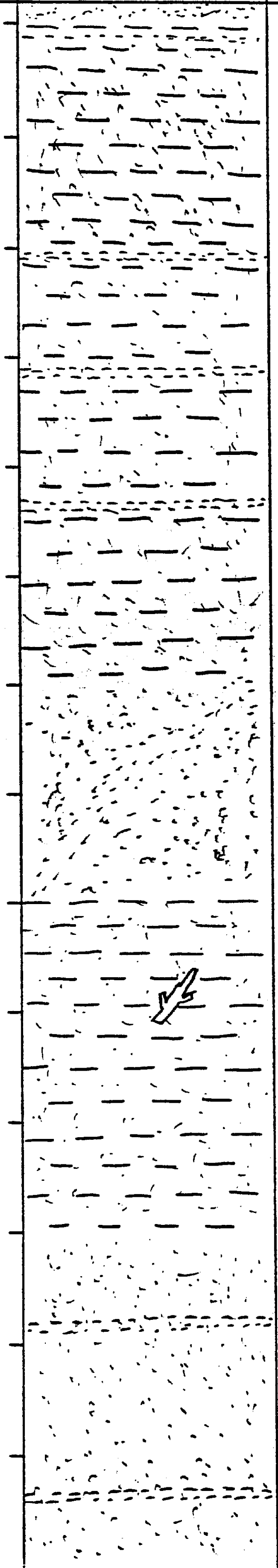
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
620				
625				
630				630-640 med Grey Shale Traces of carb. Frags
635				
640				640-675 Lt grey Sandy SlSt is primary w/ DK grey Shale as Secondary Traces of Lt Br SaSt probably from up hole.
645				
650				
655				
660				
665				
670				
675				675-690 LT Grey SaSt very Fine grained Hard, Brittle
680				
685				

BOREHOLE LOG
Logged by: J.C. YANKER

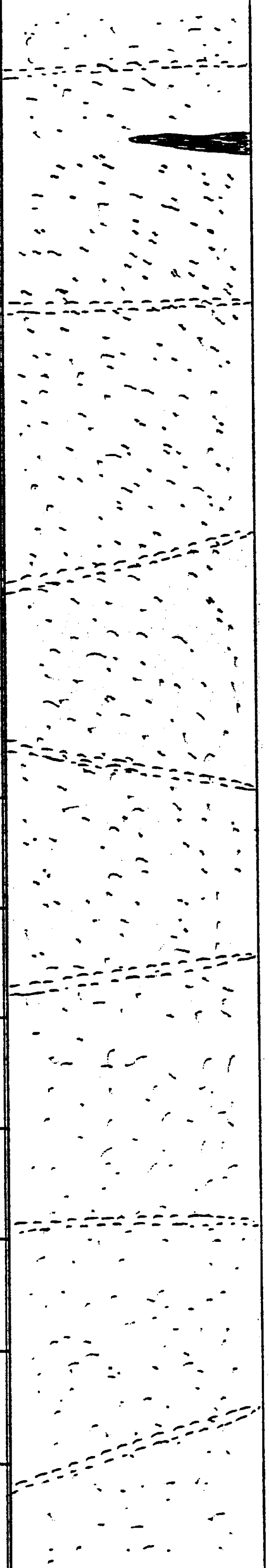
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
690				690-720 LT Grey Sandy SISt is primary w/ DK Grey Shale as Secondary Trace of yellow Brown Soft SaSt. wash ?
695				
700				
705				
710				
715				
720				720-730 Lt Grey SaSt soft crumbly
725				
730			Lost Circulation	730-745 LT Grey Sandy SIST, Firm Reddish Br. petrified wood
735				
740				
745				745-800 Lt Grey SaSt, Firm Interbedded with med. Grey Shale SaSt is V. Fine Grained and primary.
750				
755				

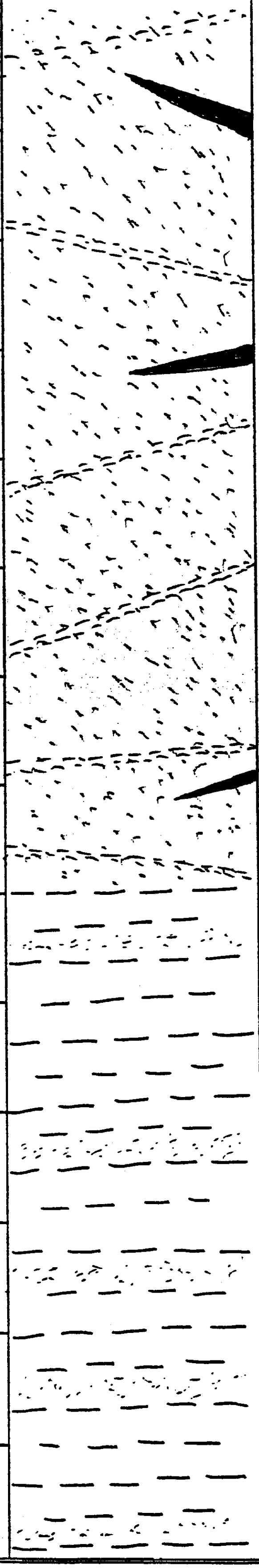
BOREHOLE LOG
Logged by: J.C. YANKER

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
760				
765				765 - Trace Coal
770				
775				
780				
785				
790				
795				795 - Red Br. Petrified wood.
800				800-850 LT Grey SaSt, Firm very fine Grained Interbedded w/ Med → DK Grey Shale SaSt is primary
805				
810				
815				
820				
825				

Logged by: J. C. YANKER

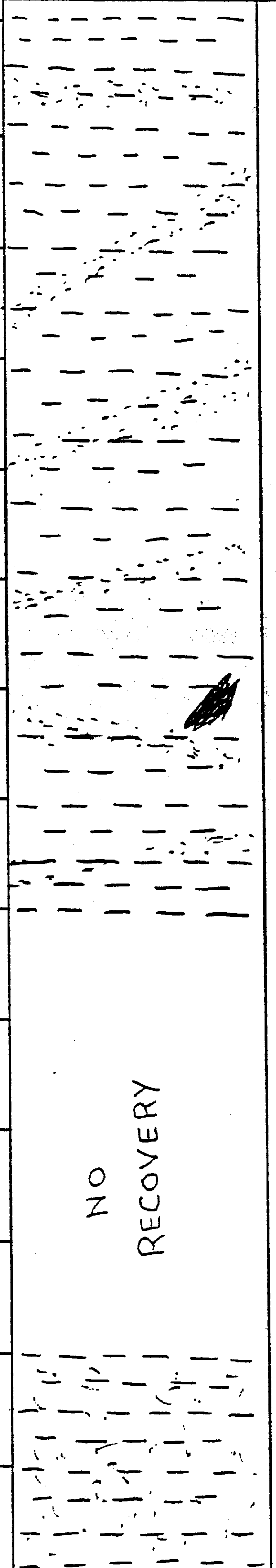
Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
830				
835				835 — Carb. frags
840				
845				845 — Coal Frags.
850				850 - 870 Lt Grey Very fine grained SaSt w/ med Grey Shale firm.
855				
860				
865				865 — Coal frags.
870				870 - 940 med grey Shale becomes primary w/ Lt Grey SaSt as Secondary
875				
880				
885				
890				
895				

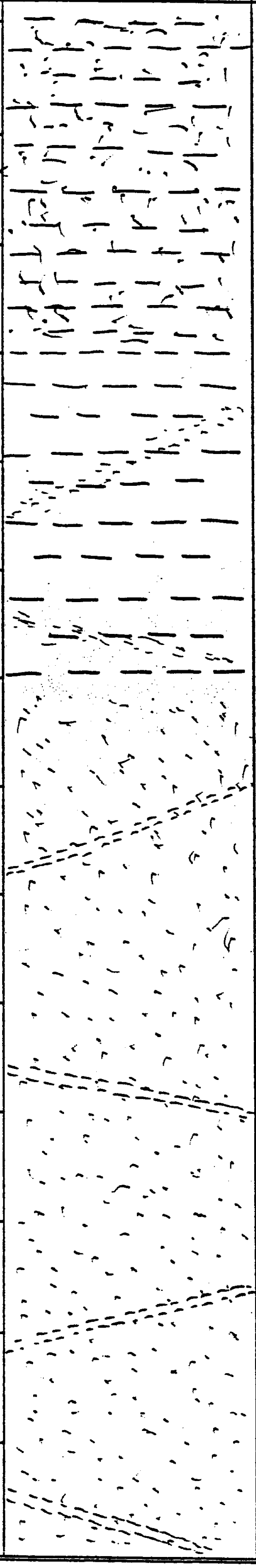
BOREHOLE LOG
Logged by: J.C YANKER

Well ID H7-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
900				
905				
910				
915				
920				
925				
930				930 - COAL Frags.
935				
940				940-960 - Very poor return mostly Just LCM.
945				
950				
955				
960				960 985 cuttings show approx. equal amounts of v. Fine grained SaSt, Lt grey, Firm and Shale Dark grey. with considerable amount of carby material.
965				

BOREHOLE LOG
Logged by: J.C. YANKER

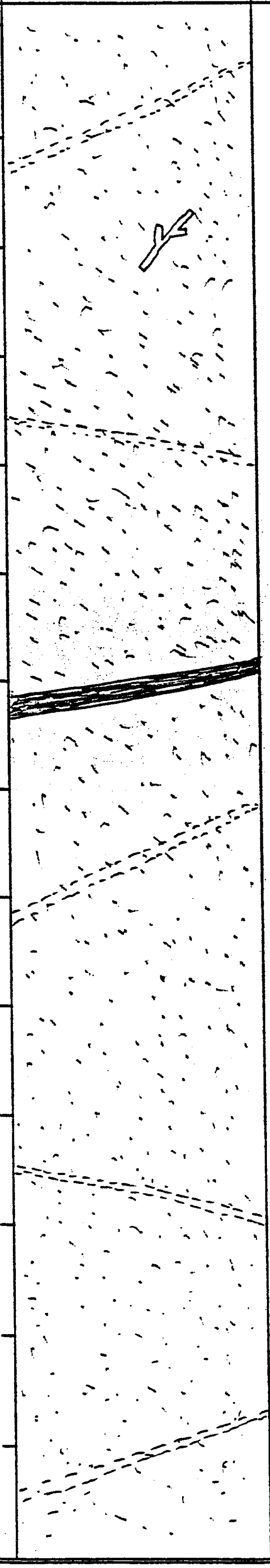
Well ID H2-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
970				
975				
980				
985				985-1000' DKgrey Shale becomes the primary rock w/ The v.fine grained LTgrey SaSt becoming Secondary Interbedded
990				
995				
1000				1000-1110 LT grey SaSt very Fine Grained, Firm w/ DK → med grey Shale as secondary Interbedder
1005				
1010				
1015				
1020				
1025				
1030				
1035			LOST circulation 1037'	

BOREHOLE LOG
Logged by: J.C. YANKER

Well ID HZ-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1040				V. Fine Grained Sa St, Lt Grey continues to be primary w/ med. grey shale as secondary. Most likely interbedded
1045				
1050				Petrified wood
1055				
1060				
1065				
1070				1070 Coal Thickness unknown
1075				
1080				
1085				
1090				
1095				
1100				
1105				

BOREHOLE LOG
Logged by: J C YANKER

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1110	?		Losing Circ. Have to add lots of LCM.	1110 - 1145 Recovery is to poor To obtain competent Lithology. However coal Frags do show From 1115-1125 Thickness unknown.
1115				
1120				
1125	?			
1130				
1135	?			
1140				
1145				1145-1175 DK grey Shale is the primary Show w/ LT. Gray very Fine grained Sa St as Secondary. coal frags showing Throughout
1150				
1155				
1160				
1165				
1170				
1175			Lost Circulation	1175 · End of Recovery

BOREHOLE LOG
Logged by: J C Yanker

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1180			Drilling Blind	1175 → 1400
1185	?			
1190	No Return			
1195				
1200				
1205				
1210	?			
1215				
1220				
1225				
1230				
1235	?			
1240				
1245				

BOREHOLE LOG
Logged by: J C Yanker

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1250	?		Drilling Blind	
1255	NO			
1260	Return			
1265				
1270				
1275				
1280	?			
1285				
1290				
1295				
1300				
1305				
1310	?			
1315				

BOREHOLE LOG Page 20 of 23

Logged by: JC YANKER Well ID H2-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1320	?		Drilling Blind	
1325				
1330	No Return			
1335				
1340				
1345				
1350	?			
1355				
1360				
1365				
1370				
1375				
1380	?			
1385				

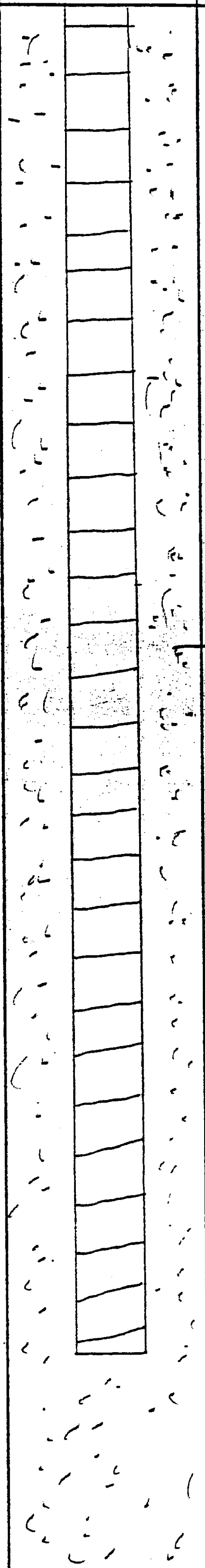
BOREHOLE LOG
Logged by: J C Yanker

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1390	No Return		Drilling Blind	
1395				
1400			1400' Begin Coring	1400-1412.5' Med. to Light Grey SaSt
1405			1st core Run 1400-1462 Recover 1400-1412.5 1420-1434.5 1440-1452.5 1460-1462	Med to Coarse Grained Crumbly, Friable, Firm, vertically Fractured, Bottom 3' Broken-up.
1410				
1415	no Recovery			
1420				1420-1434.5 SaSt, med grained, lt grey w/ lenses of shale - see core description for details
1425				
1430			1430 Top of -70 Sand	
1435	no recovery			
1440				1440-1452.5 - SaSt See core log for description & Details.
1445			1437' Top of 10/20 Sand	
1450				
1455	no Recovery			

BOREHOLE LOG
Logged by: JC Yanker

Well ID H2-01-6-1



Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1460			1459.78 Top of .020 Screen	1460 - 1462 SaSt
1465	?			Drilled Blind 1462'-1550'
1470				
1475	no return			
1480				
1485				
1490	?		10/20 Sand	
1495				
1500				
1505	no return			
1510				
1515	?			
1520			1520' Bottom of .020 Screen	
1525				

BOREHOLE LOG
Logged by: lc Yanker

Well ID HZ-01-6-1

Depth (feet)	Graphic Log	Well Construction	Drilling and Well Construction Comments	Lithologic Description
1530	no return			
1535	?			
1540			10/20 Sand	
1545	no return			
1550	1550 T.D			
1555				
1560				
1565				
1570				
1575				
1580				
1585				
1590				
1595				

BOREHOLE COMPLETION, GEOPHYSICS AND GEOLOGY

Logged By: J C Yanker

Page 1
Well I.D. HZ-01-6-1

WELL COMPLETION MATERIALS
TYPE:

.020 SS. 2" Screen	from	1520	to	1459.78	
2" I.D. Steel tubing	from	1459.78	to	G.L.+	
10/20 Sand	from	1550	to	1437	73 #50 Bags
-70 Sand	from	1437	to	1430	2 #100 Bags
Cement Grout	from	1430	to	700	
3/4" Bent Holeplug	from	700	to	93	
Cement grout	from	93	to	surface	
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		
	from		to		

GEOPHYSICAL LOGS
TYPE:

CALIPER	✓
NATURAL GAMMA	✓
16" - 64" NORMAL RESISTIVITY	
6' LATERAL RESISTIVITY	
GUARD RESISTIVITY	
SINGLE POINT RESISTANCE	✓
INDUCTION	
SPONTANEOUS POTENTIAL	
INDUCED POLARIZATION	
NEUTRON	
DENSITY	
SONIC	
TEMPERATURE	
FLUID RESISTIVITY	

GEOLOGIC LOG

Black Hawk Form.	from	0	to	1400
Spring Canyon Sand	from	1400	to	1550
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	
	from		to	

WELL CASINGS

SCREEN A	from	1520	to	1459.78
SCREEN ~~B~~	from		to	
SCREEN ~~C~~	from		to	

Lodestar Energy, Inc.
Core Log

Date Drilled 11-14-01

Hole ID HZ-01-6-1

Location

Depth 1400'-1420'

Date Logged 11-14-01

Logged By JCY

Comments: Cored 1400'-1420' Recovery 1400'-1412.5' 62.5 %

Depth	Graphic Log	% Sulfide	Veining	Sample Interval	Sample ID	$CaCO_3$	Description
1400							1400'-1412.5' SaSt - Med → Light Grey
							Med. → Coarse Grained
1402							Crumbly, Friable, Firm
1404							vertically Fractures.
1406							Bottom 3' of core broken-up.
1408							
1410							
1412							
1414							Zone 1415'-1420 Drilled considerably Faster
1416	no recovery						indicating softer material.
1418							
1420							

Lodestar Energy, Inc.
Core Log

Date Drilled 11-15-01 **Hole ID** HZ-01-6-1

Location **Depth** 1420-1440

Date Logged 11-15-01

Logged By JCY **Comments:** cored 1420-1440 Recovered 1420-1434.5' 72.5 %

Depth	Graphic Log	% Sulfide	Veining	Sample Interval	Sample ID	$CaCO_3$	Description
1420							1420-1427.7 med. → Fine Grained LT Grey SaSt Vert. Fractures, occasional Carby shale lenses, firm. sharp contact to..
1422							
1424							
1426							1427.7-1427.9 Greenish grey silt stone, Hard, gradational contact to...
1428							1427.9-1428.3 very fine grained SaSt, lt. grey gradational contact to...
1430							
1432							1428.3-1434.5 med. grained SaSt lt. → med grey firm → hard, none fractured.
1434							
1436	no recovery						1434.5-1440.0 no recovery
1438							
1440							

Depth	Graphic Log	% Sulfide	Veining	Sample Interval	Sample ID	$CaCO_3$	Description
							Cored 1440-1460 Recovery 1440-1452.5 62.5 % Cored 1460-1462 Recovery 1460-1462 100 %
1440							1440 - 1446.0 med. grained SaSt. med. grey vertical Fractures w/
1442							
1444							1445 - 1445.3 mud St. Brownish grey, soft unconsolidated
1446							1446 - 1446.9 Inter Bedded SaSt, Slst carby lenses & 1/2" of coal @ 1446.5
1448							
1450							1446.9 - 1450.1 med grained lt. grey SaSt w/ mud stone stringers
1452							
1454							
1456	No Recovery						1450.1 - 1451.6 Brownish grey Mud Stone, Fractured, Blocky
1458							1451.6 - 1452.5 med grained. lt. grey SaSt.
1460							1452.5 - 1460 no recovery, Driller said zone drilled quickly
1462							1460 - 1462 med grained lt. grey SaSt., piece of wood setting on top

APPENDIX 7-6

LETTER REGARDING ALLUVIAL VALLEY FLOORS

APPENDIX 7-7

DATA FROM USGS STREAM-GAGING STATION ON BEAVER CREEK

TABLE 7-1b

SUMMARY OF BEAVER CREEK GAIN/LOSS MEASUREMENTS

Reach No.[a]	Upstream Station(s)	Upstream Flow (gpm)	Downstream Station	Downstream Flow (gpm)	Gain/Loss (gpm)	Distance (ft)	Unit Gain/Loss (gpm/100 ft)	Remarks
1	HZ-1, HZ-2, HZ-4, HZ-5	50.6	HZ-3	43.4	-7.2	2300	-0.3	
2	HZ-3, HZ-6	81.1	HZ-7	83.5	+2.4	2850	+0.1	Approx. 1.5 gpm est. inflow observed on surface
3	HZ-7	83.5	HZ-8, HZ-9	89.7	+6.2	1850	+0.3	Downstream from extensive area of abandoned beaver ponds. Broad area of alluvium.
4	HZ-8, HZ-9	89.7	HZ-10	127.7	+38.0	2300	+1.7	Canyon bottom narrows significantly. Limited alluvium.
5	HZ-10	127.7	HZ-11	120.9	-6.8	2100	-0.3	Up- and downstream from HZ-95-1 fracture area.
6	HZ-11	120.9	HZ-12	114.3	-6.6	1750	-0.4	Approx. 0.5 gpm est. inflow observed on surface
7	HZ-12	114.3	HZ-13	78.5	-35.8	1650	-2.2	Colluvium from Castlegate Sandstone more prevalent.

[a] See Figure 7-4b

TABLE 7-1a

RESULTS OF BEAVER CREEK SEEPAGE EVALUATION

Station	Description	Throat Width[a] (in)	Flow Depth (ft)	Flow Rate (cfs)	Flow Rate (gpm)
HZ-1	Beaver Creek	1	0.20	0.02	9.0
HZ-2	Unnamed tributary	1	0.17	0.01	6.5
HZ-3	Beaver Creek	1	0.44	0.10	43.4
HZ-4	Unnamed spring	1	0.39	0.08	34.1
HZ-5	Unnamed spring	1	--	--	1[b]
HZ-6	SP-9 tributary	1	0.41	0.08	37.7
HZ-7	Beaver Cr. at SS-7	1	0.61	0.19	83.5
HZ-8	Beaver Cr. - south split	1	0.16	0.01	5.7
HZ-9	Beaver Cr. - north split	4	0.30	0.19	84.0
HZ-10	Beaver Cr. by LMC-1	4	0.37	0.28	127.7
HZ-11	Beaver Cr. by HZ-95-1	4	0.36	0.27	120.9
HZ-12	Beaver Cr. at SS-8	4	0.35	0.25	114.3
HZ-13	Beaver Cr. at road crossing	4	0.29	0.17	78.5

(a) All measurements collected on September 11, 1996 using a portable cutthroat f

(b) Estimate based on visual observation

APPENDIX 7-8

SLUG TEST RESULTS

APPENDIX 7-9

ESTIMATED WATER USE REQUIREMENTS

APPENDIX 7-10

SPILL PREVENTION, CONTROL, AND COUNTERMEASURES PLAN

OIL SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN
HIDDEN SPLENDOR RESOURCES, INC.
(SPCC PLAN)

SEPTEMBER 2003

Introduction

This Spill Prevention Control and Countermeasures (SPCC) Plan has been prepared pursuant to 40 CFR 112, Oil Pollution Prevention; Section 112.7 Guideline for preparation and implementation of a Spill Prevention Control and Countermeasure Plan. The Plan also meets the requirements of R315 of the Utah Hazardous Waste Administrative rules, Section 315-8-4, Contingency Plan and Emergency Procedures.

As defined in Section 112.3, any owner or operator of onshore or offshore facilities which may have the potential for discharging harmful quantities of oil into navigable waters shall prepare an SPCC Plan. As defined in 40 CFR 110, oil means of any kind, in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.

These regulations apply to facilities which have an aggregate above ground storage capacity of 1,320 gallons or more of oil, or any single container having a capacity in excess of 660 gallons, and facilities which have a total underground storage capacity of 42,000 gallons or more of oil.

As required in the Personnel Training Program for Hazardous Waste Management and Occupational Safety and Health Administration (OSHA) Rule 1910.120, this SPCC Plan will be incorporated into the facility training program. The Mine Manager is legally responsible for complete implementation of this plan and may be subject to civil penalties (fines and/or imprisonment) for violations. The Mine Manager's responsibilities include the quarterly inspection of all storage tanks, associated valves, piping, and containment areas. Inspection forms must be completed and signed by supervisory personnel and filed with the SPCC Plan located in the mine office. The inspector forms shall contain the signature of inspecting personnel and the Mine Manager.

The inspection forms shall indicate which facilities, if any, require corrective maintenance and what action is being taken. Conditions to be noted on the inspection forms should include but not be limited to; rust or corrosion of tanks, leaking of earth catchment facilities, erosion of earth catchment berms, and cracks in impervious catchment facilities.

The storage tank will be surrounded with a berm or containment structure adequate to contain any spill. The bermed containment area will have sufficient volume to contain the total volume of the tank. In the event it becomes necessary for water to be drained from containment structures, it is the responsibility of the Mine Manager to notify the mine engineer prior to discharge of such water. Upon notification, it will be the responsibility of the mine engineer to inspect the water discharged from the catchment areas to ensure compliance with applicable water quality standards and avoid a harmful discharge into a stream.

The water shall be pumped from these areas into a truck under the supervision of the mine engineer and disposed of in the proper manner. When drainage of a catchment area is required, any pumping operations or the opening and resealing of a drainage valve shall be supervised by the Mine Manager or other authorized personnel. A record of the date and estimated volume of water released will be filed with the SPCC Plan.

Emergency Notification Procedures

In the event of an oil spill, or in the event of any other pollution event, the mine engineer and the Mine Manager should be notified IMMEDIATELY. The action taken by the facility personnel should be containment, using whatever means is available. It is the responsibility of the Mine Manager to contact any government or regulatory agency.

In the event of a spill, personnel can be contacted at the following numbers.

Weekdays:

Mark Wayment	(435) 472-1313
Shane Hansen	(435) 472-1313
Kit Pappas	(435) 472-1313

Week Nights and Weekends:

Mark Wayment	(801) 798-0619
Shane Hansen	(801) 798-3429
Kit Pappas	(435) 637-2096

Spill Reporting Requirements

Facilities meeting one of the following requirements concerning a spill must report it to the proper regulatory agency:

1. Discharges of more than 1,000 U.S. gallons of oil into or upon navigable waters of the United States or adjoining shorelines in a single spill event.

2. Discharge of oil in harmful quantities, as defined in 40 CFR 110, into or upon navigable waters of the United States or adjoining shores in two spill events, reportable under Section 311 (b) (5) of the FWPCA, occurring within a twelve month period shall submit to the Regional Administrator, within 60 days,the information outlined in 40 CFR Part 112.4.

A reportable hazardous waste discharge (Reportable Quantity or RQ) is any spillage, leakage, discharge or disposal or a listed or characteristic hazardous waste in specified quantities as defined by the Utah Hazardous Waste Management Administrative Rules that may enter or is threatening to enter any waterway, or may be released into or onto the ground. Releases that are covered and the material recycled are not considered releases to the environment. Spills of hazardous materials or reportable quantities require notification of the Utah State Department of Environmental quality, 24-Hour answering Service at (801) 538-6333 or the National Response Center at 1-800-424-8802.

Spills will be contained with one or more of the following procedures:

1. Discontinue the source of the spill;

2. Erect an emergency containment berm;

3. Soak up spilled medium with absorbent materials (i.e. straw bale, sand, agents manufactured to absorb).

Small hydrocarbon spills on paved pad areas will be contained and absorbed with materials specifically designed for that purpose. Saturated materials will be disposed of in the methods for waste disposal described in the mine permit.

All spills will be reported to the Mine Manager or Mine Engineer.

Oil Transfer

All deliveries of oil products to the storage tanks are by motor tank vehicles. Standard operating procedures to prevent over-filling of the tanks are as follows:

1. Gauge the storage tank prior to unloading incoming product to ensure sufficient tank capacity to accept delivery.

2. Motor tank vehicle driver shall remain by unloading vehicles and be ready to discontinue the unloading operation in case of malfunction.

3. Discontinue unloading operations when the sound of escaping air from the storage tank vent stops. Cessation of escaping air signifies that the unloading tank is empty or the storage tank is full.

4. Contain and cleanup any small amount of oil discharged from overfilling or the storage tank.

Facility Inspection

All inspections performed quarterly by supervisory personnel shall include but not be limited to tanks, piping, valves, hoses, nozzles, impoundments, berms, and loading and unloading equipment and procedures. Any indication or oil leaks, oil accumulation or storage tank. Corrosion or deterioration shall be noted and reported immediately to the Mine Manager. If necessary, corrective action will be undertaken. In addition to the quarterly inspections by mine personnel, general routine inspections by operating personnel will be performed. General inspections do not require that inspection forms be complete. However, if problems are noted by operation personnel they shall be immediately reported to the Mine Manager. A "Facility Inspection Form" will be completed and filed quarterly by mine personnel. A copy of each report will be filed with the SPCC Plan and maintained for three (3) years.

Oil Storage Tanks on Mine Facilities

CAPACITY	CONTENTS	LOCATION
5,000 Gallons	Diesel Fuel	Below gate west of coal stockpile area.

Personal Training

It is the responsibility of the Mine Manger to ensure that the following training procedures are implemented.

1. The SPCC Plan will be reviewed with all mine-operating personnel by supervisory persons as part of the facility inspection procedure.

2. All new employees will be instructed in spill prevention procedures as part of their initial training.

In addition, the Mine Manager should have a designated person who is accountable for oil spill prevention. The Mine Manager should schedule and conduct spill prevention briefings for operating personnel at intervals frequent enough to ensure adequate understanding of the SPCC Plan.

A copy of the SPCC Plan will be kept in the mine manager's office and the mine engineer's office. The original will be kept in the Hidden Splendor Resources, Inc. office in Salt Lake City, Utah.

APPENDIX 7-11

ADDITIONAL AQUIFER DATA

TABLE 7-3

NUMERIC CRITERIA FOR AQUATIC WILDLIFE

Parameter	Aquatic Wildlife 3A	3B	3C	3D
PHYSICAL				
Total Dissolved Gases	(1)	(1)		
Dissolved Oxygen (mg/l) (2)				
30 Day Average	6.5	5.5	5.0	5.0
7 Day Average	9.5/5.0	6.0/4.0		
1 Day Average	8.0/4.0	5.0/3.0	3.0	3.0
Max Temperature °C	20	27	27	
Max Temperature Change °C	2	4	4	
pH (Range)	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
Turbidity Increase NTU	10	10	15	15
Metals (3) Dissolved (ug/l) (4)				
Arsenic (Trivalent)				
4 Day Average	190	190	190	190
1 Hour Average	360	360	360	360
Cadmium (5)				
4 Day Average	1.1	1.1	1.1	1.1
1 Hour Average	3.9	3.9	3.9	3.9
Chromium (Hexavalent)				
4 Day Average	11	11	11	11
1 Hour Average	16	16	16	16
Chromium (Trivalent (5)				
4 Day Average	210	210	210	210
1 Hour Average	1700	1700	1700	1700
Copper (5)				
4 Day Average	12	12	12	
1 Hour Average	18	18	18	18
Cyanide (Free)				
4 Day Average	5.2	5.2	5.2	
1 Hour Average	22	22	22	22
Iron (Maximum)	1000	1000	1000	1000
Lead (5)				
4 Day Average	3.2	3.2	3.2	3.2
1 Hour Average	82	82	82	82
Mercury				
4 Day Average	0.012	0.012	0.012	0.012
1 Hour Average	2.4	2.4	2.4	2.4

TABLE 7-3 (Continued)

NUMERIC CRITERIA FOR AQUATIC WILDLIFE

Parameter	Aquatic Wildlife 3A	3B	3C	3D
Nickel (5)				
4 Day Average	160	160	160	160
1 Hour Average	1400	1400	1400	1400
Selenium				
4 Day Average	5.0	5.0	5.0	5.0
1 Hour Average	20	20	20	20
Silver				
4 Day Average	0.12	0.12	0.12	0.12
1 Hour Average	4.1	4.1	4.1	4.1
Zinc (5)				
4 Day Average	110	110	110	110
1 Hour Average	120	120	120	120
INORGANICS (mg/l) (3)				

TABLE 7-4

NUMERIC CRITERIA FOR DOMESTIC, RECREATION, AND AGRICULTURAL USES

Parameter	Domestic Source 1C	Recreation and Aesthetics 2A	2B	Agriculture 4
BACTERIOLOGICAL (30 DAY GEOMETRIC MEAN) (#/100 ml)				
Max Total Coliforms	5000	1000	5000	
Max. Fecal Coliforms	2000	200	200	
PHYSICAL				
Min. Dissolved Oxygen (mg/l)	5.5	5.5	5.5	
pH (Range)	6.5 - 9	6.5 - 9	6.5-9	6.5-9
METALS (ACID SOLUBLE) MAX. (mg/l)(2)				
Arsenic	0.05			0.1
Barium	1.0			
Cadmium	0.01			0.01
Chromium	0.05			0.10
Copper				0.2
Lead	0.05			0.1
Mercury	0.002			
Selenium	0.01			0.05
Silver	0.05			
INORGANICS (MAX.) (mg/l)				
Boron				0.75
Fluoride	1.4 - 2.4			
Nitrates as N	10			
Total Dissolved Solids (4)				1200
RADIOLOGICAL (MAX. pCi/L)				
Gross Alpha	15			15
Radium 226, 228 (combined)	5			
Strontium 90	8			
Tritium	20000			
ORGANICS (MAX. ug/l)				
Chlorophenoxy Herbicides				
2,4-D	100			
2,4,5-TP	10			
Endrin	0.2			
Hexachlorocyclohexane	4			
Methoxychlor	100			
Toxaphene	5			

TABLE 7-4 (Continued)

NUMERIC CRITERIA FOR DOMESTIC, RECREATION, AND AGRICULTURAL USES

Parameter	Domestic Source	Recreation and Aesthetics		Agriculture
	1C	2A	2B	4
POLLUTION INDICATORS (5)				
Gross Beta (pCi/L)	50			50
BOD (mg/l)		5	5	5
Nitrate as N (mg/l)	4	4		
Phosphate as P (mg/l)(6)		0.05	0.05	

Spring No.: CC-5
Location: Coal Canyon along County Road 290

Date	Flow(gpm)	Temperature (c)	pH	Spec. Cond. (ohms)
7/96	2	5	7.69	782
9/96	2	8	7.58	813
10/96	2	11	7.97	1099

Spring No.: MC-4
Location: Canyon along County Road 290

Date	Flow(gpm)	Temperature (c)	pH	Spec. Cond. (ohms)
8/96	4	12	7.70	803
9/96	6	10	7.81	747
10/96	4	7	7.92	1068

APPENDIX 7-12

STREAM ALTERATION PERMIT

CHAPTER 8
SOIL RESOURCES

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CHAPTER 8

SOIL RESOURCES

8.1 Scope

A soil inventory of the Horizon Mine area was conducted to provide soil resource information to meet the requirements of UDOGM and OSM. The soil survey was performed by Richard A. Foster, Soil Scientist, (USDA Soil Conservation Service) in February 13, 1990 (Section 8.3.1). This is in addition to the soil survey which was performed by George Cook (Range Conservationist), Earl Jensen (Soil Scientist) and Gary Moreau (District Conservationist) of the SCS in May 1980 (Appendix 8-1).

8.2 Methodology

Soil mapping of the area (Plate 8-1) is a refinement of USDA Soil Conservation Service manuscript mapping. The soils mapping was done by Patrick D. Collins (Botanist/Reclamation Specialist) using the information supplied by George Cook of the SCS as to the locations, types and depths of soils.

George Cook (SCS) and Richard A. Foster used the pit method to estimate depths and quality of the soil. Detailed pedon are described to depths of 60 inches, or until bedrock, whichever was shallowest. These pits were dug below the mine area, up the canyon where new disturbance will occur, and at previously disturbed areas.

The soils to be saved for reclamation were tested at a approved laboratory using the UDOGM guidelines. The parameters tested were pH, electrical conductivity, saturation percent, particle size, soluble Ca, Mg & Na, Total N, Nitrate-N, Organic carbon, available water capacity, rock fragments above 2mm size, and soil color. Where a high pH was indicated, tests were preformed for Selenium and Boron.

Present and potential uses of the soils of the site have been evaluated based on Soil Conservation Service Soil Survey Interpretation information. The soils have no potential as cropland or pasture land. The soils have also been evaluated for the potential production as rangeland and their capability groups are given.

The soils have been correlated by the SCS. Classifications are based on morphology as described in the field, and to a lesser degree on the analytical data. Where analytical data do not support the field description the soils are classified according to the field description.

8.3 Soil Resource Information for the Mine Plan Area

8.3.1 Soils Identification

The soils at Horizon were initially identified on site. This allowed the consultant to determine slopes, land forms, and vegetation patterns (see Section 8.2). The soil descriptions were compared with recorded characteristics of the soils in adjacent areas and in the official SCS series descriptions. Map units are comprised of soil series and inclusions found within an area to make them site specific. The differences in symbols between the SCS report located in Appendix 8-1 and the new SCS guidelines dated June 1988 used on Plate 8-1, are as follows:

FIA	=	Shupert-Winetti Complex
GIG	=	Curecanti
HIG	=	Senchert
JIB	=	Brycan Loam
DM	=	Mine Dumps (Previous Disturbed Area)
No symbol		Rabbitex

Shupert-Winetti Complex

The Shupert - Winetti complex consists of very deep, well drained, moderately permeable soils on narrow valley and canyon floors. These soils formed in alluvium derived from sandstone and shale. Slope is 1 to 8 percent. Elevation ranges from 4,600 to 7,200 feet but commonly is 5,200 to 6,400 feet. Average annual precipitation is 12 to 16 inches, and average annual air temperature is 43 to 45 degrees F.

These soils are fine-loamy, mixed (calcareous), frigid Typic Ustifluvents.

Brycan

The Brycan Series consists of very deep, well drained, moderately slowly permeable soils on alluvium derived from shale and sandstone. Slope is 3 to 8 percent. Elevation is 7,700 to 8,600 feet. Average annual precipitation is 16 to 20 inches, and average annual air temperature is 38 to 45 degrees F.

These soils are fine-loamy, mixed Cumulic Haploborolls.

Curecanti

The Curecanti family consists of very deep, well drained, moderately permeable soils on mountain slopes. These soils formed in colluvium derived dominantly from sandstone and shale. Slope is 50 to 70 percent. Elevation is 6,800 to 9,000 feet. Average annual precipitation ranges from 16 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Argiborolls.

Rabbitex

The Rabbitex series consists of very deep, well drained, moderately permeable soils on mountain slopes and ridgetops. These soils formed in residuum and colluvium derived dominantly from sandstone, shale, limestone, and siltstone. Slope is 15 to 70 percent. Elevation is 7,000 to 9,200 feet. Average annual precipitation range from 16 to 20 inches, and average annual air temperature ranges from 38 to 45 degrees F.

These soils are fine-loamy, mixed Typic Calciborolls.

Senchert

The Senchert family consists of moderately deep, well drained, moderately permeable soils on mountain slopes, plateaus, and ridges. These soils formed in residuum and alluvium derived dominantly from sandstone and shale. Slope is 1 to 50 percent. Elevation is 8,000 to 10,100 feet. Average annual precipitation is 20 to 30 inches. An average annual air temperature is 36 to 38 degrees F. These soils are fine loamy, mixed Argic Pachic Cryoborolls.

A description of the soil sampled in Pits 1 through 7 follow.

Pit #1 - (TP-1) Shupert-Winetti Complex

Fine-loamy, mixed (calcareous), frigid Typic Ustifluvents. Colors are for dry soil unless otherwise noted.

A -- 0 to 6 inches (0 to 15.2 cm); light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate thin plate structure paring to moderate fine subangular blocky; hard, firm, sticky and plastic; common fine, many very fine roots; many fine and very fine random tubular pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); clear smooth boundary.

C1 -- 6 to 12 inches (15.2 to 30.5 cm); light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, firm; sticky and plastic; few dine, common very fine roots; common fine, many very fine random tubular pore; moderately calcareous, lime is disseminate; strongly alkaline (pH 8.5); clear smooth boundary.

C2 -- 12 to 26 inches (30.5 to 66 cm); light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse and medium subangular blocky structure; hard, firm sticky and plastic; few dine and very fine roots; common fine, many very fine random tubular pore; moderately calcareous, lime is disseminate; strongly alkaline (pH 8.5); clear smooth boundary.

C3 -- 26 to 40 inches (66 to 101.6 cm); pale brown (10YR 6/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine, common very fine random tubular pores; moderately calcareous, lime is disseminate; strongly alkaline (pH 8.5); clear smooth boundary.

C4 -- 40 to 57 inches (101.6 to 144.8 cm); pale brown (10YR 6/3) loam, very dark grayish brown (10YR 3/2) moist; may fine distinct (10YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine and very fine random tubular pores; moderately calcareous lime is disseminated; strongly alkaline (pH 8.5); clear smooth boundary.

2C -- 57 to 65 inches (144.8 to 165.1 cm); very pale brown (10YR 7/4) loamy fine sand, brown (10YR 5/3) moist; common fine distinct (10YR 5/8) mottles; massive; soft, very friable, nonsticky and non plastic; few very fine random tubular pores; moderately calcareous, lime is disseminate; strongly alkaline (pH 8.5).

The C2 horizon has thin strata of material like the C# horizon. The C# horizon has thin strata of material like the C4 horizon.

Pit #2 - (TP-2) Shupert-Winetti Complex

Loamy-skeletal, mixed (calcareous), frigid Typic Ustifluvents. Colors are for dry soil unless otherwise noted. Moist colors are darker in the upper three horizons due to the presence of coal. This is a disturbed site.

C1 -- 0 to 6 inches (0 to 15.2 cm); pale brown (10YR 6/3) sandy lam, very dark gray (10YR 3/1) moist; moderate thin plate structure parting to weak fine and very fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few coarse and medium, many fine and very fine roots; few medium and fine, many very fine random tubular pore; moderately calcareous, lime is disseminate; moderately alkaline (pH) 8.4); clear smooth boundary.

C2 -- 6 to 19 inches (15.2 to 48.3 cm); pale brown (10YR 6/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine, many very fine roots; few medium and fine, many very fine random tubular pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); clear wavy boundary.

C3 -- 19 to 34 inches (48.3 to 86.4 cm); light yellowish brown (10YR 6/4) extremely gravelly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium, fine, and very fine roots; few fine, common very fine random tubular pores; 10 percent cobble, 50 percent gravel; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.3); gradual wavy boundary.

C4 -- 34 to 47 inches (86.4 to 119.4 cm); pale brown (10YR 6/3) extremely gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine and very interstitial pores; 20 percent cobble, 50 percent gravel; moderately calcareous, lime is disseminate; moderately alkaline (pH 8.3); gradual wavy boundary.

C5 -- 47 to 60 inches (119.4 to 152.4 cm); light yellowish brown (10YR 6/4) extremely cobbly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, slightly sticky and slightly plastic; many fine and very fine interstitial pore; 10 percent stone, 55 percent cobble, 10 percent gravel; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4).

Pit #3 - (TP-3) Rabbitex

Fine-loamy, mixed Typic Calciboroll. Colors are for dry soil unless otherwise noted.

A -- 0 to 5 inches (0 to 12.7 cm); brown (10YR 5/3) gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate fine and very fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few coarse, common medium, many fine and very fine roots; common medium and fine, many very fine random tubular pores; 25 percent gravel; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.4); clear wavy boundary.

Bk1 -- 5 to 20 inches (12.7 to 50.8); brown (10YR 5/3) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium, common fine, many very fine roots; common fine, many very fine random tubular pores; 20 percent gravel; moderately calcareous, lime is disseminated and in thin coatings on rock fragments; moderately alkaline (pH 8.4); gradual wavy boundary.

Bk2 -- 20 to 45 inches (50.8 to 114.3 cm); brown (10YR 5/3) gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium, common fine and very fine roots; few fine, many very fine random tubular pore; 5 percent cobble, 20 percent gravel; moderately calcareous, lime is disseminated and in thin coatings on rock fragments; strongly alkaline (pH 8.5); clear wavy boundary.

Bk3 -- 45 to 51 inches (114.3 to 129.5 cm); yellowish brown (10YR 5/4) very gravelly loam, dark brown (10YR 4.3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium and fine, common very fine roots; few fine, common very fine random tubular pores; 5 percent cobble, 40 percent thin coatings on rock fragments; strongly alkaline (pH 8.5); clear wavy boundary.

Bk4 -- 51 to 70 inches (129.5 to 177.8 cm); brown (10YR 5/3) gravelly loam, dark grayish brown (10YR 4/2) moist; moderately medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium, fine, and very fine roots; few fine and very fine random tubular pore; 25 percent gravel; moderately calcareous, lime is disseminated and in few fine veins and thin coatings on rock fragments; strongly alkaline (pH 8.5).

This soil is an inclusion in the Rabbitex mapping unit and is found predominantly at the base of steeper slopes.

Pit #4 - (TP-4) Shupert-Winetti Complex

Loamy-skeletal, mixed (calcareous), frigid Typic Ustifluvent. Colors are for dry soil unless otherwise noted. Moist colors are darker due to the presence of coal.

A -- 0 to 10 inches (0 to 25.4 cm); pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine, many very fine roots; common medium, many fine and very fine random tubular pores; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); clear smooth boundary.

C1 -- 10 to 17 inches (25.4 to 43.2 cm); pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium, common fine and very fine roots; few medium, common fine and very fine random tubular pore; 10 percent gravel; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); gradual wavy boundary.

C2 -- 17 to 35 inches (43.2 to 88.9 cm); pale brown (10YR 6/3) very cobbly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine, common very fine random tubular pores; 10 per cent stone, 15 percent cobble, 15 percent gravel; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); gradual wavy boundary.

C3 -- 35 to 60 inches (88.9 to 152.4 cm); light yellowish brown (10YR 6/4) extremely cobbly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine and very fine random tubular pores; 10 percent stone, 20 percent cobble, 30 percent gravel; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5)

Pit #5 - (TP-5) Brycan

Fine-loamy, mixed Cumulic Haploborolls. Colors are for dry soil unless otherwise noted. Less than 5 percent stone and cobbles on the surface.

A1 -- 0 to 8 inches (0 to 20.3 cm); dark brown (10YR 4/3) loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium, common fine, many very fine roots; few medium, common fine, many very fine random tubular pores; 5 percent gravel; noncalcareous; moderately alkaline (pH 8.2); clear smooth boundary.

A2 -- 8 to 18 inches (20.3 to 45.7 cm); dark brown (10YR 4/3) gravelly loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine, common very fine roots; common medium and fine, many very fine random tubular pores; 20 percent gravel; noncalcareous; moderately alkaline (pH 8,2); gradual wavy boundary.

A3 -- 18 to 43 inches (45.7 to 109.2 cm); dark brown (10YR 4/3) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and lightly plastic; few fine and very fine roots; few fine, common very fine random tubular pores; 5 percent gravel; noncalcareous; moderately alkaline (pH 8.2); clear wavy boundary.

C -- 43 to 60 inches (109.2 to 152.4 cm); pale brown (10YR 6/3) very cobbly lam, brown (10YR 4/3) moist; massive slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots few fine and very fine random tubular pores; 20 percent cobble, 30 percent gravel; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.2).

Pit #6 - (TP-6) Shupert-Winetti Complex

Fine-loamy, mixed (calcareous), frigid Typic Ustifluvent. Colors are for dry soil unless otherwise noted.

A -- 0 to 5 inches (0 to 12.7 cm); pale brown (10YR 6/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common coarse, medium, fine and very fine roots; common medium, many fine and very fine random tubular pores; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

C1 -- 5 to 14 inches (12.7 to 35.6 cm); pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard friable, slightly sticky and slightly plastic; few coarse, medium, and fine, common very fine roots few medium, common fine, many very fine random tubular pores; 5 percent gravel; moderately calcareous, lime is disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

C2 -- 14 to 18 inches (35.6 to 45.7 cm); pale brown (10YR 6/3) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard friable slightly sticky and slightly plastic; few medium and fine, common very fine roots; few medium and fine, many very fine random tubular pores; 5 percent gravel; slightly calcareous, lime is disseminated; strongly alkaline (pH 8.6): clear wavy boundary.

C3 -- 18 to 28 inches (45.7 to 71.1 cm); pale brown (10YR 6/3) very gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine, common very fine roots; few fine, common very fine random tubular pore; 40 percent gravel; moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); gradual wavy boundary.

C4 -- 28 to 48 inches (71.1 to 121.9 cm); pale brown (10YR 6/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine, common very fine random tubular pores; 10 percent gravel with thin lenses of 50 percent gravel: moderately calcareous, lime is disseminated; strongly alkaline (pH 8.5); gradual wavy boundary.

C5 -- 48 to 60 inches (121.9 to 152.4 cm); pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine, common very fine random tubular pores; 5 percent gravel; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.4).

Pit #7 - (TP-7) Brycan

Fine-loamy, mixed Cumulic Haploborolls. Colors are for dry soil unless otherwise noted.

A1 -- 0 to 10 inches (0 to 25.4 cm); brown (10YR 5/3) loam, very dark brown (10YR 2/2) moist moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse and medium, common fine and very fine roots; few medium, common fine, many very fine random tubular pores; 5 percent gravel; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

A2 -- 10 to 17 inches (25.4 to 43.2 cm); brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium, and fine, common very fine roots; few fine, common very fine random tubular pores; 5 percent gravel; noncalcareous; moderately alkaline (pH 8.2); clear wavy boundary.

A3 -- 17 to 34 inches (43.2 to 86.4 cm); pale brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium sub angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse, medium, and fine, common very fine roots; few fine, common very fine random tubular pores; 5 percent gravel; noncalcareous; moderately alkaline (pH 8.2); clear wavy boundary.

C1 -- 34 to 52 inches (86.4 to 132.1 cm); pale brown (10YR 6/3) clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, sticky and plastic; few fine and very fine roots; few fine, common very fine random tubular pores; noncalcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2 -- 52 to 60 inches (132.1 to 152.4 cm); light yellowish brown (10YR 6/4) clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; few fine and very fine random tubular pores; slightly calcareous, lime is disseminated; moderately alkaline (pH 8.2).

Three soil test pits, TP-40 through TP-42, were excavated in the embankment located southwest of the portals. These test pits were dug to obtain samples of the material contained within the embankment to determine the suitability of the material to be used as backfill. A composite sample was obtained from each of the test pits by first excavating to total depth then obtaining a channel sample from one wall of the pit (if the material was similar throughout the excavation). If distinct units or horizons were observed to be unique to a wall of the excavation, a sample from each unique horizon was obtained and then composited with samples from all horizons observed. The composite samples were sent to Intermountain Laboratories, Inc. of Sheridan, Wyoming for analysis for the parameters listed in the Division's "Guidelines for Management of Topsoil and Overburden", (Leatherwood, 1988). Selected results of the analysis are presented in Table 8-1 and the laboratory analyses data reporting sheets are contained in Appendix 8-1.

Test pit TP-40 was excavated on the east (upstream) face of the south end of the embankment (Plate 8-1). The pit was excavated to eight feet below ground surface. Vegetative cover is very sparse and the area is well-drained. The surface and subsurface is comprised of coal waste and rock fragments. The profile consists of predominantly layered coal debris from previous mining operations.

Profile

0-8' Coal and waste rock (100%); very fine to very coarse fragments of angular to sub-angular coal debris and waste rock, coal waste is very dark brown (10YR 2/2) to black (10YR 2/1), waste rock is very dark brown (10YR 2/2), some wood fragments, trace of pyrite on some of the rock, material is dry to damp, loose.

Test pit TP-41 was excavated on the east (downstream) face of the south end of the embankment (Plate 8-1). The pit was excavated to 16 feet below ground surface. Vegetative is thin and the area is well-drained. The surface and subsurface is comprised of coal waste, rock fragments, and disturbed soil.

Profile

0-1' Coal, dark gray (10YR 4/1) to very dark brown (10YR 2/2), coarse coal fragments with some waste rock, angular to sub-angular coal debris and waste rock, some wood fragments, material is damp, loose.

1-4' Mixed Coal and Soil, Coal as above, Soil is a loam, brown (10YR 4/3), sandy with coal fines, occasional coarse rock fragments, damp, loose.

4-6' Mixed Coal and Waste Rock, Coal as above, Waste rock is sandstone and siltstone, angular, gravel to boulder size, some coal fines and soil are present as a matrix, damp, loose.

6-16' Sandy Loam, yellowish brown (10YR 5/4), mixed with some coal fines and coal waste, approximately 20 percent and greater coarse fragments, coarse fragments increase with depth, slightly sticky, slightly plastic, friable, soft to slightly hard, moist, loose.

Test pit TP-42 was excavated on the west (upstream) face of the north end of the embankment (Plate 8-1). The pit was excavated to 12 feet below ground surface. Vegetative cover is moderate and the area is well-drained. The surface is a loam and coal waste mixture and subsurface is comprised of coal waste and rock fragments. The profile consists of predominantly layered coal debris from previous mining operations.

Profile

0-5' Loam with coal fines, very dark gray (10YR 2/2) to black (10YR 3/1), sand to cobble size fragments, coarse fragments are angular and comprised of sandstone and siltstone, material is damp, loose.

5-12' Coal Waste, very dark gray (10YR 2/2) to black (10YR 3/1), includes large fragments of coal, waste rock, wood timbers, and metal pipe, fragment size is sand to cobble, damp, loose.

As described previously, the composite samples obtained from these test pits were analyzed for the parameters listed in Table 6 (Leatherwood, 1988) with the selected results listed in Table 8-1. The results of the analyses indicate that the soil and coal waste characteristics fall within the Division's acceptable range for overburden for the vegetative root zone as listed in Table 2 of the "Guidelines for Management of Topsoil and Overburden" (Leatherwood, 1988). Though the results indicate that the material is acceptable for vegetative growth, the concentration of coal eliminates most of this material from being used as topsoil. This material will be used as backfill in the facilities area. Coal and coal waste material from the embankment will be used as backfill and covered with at least four feet of acceptable backfill material as described in Section 3.3.2.5.

In addition to the soil test pits excavated in the embankment, one soil test pit (TP-43) was excavated in the bottom of the channel formed by Jewkes Creek while another (TP-44) was excavated across from the ruins of the concrete garages (Plate 8-1). These excavations were made to determine the type of soils present in these areas and their suitability as substitute topsoil. In both locations, the soils have been disturbed in the past and covered with materials imported from another location.

A composite sample of the material found in test pit TP-43 was obtained in a similar manner as described for test pits TP-40, 41, and 42. The pit was excavated to a depth of 12 feet below ground surface. The surface was covered with grasses and shrubs.

The material found in TP-43 was not predominantly coal waste, as in the case of the embankment, but was apparently deposited as a the result of mining operations. The material encountered below ground surface appeared to have been deposited by moving water on a slope of at least 10 degrees. The current ground surface is near horizontal. This suggests that the material was deposited on the face of a prograding "delta", perhaps forming in a pond. Following is a description of the soil profile observed in the excavation.

Profile

0-5" Loam with some very fine sands and clay, dark yellowish brown (10YR 4/4), some coal fines mixed with loam, abundant roots, less than 10% rock fragment, slightly sticky and plastic, friable, soft to slightly hard, blocky structure, dry to slightly damp.

5"-7' Sandy loam, dark yellowish brown (10YR 4/4) to very dark gray (10YR 3/1), interbedded with beds up to 12 inches thick of coal fines mixed with loam, occasional roots, less than 10% rock fragments, slightly sticky and plastic, friable, soft, blocky structure, occasional cobble size fragment, slightly moist. (Unit is approximately 30% coal fines and appears to have been deposited below a coal washing operation).

7-12' Sandy loam, some gravel, dark brown (10YR 3/3), trace of roots, approximately 15% sandstone and siltstone rock fragments, occasional cobble and boulder size fragments, non-sticky and non-plastic, friable, loose, crumb structure, laminated to thin bedded, sands and gravel are fine to coarse, subangular to subrounded, wet. (Unit appears to be fluvial in origin. Test pit terminated at or near bed rock.)

It is interesting to note that this excavation was located within a few feet of the stream bottom, left open for more than one-half an hour, and did not have significant water in the bottom of the pit prior to back filling.

Test pit TP-44 was excavated near the ruins of a building on the top of the west bank of the drainage formed by Jewkes Creek. It was excavated to a depth of 12 feet below ground surface. It appeared that at least the upper 5 feet of material encountered in this excavation had been disturbed or transported into this area. Soil samples were obtained from 0 to 3 feet, 3 to 5 feet, and 5 to 10 feet below ground surface for analyses. These samples were analyzed for the same parameters as TP-40 through TP-43. The results of the analyses are included in Table 8-1. Following is a description of the soil profile observed in this test pit.

Profile

0-3' Loam, very dark brown (10YR 2/2), some sand and gravel with brick and wood fragments, occasional cobble size rock fragments, rock fragments are less than 10% of total material, abundant roots, slightly sticky and slightly plastic, friable, slightly hard, blocky structure, trace of coal, slightly damp, obviously disturbed.

3-5' Loam, dark yellowish brown (10YR 4/4), some sand and gravel, approximately 15% rock fragments, fragments are sandstone, sand is very fine to fine, subangular, gravels are fine, subangular to subrounded, soil is slightly damp.

5-10' Sandy loam, brown (7.5YR 4/4), interbedded with loam as above, trace of roots, approximately 15 to 20% rock fragments, non-sticky and non-plastic, very friable, loose, crumb structure, sand is very fine to fine, subangular, occasional fine gravel, slightly damp. (Appears to be undisturbed).

10-12' Gravel, coarse to very coarse, a fine to very coarse sand matrix, some cobbles and boulders of sandstone and siltstone, loose, slightly damp.

The results of the analyses of the samples obtained from test pits TP-43 and TP-44 indicate that the soils sampled would be acceptable for use as substitute topsoil/growth medium or backfill. The exception to this would be the layers of coal fines located in TP-43.

TABLE 8-1

Horizon Coal Soil Analytical Data

Parameter	Units	Division's Acceptable Range[a]	Sample Number (Depth Interval, feet)			
			TP-40 (0-7)	TP-41 (0-16)	TP-42 (0-12)	TP-43 (0.5-7)
pH	-	4.5 - 9.0	6.4	7.4	7.2	7.1
EC	mmhos/cm	0 - 15	2.37	0.37	0.83	0.43
Saturation %	-	25 - 80%	36.6	31.2	32.0	35.7
Calcium	mg/kg	-	25.1	1.78	4.33	2.10
Magnesium	mg/kg	-	8.41	1.08	4.50	1.36
Sodium	mg/kg	-	0.58	0.51	0.41	0.58
SAR	-	0 - 12,15	0.14	0.42	0.20	0.44
Nitrate-N	mg/kg	-	1.74	1.18	1.18	1.16
Organic-C	%	-	28.8	16.3	17.2	27.6
Na (exchangeable)	meq/100g	-	0.26	0.25	0.26	0.20
Available Water Capacity[b]	%	5 - >10%	6.2	10.3	9.9	6.6
Boron	mg/kg	<5	1.35	1.46	1.31	0.29
Selenium	mg/kg	<0.1	0.02	<0.02	<0.02	<0.02
Acid/Base Potential	tons CaCO3/ 1,000 tons material	> -5	-1.16	55.6	88.0	27.4
Sample Type	-	-	Coal Waste	Coal Waste	Coal Waste	Over-burden
Texture[c]	-	-	CL	L	L	SL

TABLE 8-1

Horizon Coal Soil Analytical Data (Continued)

Parameter	Units	Division's Acceptable Range[a]	Sample Number (Depth Interval, feet) TP-44 (0-3)	TP-44 (3-5)	TP-44 (5-10)
pH	-	4.5 - 9.0	6.9	7.3	7.5
EC	mmhos/cm	0 - 15	0.35	0.31	0.41
Saturation %	-	25 - 80%	33.4	32.3	27.1
Calcium	mg/kg	-	1.87	1.51	2.24
Magnesium	mg/kg	-	0.57	0.47	0.55
Sodium	mg/kg	-	0.56	0.68	0.95
SAR	-	0 - 12,15	0.51	0.68	0.80
Nitrate-N	mg/kg	-	1.04	0.46	0.76
Organic-C	%	-	4.8	1.8	1.2
Na (exchangeable)	meq/100g	-	0.21	0.25	0.29
Available Water Capacity[b]	%	5 - >10%	11.8	11.4	11.6
Boron	mg/kg	<5	0.80	0.92	0.39
Selenium	mg/kg	<0.1	<0.02	<0.02	<0.02
Acid/Base Potential	tons CaCO3/ 1,000 tons material	> -5	2.20	112.0	93.3
Sample Type	-	-	Over-burden	Over-burden	Over-burden
Texture[c]	-	-	L	L	L

(a) Leatherwood and Duce, 1988.
(b) USDA, 1953.
(c) Texture: LS - loamy sand, SL - sandy loam, L - loam

8.3.2 Soil Series Descriptions

Permit Area

The soils contained within the permit area consists of several soils as noted on Plate 8-2. The following list of soils was compiled from the 1988 Soil Survey of Carbon Area, Utah conducted and reported by the United States Department of Agriculture - Soil Conservation Service. More detail can be found in this report located at the SCS office in Price, Utah.

63- Midfork family - Podo association
73- Pathead - Curecanti family association
107- Shupert - Winetti complex
109- Silas - Brycan loams
124- Uinta family - Podo association

63- Midfork family - Podo association

These soils appear on slopes between 30 to 70 percent at elevations between 7,500 to 8,500 feet. This unit is 40 percent Midfork family bouldery loam, 50 to 70 percent slopes; 40 percent Podo cobbly loam, 30 to 50 percent slopes; and 20 percent other soils. The Midfork soil is in narrow drainageways and on side slopes adjacent to drainageways. The Podo soil is on ridgetops, the upper part of mountain slopes, and narrow spur ridges.

The Midfork family soil is very deep and weel drained. It formed in colluvium derived dominantly from sandstone and shale. Slopes are 200 to 300 feet long and are concave. The present vegetation is mainly Douglas-fir and snowberry. Typically, the surface is covered with a mat of partially decomposed leaves, twigs, and needles about 2 inches thick. The surface layer is brown bouldery loam about 7 inches thick. The next layer is yellowish brown very channery loam 10 inches thick.

The Podo soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are 100 to 200 feet long and are convex. The present vegetation is mainly Salina wildrye, rabbitbrush, and lambsquarters. Typically, the surface layer is light brownishgray cobbly loam about 5 inches thick. The underlying materialto a depth of 11 inches is a light brownish gray gravelly loam over sandstone.

73- Pathead - Curecanti family association

These soils appear on slopes between 50 to 70 percent at elevations between 6,800 and 9,000 feet with a length between 300 to 400 feet. This unit is 40 percent Pathead extremely stony loam, 50 to 70 percent slopes; 30 percent Curecanti family loam, 50 to 70 percent slopes; and 30 percent other soils. The Pathead soil is on ridges and shoulders. The Curecanti family soil generally has north aspects and is in drainageways.

The Pathead soil is moderately deep and well drained. It formed in colluvium derived dominantly from sandstone and shale. The present vegetation is mainly Salina wildrye, low gray sage, and winterfat. Typically, the surface layer is brown extremely stony loam about 3 inches thick. The underlying material is pale brown very cobbly loam to a depth of 26 inches.

The Curecanti family soilis very deep and well drained. It formed in colluvium derived dominantly from sandstone and shale. The present vegetation is mainly Gambel oak, snowberry, Kentucky bluegrass, and aspen peavine. Typically, the upper part of the surface layer is dark grayish brown loam about 7 inches thick and the lower part is brown very stony loam about 8 inches thick.

107- Shupert - Winetti complex

These soils appear on slopes between 1 to 8 percent at elevations between 4,600 to 7,200 feet but more commonly 5,200 to 6,400 feet. The slopes are between 100 to 200 feet long and are found on narrow valley and canyon floors. This unit is 40 percent Shupert gravelly loam, 1 to 8 percent slopes; 35 percent Winetti bouldery sandy loam, 1 to 8 percent; and 25 percent other soils. The vegetation in most areas is mainly basin big sagebrush, rabbitbrush, cheatgrass, needleandthread, and dropseed.

The Shupert soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is pale brown gravelly loam about 3 inches thick. The next layer is pale brown clay loam about 6 inches thick.

The Winetti soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is grayish brown bouldery sandy loam about 6 inches thick. The next layer is pale brown loam about 5 inches thick.

109- Silas - Brycan loams

These soils appear on slopes between 0 to 8 percent at elevations between 7,700 to 8,600 feet. This unit is 65 percent Silas loam, wet, 0 to 3 percent slopes; 20 percent Brycan loam, 3 to 8 percent slopes; and 15 percent other soils. The Silas soil is in low areas adjacent to the stream channel, and the Brycan soil is on alluvial fans adjacent to the narrow alluvial valleys.

The Silas soil is very deep and somewhat poorly drained. It formed in alluvium derived dominantly from sandstone and shale from the Black Hawk Formation. Slopes are 300 to 500 feet long and are plane to concave. The present vegetation in most areas is mainly silver sagebrush, bluegrasses, sedges, wiregrass, and scattered Colorado blue spruce. Typically, the surface layer is dark grayish brown loam about 28 inches thick. The next layer is grayish brown loam about 15 inches thick.

The Brycan soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale of the Black Hawk Formation. Slopes are 100 to 200 feet long and are plane to convex. The present vegetation in most areas is mainly mountain big sagebrush and rabbitbrush. Typically, the surface layer is dark grayish brown and brown loam 12 inches thick. The subsoil is brown loam 20 inches thick.

124-Uinta family-Podo association

These soils appear on slopes that are 30 to 70 percent at elevations between 8,000 to 9,000 feet. This unit is 50 percent Uinta family loam, 40 to 70 percent slopes; 20 percent Podo cobbly loam, 30 to 50 percent slopes; and 30 percent other soils. The Uinta family soil is on foot slopes and in shallow drainageways, and the Podo soil is on ridgetops and on mountain slopes.

The Uinta family soil is deep and well drained. It formed in colluvium derived dominantly from sandstone and siltstone. Slopes are 300 to 400 feet long and are plane to slightly convex. The present vegetation is mainly subalpine fir, Engelmann spruce, and Douglas-fir. Typically, the surface is covered with mat of leaves, twigs, and needles 1 inch thick. The subsurface layer is light yellowish stony sandy loam about 8 inches thick.

The Podo soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone and shale. Slopes are 300 to 400 feet long and are dominantly convex. The present vegetation is mainly Salina wildrye, rabbitbrush, lambsquarter, and black sagebrush. Typically, the surface layer is light brownish gray cobbly loam about 5 inches thick. The underlying layer to a depth of 11 inches is light brownish gray gravelly loam over sandstone.

Disturbed Land

The disturbed area consists of generally deep, nearly level to nearly vertical, moderately well-drained materials. The fill materials are derived from sandstone, shale, and coal from previous mining operations. The fill material comprise most of the proposed disturbed area. The native vegetation has been previously disturbed in the mine area.

The available water capacity is moderate to low and permeability is moderate. The mean annual air temperature ranges from 36 degrees to 45 degrees F. and the frost free period is 60 to 120 days.

Soils are identified by four categories (FIA, GIG, HIG, JIB) and are identified on Plate 8-1 and in the text as such. Depths and types of soil were identified by SCS. The topsoil/growth medium to be saved for reclamation is also identified by category (see Section 8.2). A complete survey of the soil area was completed on November 3, 1990 and the results were incorporated into this chapter. The majority of the proposed disturbed area was previously used as a mine yard, making it difficult to determine the amount of salvageable topsoil or substitute topsoil.

Mapping Legend

The following is a list of the soil symbols and mapping units which appear in the legend on the soils maps and elsewhere in this permit.

Soil Symbol	Soil Mapping Unit Name
FIA	Shupert-Winetti Complex - 0 to 2% slopes
GIG	Curecanti - Very bouldery loam, 55-65% slopes
HIG	Senchert - Silt loam, 50-70% slopes
JIB	Brycan - 4-6% slopes
DM	Mine Dumps - Previous Disturbed Areas
No symbol	Rabbitex - Fine loamy, mixed Typic Calciborolls

The additional surface soil sampling points on Plate 8-1 are from a survey done by George Cook, Earl Jensen and Gary Moreau for the C & W Coal Producers (Appendix 8-1).

8.3.3 Present and Potential Uses - Crops and Pasture Lands

The SCS has determined that there are no prime farmlands of statewide importance, or unique in the permit area (see Figure 8-1). None of the soils mapped at the site have potential for the growth of crops or pasture land.

Rangelands

The soils of the area have been used as rangeland in the past. Data on predicted forage production for rangeland soils for various sites are available from the SCS (Section 9-9). The principle limitations are erosion and shallowness, according to the SCS the soils cannot support cultivated crops. The soils incapability have very severe limitations thus restricting the use of the land largely to grazing, woodland or wildlife.

8.4 Prime Farmland Investigation and Determination

On August 14, 1990, Blue Blaze Coal Company requested the SCS (Price, Utah office) review the soils within the mine area to determine if any soils qualified as prime farmland. The State Soil Scientist determined there were no soils classified as prime farmlands in the permit area (see Figure 8-1).

8.5 Physical and Chemical Properties of Soils and Results of Analysis

The criteria for evaluating soil as a plant growth media are given in Table 8-2. The criteria include sodium absorption ration (SAR), electrical conductivity or salinity (EC), toxic materials, soil reaction (pH), available water hold capacity (AWMC), erosion factor (K), wind erosion group, texture and percent coarse fragments.

Criteria are given for good, fair or poor sources of reconstruction material (Table 8-2). A good rating means vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion, and the reconstructed soil has good potential productivity. Material rated fair can be vegetated and stabilized by modifying one or more properties. Top dressing with better material or application of soil amendments may be necessary for satisfactory performance. Material rated poor has such severe problems that revegetation and stabilization is very difficult and costly. Top dressing with better material may be necessary to establish and maintain vegetation (USDA, 1978).

Soil Chemistry and Physical Properties

Chemical and physical data for project area soils were collected to evaluate the soils as reconstruction material for disturbed areas. Soil chemical and physical data from analysis by Commercial Testing & Engineering Company and Inter-Mountain Laboratories, Inc. are reported

United States Department of Agriculture

Soil Conservation Service

PO Box 11350
Salt Lake City, UT 84147

September 12, 1990

William R. Skaggs
Blue Blaze Coal Company
PO Box 784
Price, UT 84501

Dear Mr. Skaggs:

In response to your request August 14, 1990, we have made a review of Sections 7, 8, 17, 18, and 20, T. 13S., R8E., SLM for Important Farmlands determination.

None of these areas qualified as Important Farmland soils: steep slopes, stoney, or bouldry surfaces and soil disturbance from previous construction work are factors that eliminate these sects from categories of Important Farmlands.

Sincerely,

FERRIS P. ALLGOOD
State Soil Scientist

cc:
Price Field Office/Jan Anderson

FIGURE 8-1

11/25/90

The Soil Conservation Service is an agency of the Department of Agriculture

TABLE 8-2

Soil Reconstruction Material for Disturbed Areas

Property	Limits Good	 Fair	 Poor	Restrictive Feature
Sodium Adsorption Ratio (SAR)	<5	5 - 12	>12	Excess Sodium
Salinity (mmhos/cm)	<8	8 - 16	>16	Excess Salt
Toxic Materials	Low	Medium	High	Toxicity
Soil Reaction (pH)[a]	5.6 - 7.8	4.5 - 5.5	<4.5[b]	Too Acid
Soil Reaction (pH)	7.9	7.9 - 8.4	>8.4	Excess Lime
Available Water Capacity (IN/IN)[2]	>.10	.05 - .10	<.05	Drought
Erosion Factor (K)	<.37	>.37	---	Erodes Easily
Wind Erod. Group	3	3	1, 2	Soil Blowing
USDA Texture	---	SCL,CL, SICL	C[c], SIC[c], SC	Too Clayey
USDA Texture	---	LCOS, LS, LFS, LVFS	COS, S, FS, VFS	Too Sandy
Coarse Frag. (WTPCT) 3-10 in. (7.6-25.4 cm) 10 in. (25.4 cm)	<15 <3	15 - 35 3 - 10	>35 >10	Large Stones Large Stones

[a] Layers with high potential acidity should be rated "Poor - Too Acid"
[b] Rate "Fair - Too Acid" if found deeper than 40 inches.
[c] If in kaolinitic family, rate one class better if experience confirms.

From National Soil Handbook, NSH - Part II [403.6(2)], 1978 and Part 603 (603.03-3(e)(3)], 1983.

in Appendix 8-1. The parameters tested were under the UDOGM guidelines; pH, electrical conductivity, saturation percentage, particle size, soluble Ca, Mg & Na, sodium absorption ratio, Total N, Nitrate-N, Organic carbon, available water capacity, rock fragments, and soil color. If the pH ran high the samples were tested for Selenium and Boron.

Suitability as a Source Material for Reclamation of Disturbed Lands

Appendix 8-1 contains a chemical evaluation of the soils in both the undisturbed area and the area to be redisturbed. The soils are rated as good, fair or poor sources for reconstruction material. The overall rating given for each horizon is the rating for the most limiting criteria, and no horizon can be rated better than an overlying horizon. Vegetation is difficult to establish on soils with high SAR which indicates potential instability of water transmission problems (USDA, 1978). All of the soils of the site were rated good for SAR.

Electrical conductivity is a measure of soil salinity. Excessive salts restrict plant growth, create problems in establishing vegetation and therefore also influence erosion and the stability of the surface (USDA, 1978). All of the soils of the site were rated good for EC.

Excessively high or low pH causes problems in establishing vegetation and as a result influences erosion and stability of the surface (USDA, 1978). The substratum of the soils are rated good for pH.

The AWHC also is important in establishing vegetation. Soils with low available water capacity may require irrigation for establishment of vegetation (USDA, 1978). AWHC was estimated based on field texture and percent coarse fragments (U.S. Forest Service, 1974). The soils are rated fair to good for AWHC.

The stability of the soil depends upon its erodibility by water and wind and its strength. Water erodibility is indicated by the K factor; wind erodibility is rated according to the wind erodibility group. K values for soils of the project area are from the best data available in the SCS Soil Survey Interpretation Records (USDA, 1978). Soils of the site are rated good for erodibility. Wind erodibility is based on SCS Soil Survey Interpretation Records for the surface horizons.

Wind erodibility data is available for only the surface soils of the site (USDA, 1978). The surface layers of the Pathead and Curecanti soils are rated good for wind erodibility.

USDA texture also influences available water capacity and erodibility by wind or water. Texture influences soil structure, consistence, water intake rate, runoff, fertility, workability, and trafficability. Potential slippage hazard is related to soil texture, and although other factors also contribute, the ratings of soil texture represent one important factor (USDA, 1978). Soil texture for soils of the site are rated fair to poor, but are generally not considered the limiting factors. The fill textures for soils of the site were described in the field and the evaluations are based on the field determinations.

Coarse fragments influence the ease of excavation, stockpiling and respreading, and suitability for the final use of the land. A certain amount of coarse fragments can be tolerated depending upon the size and intended use of the reclaimed area.

Test pit 1 was determined by SCS to be unsuitable for salvage. A summary of TP-1 characteristics are summarized in a table in Appendix 8-1.

Salvageable topsoil/growth medium will be placed in a stockpile. The soil will be spread over a large area so that the application of soil nutrients can be carefully controlled. The stockpile will be surveyed to verify that the quantity of soils contained are sufficient for reclamation.

Topsoil/growth medium which meets the UDOGM suitability criteria will be salvaged from all areas within the permit area. ~~Horizon~~Hidden Splendor Resources, Inc., commits to excavating the A or E horizon for the Curecanti Family and Senchert Series in accordance with the profile descriptions located in the USDA\SCS Soil Survey for the Carbon County Area, Utah. The applicant will submit as-built surveys of the completed subsoil and topsoil stockpiles. The surveys will include: volume of material, maximum and minimum elevations and slopes, cross sections, and all other pertinent dimensions. Based on the survey information topsoil and subsoil mass balance tables will be amended.

All topsoil/growth medium to be used for reclamation will be tested according to the UDOGM soil guidelines, including any imported topsoil/growth medium. The requirements of regulation R645-301-233 will be meet in the event the mass balance calculations indicate a topsoil\subsoil deficiency.

Depths of Suitable Topsoil Available for Reclamation

Table 8-3 presents the topsoil/growth medium recovery calculations, soil types, as well as the recommended depth of stripping. Volumes of soil available for storage are also indicated. Figure 8-2 shows the location of each recovery area.

Much of the site is mapped as disturbed land. The fill material has variable properties, but the main restrictive features are coarse fragments and slope. The chemistry of the fine earth fraction is fair. The fill material is the only readily available reconstruction material in the mapped area. Included in the map unit DM (Mine Dumps) are areas of excessive large stones, rock outcrops, coal and rock dumps from previous mining. The coal and coal waste material from this areas (specifically the embankment at the mouth of Portal Canyon) will be handled as outlined in Section 3.3.2.5.

TABLE 8-3

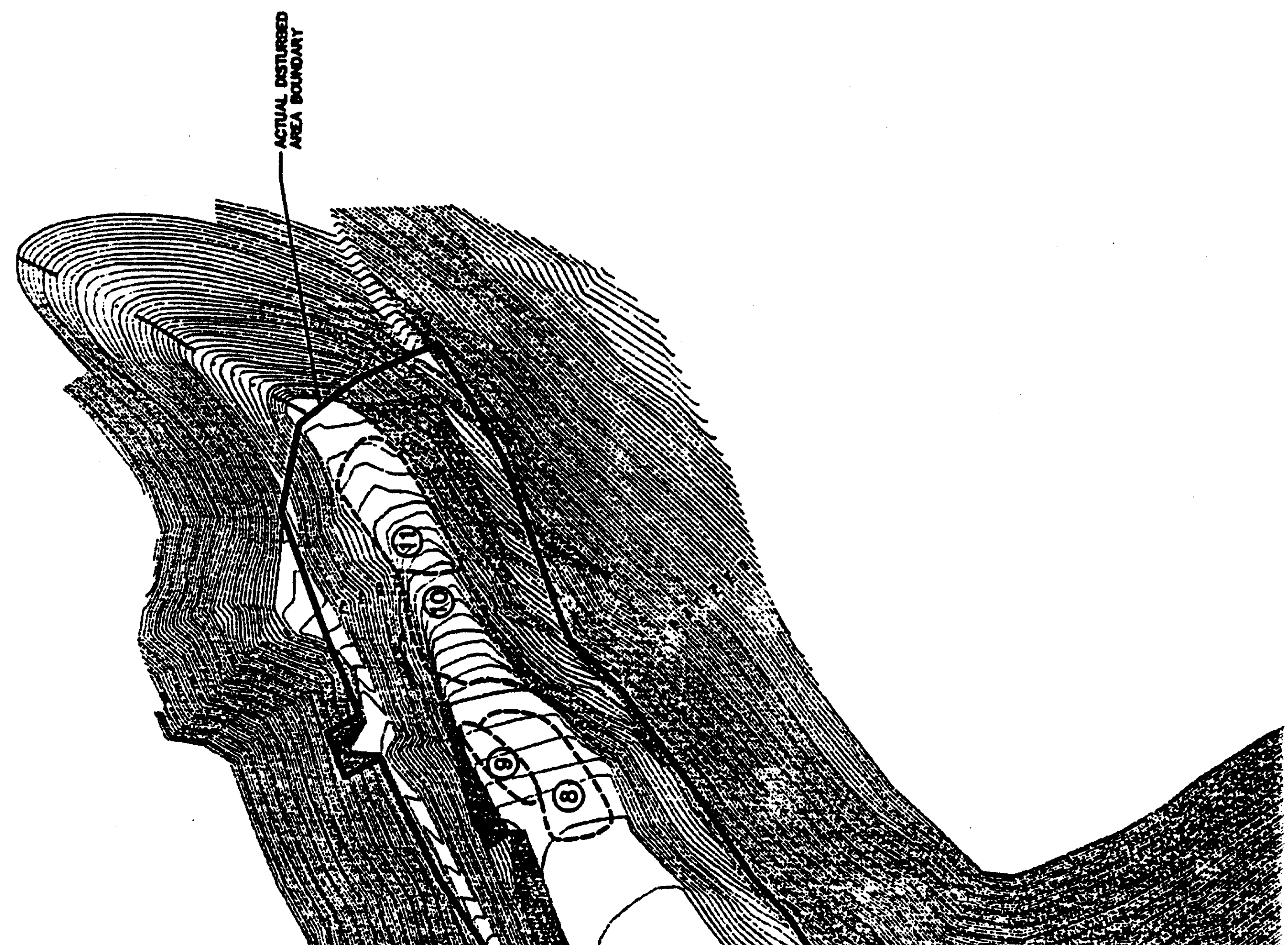
Potential Topsoil/Growth Medium Available for Salvage

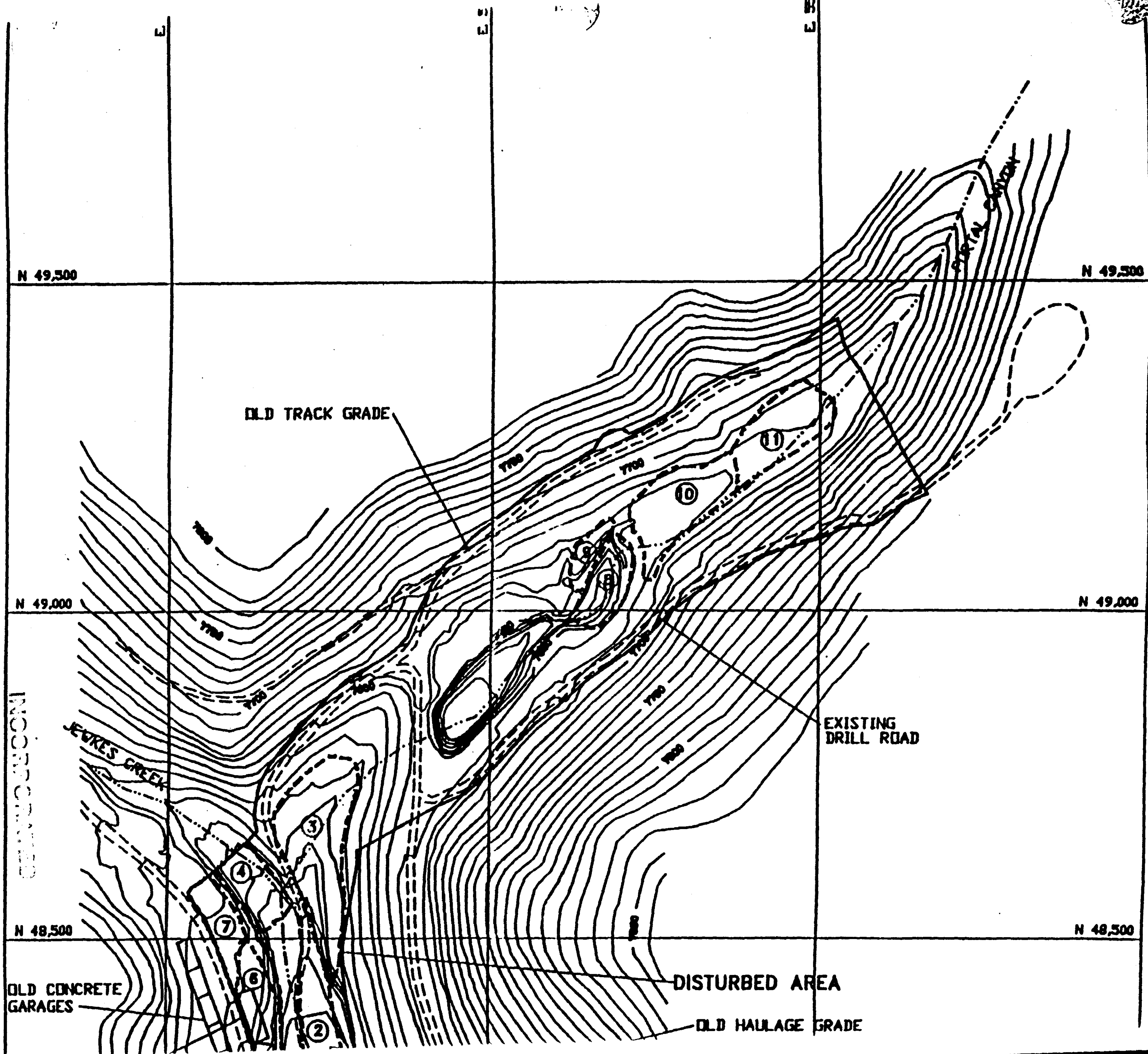
Recovery Area No.	Soil Type	Depth To Be Removed (Feet)	Volume (CY)[A]
1	DM	1.0	513
2	GIG	2.0	704
3	JIB	3.0	3000
4	DM	3.0	1173
5	DM	1.5	773
6	DM	3.0	1280
7	GIG	4.5	1600
8	FIA	2.5	667
9	DM	3.0	227
10	FIA/JIB	4.0	2133
11	JIB	3.0	1600
12 [B]	Riparian	1	156
12 [B]	GIG/DM	1	124 [c]
Total			13,950 CY

[A] All topsoil/growth medium to be stored at the top of Portal Canyon.

[B] Actual quantities of topsoil/growth medium removed and temporarily stored in Area E, Plate A, Appendix 8-1

c Approximately 90 cy of this soil was placed on Area E as contemporaneous reclamation topsoil per approval by Robert Davidson. Thus reducing available reclamation topsoil.


ACTUAL DISTURBED
AREA BOUNDARY



8-26

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All disturbance was conducted prior to enactment of regulations requiring salvaging of topsoil. Due to the already disturbed area a limited amount of the original topsoil/growth medium can be salvaged for storage.

Soils will be removed to the proper depth by use of an island method and replaced by the use of wooden stakes with depth marks on them to assure equal distribution.

Sampling of soil test pits prior to disturbance within the proposed disturbed area have provided positive indications that the soils in the area are capable of sustaining vegetation. Soils which lack the ability to sustain vegetation will be covered with topsoil/growth medium in sufficient depth to sustain and support vegetation. ~~Horizon~~Hidden Splendor Resources, Inc., commits to cover any toxic-or acid-forming material with four feet of topsoil/growth medium prior to reclamation revegetation.

8.6 Use of Selected Overburden Materials or Substitutes

It is anticipated that there will be enough topsoil/growth medium stockpiled to re-distribute over the disturbed area (see Section 8.3.2). Contaminated material will be removed from the site and disposed of properly before topsoil/growth medium is replaced.

8.7 Soil Plan for Removal, Storage, and Protection

It is proposed to remove the topsoil/growth medium using the island method to insure that the proper thickness of the soil is removed. At the time of soil removal a professional soil scientist or equivalently qualified individual will be on site to insure proper separation and stockpiling of topsoil (A and/or B horizons) and subsoil (B and/or C horizons) and to delineate phase and inclusion variation and salvage depths.

In areas of disturbance, available topsoil/growth medium will be salvaged and stored. The exception will be the riparian area where only topsoil (A horizon) will be salvaged due to the inplace soil's value for reestablishment of riparian vegetation during reclamation. Topsoil/growth medium salvaged from the riparian area will be dried (when necessary) prior to inclusion in the topsoil stockpile.

A temporary riparian topsoil stockpile will be established for the soil being removed for the extension of Culvert UC-3, refer to Appendix 3-9 for additional details concerning the temporary storage area.

The excavation of the sediment pond will likely occur where remnants of a building's foundation exists. The size of this foundation is unknown. Therefore, the quantity of topsoil/growth medium available for salvage is unknown. All available topsoil/growth medium will be salvaged during the excavation of the sediment pond and stored in the stockpile.

The vegetative cover will be removed with and incorporated into the topsoil prior to placement of the topsoil in the stockpile. Leaving the vegetation in the stockpiled topsoil should allow natural degradation of the plant material to occur, thus enhancing the organic content of the stored topsoil.

The soil will be transported to the topsoil storage area shown on Plate 3-1. The soil will then be contoured at a rate of not more than 2:1 (see Section 8.8). Mulch will be applied as outlined in Section 3.5.5.3. The soils will be tested and fertilized with an organic material to insure the interim revegetation will succeed. The topsoil stockpile will be seeded using the seed mix listed in Table 3-2 for temporary reclamation. Signs will be placed in this area indicating "Topsoil Storage". If necessary, the area will be fenced to prevent livestock from entering the area. A berm will be placed around the stockpile to prevent runoff from the storage piles entering the water courses in the mine area.

Trash, concrete, and debris will be hauled to a properly licensed disposal facility as it is removed from the mine site during topsoil/growth medium removal. The majority of the debris will be loaded directly into trucks and hauled from the site. On occasion debris will be stored until a truckload is collected, there will be not permanent storage on site for the debris collected during topsoil/growth medium removal.

8.8 Plans for Redistribution of Soils

Deep scarification of overburden and compacted areas (of no less than 12" depth), will be accomplished to ensure good overburden and redistributed topsoil contact to prevent slippage. The regraded material will be topographically conformed to the relative environmental conditions, which will be approximate to the premining topography with the highwalls being eliminated. A qualified soil scientist will be employed at the time of reclamation to evaluate the excavated soil around the portals to determine if this material could be used as additional topsoil to improve vegetation habitat by making deeper microsites. This soil would be recovered prior to the demolition of the portal covers.

Topsoil/growth medium will be placed over the reclaimed areas as illustrated on Plate B, Appendix 8-1 at a minimum thickness of 10 inches. The thickness of the topsoil/growth medium is based on the total available medium divided by the total area to be reclaimed within the disturbed area. As shown on Plate B Appendix 8-1, not all of the area within the disturbed area boundary will actually be disturbed under current mining plans (disturbed area 9.15 acres and areas to be recontoured and receive topsoil is 5.49 acres). If disturbance does occur in these areas, the soils will be salvaged as required by this M&RP. Soils will be placed to aid in the achievement of the reclamation groundcover success standards described in Section 9.8.

Soil will be redistributed using the wooden stake method, where a stake is marked to the depth of fill, then the soils will be added to accomplish that depth. The soil will then be harrowed to break up the cloddy surface and scarify to a depth of 18 inches (see Section 3.5.5.1). The regraded soils surface roughness will be maximized by pitting and gouging. Particular care will be taken not to compact soils placed in the riparian area.

The soil will then be sampled as stated in Section 8.9 to determine needed fertilization levels. The area will then be fertilized as required and mulched (Section 3.5.5.3). Seeding will then commence using the final reclamation seed mix listed in Table 3-3. Erosion control matting will be used where the slope grades are 2 1/2H:1V or steeper.

During reclamation, salvaged riparian soil (i.e., the 100-foot extension of Culvert UC-3) will be placed in the floodplain area of Jewkes Creek beginning at the upstream end. The riparian soil will be placed at a depth of 20 inches. The soil will be used in the floodplain areas until the stockpile has been depleted. The locations of the flood plains are shown on Plate 3-7.

8.8.1 Resoiled Areas

During 1997 and 1998, various areas and slopes within the disturbed area received topsoil as outlined on Appendix 8-1, Plate A. The soil was distributed, seeded, fertilized, and stabilized as described in Section 3.5.1. The resoiled areas were seeded with Seed Mix No. 1, mulched with a wood fiber, fertilizer, and tackifier. The seeding mixture was intended to protect and enhance the soil during the winter (1997 - 1998). As currently planned, the resoiled areas will be retained and not redisturbed except as noted on Plate 3-7 .

Within portions of Section 17, Township 13 South, Range 8 East are locations which were previously disturbed by mining operations in the early to mid 1900's. Due to the preferences of the landowner (Hidden Splendor Resources, Figure 4-1) many of these disturbances/areas have been cleared of debris including concrete, metal, mine waste, masonry, and coal refuse. Hidden Splendor Resources requested of Carbon County that the topsoil/growth medium be salvaged during realignment of the Consumers/Clear Creek county road in Jewkes Canyon. Once the areas were cleared the landowner contracted with a construction company to grade selected areas and cover the areas with topsoil for eventual reseeding. Hidden Splendor Resources requested a recommendation for the depth of topsoil/growth medium to be placed from an environmental consulting firm. The firm suggested the depth of 11 inches as committed to by Horizon Mine in their 1996 approved permit. The Hidden Splendor Resources contractor spread between 10 - 12 inches of soil on the resoiled areas. The locations within the disturbed area which were resoiled by the landowner are designated on Plate A within Appendix 8-1.

During the 1998 the old fan portal and corresponding access road was resoiled and seeded by employees of White Oak Mining and Construction. The person or persons who performed the work no longer reside in the western United States and have no affiliation with ~~Lodestar Energy~~Hidden Splendor Resources, Inc.~~.~~ ~~Lodestar Energy~~Hidden Splendor Resources, Inc. is unaware of where the soils came from, their characteristics or the depth of the soil placed. Assumptions have been made that the soil was taken from the topsoil storage pile.

It is important to note that at several locations within the area (Section 17) currently owned by Hidden Splendor Resources, coal waste was buried as part of at least one UDOGM Abandoned Mining Lands (AML) project. These projects were completed prior to the work performed by the landowner in 1997.

With permission from the UDOGM Price office, a portion of the stockpiled topsoil/growth medium salvaged during mine construction has been subsequently placed on the hillside designated as Area D on Plate A of Appendix 8-1 to protect the soil from contamination and compaction. This material was removed from above and around a crushed culvert which runs through the topsoil stockpile. The culvert was crushed during portal construction, thus requiring replacement and realignment (per N97-26-5-1). To provide drainage past the crushed culvert, a ditch was dug to transport water from the exposed end of the intact portion of the culvert to ditch DD-1.

Culvert UC-2 was installed within the topsoil stockpile. Fill material was not used during the original installation of UC-2 within the topsoil stockpile nor was it used during culvert repair and realignment.

Protection of the resoiled area will be achieved by the reestablishment of vegetation and by excluding redisturbance. Other methods of protection could include signing, barriers and erosion control. To assist in the protection of the slope in Portal Canyon which parallels the coal stockpile, concrete barriers (jersey) will be placed at the bottom of the slope to prevent equipment from accessing the slope and as a boundary for the bottom of the coal stockpile. Should the resoiled areas adjacent to the coal loading facilities become impacted with coal to the extent that vegetation is impaired, alternate methods will be implemented (such as vacuuming).

During recontouring of the HZ-95-3 well road (Area A, Plate A Appendix 8-1) the in-place soils below the road cut were disturbed by earthmoving equipment. These soils are comprised of both undisturbed and pre-Horizon Mine disturbed soils. No topsoil was placed on these in-place soils but they were fertilized and reseeded after recontouring was completed. Similarly, in-place soils above the portals were disturbed during portal construction. These soils have also been reseeded. The soils disturbed during construction of the portals and recontouring of the HZ-95-3 access road were seeded in 1997 at the time the adjacent resoiled areas were seeded.

During mine construction in 1996/1997 and after the removal of topsoil/growth media, Mr. Brad Derrick, P.E. determined that the Portal Canyon pad area was 6 to 8 feet higher in elevation than the portal openings. As a result of this discovery, the pad area was regraded in 1997 and the materials were distributed to various locations within the disturbed area boundary. Contours on Plate A within Appendix 8-1 reflect the pad regrading and placement of the soils.

The difference in earlier topsoil pile volumes from the latest resurvey by Lodestar in 2001 can be explained in this manner. The previous operator completed several regrading and recontouring projects within the disturbed area boundary after the construction of the portals. Materials were moved to regrade the old drill road on the southeast side of Portal Canyon and the old mine access road and old portal area on the northwest side of Portal Canyon. These areas were also revegetated with the interim seed mixture. These areas along with the material placed between the newly installed portals more than likely came from the topsoil storage area. These projects were not completed with the proper review process and no record of material distribution accounting was prepared.

Soils within the area labeled on Plate A (Appendix 8-1) as "unsalvaged hillside" were initially part of the volume of soils planned for salvage during final reclamation. However, the hillside blends with the adjacent area and much of the pre-Horizon Mine vegetation still remains in place. Areas on this hillside that were disturbed during construction were reseeded. Therefore, ~~Horizon~~Hidden Splendor Resources, Inc., recommends it remain intact and has not included the volume of potential topsoil from this hillside in it's 1997 topsoil/growth media calculations.

The area designated as Area D on Plate A (Appendix 8-1) received topsoil from the topsoil stockpile. Approximately 11 inches of topsoil was placed using the previously described "stake" method. Adjacent in-place undisturbed and pre-Horizon Mine disturbed soils above Area D were disturbed by machinery during the placement of topsoil. The in-place soils were graded where necessary to blend with the surface contour of the topsoiled area. The entire area, including the in-place and topsoiled areas, was fertilized and seeded.

The Topsoil Stockpile table provided in Appendix 8-1 was created using the following information.

1) The contours of Portal Canyon from a 1984 AML map were used to determine the area available for topsoil storage prior to placement of salvaged topsoil/growth medium. A subsequent survey of the canyon performed in 1996 was unusable.

2) The topsoil stockpile was surveyed in May of 1997 and again in September/October 1997. Surveyed data was compared to AML data and areas were calculated using AUTOCAD™ computer software.

3) The area designated to receive topsoil from the topsoil stockpile (Area D ,Plate A Appendix 8-1) was measured. The quantity of topsoil placed was calculated by multiplying the area by the depth of soil placed. Approximately 11 inches of topsoil was placed.

4) Topsoil placed by Hidden Splendor Resources within the disturbed area boundary was calculated by multiplying Areas A, B, and C by the depth of 11 inches. The placement of soil was accomplished by driving wooden stakes into the surface of these areas, marking on the wooden stakes a point 11 inches above the in-place soil, and placing the imported soil to the mark on the stake.

Pits were dug within the boundary of the topsoil stockpile during November of 1999 to verify the quantity of topsoil in the stockpile. The stockpile was divided into thirds and two pits were dug within each third. The pits were excavated to the top of natural soil. The depths were measured and area calculated. The calculated quantity is reflected below. Permission to dig the pits was requested and granted by Robert Davidson of the Division.

TABLE 8-4

1999 Topsoil Quantity Table (Pit Survey of Recovered Material)

Cross-Section	Area (Feet)	Depth (Inches)	Topsoil (Cubic Feet)
A	50 X 20	20"	1670
B	60 X 50	24"	6000
C	70 X 50	62"	18095
D	90 X 50	67"	25110
E	60 X 50	26"	6480
F	40 X 50	30"	5000
G & H	40 X 60	20"	4008
TOTAL OF RECOVERED MATERIAL IN PILE			66363 (CF)

* Plate 3-7b contains cross-sections which support Table 8-4

66363 cubic feet = 2458 cubic yards

The estimated 2,458 cubic yards is the estimate of recovered soils on the topsoil stockpile, but not the riparian soil stockpile. This is a conservative estimate due to no measurements taken where the original stream channel existed, depths are calculated on a flat bottom.

To protect the resoiled areas of interim reclamation from erosion, the operator has taken steps to reduce the effects of runoff on these areas. Specifically, the areas that were resoiled were roughened with either the tracks of a dozer or a trackhoe prior to mulching and reseeding. After roughening was completed, a hydoseed mixture was applied the soil surface. The mixture included long fiber mulch with a tackifier and was applied to the surface at a rate intended to form a significant blanket over the soils. This blanket of seed and mulch is intended to protect the roughened soil surfaces from the formation of rills, gullies, and damage to soil and germinating seed from rain drop strikes. Since the watersheds above the resoiled areas generally do not discharge significant runoff (i.e. limited area and good vegetative cover), diversion berms and ditches were not constructed. The operator will maintain the resoiled areas of interim reclamation by filling rills and gullies and reseeding when necessary until vegetation is established. These areas will be identified with topsoil storage pile signs.

8.9 Nutrients and Soil Amendments

Tests will be taken of soils to be used for final reclamation in order to evaluate the need for soil amendments and nutrients. Soil testing will be performed by a qualified laboratory which uses accepted analytical procedures (UDOGM soil guidelines). The soils chosen for sampling will be based on previous analysis, affected soil series type, postmining land use, and the postmining vegetation ecosystem. Twenty sub-samples per acre will be taken at 12 inch depths then combined, 5 samples will be taken from the combined sub-samples and sent to a qualified laboratory for testing. The tests to be performed will be pH, electrical conductivity, sodium absorption ratio, texture, nitrogen, organic content, phosphorus, potassium, available water capacity, and percent rock fragments, in order to determine needed fertilization levels. Commercial organic fertilizers will be added to replenish soil nutrients and to enhance successful revegetation. The soil nutrient and amendments plan will also follow the Divisions Guidelines for management of topsoil and overburden for underground and surface coal mines.

8.10 Effects of Mining Operations on Soils, Nutrients and Amendments

The previously disturbed land which has been impacted by mining operations has some inherit problems. These problems include large stones and compacted zones. The large stones will be removed by standard earth moving equipment and/or commercial rock-picker implements. Compacted zones will be eliminated by deep chiseling, prior to final reclamation. See Section 8.9 for nutrients and soil amendments.

8.11 Mitigation and Control Plans

No additional surface disturbance involving soils will be required for the surface facilities. Therefore, the stripping and stockpiling of soils will be the soils saved from the previously disturbed areas.

8.12 References

Black, C.A. 1965. Methods of Soil Analysis. American Society Agronomy No. 9 parts 1 and 2. Madison. Wisconsin. 1572 pgs.

Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

USDA, Soil Conservation Service. Soil Survey Staff 1975. Soil Taxonomy - a basic system of soil classification for marking and interpreting soil surveys, USDA Agricultural Handbook No. 436.

USDA, 1978 Soil Conservation Service, National Soils Handbook (Compendium of SCS in-house memos, various dates) Part II (403.6[a]).

USDA, 1983 Soil Conservation Service, National Soils Handbook (various dates) Part 603 Application of Soil Information, Part 603 [403.03-3(e)(3)]

USDA, Soil Survey Staff, 1951, Soil Survey Manual, USDA Agricultural Handbook No. 18.

USDA, Soil Survey Staff, 1953, Saline and Alkali Soils, USDA Agricultural Handbook No. 60, page 111.

USDA, Forest Service, 1974; Branch of Soils, Division of Watershed Management, Rocky Mountain Region, Guidelines for Making Soil Interpretations.

USDA, Soil Conservation Service, June 1988, Soil Survey of Carbon Area, Utah.

APPENDIX 8-1

SOILS DATA

Soil Chemical and Physical Properties - Pit #1

Sample depth (cm)	pH	Ec mmho s/cm	Sat%	Particle Size%	Ca meq/l	Mg meq/l	Na meq/l	SAR	Rock Frag. %	N%	Nitrate mg/kg	Organic carbon	Available Water Capacity
0-15[a]	7.9	0.6	82.4	%Sand 0 %Silt 56 %Clay 44	3.42	2.45	0.89	0.52	34.0%	0.35	13.2	3.58%	17.5
15-30[b]	8.0	0.5	79.6	%Sand 2 %Silt 56 %Clay 42	2.94	2.56	0.81	0.48	46.1%	0.31	15.2	3.23%	16.1
30-45	8.0	0.7	29.6	%Sand 27 %Silt 40 %Clay 33	3.60	2.50	1.54	0.88	40.0%	0.27	0.4	1.44%	16.1
45-75	7.8	1.2	26.2	%Sand 51 %Silt 33 %Clay 16	4.93	3.33	0.46	0.23	70.5%	0.25	0.3	2.65%	14.7
76-106	7.8	1.1	28.8	%Sand 54 %Silt 33 %Clay 13	5.99	3.90	2.72	1.22	61.3%	0.19	0.36	2.80%	14.8

[a] Selenium mg/kg <0.1, Boron mg/kg 1.24
[b] Selenium mg/kg <0.1, Boron mg/kg 0.86

Appendix 8-1
Topsoil Stockpile Table

Topsoil/Growth Medium Recovery and Placement Calculations					
	1996	1997	Total (CY)	1999	2001
Topsoil Recovered During Mine Construction[a]	10,993[b]		10,993		
Topsoil Placed on Area D Appendix 8-1 - Plate A	-	499	- 499		
Topsoil in Stockpile			10,494		2,458
Area E - Riparian Soil			156	156	156
Area E - Soils not Riparian[c]			124		
Total Salvaged Soils			10,774		
In-place Soils (Estimate) Areas 10 & 11	3,733		3,733	3,733	3,086
Soil Medium Potentially Available for Reclamation[d]			14,507		
November 1999 Pits - Topsoil Estimate (CY)				2,458	
1999 Topsoil Estimate plus Riparian Stockpile (CY)				6,347	
2001 Topsoil Estimate (CY)[e]					5,700

(a) Surveyed Quantity
(b) Excludes hill described in Section 8.8.1 and on Plate A.
(c) Approximately 90 cy of this soil was placed on Area E as contemporaneous reclamation topsoil per approval by Robert Davidson. Thus reducing available reclamation topsoil to 14, 417 cy.
(d) Total of topsoil in stockpile plus in-place soils to be salvaged from areas 10 and 11. Approximately 10" of soil will be available for final reclamation (4.04 acres within disturbed area to be resoiled). Soils placed on Areas A, B, and C were generated during county road construction. Volume of soil used in Areas A, B, and C is not included in stockpile calculation. Refer to Plate B in Appendix B-1.
(e) Volume of topsoil from Survcadd calculated volume between operating contours and reclamation contours using pit survey volume and riparian stockpile. Refer to Plate 3-7b Top Soil Storage Area.

Imported Topsoil Table	
Area	Topsoil (CY)
Jewkes Canyon - Area A	337
Portal Canyon - Area B	189
Portal Canyon - Area C	449
Total	**975**

Revised 3/9/98, 4/00, 5/01

November 20, 1997

Mr. Robert Davidson
Reclamation Specialist
State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
1594 West No. Temple
Suite 1210
Salt Lake City, UT 84114-5801

RE: Soil Sampling of Areas A, B, and C, Plate A, Appendix 8-1

Dear Mr. Davidson:

On November 12, 1997, soil samples were obtained from three areas at the Horizon Mine. These areas are designated as Areas A, B, and C on Plate A, Appendix 8-1. These areas had been resoiled with material imported during construction of the county road re-alignment. The purpose of the sampling event was to determine if the soils were suitable as substitute topsoil and growth media for the vegetative root zone. This letter report describes the methods used to obtain the soil samples and the results of the laboratory analysis performed on the samples.

SAMPLING METHODS

As was requested by you, random samples from each area were obtained and composited into one sample that could be considered representative of the soils in each area. To ensure that the samples were taken randomly, a map of each area was generated. The map included a grid pattern set on two-foot centers. Next, a random number table beginning with the number 1 and terminating with the number 500 was generated using Microsoft Excel® computer software. Five pairs of random numbers were selected from the table for Areas A and B and seven pairs of numbers for Area C. Each pair was plotted on the area grid pattern using one number to represent an X-axis point and the other number to represent a Y-axis point. The location of the selected points are illustrated on Plate A, Appendix 8-1.

On November 12, 1997, samples were obtained from each of the randomly selected points in each of the three areas. The samples were obtained using a 12-inch long 4-inch diameter stainless steel bucket auger. Care was taken to obtain the same volume of soil at the same depth intervals at each of the locations within the three areas. After obtaining the sample, the soils were placed in a five gallon plastic bucket and thoroughly mixed. A representative portion of the bulk sample was obtained, placed in a Ziplock® bag, and the bag appropriately labeled. This sampling process was repeated in each area. The three samples were sent to Inter-Mountain Laboratories, Inc. in Sheridan Wyoming via Federal Express for analysis.

SAMPLE ANALYSIS

The composited samples were analyzed for the following parameters:

- pH
- Electrical Conductivity
- Saturation
- Calcium
- Magnesium
- Sodium
- Sodium Absorption Ratio

- Coarse Fragment, Sand, Silt, Clay percentages
- Texture
- Total Organic Carbon
- Total Sulfur
- Acid/Base Potential
- Potassium
- Phosphorus
- Nitrate-Nitrogen
- Available Sodium
- Exchangeable Sodium
- Total Kjeldahl Nitrogen
- Available Water Holding Capacity

The results of the analysis of each sample are attached to this letter. The attached table summarizes selected results from the analysis.

Based on the results of the analysis of the composite samples, these soils appear to be adequate as substitute topsoil/growth media. None of the reported analysis parameter results exceeded the Division's suggested limits for Vegetative Root Zone material as listed in Table 2 of the "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining", Leatherwood, 1988.

If you have any questions regarding the sampling methods or analysis results, please give me a call at (801) 561-1555.

Sincerely,

Chris D. Hansen

attachments

SELECT SOIL ANALYTICAL DATA
PORTAL and JEWKES CANYON AREAS 1, 2, AND 3

PARAMETER	UNITS	UDOGM ACCEPTABLE RANGE	LAB SAMPLE NUMBER/AREA		
			#1/C	#2/B	#3/A
pH		4.5 - 9.0	7.4	7.3	7.5
EC	mmhos/cm	0 - 15	0.63	0.83	0.59
SATURATION	%	25 - 80%	36.6	33.9	35.4
SAR		0 - 12, 15	0.45	0.56	1.08
CALCIUM	meq/l	na	3.93	5.58	3.41
MAGNESIUM	meq/l	na	1.57	2.32	0.89
SODIUM	meq/l	na	0.75	1.10	1.59
COARSE FRAGMENTS	%	na	23.8	8.8	8.0
SAND	%	na	42.0	44.0	36.0
SILT	%	na	38.0	34.0	41.0
CLAY	%	na	20.0	22.0	23.0
AVAILABLE WATER HOLDING CAPACITY	%	5 - 15%	8.4	7.6	8.9
ACID POTENTIAL (% SULFUR)	tons $CaCO_3$/ 1,000 tons material	na	0.03	0.09	0.04
NEUTRALIZATION POTENTIAL (% $CaCO_3$) (1)	tons $CaCO_3$/ 1,000 tons material	na	35.5	31.7	25.0
ACID/BASE POTENTIAL (2)	tons $CaCO_3$/ 1,000 tons material	> -5	34.5	28.9	23.7
TEXTURE (3)		na	L	L	L

(1) $CaCO_3$ shown on IML lab data sheets as Neut. Pot. X 0.10. (i.e. Sample 129266 $CaCO_3$ = 19.8 X 0.1 = 1.98)
(2) Acid/Base potential (ABP) calculation based on ABP = NP - AP, where NP is neutralization potential and AP is acid potential, NP = % $CaCO_3$ X 10 = tons of $CaCO_3$/tons of material, and AP = % S X 31.24 = tons of $CaCO_3$/tons of material.
(3) Textural Classes: L - loam; SL - sand loam; LS - loamloamy sand.

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CHAPTER 9

VEGETATION RESOURCES

9.1 Scope

The purpose of this chapter is to describe the vegetation of the Horizon No. 1 Mine site. Description of the permit area disturbance as well as some of the surrounding areas are included.

A methodology section is provided for the study. General site descriptions are provided on areas where quantitative data are to be supplied as well as areas where only qualitative data were obtained.

9.2 History

The proposed permit area is the site of previous mining activity, the final mining operations closed in 1953. Consequently, much of the surface area has been previously disturbed. Since 1953 there has been considerable interest in reactivating the area to mining.

In 1981, Mt. Nebo Scientific completed a preliminary vegetation study of the area for Sanders Exploration, Ltd. (C & W No. 1 Mine). In 1990, Mt. Nebo Scientific performed a vegetative study for Blue Blaze Coal Company, which was submitted to UDOGM in a permit application.
Mt. Nebo Scientific did a threatened and endangered plant and general vegetation study for Horizon in 1995. A habitat study for Ute Lady's Tresses (Spiranthes diluvialis Shev.) was performed in August of 1995 (See Appendix 9-1).

9.3 Methodology

Information for this chapter was obtained by utilizing previous vegetation studies and field work by Mt. Nebo Scientific (1981, 1990, 1995). In November 1990 qualitative analyses, vegetation mapping, and selection of transect areas to be sampled were accomplished. Additionally, on-site sampling areas were approved and 1991 sampling plans were submitted to the UDOGM.

Vegetation mapping was accomplished by using aerial photographs and on-site field mapping on contour maps.

9.4 General Site Description

The permit area is dotted with old mine structures, building ruins, and debris. Previous mining operations left varied degrees of disturbance to the vegetation. Due to grazing in the area some vegetation species are struggling while others seem to have benefited. Livestock and man have introduced many foreign species within the area designated for redisturbance. In addition to mining the permit area has been used for recreation and grazing. The logging and road maintenance crews have used the area for parking machinery and equipment.

The mine site lies between 7,500 and 7,700 feet above sea level. The climate is characterized by cold winters and warm, dry summers. Average annual precipitation ranges from 12 to 20 inches.

9.4.1 Vegetation Patterns

Since revegetation was never performed on the mine site, a host of exotic plant species have been introduced into the disturbed area. For the Mt. Nebo study plant communities were designated as slightly disturbed, moderately disturbed, and severely disturbed.

The mine permit area has been mapped with several vegetation types including: 1) Oak Brush, 2) Salina Wildrye, 3) Maple/Oak Brush/Aspen, 4) Fir/Aspen, 5) Manzanita, 6) Alpine Herb/Grassland, 7) Sagebrush/Grass/Rabbit Brush, and 8) Disturbed/Altered communities. The map provided delineates these vegetation types within and adjacent to the mine permit boundaries (see Plate 9-1).

Except for a relatively small community of Salina wildrye, most of the proposed disturbance will be on areas that have been previously disturbed by mining activity. A description of the existing vegetation types follow.

9.4.1.1 Salina Wildrye Community

This is a relatively small area and is the only undisturbed area that proposed mining activity could affect. This community lies primarily on a dry, west-facing slope, with a 60% incline. Previous sampling indicated a mean total living cover of 43.12%. Ninety-two percent of the living cover were grass species. For a species list, refer to Table 9-1.

9.4.1.2 Disturbed, (Altered) Drainage Bottoms

Another area proposed for disturbance is a site previously disturbed or "altered" by mining activity. Because the area is near the bottom of a drainage, the vegetation community patterns are somewhat dissimilar to adjacent slopes. The bottoms probably have somewhat deeper soils, while some of the species are more mesic. The steep side slopes of oak brush and Salina wildrye often protect the bottoms from exposure to the sun. Consequently, small stands of aspen (Populus tremuloides), white fir (Abies concolor) and oak brush (Quercus gambelii) can be found in and around the drainage. Muttongrass (Poa fenderiana) is one of the dominate grass species of the bottom lands. For a general species list, refer to Appendix 9-1.

Rick Smith of Engineering Planning Group, was recommended by the Army Corp of Engineers (Corp) as an approved wetland specialist. During a site visit on August 16, 1995, he proposed a visit by personnel from the Corp for wetland determination. He performed a soil and vegetation survey during his site visit and was assisted in surveying the potential wetlands (0.42 acre) by EarthFax Engineering personnel (Brad Derrick).

TABLE 9-1

Species List for Undisturbed Salina Wildrye Community (1990)

Trees and Shrubs	
Bigelov's Sagebrush	Artemisia bigelovii
Big Sagebrush	Artemisia tridentata
Mountain Mahogany	Cercocarpos montanus
Rubber Rabbitbrush	Chrysothamnus nauseosus
Corymb Buckwheat	Eriogonum corybosum
Broom Snakeweed	Gutierrezia sarothrae
Rocky Mountain Juniper	Juniperus scopulorum
Oregon Grape	Mahonia repens
Prickly Pear Cactus	Opuntia polyacantha
Scrub Oak	Quercus gambelii
Elderberry	Sambucus caerulea
Snowberry	Symphoricarpos oreophilus
Gray Horsebush	Tetradymia canescens
Forbs	
Yarrow	Achillea millefolium
Androsace	Androsace septentrionalis
Rosy Pussytoes	Antennaria microphylla
Louisiana Sagewort	Artemisia ludoviciana
Milkvetch	Astragalus spp.
Thistle	Circium sp.
Rock Goldenrod	Petradoria pumila
Globemallow	Sphaeralcea coccinea
Grasses	
Tall Oatgrass	Arrhenatherum elatius
Salina Wildrye	Elymus salinus
Western Wheatgrass	Elymus smithii

Junegrass	Koeleria macrantha

TABLE 9-2

Species List for Disturbed Area (1995)

Trees and Shrubs	
Rubber Rabbitbrush	Chrysothamnus nauseosus
Wood's Rose	Rosa woodsii
Low Rabbitbrush	Chrysothamnus viscidiflorus
Big Sagebrush	Artemisia tridentata
Broom Snakeweed	Gutierrezia sarothrae
Wax Current	Ribes cereum
Snowberry	Symphoricarpos oreophilus
Forbs	
White Yarrow	Achillea millefolium
Sagebrush	Artemisia dracunculus
Aster	Aster foliaceus
Hound's Tongue	Cynoglossum officinale
Fireweed	Epilobium halleanum
Buckwheat	Eriogonum sp.
Hoary Aster	Machaeranthera canescens
Curly Dock	Rumux crispus
Russian Thistle	Salsola pestifer
Scarlet Globemallow	Sphaeralcea coccinea
Showy Goldeneye	Viguiera multiflora

TABLE 9-2

Species List for Disturbed Area (1995) (Continued)

Grasses	
Cheatgrass	Bromus tectorum
	Elymus trachycaulus
Wheatgrass	Elymus spicatus
Salina Wildrye	Elymus salinus
Foxtail Barley	Hordeum jubatum
Muttongrass	Poa fendleriana
Kentucky Bluegrass	Poa pratensis

Michelle Waltz of the Corp was contacted to set up a site visit, instead she request that three soil samples be collected at designated locations within the potential wetland area and delivered to the Corp office for evaluation. Jaime of the Corp contacted Vicky Bailey of EarthFax Engineering and stated that "the soil samples they evaluated made the Corp lean towards the determination that the area was not a wetland, however they wanted the Division of Water Rights to visit the site and confirm their decision". The Corp then turned the determination responsibility over to Mark Page from the Division of Water Rights (Water Rights). Mark Page evaluated the site on May 16, 1996. Water Rights and the Corp have determined the Horizon site (0.42 acre) under consideration to be a riparian area not an Army Corp jurisdictional wetlands.

Rick Smith suggests that the following vegetation exists in the riparian bottom at the Horizon site: Quaking aspen, Common reedgrass, Rush, Clover, Scouring rush, Western cornflower, Big rabbitbrush, Bull thistle, Big sagebrush, Purple aster, Wildrose, Houndstongue, Dandelion, Common tansy, Stinging nettle, Bluegrass, Foxtail Barley, Witchgrass, Cheatgrass and Horsetail.

The riparian area was described by Mt. Nebo Scientific in their 1995 study, however quantitative sampling was completed in 1996. Mt. Nebo Scientific studied the area designated on Plate A in Appendix 9-2. For clarification the stream channel had been moved and vegetation disturbed on the lower end of the study area by the the logging industry, between the studies in 1995 and 1996.

The data generated by these surveys were incorporated into this permit text and Appendix 9-2. All the information contained in this survey will not be incorporated into this text, but can be referenced directly in Appendix 9-2.

The riparian vegetation within the permit area grows along Jewkes Creek. In the upper portions of the creek the channel is covered by quaking aspen, maple, and oak, with willows growing in the channel sporadically along the banks. The riparian vegetation continues down the channel until it reaches the top of the Horizon disturbed area. Once within the disturbed area the channel splits into several small channels which join at the bottom of the disturbed area and drain into a culvert which drops the flow into a channel which eventually empties into the North Fork of Gordon Creek. Riparian vegetation covers an area of 0.42 acre (as along Jewkes Creek.

Prior to site construction, the water within the disturbed area spread into multiple channels, covering an area between thirty and fifty feet wide with water and supplying various vegetation. Riparian vegetation grows in the channel directly above the disturbed area and continues for approximately two hundred and forty feet down stream. The riparian vegetation cover is approximately fifty feet wide in this area, it then narrows and shifts sides of the canyon as it proceeds another 600 feet to Consumer/Clear Creek road where it crosses the existing culvert.

During the summer of 1997, the Horizon Mine site received extensive precipitation, with several storm events testing the drainage capacity of the culverts within the disturbed area. Runoff from storms on August 4 and 6 blocked or bypassed culverts ranging in size from 18 to 48 inches within the disturbed and permit boundaries. During the storm events, the riparian vegetation above and below the pad area was flattened by runoff and in some places uprooted and carried downstream. The damage to the area included extensive erosion, displacement of culverts, straining of sediment control structures, and cutting of new stream channels. To prevent additional erosion and damage to the area, a single channel (containing Jewkes Creek) was defined and constructed within the disturbed area boundary as described in Section 7.2.3.2.

The Jewkes Creek channel was extended by Carbon County and Hidden Splendor Resources below the disturbed area boundary and joins the North Fork of Gordon Creek. The altered Jewkes Creek channel involves property owned by Hidden Splendor Resources and Carbon County and a commitment has been made to reestablish riparian vegetation in this area (Stream Channel Alteration Permits Numbers 97-91-06SA and 97-91-12SA). Horizon was requested by both parties to assist in the planting of riparian vegetation. Horizon agreed to provide labor, seed, and plants to complete the planting of the entire realigned channel (861 feet) both within (151 feet) and beyond (710 feet) the disturbed area boundary. The channel bottom width is approximately 10 feet within the disturbed area boundary and varies between 6 and 10 feet below the disturbed area boundary. The channel area receiving riparian mitigation outside the disturbed area boundary is approximately 0.13 acre. The reseeded area within the disturbed boundary is 0.034 acre.

The channel was planted in 1997 with the Revegetation Seed Mix (Appendix 3-9) approved by the Division of Water Rights (Stream Channel Alteration Permits Numbers 97-91-06SA and 97-91-12SA). The reclamation riparian seed mix described in Section 3.5.5.2 will be planted in the reclamation channel during final reclamation within the disturbed area boundary, if the vegetation is not sufficient to meet revegetative success standards.

An area approximately 40 feet x 60 feet (0.055 acre) of preconstruction riparian vegetation below the sediment pond on the east side of Jewkes Creek was left as a mitigation requirement of UDOGM. Theis area ~~is fenced and~~ receives the annual precipitation for the area. However, due to the alteration of Jewkes Creek, the area will not receive significant water from the creek. The area was fenced until 1998 when according to Bill Malencik - DOGM the area was disturbed during the culvert extension and the cattle still found ways to get into this area. The fence was removed with his knowledge. This area is no longer required to be fenced. The planting of riparian vegetation in the altered Jewkes Creek channel outside the disturbed area ~~should~~would compensate for this area, in addition to the area (0.068 acres) ~~planned~~ for disturbance in the extension of Culvert UC-3. ~~In addition, a~~ At the request of UDOGM and the Division of Wildlife Resources and to satisfy mitigation requirements, a wetland (approximately 1.5 acres) owned by the Division of Wildlife Resources was fenced by Horizon in Coal Canyon one mile to the west of the mine site.

The protection of the riparian community within the disturbed area has been enhance by the realignment of the Consumers/Clear Creek county road and the Jewkes Creek channel. The realignment has moved the road approximately 200 feet west of the channel, where previously the road ran immediately adjacent to the stream channel.

Enhancement will include the application of mulch, fertilizer, tacifier and the planting of willows, sedges, and grasses. The channel has been designed to include meanders and a beneficial grade. Furthermore, coal waste no longer exists as a base material for the channel. The channel currently runs through clean rip-rap and fill material.

The 1997 environment for a riparian community is above and below the 36" culvert outlined on Plate 7-4. The riparian community above the Horizon disturbed area boundary was established many years prior to the current disturbance. The riparian community below the culvert is being recreated within the realigned channel. The first planting of willows and grasses have begun to sprout in the channel bottom, and a supplimental planting is planned for October 1997.

A threatened and endangered vegetation study of the permit area was done the week of August 21, 1995 by Patrick Collins of Mt. Nebo Scientific.

9.4.1.3 Moderately Disturbed Areas

Some of the areas have had considerable disturbance to the vegetation and the top few inches of soil, but have had relatively little deep, subsurface disturbance. These areas are presently dominated by rabbit brush (Chrysothamnus nauseosus), Wood's rose (Rosa woodsii), stinging nettle (Urtica dioica) and other species that can exist on disturbed areas (Appendix 9-1).

9.4.1.4 Severely Disturbed Areas

Other areas seemed to be severely disturbed to deeper levels in the soil horizons. These soils/spoils are often compacted and intermixed with coal waste. Much of this area is dominated by weedy species i.e. summer cypress (Kochia scoparia) and ragweed (Ambrosia psilostachya). For a list of existing plant species, refer to Appendix 9-1.

9.4.1.5 Results From Disturbed Areas

When the three disturbance types (altered drainage bottoms, moderately disturbed, severely disturbed) were combined, the total living cover was estimated at 48.35%. The cover consisted of 59.37% shrubs, 15.30% forbs and 25.33% grasses (Mt. Nebo Scientific, 1995, Appendix 9-1). A general species list for the 1995 disturbed area study by Mt. Nebo Scientific are listed in Table 9-2.

9.5 Vegetation Patterns Prior to Existing Disturbance

The areas previous disturbed by mining activities and which are proposed for new disturbances, are on valley bottoms and adjacent side slopes. Prior to disturbance, the drainages were probably dominated by a big sagebrush/grass/rabbit brush communities. The sagebrush/grass/rabbit brush communities likely had small, isolated patches of aspen, oak brush, fir and/or maple. Although water fed by springs and run off sometimes dissects the bottom lands, no developed riparian community within the proposed disturbed area existed prior to mining disturbance. However, presently riparian vegetation has established in the area.

The slopes that surround the valley bottoms are dominated by two major community types in its present natural condition: 1) big sagebrush/grass/rabbit brush (valley bottoms) and 2) oak brush/salina wildrye (side slopes). The Soil Conservation Service (George S. Cook, 1991) estimates that premining forage for the area were 950 lbs per acre for the big sagebrush/grass/rabbit brush community, 900 lbs per acre for the oak brush/salina wildrye communities and 1,500 lbs per acre for the semi-wet meadow range (1980).

9.6 Reference Areas

If needed and justified, reference areas will be established.

9.7 Vegetation Map

Plate 9-1 is the vegetation map of the permit area.

9.8 Success Monitoring and Bond Release

Transect areas were chosen and approved by the UDOGM to simulated the previously disturbed areas in their natural, undisturbed condition. The transects were sampled during the 1991 growing season by Mt. Nebo Scientific. Sampling methods followed UDOGM sampling guidelines (see Appendix 9-1). For bond release the sampling methods will be identical to those used in the baseline vegetation sampling, i.e. the UDOGM sampling guidelines contained in Appendix 9-1.

During 1995 Mt. Nebo Scientific sampled the Horizon disturbed area, transects were chosen and sampled. The transects are outlined on Plate 9-1. The riparian area along Jewkes Creek was sampled by Mt. Nebo Scientific in July of 1996. The total living cover of the surveyed riparian area was estimated by Mt. Nebo to be 71%, therefore postmining land use revegetation standards for the riparian zone within the disturbed area boundary, displaced by mine construction (Plate A, Appendix 9-2) will be met when the vegetation total living cover is 71%, corresponding with the 1996 sampling survey. This living cover will include grasses, forbs and shrubs. The 1996 survey listed the living cover to be comprised of 3.05% shrubs, with 66.19% grasses and the additional 30.76% of the cover being made up of forbs. Sampling and monitoring will be as outlined in this section.

Horizon commits to provide a reclamation channel design which will allow a reasonable likelihood of restablishing the riparian vegetation along Jewkes Creek which existed prior to the construction of the Horizon Mine.

The reclamation ground cover success will be monitored qualitatively every year of the 10 full years required. The ground cover will be monitored quantitatively in year 2, 3, 5, 9, and 10 during the 10 years of extended responsibility (see Table 9-3). The data collected will be submitted to UDOGM in an annual report.

At a minimum the reclamation vegetative ground cover will equal the present ground cover, and will be adequate to control erosion. Revegetative success standard will comply with UDOGM regulation R645-301-356.

Postmining land use revegetation standards will be met when the vegetation total living cover
is 48% which corresponds with the 1995 sampling survey performed by Mt. Nebo Scientific. This living cover should include 59% woody species, with the additional 41% of the cover being made up of flora and grasses.

At the time of bond release, shrubs and trees will be healthy, and at a minimum 80 percent will have been in place for at least six growing seasons during the 10 year period of responsibility. Vegetative ground cover will be sufficient to achieve postmining land use and comply with reference area standards of vegetative cover success.

9.9 Threatened and Endangered Species

Table 9-4 contains Federally listed and proposed endangered species in Utah. No threatened or endangered plant species were observed during the study and sampling by Mt. Nebo Scientific in 1995.

TABLE 9-3

Reclamation Monitoring Schedule

	YEAR									
	1	2	3	4	5	6	7	8	9	10
QUALITATIVE SAMPLING	X	X	X	X	X	X	X	X	X	X
QUANTITATIVE SAMPLING										
Cover		X	X		X				X	X
Frequency		X	X		X				X	X
Woody Plant Density		X	X		X				X	X
Transplant Survival	X	X	X		X					
Productivity									X	X

TABLE 9-4

Federally Listed and Proposed Endangered Species in Utah
January 1996

Plants

Arizona willow	Salix arizonica	PE
Autumn buttercup	Ranunculus aestivalis	E
Barneby reed-mustard	Schoenocrambe barnebyi	E
Barneby ridge-cress	Lepidium barnebyanum	E
Clay reed-mustard	Schoenocrambe argillacea	T
Clay phacelia	Phacelia argillacea	E
Dwarf bear poppy	Arctomecon humilis	E
Heliotrope milk-vetch[1]	Astragalus montii	T
Jones cycladenia	Cycladenia humilis var. jonesii	T
Kodachrome bladderpod	Lesquerella tumulosa	E
Kodachrome pepper-grass	Lepidium montanum var. stellae	PE
Last chance townsedia	Townsendia aprica	T
Maguire daisy	Erigeron maguirei var maguirei	E
Maguire daisy	Erigeron maguirei	PT
Maguire primrose	Primula maguirei	T
Navajo sedge[1]	Carex specuicola	T
San Rafael cactus	Pediocactus despainii	E
Shrubby reed-mustard	Schoencrambe suffrutescens	E
Siler cactus	Pediocactus sileri	T
Uinta Basin hookless cactus	Sclerocactus glaucus	T
Ute Ladies'-tresses	Spiranthes diluvialis	T
Welsh's milkweed[1]	Asclepias welshii	T
Winkler cactus	Pediocactus winkleri	PE
Wright fishhook cactus	Sclerocactus wrightiae	E

[1] Critical habitat designated.

E - Endangered PE - Proposed Endangered T - Threatened PT - Proposed Threatened

For additional information contact: U.S. Fish and Wildlife Service, 145 East 1300 South, Salt Lake City, Utah 84115, Telephone: (801)524-5001

APPENDIX 9-1

VEGETATION DATA

SPECIES LIST FOR PREVIOUSLY ALTERED DRAINAGE

Trees and Shrubs	
White Fir	Abies concolor
Big-toothed Maple	Acer grandidentatum
Box Elder	Acer negundo
Serviceberry	Amelanchier utahensis
Big Sagebrush	Artemisia tridentata
Rubber Rabbitbrush	Chyrysothamnus nauseosus
Low Rabbitbrush	Chrysothamnus vicidiflorus
Oregon Grape	Mahonia repens
Aspen	Populus tremuloides
Chokecherry	Prunus viginiana
Douglas Fir	Pseudotsuga menziesii
Scrub oak	Quercus gambelii
Wood's Rose	Rosa woodsii
Willow	Salix caudata
Snowberry	Symphoricarpos oreophilus
Forbs	
Yarrow	Achillea millefolium
Louisiana Sagewort	Artemisia ludoviciana
Aster	Aster spp.
Milkvetch	Astragalus spp.
Thistle	Circium pulchellum

SPECIES LIST FOR THE PREVIOUSLY ALTERED DRAINAGE (Continued)

Forbs	
Thistle	Circium vulgare
Wild Geranium	Geranium carolinianum
Stickweed	Hackelia micrantha
Hoary Aster	Machaeranthera canescens
Penstemon	Penstemon sp.
Watson's Penstemon	Penstemon watsonii
Curly Dock	Rumex crispus
Dock	Rumex pauciflorus
Russian Thistle	Salsola iberica
Globemallow	Sphaeralcea coccinea
Stinging Nettle	Urtica dioica
Showy Goldeneye	Viguiera multiflora
Mules Ear	Wyethia amplexicaulis
Grasses	
Tall Oatgrass	Arrhenatherum elatius
Orchardgrass	Dactylis glomerata
Salina Wildrye	Elymus salinus
Western Wheatgrass	Elymus smithii
Junegrass	Koeleria macrantha
Indian Ricegrass	Stipa hymenoides
Timothy	Phleum alpina
Muttongrass	Poa fendleriana
Squirreltail	Sitanion hystrix

SPECIES LIST FOR MODERATELY DISTURBED AREA

Trees and Shrubs	
Rubber Rabbitbrush	Chrysothamnus nauseosus
Wood's Rose	Rosa woodsii
Elderberry	Sambucus caerulea
Snowberry	Symphoricarpos oreophilus
Forbs	
Burdock	Arctium minus
Aster	Aster spp.
Hound's Tongue	Cynoglossum officinale
Stinging Nettle	Urticka dioica
Grasses	
Salina Wildrye	Elymus salinus
Wheatgrass	Elymus spp.
Letterman nettlegrass	Stipa lettermanii

SPECIES LIST FOR SEVERELY DISTURBED AREA

Trees and Shrubs	
Big Sagebrush	Artemisia tridentata
Rubber Rabbitbrush	Chrysothamnus nauseosus
Scrub Oak	Quercus gambelii
Forbs	
Western Ragweed	Ambrosia psilostachya
Burdock	Arctium minus
Thistle	Circium pulchellum
Bindweed	Convolvulus arvensis
Tansy Mustard	Descurainia pinnata
Stickseed	Hackelia micrantha
Kochia	Kochia scoparia
Stickweed	Lappula redowski
Hoary Aster	Machaeranthera canescens
Bluebells	Mertensia ciliata
Curly Dock	Rumex crispus
Russian Thistle	Salsola iberica
Stinging Nettle	Urtica dioica
Mules Ear	Wyethia amplexicaulis
Grasses	
Cheatgrass	Bromus tectorum
Foxtail Barley	Hordeum jubatum
Rabbitfoot Grass	Polypogon monspeliensis

SPECIES LIST FOR UNDISTURBED SALINA WILDRYE COMMUNITY

Trees and Shrubs	
Bigelov's Sagebrush	Artemisia bigelovii
Big Sagebrush*	Artemisia tridentata
Mountain Mahogany	Cercocarpos montanus
Rubber Rabbitbrush	Chrysothamnus nauseosus
Corymb Buckwheat	Eriogonum corybosum
Broom Snakeweed	Gutierrezia sarothrae
Rocky Mountain Juniper	Juniperus scopulorum
Oregon Grape	Mahonia repens
Prickly Pear Cactus	Opuntia polyacantha
Scrub Oak	Quercus gambelii
Elderberry	Sambucus caerulea
Snowberry	Symphoricarpos oreophilus
Gray Horsebush	Tetradymia canescens
Forbs	
Yarrow	Achillea millefolium
Androsace	Androsace septentrionalis
Rosy Pussytoes	Antennaria microphylla
Louisiana Sagewort	Artemisia ludoviciana
Milkvetch	Astragalus spp.
Thistle	Circium sp.
Rock Goldenrod	Petradoria pumila
Globemallow	Sphaeralcea coccinea

SPECIES LIST FOR UNDISTURBED SALINA WILDRYE COMMUNITY (Continued)

Grasses	
Tall Oatgrass	Arrhenatherum elatius
Salina Wildrye	Elymus salinus
Western Wheatgrass	Elymus smithii
Junegrass	Koeleria macrantha

APPENDIX 9-2

RIPARIAN DATA

Add to the end of existing data

CHAPTER 10

FISH AND WILDLIFE RESOURCES

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CHAPTER 10

FISH AND WILDLIFE RESOURCES

10.1 Scope

10.1.1 Objectives

The fish and wildlife studies for the ~~Horizon Coal Corporation~~Hidden Splendor Resources, Inc., Carbon County, Utah have been designed to satisfy the regulations for permit applications for the Utah Division of Oil, Gas and Mining (UDOGM). The studies also will provide data useful to ~~Horizon Coal Corporation~~Hidden Splendor Resources, Inc. in future mining activities and long-term reclamation programs.

10.1.2 Location and Ecological Setting

The study area is located along the eastern edge of the Wasatch Plateau in Carbon County, Utah. Topographically, the study area consists of steep slopes on the face of the plateau and along drainages, flat surfaces or terraces or flood plains in valley bottoms and relatively gentle terrain on top of the plateau. The area is underlain by nearly flat sedimentary rocks of the Tertio-Cretaceous North Horn Formation and the Lower Tertiary Flagstaff Formation.

The study area has a highly continental climate with large daily and seasonal variations in temperature. Higher elevations receive more precipitation, much of it as snow which persists through the winter. The vegetation of the study area is highly variable, due to difference in elevation and exposure.

10.2 Methodology

10.2.1 Literature Review

One of the initial steps in the fish and wildlife studies was to review open-file data and range maps available from the Utah Division of Wildlife Resources (DWR) Regional Office in Price, Utah. The purpose of this effort was two-fold: first, it provided a regional backdrop of wildlife information; second, it was helpful in identifying areas of concern to DWR and thus ensuring that their needs and preferences were addressed.

In March 1981, DWR provided detailed wildlife information for the permit area, as requested by Blue Blaze Coal Company. DWR also prepared a wildlife plan representing their recommendations for mitigation and impact avoidance procedures. The DWR personnel providing the information contained in this chapter were John Livesay, Larry Dalton, Darrel Nish, Clark Johnson, Bill Bates, Robert G. Valentine, and Cleon B. Feight.

10.2.2 Terrestrial Studies

The methods used during field work were designed to provide descriptive and quantitative data for terrestrial wildlife in the mine plan area. Wildlife data collected for the studies followed a stratified approach based on habitat types. In many instances, wildlife habitats did not strictly coincide with plant communities, being based on topographic as well as vegetational factors. Therefore, some plant community units were combined or split to best reflect wildlife utilization. The correlation between plant communities and wildlife habitats is discussed in Section 10.3.1.

The methods employed in addressing the various groups of terrestrial vertebrates were discussed with Larry Dalton of DWR in Price, Utah, in September 1980 prior to initiating field studies. These methods are summarized in the following sections.

10.2.2.1 Mammals

For the purpose of field study, this diverse group of organisms was divided into large mammals, medium-sized mammals, and small mammals.

Large mammals consist of large herbivores and large carnivores. For the North Fork Gordon Creek study area these species were studied through a combination of systematic transects and opportunistic sightings. Road surveys were conducted during each field session to obtain data on abundance, distribution, and habitat use. This data was augmented with walked transects across each habitat type. Walked transects afforded an opportunity to evaluate differential habitat uses from indices such as pellet group densities and percent browse utilization. Opportunistic sightings during other wildlife efforts were particularly useful for species either too uncommon or furtive to be regularly encountered during systematic surveys or restricted to limited habitats. Aerial surveys were initially proposed but were dropped at the request of DWR.

Medium-sized mammals, such as predators, lagomorphs (rabbits and hares), and large rodents were also surveyed by a combination of systematic and opportunistic techniques. Road transects at dawn and dusk were important for predators and lagomorphs, most of which are most active at these times (i.e., "crepuscular"). Data on sign of the crepuscular species and on actual observation of diurnal species were recorded in conjunction with various daytime field efforts.

Small mammals, which may be used as indicators of ecosystem quality and reclamation success, were to have been surveyed using Sherman live-traps set in lines through each habitat type. As the aerial surveys, DWR specified that this technique was not being used. Therefore, small mammal information presented in this report is drawn almost exclusively from DWR (1978) and Durrant (1952).

10.2.2.2 Birds

The most efficient grouping of birds for field studies and baseline reports is raptors, upland fowl, water birds and small birds or songbirds.

Raptors were observed and recorded throughout the field program. Daytime surveys were best for hawks and eagles, while dawn/dusk surveys resulted in most sightings of owls. In addition, areas of potential importance e.g., cliffs, riparian areas, and abandoned buildings were specifically searched in an attempt to locate nest sights. Raptor surveys followed the standard survey techniques described by Call (1978). The raptor nestings were documented by the DWR (see Section 10.3.2.4). A baseline raptor study was done by Janet Lee Young, Ph.D. in a one kilometer radius from the portal area on May 28 - 30, 1980. The general information contained in this section was provided by the DWR.

Upland game bird surveys were conducted in conjunction with other field programs and relied primarily on chance encounters of the birds of their sign. Special effort was placed on determining if upland fowl breed in the study area or are present in sufficient numbers to offer recreational value.

Water birds (waterfowl, shorebirds, wading birds) were surveyed in a similar approach as other large birds i.e., during all field programs plus specific visits to suitable habitats, such as ponds and slow-moving streams. As with the upland game birds, emphasis were placed on determining the extent to which the study area provided breeding sites and the importance of these species as a recreational resource.

"Small birds" are a heterogeneous group. For the wildlife studies, this group included perching birds, woodpeckers, hummingbirds, swifts, and frog-mouths. In late summer, fall and winter surveys, the presence, distribution, and abundance of small birds was determined along walked transects in each habitat type and by opportunistic sightings during the initial site reconnaissance. During the breeding season (spring and early summer), quantitative data were obtained by counting the number of breeding pairs (territorial males) of each species within numerous plots located systematically along transect routes through each habitat type. Audial identification was emphasized during this census to avoid problems of differential detectability of species (as a function of conspicuousness and activity patterns) and visual penetration of habitats (e.g., and dense willow thicket verses an open stand of mountain brush).

The small bird transects were not permanently established routes, because the emphasis was on obtaining data from a large number of plots throughout each habitat type, rather than on repeated surveys of a small number of plots. The reasons for selecting this technique are that (1) habitats in the study area are heterogeneous and a larger sample size is necessary to adequately describe the avifauna of each, and (2) year-to-year variability within the complex habitats probably would mask any long-term trends in density, diversity, and composition.

10.2.2.3 Reptiles and Amphibians

These species were surveyed in combination with other field efforts. For most reptiles and amphibians, sightings provided sufficient detail on abundance and distribution. Amphibians, however, were surveyed by visiting potential breeding sites, such as ponds or marshy areas, during the spring breeding period, when they could be identified by their vocalizations.

10.2.3 Aquatic Studies

Field and lab methods used in the North Fork Gordon Creek and Beaver Creek aquatic studies were selected in describing the biotic and abiotic components of study area streams, discerning possible impacts of the proposed mining operation, and recommending future mitigation and monitoring programs. Biotic components specifically included sampling for macroinvertebrates and evaluating the fisheries potential. Abiotic components included field techniques for testing water quality, as well as descriptions of substrate and channel morphology. Studies were conducted in November 1980 and April and June 1981.

The overall quality of aquatic habitat in Jewkes Creek is limited due to erosion, siltation, limited cover, and low flow during most months, except during spring runoff. Jewkes Creek runs over an area disturbed by mining, grazing, and recreational use. In addition the county road (Consumer/Clear Creek) along most of Jewkes Creek provides a source for dust, debris, and silt. During 1995 the road was graded and widened constantly by a logging operation, timbering along the Consumer/Clear Creek road near Beaver Creek, causing a substantial increase of erosion and siltation in the both Jewkes and Beaver Creeks. Several springs contributing to Jewkes Creek run along the road, thus collecting more sediment than prior to the logging operation. The Consumer/Clear Creek road connecting Carbon County Road 290 to Utah State Highway 96 at Clear Creek has been used for recreation and the movement of livestock since the early 1900. The road receives use from snowmelt in the Spring to snowfall in the Winter.

Under the present conditions Jewkes Creek is limited in it's ability to support aquatic life. The presence of thick silt/clay layer on the creek substrates limit the development of a productive and diverse macroinvertebrate community, thus fish would not have a sufficient food source in Jewkes Creek.

A spring (late May/early June) and a fall (September/October) macroinvertebrate survey will be performed in the North Fork of Gordon Creek, by a qualified person, on standardized dates beginning in the spring of 2001. The surveys will be done every year for three years then every other year after that until final bond release. On each sampling date, samples will be taken from a site 0.2 of a mile above the confluence of the Jewkes Creek and the North fork of Gordon Creek, and a site 0.1 below the confluence of those streams. The Division will be notified prior to the surveys.

In conjunction with the discharge of in-mine water to the sediment pond in 1998 and 1999 a W.E.T. Chronic Toxicity Report was prepared. Tests were performed on fathead minnows and ceriofaphnia dubia to determine survival and reproduction in the water being discharged from the mine and the water in Jewkes Creek. The report and its findings are located in Appendix 7-2, Attachment A.

Although the riparian cover provided by Jewkes Creek is very important the quantity of cover is limited due to the variation in flow during the growing months. During 1996 the spring runoff was early and carried an increased amount of sediment to the North Fork of Gordon Creek. Unlike the present industrial disturbance (logging) to Jewkes Canyon, Horizon will install and maintain proper sediment control measures during facility construction and operation.

10.2.3.1 Sample Site Selection

Aquatic studies involved six stream sample sites: four in the Beaver Creek system and two in the North Fork Gordon Creek system. The sites were selected to provide information from representative stream reaches, above and below substantial tributaries.

The sites on North Fork Gordon Creek were located in the drainage south of Bryner Canyon (see Appendix 10-2). The sites are located southwest of the Horizon permit area.

The two sites in Beaver Creek were located upstream of the unnamed stream which is tributary in extreme northwestern Section 18. A third site was located on the unnamed tributary called Spring Creek), and the fourth site was about 1 kilometer farther downstream, in southern Section 7.

See Section 10.2.3 for details of planned aquatic studies.

10.2.3.2 Habitat Quality

Basic physicochemical characteristics of surface water related to aquatic ecosystem quality were evaluated using standard field equipment during both the spring and winter surveys. Chemical characteristics at all sample sites were determined with a Hach Fish Culturist water chemistry kit, while temperature was measured with a mercury thermometer submersed for at least 5 minutes.

10.2.3.3 Aquatic Invertebrates

Biological community surveys involved use of a 0.5 mm mesh Surber sampler to collect aquatic invertebrates. At each sample site, the substrate was agitated with a 1 square foot area to dislodge invertebrates, which were swept by the stream current into a trailing net. Surber samples were collected from a riffle, a run, and a pool at each site. The composite samples were fixed in the field and returned to the lab for enumeration and identification to the lowest practicable taxonomic level (usually genus). Identification was based on standard reference works for the region (e.g., Baumann et al. 1977, Merritt and Cummins 1978, Pennak 1978).

Nongame fish were to be sampled with a dip-net to determine species composition and relative abundance, but none was observed during either survey.

10.3 Existing Fish and Wildlife Resources

10.3.1 Wildlife Habitats in the Mine Plan Area

Wildlife habitat types were identified and described during the initial field visits to the North Fork Gordon Creek area. Habitats distinguishable in the North Fork Gordon Creek area are described below.

10.3.1.1 Big Sagebrush

At lower elevations, Big Sagebrush occurred as dense, essentially monotypic stands on terraces adjacent to major drainages. The availability of green sapwood throughout the winter probably makes these areas fairly attractive to large herbivores during periods when browse is unavailable or snow is too deep at higher elevations.

Atop the plateau, Big Sagebrush occurred as relatively small stands on slopes adjacent to valley bottoms, particularly on south-facing exposures. Other shrubs associated with this community type included Antelope Bitterbrush, Rubber Rabbitbrush, and Silver Sagebrush.

10.3.1.2 Mountain Shrub

One of the most widespread habitats, especially on steep slopes at lower elevations, was a highly variable mixture of shrub species typical of mountainous areas in the region. In general, two basic phases could be defined.

The xeric phase was prevalent on south-facing slopes. Characteristically, these areas were dominated by open stands of Gambel's Oak with varying amounts of Alder-leaf Mountain Mahogany, Serviceberry, Snowberry, Antelope Bitterbrush, and Rubber Rabbitbrush. Conspicuous herbaceous species during early fall were a Tansy-aster and Salina Wildrye. At higher elevations, some southfacing slopes were strongly dominated by Greenleaf Manzanita an evergreen shrub of particular values to wildlife.

The mesic phase, typically occurring on north-facing slopes, was dominated by dense stands of Gambel's Oak or Wasatch Maple. Associated woody plants included isolated clumps of Quaking Aspen, scattered Douglas Fir, and White Fir (often appearing to represent a later successional stage), and shrubs such as Chokecherry, Serviceberry, Snowberry, Woods' Rose, Oregon grape, and Mountain lower. The variable herbaceous stratum was dominated by Mountain Brome, Nodding Brome, and perennial forbs such as Aster, Erigeron, Fragaria, Frasera, Galium, Geranium, Lathyrus, Thalictrum, and Vicia.

The Vegetation Map (Plate 9-1) refers to both of these habitat phases as Oakbrush.

10.3.1.3 Slope Bunchgrass

This rather widespread habitat was similar in composition to Xeric Mountain Shrub habitat, except for the near absence of woody species. The dominant plant was the bunchgrass Salina Wildrye. The casual distinction between these two xeric communities is not clear, but it probably is related to soil moisture and texture.

10.3.1.4 Middle Elevation Conifer

This widespread habitat type was limited to north-facing slopes and along drainages, typically appearing as isolated clumps scattered through larger areas of Aspen or Mesic Mountain Shrub. Mature White Firs and Douglas Firs were visually and numerically dominant throughout. Prominent understory species were Mountain Snowberry, Oregon Grape, Currants, Mallow Ninebark, Woods' Rose, Aster, Fragaria, and Heuchera.

10.3.1.5 High Elevation Conifer

Atop the Wasatch Plateau especially at elevations of 8,500 ft. or higher, coniferous forests were dominated by Engelman Spruce, Subalpine Fir, and Douglas Fir. Understory species were similar to those described above for Middle Elevation Conifer Forests. Although comprising a significant portion of the mine study areas. High Elevation Conifer habitats did not occur in the mine area.

10.3.1.6 Aspen

Dense stands of mature Quaking Aspen occurred as a mosaic in moist sites, either on north slopes among Mesic Mountain Shrubs and Middle Elevation Conifers or along forest edges adjacent to High Elevation Conifers. In both occurrences, the understory was similar to other mesic habitats; prominent species included Mountain Snowberry, Mountain-lower, Oregon Holly-grape, Fragaria, Geranium, Lathyrus, Thalictrum, and Vicia. In the north-slope phase of this community type, Wasatch Maple often was sufficiently common to be considered a co-dominant. This habitat does not occur in the disturbed mine area.

10.3.1.7 Mixed Riparian

Streams at lower elevations in the study area generally were characterized by riparian vegetation dominated by larger deciduous shrubs: Mountain Maple, Redtwig Dogwood, Elderberry, Chokecherry, and Willow (Salix) species. This assemblage was most common in shaded areas, where the stream was closest to the base of north-facing slopes. More open sites often lacked a distinct riparian community, instead being dominated by species occurring on adjacent xeric hillsides. Trees frequently were absent altogether, but some sites did support large Plains Cottonwoods and Box Elders.

At higher elevations, aspen and conifers (including Blue Spruce) often occurred as part of the riparian complex. Refer to Chapter 9 for information pertaining to the riparian vegetation within the area to be disturbed by mining operations.

10.2.1.8 Subalpine Moist Meadow

Moist meadows commonly were the dominant riparian habitat type above 8,500 ft. These open areas supported dense stands of mesic grasses, such as Foxtail, Red-top, Canada Wildrye, Reed Canary-grass, Bluegrass species, and Sedge species.

10.3.1.9 Aquatic Ecosystems

The two major aquatic habitats within the study area are North Fork Gordon Creek and Beaver Creek.

North Fork Gordon Creek originates from two unnamed intermittent tributaries about 5 kilometers (km) southwest of the mine site, at an elevation of about 8,750 ft. Within the study area, North Fork Gordon Creek is augmented by a number of minor intermittent tributaries, (particularly the Jewkes Creek) that flows through the mine site. North Fork Gordon Creek covers approximately 3.5 miles of stream length, with a mean gradient of 340 ft/mile or 6.5 percent. The stream has few meanders but is characterized by scattered beaver ponds. Riparian vegetation is poorly developed along much of its length.

Beaver Creek originates at 9,200 ft. about 4 km west of the mine site, first being mapped as a perennial stream at an elevation of 8,950 ft. 0.8 kilometer below its upper end. Beaver Creek is fed by a perennial stream ("Spring Creek") within the study area. During the 1980-81 field studies, however, this tributary was dry above the spring (8,550 ft.) except during snow-melt. Between the upper limits of permanent water and its confluence with Sand Gulch near the northern end of the study area at 8,300 ft., Beaver Creek has a mean gradient of 650 ft/mile (12 percent). Much of the stream length is characterized by active or abandoned beaver ponds, willow thickets, and wet meadows with fairly well-developed meanders in some broader sections.

Jewkes Creek originates at 8,240 feet at the spring being monitored by Horizon as SP-1. For the location of SP-1 refer to Plate 7-1. Multiple springs add to the flow in Jewkes Creek as it drops from the 8,240 feet to 7,600 feet and empties into the North Fork of Gordon Creek. Jewkes Creek is an intermittent stream which enters the ~~Horizon~~Hidden Splendor Resources, Inc. disturbed area at approximately 7,600 feet. A riparian area has developed within the disturbed area and is of value to the established vegetation and area wildlife.

10.3.2 Wildlife

10.3.2.1 Aquatic Wildlife Habitat Value Determination

Based on benthic macroinvertebrate and aquatic habitat surveys, and on data provided by DWR (1981a), North Fork Gordon Creek was of limited value as a fishery. North Fork of Gordon Creek did not support game species until the early 1980s when cutthroat trout were introduced into the North Fork Gordon Creek bv DWR and Gordon Creek Coal Company employees. ~~Horizon~~Hidden Splendor Resources, Inc., will avoid disturbance to riparian vegetation associated with the North Fork of Gordon Creek and Beaver Creek.

Beaver Creek is ranked by DWR as being of substantial value as a salmonid fishery, with a self-sustaining population of introduced Yellowstone Cutthroat Trout. Nongame fish species listed by DWR for Beaver Creek in the study area are the Mottled Sculpin, Mountain Sucker, and Speckled Dace. No fish were seen in Beaver Creek during the April or June surveys, suggesting that populations are fairly small in the study area, probably due to low flows and low gradients (the latter reflected by fairly high temperatures). Fish surveys were not conducted because the mining project is not expected to affect the stream. This was recognized by DWR in their evaluation of wildlife in the study area (DWR 1981a).

The greatest value of both Beaver Creek and North Fork Gordon Creek aquatic habitats in the area probably is the water, cover, food and breeding sites they provide to a variety of terrestrial vertebrates.

As used in this report, "value" incorporates both ecological and economic criteria. Examples of criteria used in evaluating value include considerations such as whether a species is an indicator of environmental stress, critical to the food web as a prey or predator, important for monitoring programs. High value habitats are those which support especially high diversities or densities of wildlife, attract species not otherwise found in the area, or are important to high value wildlife species.

Information provided by DWR (1981a) indicate that the most important habitat types in the study area are the Mixed Riparian zones along Beaver Creek and North Fork Gordon Creek and the Subalpine Moist Meadows atop the plateaus. The reasons for classifying Mixed Riparian as the highest priority wildlife habitat are the availability of water and the structural and compositional diversity of the plant community. The second point directly or indirectly affects a number of factors, such as feeding sites, nesting sites, resting or roosting sites, and quantity and quality of food items (such as herbage, seeds, fruit, invertebrates, and small vertebrates). Moist meadows also possess many of these ecological qualities, although they lack structural diversity.

Other high priority habitats listed by DWR (1981a) are seeps or springs which provide water, and cliffs which afford nesting sites for many species of raptorial birds.

DWR's designation of riparian and moist meadow habitats as "crucial", because they are limited in extent, attract species not otherwise present, and support high densities of small animals. However, all habitats are important by some criteria. Thus, for example, Xeric Mountain Shrub provides valuable winter forage for deer and elk, while Middle and High Elevation Conifers and Aspen provide thermal and hiding cover for the same species.

Certainly one of the most important habitats is in the vicinity of the North Fork Gordon Creek Study area is the mosaic or chained pinyon/juniper and pasture maintained by DWR as the Gordon Creek Wildlife Management Area to provide high priority and crucial-critical winter range for deer and elk. The high quality of these areas is related to the combination of shrubs for winter browse in the chained areas, palatable grasses and legumes for nutritions early spring forage in the pastures, and thermal and hiding cover in unchained areas along drainages. The value of these areas is discussed further in subsequent sections on big game impacts.

At the request of the applicant, the methods used for studying the various groups of terrestrial vertebrates were discussed informally with Larry Dalton of DWR in Price, Utah, in September, 1980. These methods are summarized in the following sections.

10.3.2.2 Mammals

Sixty-six species of mammals are known to inhabit the biogeographic area in which the project and adjacent areas are located. It is probable that all of these species inhabit the project area (reference the DWR Publication No. 90-11).

The red bat is a summer resident of the biogeographic area that surrounds the project site. The animal roosts in wooded areas (riparian woods and pinion-juniper forests) of the submontane ecological association. Such areas represent this animal's substantial valued use area. An occasional individual has been known to utilize caves; those individuals could hibernate and remain over winter.

The western big-eared bat is a year resident of the biogeographic area that surrounds the project site. This animal roosts and hibernates within caves, mine tunnels or suitable buildings located in the pinion-juniper, shrubland and low elevation spruce-fir habitats of the submontane and montane (Canadian life zone) ecological association. Such areas represent this bat's substantial valued use area. No bats were found to inhabit the mine tunnels of the mine area. At the request of Bill Bates of the DWR a letter was written to his attention on April 30, 1992 by William R. Skaggs. The letter stated that Mr. Skaggs had observed no bats inhabiting the mine workings when he had been inside the mine. Mr. Brad Bourquin has written a letter concerning his inspection in December 1995 of the abandoned Blue Blaze mine portals for bats. Mr. Bourquin did not observe bats during his inspection. Copies of these letter can be found in Appendix 10-1.

On June 14, 1996 a bat survey in the proposed Horizon mine portals was performed by Brad Lengas, a qualified biologist. A report of his findings is included in Appendix 10-1. The report states that "the adit(s) show no evidence of being used as summer bat roost(s)".

The snowshoe hare is a yearlong resident of the biogeographic area that surrounds the project site. Its relative abundance has been determined to be limited, since its substantial values use area is restricted to the spruce-fir and nearby aspen and riparian habitats of the montane (Canadian and Hudsonian life zones) ecological association. Such areas are ranked as being of high-priority value to the animal during its breeding season which spans the period between early April and Mid-August.

The cottontail rabbit (mountain cottontail inhabits sites lying between 7,000 and 9,000 feet in elevation and the desert cottontail inhabits sites lower than 7,000 feet in elevation) is a yearlong resident of the biogeographic area that surrounds the project site. The entire project area represents a substantial valued use area for cottontails. Their young are born between April and July. This is a crucial period for maintenance of the cottontail population.

The northern flying squirrel is a yearlong resident of the biogeographic area that surrounds the project site. Currently, its relative abundance is unknown. Its substantial valued use area is restricted to spruce-fir or other mixed conifer habitats of the montane (Canadian and Hudsonian life zones) ecological association. This species is the only nocturnal squirrel in Utah. The flying squirrel may build its nest within an old woodpecker hole or it may build an outside nest of leaves, twigs and bark. Mating occurs twice in each year, February through March and June through July. Two to six young are born after a gestation period of 40 days, April through May and August through September. These periods are of crucial value to maintenance of their populations. During winter flying squirrels are gregarious; 20 or more have been known to den together.

Beaver are yearlong inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is restricted to riparian and adjacent aspen habitats (those located within 100 meters of the riparian zone) in the cold desert, submontane and montane (Canadian life zone) ecological associations. These animals construct a conical shaped lodge in which a family group lives throughout the year. The lodge is of critical value to maintenance of the beaver population. One litter of kits is produced each year; they are born between late April and early July after a gestation period of 128 days. Kits and yearlings co-inhabit the lodge with the adult pair. When they attain 2 years of age they are forced to leave; females can breed at 2.5 years of age. Due to the animal's dependency upon flowing water and the associated riparian vegetation, the riparian wildlife habitat is ranked as being of critical value to beaver populations.

The red fox is a yearlong inhabitant of the biogeographic area that surrounds the project site. The substantial valued use area for the red fox would include all wildlife habitats extending from the cold desert through the montane (Canadian life zone) ecological associations. Almost nothing is known of their population dynamics. Without doubt a crucial period for the red fox is when they are caring for young in the den. Dens while being inhabited are a critical use area.

The gray wolf is a historic inhabitant of the biogeographic area that surrounds the project site. Currently its relative abundance is so low that the animal is listed as endangered with extinction. The wolf's substantial valued use would be represented by any remote habitat in any ecological association.

Black bears are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is represented by all natural wildlife habitats (excluding the pasture and fields and urban or park types) extending from the submontane into the montane (Canadian and Hudsonian life zone) ecological associations. These animals go into a semi-hibernation during winter. During this crucial period, which may last from December through March, the animal secrets itself in a den in order to conserve body energy reserves. The young are born in the den during January or February. Dens while being inhabited represent a critical valued use area for bears.

Many of the members of the family mustelidae are known to inhabit the biogeographic area that surrounds the project site. They are all protected and classified as furbearers, short-tailed and long-tailed weasels, mink, wolverine, marten, badger, striped and spotted skunks. Additionally, raccoon and muskrat, although not furbearers, are also inhabitants of the biogeographic area that surround the project site.

The substantial valued use area for short-tailed and long-tailed weasels, mink, muskrat and raccoons is the riparian habitat. Weasels, which are inhabitants of the project site, do make some use of other habitats that are proximal to riparian zones. Muskrats and raccoons are restricted to riparian habitats of the cold desert and submontane ecological association; thus, they are not found on the project area. The long-tailed weasel can be found from the cold desert up into the montane (Canadian and Hudsonian life zones) ecological associations. The short-tailed weasel and mink populations extend their use from the submontane into the montane ecological association. It is important to note that the weasel is restricted to the Canadian life zone; where as the mink utilize the Canadian and Hudsonian life zones.

The substantial valued use area for marten and wolverine is the montane ecological association. The marten does not utilize the Alpine life zone but the wolverine can be found at that elevation. Both species could be found in the environs of the project site.

The substantial valued use area for badger and skunk span all wildlife habitats other than dense forests in the cold desert, submontane and montane (Canadian life zone) ecological associations. Skunks show some preference for habitats proximal to water. Skunks and badgers are dependent upon a suitable prey source.

A crucial period for maintenance of all fur bearers, raccoons and muskrat populations is when they have young in a nest, den or lodge. Such sites are critical for reproductive success.

Bobcat, Canada lynx and cougar are known to inhabit the biogeographic area that surrounds the project site. For all of these species a crucial period for maintenance of their population is when the female has her young secreted at a den site. It is also crucial to their survival that a female accompanied by young not be killed or harassed.

The substantial valued use area for bobcats extends from the cold desert through the submontane and into the montane (Canadian life zone) ecological association. The bobcat is normally associated with precipitous terrain, but has been observed in every wildlife habitat within the aforementioned ecological associations.

The substantial valued use area for the Canada lynx is restricted to the Canadian and Hudsonian life zones of the montane ecological association. Normally, this cat would only be expected to utilize riparian and forested wildlife habitats. The lynx is similar to predation habits to the bobcat.

The substantial valued use area for the cougar extends from the submontane into the montane (Canadian and Hudsonian life zones) ecological association. Due to the dependance of the cougar upon mule deer as a prey source, a ranking of the lion's seasonal distribution parallels that of the deer.

Mule deer are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the cold desert through the submontane and montane ecological associations. In some situations deer show altitudinal migrations in response to winter conditions. There are, however, habitats where deer reside on a yearlong basis.

Migration of mule deer from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting season coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the deer's urge to migrate and continued adverse weather keeps the deer on the winter rage.

A portion of the area represents winter range for mule deer herd unit 30. Winter ranges for mule deer are all ranked as being of high-priority value to the animal (inhabited between November 1 and May 15). During winters with severe conditions the higher elevation portion of the winter range becomes unavailable to deer due to snow depth. Although, no critical winter range is found on the project area, the access route passes through high-priority and critical valued use areas.

Mule deer fawn during the month of June. The wildlife habitats extending from the pinion-juniper through the shrubland and into the aspen type probably represents the fawning area. All riparian areas are of critical value for fawning and maintenance of the deer population. To date no specific areas showing annual use for fawning are known. It is important to note that June represents a crucial period for maintenance of deer populations.

Agriculture areas nearby (Gordon Creek Wildlife Management Area) to the project area are utilized yearlong by mule deer. Their use is intensified during the winter and spring periods.

Moose are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats in the montane ecological association except those associated with the Alpine life zone. Migration of moose from summer range to winter range is initiated during late November. Winter ranges are usually inhabited by moose between December 1 and May 15 each year. Calving takes place in the riparian or adjacent forest habitats during June.

Rocky Mountain elk are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the submontane through the montane ecological association. Elk do not show as strong of altitudinal migration as mule deer do in response to winter conditions, but they do migrate to wintering areas.

Migration of elk from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting seasons coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the elk's urge to migrate and continued adverse weather keeps elk on the winter range.

A portion of the area represents winter range for the Manti elk herd unit 12. Winter ranges for elk are all ranked as being of critical to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions some portions of the winter range become unavailable to elk due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the elk; these sites are ranked as being of critical value. Critical valued sites must be protected from man's disturbance when the elk are physically present on the range.

Elk begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area support the Manti elk herd-unit 12; they are ranked as being of critical value.

Elk calf during the month of June. Their preferred calving areas are best described as aspen forests with lush understory vegetation. All riparian areas on the summer range are of critical value for calving and maintenance of the elk population. It is important to note that June represents a crucial period for maintenance of elk populations.

In the future, if additional species of wildlife become of high interest to the local area, Utah or the Nation, ~~Horizon~~Hidden Splendor Resources, Inc., will make the required periodic updates of project permits. Reclamation plans will be adjusted and appropriate recommendations made.

10.3.2.3 Birds

Two hundred forty-two species of birds, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is possible that one hundred thirty-eight of these species inhabit the project area.

Ducks commonly known as waterfowl are not known to utilize the project area. However for short periods and on occasion or during different seasons of the year an occasional bird, pair or flock may inhabit the area. All waterfowl are of high interest to the State of Utah. Generally speaking, the riparian and wetland habitats encompassed by the project and adjacent areas provide substantial valued habitats for waterfowl.

The period March 15 through July 15 would be ranked as being of crucial value to maintenance of the waterfowl population. Following incubation, which dependent upon the species may vary between 20 and 28 days and extend up until mid-August, the riparian and wetland habitats represent a high-priority brooding area. Additionally, the wetland habitat (only large open water areas or dense marshland) is of high-priority for seclusion and protection of adult waterfowl during their flightless period when they moult. Males may begin the moult in early June and both sexes and the young are capable of flight by mid-August.

All wetlands and open water areas can become locally important as high-priority use areas for waterfowl during peak migration periods in the spring (March 15 through May 15) and fall (August 15 through October 15).

The project and adjacent areas provides substantial valued habitat for a multitude of raptors - turkey vulture, bald and golden eagles, four species of falcons (prairie, American peregrine and arctic pere falcons, and American kestrel), five species of hawks (goshawk, sharp-shinned, Cooper's, red-tailed and Swainson's hawks) and seven species of owls (barn, screech, flammulated, great horned, pygmy, long-eared and saw-whet owls). Many of these species are of high federal interest. The project area was flown by the DWR on June 5, 1989 and in 1995 with an intense search for the nesting of raptors (see Plate 10-1).

Realistically, nesting habitat does not exist on the project or adjacent areas for some of these species. However, if a species were to nest on or adjacent to the project area, it would have a specific crucial period during which the aeries would need protection from disturbance; this period of time lies between February 1 and August 15. Generally speaking, when occupied aeries represent a critical valued site and need protection from significant or continual disturbance within a one-half mile radius of the nest.

Golden eagles are a common yearlong resident of the mine plan area. No active aerie territories are known inside the project area. An aerie territory is utilized by one pair of eagles but may contain several nest sites. Golden Eagle/Prairie Falcon nests were observed during the 1995 survey, Bill Bates (DWR) confirmed that they had not been nor were they inhabited recently. The nesting area surveyed by DWR is used by Golden Eagles one year and by Prairie Falcons another year, only one species will use the nesting area any given year. Neither species used the nesting area show on Plate 10-1 in 1995. The raptor nests are located on a rock face at the head of Spring Two Canyon (Bill Bates).

Should the raptor nests shown on Plate 10-1 become active during the operation of the mine, mitigation for disturbance will be determined in consultation with UDOGM, USFWS, and DWR, various methods will be explored and a decision made on a case by case basis. A possible solution may be to cover specific raptor nests during the period of potential subsidence to prevent habitation.

To date there are no known high-priority concentration areas or critical roost trees for golden eagles on the project area. The mine plan and adjacent areas have been ranked as being of substantial value to golden eagles.

The northern bald eagle is an winter resident (November 15 to March 15) of the local area. There does exist a high-priority winter concentration area adjacent to the permit area. The access route to the permit area dissects this use area. The mine plan area has been ranked as being of substantial value to wintering bald eagles, therefore the permit area may be used by the bald eagle. Historic data documents nesting activity by these birds in the State. There is no known historic evidence of the northern bald eagle nesting on the mine site.

The American peregrine falcon and the prairie falcon are yearlong residents of the mine plan and adjacent areas. Each of these species utilized cliff nesting sites. Suitable nesting habitat for the American peregrine falcon cannot be found on the mine plan and adjacent areas. The falcon's period of use at the aerie site spans the spring and early summer period-prairie falcon, April 15 to June 30; peregrine falcon, March 1 to June 30.

The endangered arctic peregrine falcon is a winter resident (November 15 through March 15) of the local area. This species has not been observed to utilize the environs on or adjacent to the mine plan area, however, its occasional presence would not be unlikely. Therefore, the project area is ranked as being of limited value to this species.

The blue grouse is a yearlong resident of the project area. Adult birds prefer open stands of conifers. During winter the blue grouse feeds exclusively upon needles and buds of douglas-fir and spruce trees. Thus, this wildlife habitat (spruce-fir forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February.

Blue grouse annually exhibit what has been termed as reverse vertical migration. That is, during the spring months, they migrate from the high elevation spruce-fir habitat to lower elevation sagebrush, pinion-juniper or shrubland habitats. This movement is caused by a need of the birds to feed on early developing vegetation. Such movement also facilitates successful breeding, nesting and brooding of their young. Then as the year progresses, they move to the higher elevations.

Territories for booming and breeding activities are critical to maintenance of the population during the crucial period of mid-March through mid-June. The young blue grouse rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to blue grouse. As summer progresses into the fall season the grouse consumes large quantities of berries.

The ruffed grouse is a yearlong resident of the project area. These grouse are usually found in the continuum of habitats extending from aspen to shrubland types. But, during winter they often roost in dense stands by conifers. Generally speaking ruffed grouse prefer habitats lying within 0.25 mile of a stream course; such areas are ranked as being of high-priority value to their population. During winter the ruffed grouse feeds exclusively upon staminate aspen buds. Thus, this wildlife habitat (aspen forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February. During the remainder of the year their diet shifts to include a wide variety of plant and insect material.

Ruffed grouse do not exhibit any type of seasonal migration. The males are polygamous and will set up and defend territories against other breeding males. The focal point for breeding activity is the drumming log; all such logs are ranked as being of critical value to grouse since they represent sites of historical use. Such territories are critical to maintenance of the population during the crucial period of early March through May.

After breeding the female develops a nest site which is secreted on the ground and deep within an aspen grove; the nest is of critical value to maintenance of the ruffed grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young ruffed grouse while being brooded rely heavily on insects for their protein needs during the first several months of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to ruffed grouse. The crucial period for brooding extends from hatching into mid-August.

The band-tailed pigeon is a summer resident of the project area. This bird is seldom observed to utilize the Wasatch Plateau, but when observed the species is only represented by a single bird, pairs or even less frequently a small flock. Since the band-tailed pigeon's use of the Wasatch Plateau is best described as "occasional", the environs associated with the project are only ranked as being of limited value to the bird. Nesting birds secret their nest in trees within the spruce-fir wildlife habitat. Peak on-nest activity occurs in late July and early August.

Mourning doves normally inhabit the project and adjacent areas, which represent a substantial valued use area for these birds, between May 1 and September 15 each year. They nest throughout most of this period and each pair produces two clutches. The pinion-juniper and riparian habitats are ranked as being of high-priority value for nesting. Locally, mourning doves show two peeks in on-nest activity - early July and early August. Successful nesting activities and any water sources are critical to maintenance of the mourning dove population.

The yellow-billed cuckoo is a summer resident of the project area. This bird only nests in the riparian wildlife habitat, therefore, such areas are of critical value to maintenance of this species. Little is known concerning the yellow-billed cuckoo. Its nest is represented by a frail, saucer shaped structure of twigs and is always placed in brush or trees.

The black swift is a summer resident of the Wasatch Plateau. The montane ecological association represents the swift's substantial values use area. Normally, the bird is associated with a small flock that represents a colony. Black swifts are usually observed soaring as pairs and they feed upon flying insects. A colony's nests are scattered along precipitous terrain where the nest is often secreted behind a waterfall. Such a moist habitat is not known to exist on the project area. Cliff and talus wildlife habitats are ranked as being of high-priority value to the black swift. There is evidence that pair bonds are long lasting and that a nest may be utilized in successive years.

The belted kingfisher is a yearlong resident of the project area. It is found only along riverain systems and its substantial value use area extends from the cold desert through the submontane and into the montane ecological associations. Therefore, the riparian wildlife habitat represents a high-priority valued use area for this bird. It feeds exclusively upon fish. The kingfisher's nest is always secreted within a burrow along stream banks thus, dirt bank habitats along riparian areas are of critical value to this bird.

The pileated woodpecker is a species having high federal interest. The spruce-fir and aspen wildlife habitats of the montane ecological association represent this bird's substantial valued use area. It is important to note that the pileated woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a yearlong resident with a relative abundance considered to be rare.

The Williamson's sapsucker is another species having high federal interest. Typically, the substantial valued use area for this species is the spruce-fir habitat of the Hudsonian life zone in the montane ecological association. Therefore, the spruce-fir habitat of the Canadian life zone on the project site would only represent the substantial valued use area for the yellow-bellied sapsucker. The yellow-bellied sapsucker is a yearlong resident of the environs associated with the project area and it has a relative abundance considered to be common. Where as the Williamson's sapsucker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the Williamson's sapsucker is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

The Lewis woodpecker is also another species having high federal interest. Its substantial valued use area is represented by riparian habitats characterized by cottonwood stands and ponderosa forests. These habitats do not exist on the project site. It is important to note that the Lewis woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a summer resident or only a transient. Its relative abundance is unknown.

The purple martin is a summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. In Utah its substantial valued use area is represented by open spruce-fir, aspen or ponderosa forest habitats of the montane ecological association. The purple martin feeds on flying insects and may secret its nest within any suitable above ground cavity.

The western bluebird is an uncommon summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. Where as the mountain bluebird is a common yearlong resident of the area. Both birds are cavity nesting species. The western bluebird nests from the pinion-juniper habitat of the submontane ecological association up into the lower forest habitats within the Canadian life zone of the montane ecological association. The mountain bluebird utilizes the same continuum of habitats for nesting, but also extends its nesting use across the Canadian and Hudsonian life zones and into the Alpine life zone. During winter both species show elevational and longitudinal migrations; they then utilize all habitats associated with the cold desert ecological association. Therefore, the substantial valued use area for each species spans a broad continuum of habitats. It is important to note that trees with cavities located on the project area can be of critical value to bluebirds.

The grasshopper sparrow is a rare transient species known to inhabit the environs of the biogeographic area that surrounds the project site. It only frequents dry grassland areas in the desert scrub habitat of the cold desert and possibly into the submontane ecological association during spring and fall migration periods. Since its use of such sites is best described as "occasional", those habitats in the region are only ranked as being of limited value to the birds.

10.3.2.4 Reptiles and Amphibians

Reptiles

Reptiles, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that sixteen reptile species inhabit the project area.

The Utah milk snake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the upper Sonoran (cold desert life zone) through the submontane (Transition life zone) and into the montane (Canadian and possibly Hudsonian life zone) ecological association. Although its use area spans a multitude of habitats, the animal is extremely secretive, mostly nocturnal and is often found inside or under rotten logs, stumps, boards, rocks or within other hiding places. At night they can be found in the open where they hunt for small rodents, lizards and other small snakes. Occasionally, the milk snake may take small birds or bird eggs.

The milk snake may live beyond twenty years and it becomes sexually mature during its third spring season. After mating, which occurs during spring or early summer when they are leaving the den, female milk snakes produce clutches which average seven eggs. The eggs are secreted in a moist warm environ and then abandoned; incubation lasts 65 to 85 days. The site where an individual snake has deposited its clutch of eggs is of critical value to maintenance of the species. The Utah milk snake was listed in 1995 as a sensitive species native to Utah.

The Utah Mountain King Snake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the submontane (Transition life zone) into the montane (Canadian and possibly Hudsonian life zone)ecological association. Little is known concerning this reptile except that it frequents areas of dense vegetation and that it is often found near water. It's life history and food habits parallel that described for the Utah milk snake.

To date snake dens, which are protected and of critical value to snake populations, have not been identified on or adjacent to the project area. It is important to note that inventory for such has not been attempted. If the company at some later time discovers a den it should be reported to the DWR. If a den(s) is currently known, its location must be included with the permit application.

No reptiles which are known to inhabit the mine area are federally listed as a threatened or endangered species.

Amphibians

Six species of amphibians, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that all of these species inhabit the project area.

The tiger salamander is a yearlong resident animal of the project area. The substantial value use area for the adult form is represented by any moist underground site or any similar habitat such as inside rotten logs, cellars or animal burrows. Such sites can be found within any wildlife habitat extending from the cold desert (upper Sonoran life zone) through the submontane (Transition life zone) and into the montane (Canadian life zone) ecological association. The larva form, often referred to as a mud-puppy, is a gilled animal that must remain in water within the above described ecological associations. It is interesting to note that the larva may fail to transform into an adult, even after their second season, and they can breed in the larva condition.

Once the larva is transformed into the adult form the animal is primarily terrestrial. Salamanders do migrate to water in the spring for breeding and may remain there during much of the summer. Such as intensive use area would be ranked as being of high-priority value to the animal. In September the newly transformed animals leave the water to find suitable places to spend the winter.

The tiger salamander breeds from March through June and is sexually mature after one year. The male deposits a small tent-shaped structure containing a myriad of sperm on the pool bottom. During courtship the female picks up this structure in her cloaca; then the eggs are fertilized internally before or just at the time they are laid. The eggs, singly or in small clusters, adhere to submerged vegetation; after 10 to 12 days they hatch . Obviously, a critical period for maintenance of the population is when breeding salamanders, eggs or their larva are inhabiting a water.

Post-embryonic development of a salamander's larval form progresses at a pace somewhat controlled by water temperature; in some cold waters the larva may not transform into an adult and drying up of a pool may hasten the process.

Migration to or from water usually occurs at night, during or just after a rain storm. When inhabiting terrestrial sites the tiger salamander is most active at night, particularly on rainy nights, from March through September.

Larva, when small feed on aquatic invertebrates and become predacious to the point of cannibalism when they are larger. Food items for adults include insects, earthworms and occasionally small vertebrates.

No amphibians which are known to inhabit the mine area are federally listed as a threatened or endangered species.

10.3.2.5 Aquatic Organisms

No fish were seen or collected in either the North Fork Gordon Creek or Beaver Creek (DWR, 1981a). Robert G. Valentine, DWR Director reports cutthroat trout have been observed in Gordon Creek in the past several years, we assumed he is referring to the North Fork of Gordon Creek which flows south of the permit boundary (DWR correspondence with UDOGM, October 31, 1996). As a point of information employees of Gordon Creek Coal Company requested that trout be planted in the North Fork of Gordon Creek in the early 1980s. With permission and assistance from the DWR the trout were planted by coal company employee volunteers. The Gordon Creek No. 2/7/8 Mines Mining and Reclamation Plan stated in their 12/15/92 submittal that "cutthroat trout have been planted in the North Fork of Gordon Creek".

Through the past ten to twelve years the fish have survived with the care taken by the Gordon Creek Coal Company to maintain the quality of the water discharged into North Fork of Gordon Creek. ~~Horizon~~Hidden Splendor Resources, Inc., intends to continue the maintenance of the water quality necessary to encourage all aquatic life by controlling sediment and contaminants associated with the mining operation from entering the North Fork of Gordon Creek.

The benthic macroinvertebrate community of North Fork Gordon Creek was surveyed by the DWR and Western Resource Development in 1980 and 1981. Appendix 10-2 contains a figure showing the location of the sample sites discussed below.

Site NFG-1 was located about 250 meters above the Bryner Creek confluence, in the vicinity of remnants of an earlier mining episode. The main flow pattern was riffle, although a few small pools were formed behind larger boulders and along the banks. Mean water depth was 35 cm, and stream width averaged 2.1 meters. In the sample area, rubble dominated the substrate, but sand gravel, and a few boulders were also present. Slow velocity areas had a small amount of silt on the substrate. Riparian vegetation was scattered and provided an incomplete canopy. Primarily riparian species were Quaking Aspen, Blue Spruce, and willows on the north bank, and Gamble's Oak and Quaking Aspen on the south bank. Banks were eroded and void of vegetation on several bends in the site area.

Twenty taxa of seven major groups were found at Site NFG-1 in three pooled Surber samples (Appendix 10-2). The midge Chironomidae (Diptera) and the mayfly Cinygmula sp. (Heptageniidae) were the most common aquatic invertebrates collected (33.9 percent and 21.2 percent, respectively). Early instars of the stonefly family Perlodidae, the mayfly Baetis sp. (Beatidae), and caddisflies Hydropsyche sp. (Hydropsychidae) and Oligophleboides sp. (Limnephilidae), and the crane fly Antocha sp. (Tipulidae) were moderately common (2.4 percent, 5.7 percent, 12.1 percent, 16.0 percent, and 2.0 percent, respectively).

Moderately high readings of alkalinity, hardness, and pH were obtained. Dissolved oxygen and water temperature were not abnormal.

Site NFG-2 was located about 30 meters (m) below a water withdrawal point and old concrete abutments, several pools were within the area sampled, but riffles were the dominate flow pattern. Average stream width and depth were 2.8 m and 20 centimeters (cm) respectively. Rubble and gravel were the primary substrate types in the riffles, while sand and silt were the main substrate in the pools and had partially filled the interstitial spaces among rubble in the riffles. Dense willow stands provided an almost complete canopy over the stream in the study site.

The aquatic invertebrate community of Site NFG-2 was much less diverse and had significantly fewer members then Site NFG-1. In the three pooled Surber samples Baetissp. was the most abundant organism (63.6 Percent); Oligochaeta and Hesperophylax sp. (Limnephilidae were moderately common (14.5 percent and 9.1 percent, respectively). All other taxa were represented by less than five individuals.

Dissolved oxygen, alkalinity, and pH were slightly higher than at Site NFG-1 (Appendix 10-2). Hardness and water temperature were not different.

The aquatic invertebrate communities were significantly different at the two sites. The probable reason for the change was the increased sediment load at the lower site to which the unpaved roads may contribute. However, much of the siltation is probably natural, since the stream and its tributaries drain areas of relatively erodible soils. In addition, "riparian" vegetation changes from aspen, conifers, and dense shrubs to more open stretches often dominated by sagebrush with only scattered trees.

The conclusion that the shift of macroinvertebrates is related to siltation is supported by the ecologies of certain key species. The best example is the reversed abundances of Cinygmula sp., which is best suited for clinging to coarse substrata, and Baetis sp., which is ambulatory and thus able to move freely along a silty bottom.

Macroinvertebrates in the Beaver Creek drainage were sampled in late April and middle June 1981 at stations about 1 km above (BC-1), less than 50 m above (BC-2, and about 1 km below the confluence with an unnamed tributary in extreme northwestern Section 18. For convenience, the unnamed tributary is referred to in this report as "Spring Creek" the site on this tributary is identified as SC-1.

Site BC-1 was located near the western edge of the study area, in southeastern Section 2. Both Beaver Creek and the intermittent tributary joining it near BC-1 were essentially dry above the junction itself.

Riparian vegetation through this stretch was primarily wet grasses (Subalpine Moist Meadow), but aspen and conifers were scattered along the creek and provided a spotty canopy. Substrate was mainly gravel and small rubble, with a thin silt overburden in slow stretches. The dominant flow pattern was riffle, but the low gradient reduced velocity to about 0.5 m/sec. Mean stream with and depth were 60 cm and 5 cm, respectively.

The invertebrate community was composed of sixteen taxa. Chironomidea were the most common organism (71.9 percent of sample). All other taxa occurred in comparatively low numbers but the planarian Polycelis coronata, oligochaetes, the stonefly Zapada, the mayflies Beatis and Cinygmula, and caddisfly Rhyacophila, and the cranefly Dicranota were represented in moderate numbers (Appendix 10-2). The water at BC-1 was slightly alkaline, and temperature was 14 degrees C. in June.

Site BC-2 was located just below several active and inactive beaver ponds and just above the confluence with Springs Creek. The banks at and above BC-1 were eroded and unstable, apparently partly due to realignment of the stream because of the beaver activity. Heavy use of the area by livestock probably contributed to this condition. Riparian Blue Spruce, Subalpine Fir, and willows provided a partial canopy; branches from terrestrial fall-in and broken beaver dams cluttered the stream, but there were relatively few leaf packs. Gravel and rubble were the most common substrate constituents, and silt covered coarse substrata in slow-velocity reaches. The slight gradient and meandering character of the stream near BC-2 resulted in several pools, but the dominant flow pattern was riffle. Mean stream width and depth were 50 cm and 10 cm, respectively. Depth of pools did not exceed 45 cm.

The mayfly Baetis sp. was the most abundant organism collected at BC-2 (44.0 percent), but six taxa (Planariidae, Oligochaeta, Cinygmula sp., Rhycophila sp., Hesperophylax sp., and Chironomidae) occurred in moderate numbers.

The water at BC-2 remained slightly alkaline, but the slower flows and limited shading resulted in warmer temperatures of 17.5 degrees C. in June.

Site BC-3 was located in an area where the valley was broader and the stream was incised. The most common vegetation on the flood plain was sagebrush, and shade was provided only where the stream ran along the foot of a forested north-facing slope. Poor bank stability resulted in a layer of fine sediments over the native gravel rubble substrate. In pools the substrate was primarily sand and silt. Mean stream width was 90 cm; depth ranged from 10 cm in riffle-runs to 50 cm in pools. Several tree limbs were in the water, but there was little leaf litter.

At least twenty-two invertebrate taxa were collected at BC-3 and no single taxon dominated the community. Chironomids, the most common form, and the amphipod Crangonyx, accounted for only 26.8 percent and 20.3 percent of the invertebrates collected. Five taxa (Oligochaeta, Baetis sp., Cinygmula sp., Hydropsyche sp.) were moderately abundant.

Chemical characteristics of the water at BC-3 were not significantly different from those recorded at upstream sites, except that water temperature was slightly higher at 20 degrees C.

Site SC-1 was located on the unnamed tributary (Spring Creek), approximately 50 m above its confluence with Beaver Creek and just below the spring which provides most (about 75 percent) of its flow, and its unofficial name. Above the spring, most of the flow was from snowmelt during both the late April and middle June surveys. The stream was marked by several abandoned and barely distinguishable beaver ponds, none of which appeared to have held water for a number of years (based on vegetational re-establishment). Scattered Blue Spruce shaded portions of the stream, and grasses retained the banks. The substrate was primarily sand and gravel interspersed with a few larger stones. Width was not greater than 60 cm, and depth did not exceed 6 cm. The main flow pattern was run; no true pools were present in the sampled stretch.

The mayfly Baetis sp. and chironomids were the most common (51.2 percent and 23.0 percent, respectively) of the sixteen taxa collected at the site. Oligochaeta, Cinygmula sp., Ceratopogonidae, and Dicranota sp. were found in moderate numbers. A caddisfly Oligophlebodes, and a mothfly, Psychodidae, were unusual occupants of the creek.

The chemical characteristics of the water in the unnamed tributary were similar to those of Beaver Creek; the markedly colder temperature (1 degrees C.) was related to its proximity to a spring and the fact that data were recorded in April at that site, versus June at the Beaver Creek Site.

The invertebrate community of the creek changed notably in a downstream direction. Site BC-1 produced the greatest number of organisms, but community diversity was lower than at downstream sites. Nor were the downstream communities as completely dominated by one or two taxa as was BC-1. The invertebrate community of the unnamed tributary was more similar to that of BC-1 than to BC-2 and BC-3.

The differences in community composition and structure probably were at least partially attributable to the overall character of the aquatic habitat. Site BC-1 was in a typical subalpine zone, but at BC-2 and BC-3 the creek had emerged into a more open, sagebrush-dominated terrestrial area with more erodible streambed material. Between BC-1 and BC-3, several beaver ponds interrupted flow patterns, contributed to high water temperatures, and altered the nutrient production and transport capabilities of the stream.

Relatively low diversity and chironomid dominance of the BC-1 invertebrate community was partially a function of the ephemeral character of the stream in its upper reaches.

Streams subject to periodic desiccation are less likely to support a diverse community than perennial streams and only those forms adapted to survival in such areas are likely to be successful.

Although sedimentation was greater at BC-2 and BC-3 than at BC-1, the greater physical stability of the system in the lower reaches contributed to greater community diversity. Moreover, sediment transport probably did not exceed threshold tolerances of most invertebrates occupying the lower reaches. Additionally, the reduced riparian canopy below BC-1 and the beaver ponds enhanced autochthonous productivity for the benefit of the invertebrate communities in the lower reaches. Such a change in the energy dynamics of the system would allow forms unable to survive the "oligotrophic" upper reaches to survive the more nutrient-enriched lower reaches.

Site BC-1 had no taxa unique to it, but two forms (Hydracarina and Chloroperlidae) were shared only with Site SC-1. In contrast, at least fourteen taxa were found only at Sites BC-2 and/or BC-3. An explanation may be that Iligophlebodes sp. and Psychodidae are not particularly common forms.

However, differences between the communities of the unnamed tributary and Sites BC-2 and BC-3 may be an artifact of season sampled rather than actual differences. Each form peculiar to Site SC-1 very likely occurs in Beaver Creek but had already hatched when Beaver Creek was sampled six weeks later.

Seven forms (Oligochaeta, Baetis sp., Cinygmula sp., Hesperophylax sp., Chironomidae Tipula sp., and Dicranota sp.) were common to all sites. Each is a relatively large group, has representatives in a variety of habitats, and is widely distributed.

More intensive sampling of Beaver Creek and its unnamed tributary probably would reduce the number of taxa limited to particular reaches, but the patterns discerned would remain similar.

Jewkes Creek provides a water source used by all species of wildlife which frequent the area.

10.3.3 Species of Special Significance

See Tables 10-1 and 10-2.

10.3.3.1 Threatened and Endangered Species

Listed threatened and endangered species potentially present in the study are the American Peregrine Falcon, which breeds in Utah; Arctic Peregrine Falcon, which migrates through Utah; and Bald Eagle, which winters in Utah. Areas of potential occurrence include riparian forests for the Bald Eagle, cliff areas in the region for the American Peregrine Falcon, and upland areas for the Arctic Peregrine Falcon. Bald Eagles are known to use riparian woodlands along lower North Fork Gordon Creek and the Price River as winter roosts (DWR 1981a). If any endangered or threatened species are found in the permit area they will be promptly reported the Division and the DWR.

The loggerhead shrike and willow flycatcher have been added to the list of sensitive species occurring in Utah. The mine disturbed area elevation is high for the willow flycatcher, but it may occur in the general area during the summer months. The loggerhead shrike is a yearlong inhabitant of the Wasatch Plateau and is most likely found in the mine area (DWR, 1990).

The most likely raptors in the mine area are the Flammulated Owl and Cooper's Hawk, which occur in the Wasatch Plateau and prefer wooded country, such as riparian and conifer forests. With the availability of cliffs for nesting and open areas for hunting within a relatively short distance the Prairie Falcon is a potential breeder in the area.

TABLE 10-1

Federally Listed and Proposed Endangered Species in Utah
January 1996

Mammals		Status
Black-footed ferret[1]	Mustela nigripes	E
Utah prairie dog	Cynomys parvidens	T
Birds		
American peregrine falcon[2]	Falco peregrinus anatum	E
Bald eagle[4]	Haliaeetus leucocephalus	T
Southwestern willow flycatcher[6]	Empidonax tralii extimus	PE
Whopping crane[3]	Grus americanus	E
Mexican spotted owl	Strix occidentalis lucida	T
Fish		
Bonytail chub[5]	Gila elegans	E
Colorado squawfish[5]	Ptychocheilus lucius	E
Humpback chub[5]	Gila cypha	E
Lahontan cutthroat trout	Oncorhynchus (Salmo) clarki henshawi	T
June sucker[5]	Chasmistes liorus	E
Razorback sucker[5]	Xyrauchen texanus	E
Virginia River chub	Gila robusta seminuda	E

TABLE 10-1

Federally Listed and Proposed Endangered Species in Utah (Continued)

Fish		**Status**
Virgin spinedace	Lepidomeda mollispinis mollispinis	PT
Woundfin	Plagopterus argentissimus	E
Reptiles		
Desert tortoise[5]	Gopherus agassizi	T
Snails		
Kanab ambersnail[6]	Oxyloma haydeni kanabensis	E
Utah valvata snail[8]	Valvata utahensis	E

[1] Known historically, including two confirmed sightings in Utah in 182.
[2] Nests in Utah.
[3] Migrates through Utah, no resident populations.
[4] Wintering populations (only three known nesting pairs in southeastern Utah).
[5] Critical habitat designated.
[6] Critical habitat proposed.
[7] Emergency listing.
[8] Only known historically.
The Arctic Peregrine falcon is protected as endangered (Utah) or threatened while migrating through the 48 conterminous states under similarity of appearance provision.

E - Endangered PE - Proposed Endangered T - Threatened PT - Proposed Threatened

For additional information contact: U.S. Fish and Wildlife Service, 145 East 1300 South, Salt Lake City, Utah 84115, Telephone: (801)524-5001

TABLE 10-2

Native Utah Wildlife Species of Special Interest
Revised 1995

Mammals		Status
Grizzly Bear	Ursus horribilis	EX
Fisher	Martes pennanti	EX
Black-footed Ferret*	Mustela nigripes	EN
Wolf	Canis lupus	EN
Utah Prairie Dog*	Cynomys parvidens	T
Dwarf Shrew	Sorex nanus	S
Desert Shrew	Notiosorex crawfordi	S
Red Bat	Lasiurus borealis	S
Mexican Big-eared Bat	Plecotus phyllotis	S
Spotted Bat	Euderma maculatum	S
Big Free-tailed Bat	Tadarida macrotis	S
Abert's Squirrel	Sciurus aberti navajo	S
Belding's Ground Squirrel	Spermophilus beldingi	S
Richardson Ground Squirrel	Spermophilus richardsoni	S
Thirteen-lined Ground Squirrel	Spermophilus tridecemlineatus	S
Spotted Ground Squirrel	Spermophilus spilosoma	S
Yellow Pine Chipmunk	Eutamias amoenus	S
Rock Pocket Mouse	Perognathus intermedius	S

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Mammals (Continued)		**Status**
Wyoming Pocket Mouse	Perognathus fasciatus	S
Merriam's Kangaroo Rat	Dipodomys merriami	S
Desert Kangaroo Rat	Dipodomys deserti	S
Cactus Mouse	Peromyscus eremicus	S
Rock Mouse	Peromyscus difficilis	S
Southern Grasshopper Mouse	Onychomys torridus	S
Stephen's Woodrat	Neotoma stephensi	S
Mexican Vole	Microtus mexicanus	S
Wolverine	Gulo gulo	S
River Otter	Lutra canadensis	S
Canada Lynx	Lynx canadensis	S
Birds		
Passenger Pigeon	Ectopistes migratorius	E
California Condor	Gymnogyps califronianus	EX
American Peregrine Falcon*	Falco peregrinus anatum	EN
Bald Eagle*	Haliaeetus leucocephalus (Linnaeus)	T
Whooping Crane*	Grus americana	EN

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Birds (Continued)		Status
Arctic Peregrine Falcon	Falco peregrinus tundrius	T
Mountain Plover	Charadrius montanus	S
Snowy Plover	Charadrius alexandrinus	S
Long-billed Curlew	Numenius americanus	S
Yellow-billed Cuckoo	Coccyzus americanus	S
Lewis' Woodpecker	Melanerpes lewis	S
Western Bluebird	Sialia mexicana	S
Ferruginous Hawk	Buteo regalis	S
Swainson's Hawk	Buteo swainsoni	S
American White Pelican	Pelecanus erythrorhynchos	S
Double-crested Cormorant	Phalacrocorax auritus	S
Caspian Tern	Sterna caspia	S
Purple Martin	Progne subis	S
Bell's Vireo	Vireo bellii	S
Grasshopper Sparrow	Ammodramus savannarum	S
Greater Roadrunner	Geococcyx californianus	S
Spotted Owl	Strix occidentalis	S
Osprey	Pandion haliaetus	S

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Birds (Continued)		Status
White-faced Ibis	Plegadis chihi	S
Great Blue Heron	Ardea herodias	SQ
American Bittern	Botaurus lentiginosus	SQ
Western Grebe	Aechmophorus occidentalis	SQ
Black-crowned Night Heron	Nycticorax nycticorax	SQ
Pileated Woodpecker	Dryocopus pileatus	SQ
Red-headed Woodpecker	Melanerpes erythrocephalus	SQ
Mountain Bluebird	Sialia currucoides	SQ
Yellow-breasted Chat	Icteria virens	SQ
Fox Sparrow	Passerella iliaca	SQ
Loggerhead Shrike	Lanius ludovicianus	S
Willow Flycatcher	Empidonax traillii	S
Fish		
Utah Lake Sculpin	Cottus echinatus	E
Bonytail Chub*	Gila elegans	EN
Colorado Squawfish*	Ptychocheilus lucius	EN
Humpback Chub*	Gila cypha	EN
Woundfin*	Plagopterus argentissimus	EN
June Sucker*	Chasmistes liorus mictus	EN

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Fish (Continued)		Status
Virgin River Chub*	Gila robusta seminuda	EN
Razorback Sucker*	Xyrauchen texanus	EN
Lahontan Cutthroat Trout* (Not native to Utah)	Salmo clarki henshawi	T
Least Chub	Iotichthys phlegethontis	T
Virgin River Spinedace	Lepidomeda mollispinis	T
Leatherside Chub	Gila copei	S
Bear Lake Sculpin	Cottus extensus	S
Roundtail Chub	Gila robusta robusta	S
Colorado Cutthroat Trout	Salmo clarki pleuriticus	S
Bonneville Cutthroat Trout	Salmo clarki utah	S
Bonneville Cisco	Prosopium gemmiferum	S
Bonneville Whitefish	Prosopium spilonotus	S
Bear Lake Whitefish	Prosopium abyssicola	S
Piute Sculpin	Cottus beldingi	SQ
Reptiles and Amphibians		
Relict Frog	Rana onca	E

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Reptiles and Amphibians (Continued)		Status
Gila Monster	Heloderma suspectum	EN
Desert Tortoise*	Gopherus agassizi	EN
Western Spotted Frog	Rana pretiosa	T
Desert Iguana	Dipsosaurus dorsalis	S
Chuckwalla	Sauromalus obesus	S
Desert Night Lizard	Xantusia vigilus	S
Western (Utah) Banded Gecko	Coleonyx variegatus utahensis	S
Zebra-tailed Lizard	Callisaurus draconoides rhodostictus	S
Many-lined Skink	Eumeces multivirgatus gaigeae	S
Plateau Whiptail	Cnemidophorus velox	S
Arizona Toad	Bufo microscaphus microscaphus	S
Pacific Tree Frog	Hyla regilla	S
Speckled Rattlesnake	Crotalus mitchellii pyrrhus	S
Mojave Rattlesnake	Crotalus scutulatus scutulatus	S
Sidewinder Rattlesnake	Crotalus cerastes cerastes	S
Utah Black-headed Snake	Tantilla planiceps utahensis	S
California Kingsnake	Lampropeltis getulus californiae	S

TABLE 10-2 (Continued)

Native Utah Wildlife Species of Special Interest

Reptiles and Amphibians (Continued)		Status
Desert Glossy Snake	Arizona elegans	S
Utah Blind Snake	Leptotyphlops humilis utahensis	S
Mojave Patch-Nosed Snake	Salvadora hexalepis mojavensis	S
Arizona Lyre Snake	Trimorphodon lambda	S
Utah Mountain Kingsnake	Lampropeltis pyromelena infralabialis	S
Utah Milk Snake	Lampropeltis triangulum taylori	S
Great Plains Rat Snake	Elaphe guttata emoryi	SQ
Western Smooth Green Snake	Opheodrys vernalis blanchardi	SQ

E - Extinct:	Any species that has disappeared in the world.
EX - Extirpated:	Any species that has disappeared, as a part- or full-time resident, from the state since 1800.
EN - Endangered:	Any species, subspecies or subpopulation which is threatened with extinction resulting from very low or declining numbers, alteration and/or reduction of habitat, detrimental environmental changes, or any combination of the above. Continued survival is unlikely without implementation of special measures.
T - Threatened:	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
S - Sensitive:	Any species which, although still occurring in numbers adequate for survival, has been greatly depleted or occurring in limited areas and/or numbers due to a restricted or specialized habitat. A management program, including protection or habitat manipulation, is needed.
SQ - Status Questioned:	Insufficient data available on which to base a reliable assessment as to status.

* Denotes Federally classified endangered or threatened species found in Utah.

Utah Division of Wildlife Resources, 156 West North Temple, Salt Lake City, Utah 84116-315.

Williamson's Sapsucker was determined to breed in the study area during site-specific field studies. The presence of this species is not surprising, because the open aspen/conifer mosaic provides preferred nesting habitat (Crockett and Hadow 1974, Crockett and Hansley 1978), and it has been reported as breeding in "all the mountainous counties of the state' Hayward et al. 1976 p 120). Although no nests were located, the status of Williamson's Sapsucker as a breeder was inferred from observations of courting adults in spring and juveniles in late summer. The area in which the sapsuckers were observed was an open aspen stand about 0.5 km west of the mine site in southwestern Section 18. The nest, though not located, is believed to have been in an open stand of mature aspen about 3/8 mi. west-north-west of the mine site.

The Purple Martin is known to occupy the area during the summer in open conifer or aspen forests in the Wasatch Plateau region. Because these preferred habitats are widespread in the study area, Purple Martins should be expected to occur occasionally. However, none was observed during site-specific field studies.

10.4 Potential Impacts on Fish and Wildlife

Wildlife impacts typically can be categorized into three groups: loss or modification of habitat, disturbance, and mortality.

Aquatic habitat loss along North Fork Gordon Creek apparently has not occurred, because (1) the stream has not been significantly disturbed and (2) the intermittent stream near the disturbed area does not offer good aquatic wildlife potential. Due to its remoteness from the proposed disturbed area, the aquatic habitat of Beaver Creek probably will not be affected by the mining operation.

The limited amount of surface disturbance associated with the mining operation will result in minimal habitat loss during the life of the mine. Larger species of birds and mammals (i.e., deer, carnivores, and raptors) tend to avoid a working mine site. Most of these species are likely to move freely around the mine site when not in operation and to quickly re-inhabit the area after reclamation.

Two types of mortality potentially are associated with operation of the coal mines; raptor electrocution on unsafe power poles and mammal road kills. A raptor hazard survey was conducted in the area in conjunction with baseline field studies. The results of this survey indicate that the four-phase line running from the substation at the abandoned townsite of National represents a potential hazard because of the closeness of two conductors on one side of the cross-arm. However, the actual hazard probably is slight, because (1) the positioning of the poles relative to adjacent topography would tend to limit use. This conclusion was confirmed by raptor biologist Ron Joseph and Bruce Waddell of the U.S. Fish and Wildlife Service, who visited the site in August 1981.

A few kilometers to the east, along Consumers Road, the power poles are a more prominent feature on the flat landscape and appeared to receive more use, especially during the winter.

All power lines to be constructed within the permit area will be designed to minimize electrocution hazards to raptors. UP&L currently constructs all power lines to be raptor safe, therefore power line towers will be designed to protect raptors in accordance with regulations governing UP&L construction.

Mule Deer road kills along the North Fork Gordon Creek haul road have been monitored. In the interval from May 1980 to May 1981, only two deer road kills were recorded; this represents a very small percentage of both the wintering herd and the total population of the game management unit. Most of the road kill problem is along a stretch beginning about 1 - 1.5 km below the turnoff to Coal Canyon. The major factor contributing to mortalities in this stretch is that the road passes through an area of sagebrush, chained pinyon/juniper, and pasture maintained by DWR as winter habitat. The winter herd in this area was about 500 animals in 1980-1981, and deer remained until late spring despite the unusually mild winter (probably to take advantage of emergent alfalfa and range grasses).

Robert G. Valentine, DWR Director reports "since the Beaver Creek Mine closed in 1992, we are not aware of any road killed game west to the Wildcat Loadout" (DWR correspondence with UDOGM, October 31, 1996). Great Lake Timber Company has been timbering on private land northeast of the Horizon permit boundary since Spring of 1995. A representative of Great Lake Timber Company estimated that their logging truck make round trip to and from the logging camp every two hours during daylight. Their hauling route runs from Section 12, R7E, T13S to Section 33, R9E, T13S on the county roads. Since the DWR is unaware of any road killed game west to the Wildcat Loadout, we presume the logging trucks have created minimal impact to the elk and deer along the county road running through the Gordon Creek Wildlife Management Area. The logging trucks were still operating as of June 18, 1996 and has operated through the winter months (1995 - 1996).

~~Horizon's~~Hidden Splendor Resources, Inc., planned use of Consumer's Road for coal haulage is expected to cause no more impact to the elk and deer populous than did the logging operation in 1995.

Impacts to aquatic ecosystems have been minor. North Fork Gordon Creek apparently has sustained a change in the character of the macroinvertebrates as a result of an increased suspended load along the unpaved road below the mine site. Much of this appears to be naturally related to soil erodibility, although the adjacent road and the water collection point undoubtedly are contributors. The increased siltation below Beaver Creek Mining Operation has had much less influence on the quality of the North Fork Gordon Creek aquatic ecosystem than the low and variable flows.

Beaver Creek has been essentially unaffected by mining or exploratory drilling programs in the Beaver Creek valley. This situation is not expected to change with an additional mining operation.

10.5 Mitigation and Management Plans

The small-scale surface disturbance associated with the mining operation will be mitigated upon completion of the project by reclaiming the disturbed sites. The revegetation plant mix includes herbaceous and woody species that are adapted to on-site conditions and are of known value to wildlife for cover and forage. Details of the reclamation plan are provided in Section 3.5.

Habitat loss associated with disruption or pollution of North Fork Gordon Creek will be controlled through the runoff- and sediment-control plan. Details regarding this plan are presented in Chapter 7.

Impacts to wildlife will be further minimized by employee awareness programs which will inform mine personnel of especially sensitive periods (e.g., the nesting season for raptors, fawning season for deer) or habitats in the vicinity of the mine area. The awareness program will be implemented as part of the mandatory mine safety training. Road kills will be mitigated through the awareness program, speed limits, and game crossing signs. Mine personnel will be strongly discouraged from leaving the disturbed area boundary.

~~Horizon~~Hidden Splendor Resources, Inc., is sensitive to the hazard road-killed deer and elk pose to feeding raptors and to other motorists. Therefore, ~~Horizon~~Hidden Splendor Resources, Inc., agrees to remove road killed deer and elk from the road between the Wildcat Coal Loadout and the mine site during mining operations. The occurrence of road kill will be reported to the DWR when they occur or at a minimum on a quarterly basis. Should deer and elk road kills indicate a significant increase, the DWR will be consulted for recommendations to minimize the road kill rates. A record of the deer road kills for 1997 through December of 1999 is included in Appendix 10-1per discussion with Derris Jones - DWR (Habitat Manager).

Many of the mitigation and impact avoidance procedures utilized in the following sections have been drawn from information provided to the applicant by DWR personnel (Larry Dalton).

In order to take extra precautions the following actions will be taken in order to minimize disruption to the wildlife and the habitat surrounding the project:

1. Controlled speed limits on haulage roads to protect wildlife.

2. Wildlife habitats will be revegetated with beneficial species. Trees and shrubs will be planted in clumps to provide shelter.

3. Pesticides will be avoided on the mine site. Herbicides may be used to control vegetation growth in drainage ditches within the disturbed area.

4. Toxic materials will be safely stored on the mine site. All toxic materials will be fenced to keep wildlife out, and taken to a disposal site.

5. Native plants and berry producing shrubs will be planted for avian species during reclamation.

6. Raptors and their offspring will be protected from disturbance and subsidence.

7. Electrical and other transmission lines will be designed in accordance with the regulatory guidelines.

8. Due to the length of conveyors there should be no barriers. Cross unders can be installed along the belt lines if needed.

Jewkes Creek provides a riparian habitat within the area to be disturbed by facility construction for the Horizon mine. Due to road construction and improvement by Carbon County in the immediate area, Jewkes Creek's channel has been realigned above and within the disturbed area. This realignment above has made available an area of approximately 1 acre which in time will replace the riparian area disturbed by ~~Horizon~~Hidden Splendor Resources, Inc.. Although the area is more open, being less obstructed by topography, it does provide access to water by wildlife that the steeper stream channels along Jewkes Creek do not. The realignment was done in the Fall of 1995, over time the cover in the area will improve to provide more shelter for larger species of wildlife. Livestock has been restricted from the area except for an occasional stray which may be separated from the herd during movement to pasture on Beaver Creek.

Riparian areas provide wildlife a source of water and food; a feeding and nesting site; and a resting or roosting site. ~~Horizon~~Hidden Splendor Resources, Inc., understands the importance of the riparian area which they will disturb, therefore they have agreed to properly reclaim and improve the riparian area.

Mitigation measures for riparian replacement have been discussed with Bill Bates of the DWR, however the exact mitigation will be determined by ~~Horizon~~Hidden Splendor Resources, Inc., UDOGM and DWR at a later date.

<u>Fish and Wildlife Monitoring</u>

A wildlife monitoring program will be conducted throughout the operational life of the mine as required by regulatory agencies. The monitoring will utilize the services of an environmental specialist or as necessary, professional consultants. The program will also ensure that sensitive or critical use areas remain undisturbed by future activities and permit monitoring of reclamation efforts upon completion of mining activities.

The monitoring program will be initiated upon opening the Horizon Mine: (a) reporting of deer or elk road kills (see Section 10.5), (b) Nest surveys as dictated by the regulatory agencies prior to surface disturbance within the disturbed area boundary.

10.5.1 <u>Terrestrial Habitats and Wildlife</u>

DWR (1981b) emphasized three basic aspects to migration and impact avoidance for the terrestrial habitats at the mines: habitat and wildlife protection, reclamation, and wildlife management.

Habitat protection measures center on avoiding especially important or sensitive areas, such as riparian zones, and not using persistent pesticides, which would diminish the long-term health of an ecosystem.

Reclamation is particularly important as a means of controlling erosion and restoring disturbed areas to productive wildlife habitat. Recommended procedures in achieving the reclamation goal include (1) planting a diverse mixture of native grasses, forbs, and where appropriate woody species, (2) using seedling stock rather than relying solely on seeds for trees or shrubs, (3) planting vegetation to create an edge effect by clumping selected shrub or tree species, (4) actually transplanting stock or turf from new disturbed sites to reclaimed sites, and (5) leaving islands of natural vegetation in new disturbed sites.

Wildlife management is important for minimizing harmful effect (e.g., fencing animals out of areas containing toxic substances) and preventing damage to newly reclaimed areas (e.g., excluding large herbivores and possibly controlling rodents).

Direct impacts on springs and seeps on or adjacent to the permit area are not expected based on past mining experiences in the area. However, if mining operations negatively impact these features, Horizon plans to provide measures for replacement. See Chapter 7 for a discussion of the permit area hydrology.

10.5.1.1 Mammals

For small mammals, most of which are secretive and have small home ranges, mitigation will be almost totally related to habitat protection and reclamation (minimizing short and long-term habitat loss). For larger species the problem is complicated by their large home ranges, seasonal movements, and sensitivity to disturbance.

Disturbance-related impacts will be mitigated to a significant extent by ~~Horizon Coal Corporation~~Hidden Splendor Resources, Inc., policies against harassing or hunting wildlife in the permit area by employees. These policies will continue throughout the operation of the mine. Sensitive aspects of the ecosystem will be avoided during future exploration, operation, and reclamation activities.

10.5.1.2 Birds

Like small mammals, songbirds and other small species are most sensitive to habitat loss, and mitigation will therefore focus on habitat protection and reclamation. In addition, active raptor nests or nest trees will not be disturbed.

Protection plans for raptor nests will be incorporated in the following manner. An active raptor nest will be verified prior to full pillar extraction being completed within 500 feet of an active nest.

If the nest is still active, full pillar mining will leave a 200 foot barrier around the nest location. If the nest is inactive, a barrier of 100' will be left around the nest location. Mitigation of nests either active or inactive being lost due to subsidence or other mine related causes will be corrected by the placement of a replacement nest constructed under the guidelines and assistance of the DWR. The replacement nest would be placed at or near the site of the lost nest.

10.5.1.3 Reptiles and Amphibians

Besides minimizing habitat loss and restoring native vegetation, the principal mitigation measures for reptiles will be to avoid killing individuals and to not disturb or destroy snake dens, amphibian breeding ponds, and other sensitive use areas.

10.5.2 Aquatic Habitats and Organisms

Habitat loss or deterioration of the North Fork Gordon Creek aquatic ecosystem will be limited by constructing a sediment pond to protect the stream from an increased sediment load from the mine affected area. Additional details of these procedures for protecting stream quality are provided in Chapter 7 of the mine permit application.

10.6 Stream Buffer Zone Determination

Refer to Chapter 7 for details concerning buffer zones, sedimentation, and runoff controls.

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APPENDIX 10-1

WILDLIFE INFORMATION

APPENDIX 10-2

AQUATIC INFORMATION

APPENDIX 10-3

RAPTOR SURVEYS

CHAPTER 11

CLIMATOLOGY AND AIR QUALITY

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CHAPTER 11

CLIMATOLOGY AND AIR QUALITY

11.1 Climate

The climate can be characterized as arid, specifically dry continental. The prevailing local low-level meteorological influences are mountain-valley breeze systems. The low amount of annual precipitation is a result of the Sierra Nevada and Cascade ranges which act as natural barriers and prevent moist maritime air from the North Pacific from reaching the interior basins to the east. The Wasatch Mountains to the west of Castle Valley and the Tavaputs Plateau to the north provide a shelter from storms associated with westerly and northerly winds.

Average annual temperature for 1993 at Scofield (Skyline Mine) and Price are 37.7 and 62.1 degrees Fahrenheit, respectively. Annual precipitation averages 27.37 inches at Scofield (elevation 8710')and 10.94 at Price (elevation 5700'). At the Scofield (Skyline Mine) monitoring station northwest of the mine area, January is the coldest month (-9 degrees F.) and August the warmest (80 degrees F.). The average annual temperature at the mine site is estimated to ranges from 36°F to 45°F and the cumulative annual precipitation ranges from 12 to 20 inches. The growing season ranges from 110 to 135 days.

Winds are generally light to moderate all seasons of the year. Strongest winds generally occur in the spring with moderate to strong southerly flow for several days at a time.

Relative humidity is highest during the winter and lower in the summer. Mean annual relative humidity is 55%. As a result of low annual precipitation totals, low mean annual relative humidity, high percentage of sunshine (absence of cloud cover), and moderate solar insulated intensity, evaporation rates are expected to be rather high in this plateau desert region.

11.2 Air Quality

Regional impacts from coal mining operations on particulate air quality is expected to be minimal due to the rapid fallout of particles with distance from the source and the existence of few mining operations in the canyon.

Particulate matter is predominantly fugitive dust, the increase in concentrations of other pollutants (such as sulfur dioxide, nitrogen oxides, carbon monoxide,and photochemical oxidants) are minimal. The primary source of fugitive dust will be surface disturbance by construction equipment and haul trucks. Control measures such as water and/or chemical stabilizers will be applied to the surface facility area to minimize dust. The conveyor ~~and coal stockpile~~ will be sprayed with water to control fugitive dust emissions.

Soil stockpiles will be seeded with a temporary seed mix to help protect the soil from erosion by wind and precipitation. Once the vegetation is in place dust from the stockpiles will be minimal.

The Bureau of Air Quality issued an "Approval Order for Underground Coal Mine, Gordon Creek Canyon Carbon County - BAQE-336-91" to Blue Blaze Coal Company on May 23, 1991. ~~Horizon~~Hidden Splendor Resources, Inc., will modify the existing approval order to include ~~Horizon Coal Corporation~~Hidden Splendor Resources, Inc., as the present operator of the mine.

11.2.1 Mitigating Measures to be Employed to Control Air Pollutants

Due to the moisture content of the coal (4.4%) and the water carryover from dust suppression sprays underground, the potential for fugitive dust emissions from coal is minimal. Water sprays are used on the continuous miners to eliminate coal dust at the working face underground. As coal is loaded onto the mine conveyor, it is again sprayed with water for additional dust suppression.

Whether the coal drops from a chute or from a conveyor to the stockpile area, fugitive emissions will be minimized due to the water carryover from the in-mine dust-suppression activities. Limited drop distances from coal loading by front-end loaders to haul trucks will further reduce fugitive emissions during conveying operations.

Coal haulage over unpaved road surfaces have the greatest potential for fugitive dust emissions. Mitigating measures such as ~~covered haul trucks, abiding by speed limits,~~ watering the road surface on an as-needed basis or using approved dust suppressant chemicals will be used. Frequency of water and chemical dust suppressant application on the unpaved road surfaces will be determined by visual observation of the degree of road dustiness. Furthermore, surface dust-suppression activities will be extended to the loading pad.~~and around the stockpile area if necessary~~

Hidden Splendor Resources, Inc.

~~Horizon~~,will control air pollutants in accordance with the specifications Air Quality Approval Order BAQE-336-91 included in this chapter as Appendix 11-1.

11.2.2 Air Quality Monitoring Plans

Neither the Utah Division of Air Quality and nor the U.S. Environmental Protection Agency have established air quality monitoring network requirements for the area. Therefore, no air quality monitoring is planned for the permit area.

APPENDIX 11-1

BUREAU OF AIR QUALITY APPROVAL ORDER