RHINO
CASTLE VALLEY MINING LLC

5 July 2018

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

Re: Castle Valley Mining, LLC, C/015/0018
Waste Rock Site Permit Application

Dear Mr. Haddock

Attached are C1 and C2 forms with supporting documentation for the transferring of the Deer Creek Waste Rock site to Castle Valley Mining, LLC Waste Rock site. This a stand-alone document. This document was created by merging the existing approved Deer Creek Waste Rock Permit and Bowie Coal Recovery Permit.

If you have any questions, please call me at (435) 687-5454

Sincerely,

JAREN JARGENSEN FOR TONY WELCH

Tony Welch
Resident Agent

P.O. Box 475 • Huntington, UT 84528
Phone (435) 687-5454 • Fax (435) 687-5037

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☐ New Permit ☒ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Castle Valley Mining, LLC

Mine: Bear Canyon Mine **Permit Number:** C/015/0018

Title: Deer Creek Waste Site (now know as the Castle Valley Mining, LLC Waste Rock Site)

Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight (gray) questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☒ Yes ☐ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☒ Yes ☐ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☐ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☒ Yes ☐ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☒ Yes ☐ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?

Please attach one (1) review copy of the application.

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

JAREN JORGENSEN
Print Name

Sign Name, Position, Date

Subscribed and sworn to before me this 3RD day of JULY, 20 18

Dee Ann Finger
Notary Public

My commission Expires: 4-10, 2021

Attest: State of UTAH } } ss:
County of CARBON

DEEANN FINGER
Notary Public, State of Utah
Commission # 665425
My Commission Expires On
April 10, 2021

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining

Form DOGM- C1 (Revised 9/17/2013)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Castle Valley Mining, LLC
Mine: Bear Canyon Mine **Permit Number:** C/015/0018
Title: Deer Creek Waste Rock Site(now known as the Castle Valley Mining, LLC Waste Rock Site)

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
■ Add	☐ Replace	☐ Remove	Chapter 1 text, tables, figures, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 2 text, figure, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 3 text, table, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 4 text, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 5 text, table, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 6 text, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 7 text, tables, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 8 text, and appendices
■ Add	☐ Replace	☐ Remove	Chapter 9 text
■ Add	☐ Replace	☐ Remove	Cover page
☐ Add	☐ Replace	☐ Remove	
■ Add	☐ Replace	☐ Remove	Plate 1-1 Surface and Subsurface Owner
■ Add	☐ Replace	☐ Remove	Plate 2-1 Soil Depths and Stockpile Locations
■ Add	☐ Replace	☐ Remove	Plate 3-1 Vegetation Map
■ Add	☐ Replace	☐ Remove	Plate 3-2 Wildlife Habitat Map
■ Add	☐ Replace	☐ Remove	Plate 5-1 Permit Facilities & Typical RD X-Sections
■ Add	☐ Replace	☐ Remove	Plate 5-2 Reclamation Plan Map
■ Add	☐ Replace	☐ Remove	Plate 5-3 Road Reclamation Cross Sections
■ Add	☐ Replace	☐ Remove	Plate 5-4 Pile Reclamation Cross Sections
■ Add	☐ Replace	☐ Remove	Plate 6-1 Geology Map
■ Add	☐ Replace	☐ Remove	Plate 7-1 Sediment Detention Pond
■ Add	☐ Replace	☐ Remove	Plate 7-2 Site Drainage Map
■ Add	☐ Replace	☐ Remove	Plate 7-3 Drainage Details
■ Add	☐ Replace	☐ Remove	Plate 7-4 Surface Body Water Locations
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**

R645-301-100

GENERAL CONTENTS

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645-301-100 GENERAL CONTENT

R645-301-100 Minimum Requirements

R645-301-111 Introduction

R645-301-111.100 Objectives

This chapter provides information regarding ownership and control of the permit area. The compliance status of the operator at other locations is also provided herein. The waste rock pile covered by this application was first permitted for use on September 13, 1988 by the Utah Division of Oil, Gas and Mining (the "Division"). The original permit was issued to Utah Power and Light Company for disposal of waste rock generated at their Deer Creek Mine. The Deer Creek waste rock site (the "Deer Creek site" or the "site") has since been purchased by Castle Valley Mining, LLC (CVM). The site is located in Sections 5 and 6, Township 17 South Range 8 East, SLBM, immediately north of State Route 31 approximately 6 miles northwest of Huntington, Utah.

R645-301-112 Identification of Interests

R645-301-112.100 Statement of Corporation

Castle Valley Mining, LLC (CVM) is a limited liability company, registered in the state of Utah. Castle Valley Mining LLC is the payer of the abandoned mine reclamation fee. Federal Identification Number 27-29909495.

R645-301-112.200-230 Names, addresses, and telephone number of the applicant, and the Applicant's resident agent who will accept service of process.

Applicant: Castle Valley Mining
P. O. Box 475
5550 W. Bear Canyon Rd.
Huntington, UT. 84528
(435)687-5454

Correspondence should be sent to the Applicant

Resident Agent: Tony Welch
P. O. Box 475
5550 W. Bear Canyon Rd.
Huntington, UT. 84528
(435) 687-5454.

Person paying the abandoned mine land reclamation fee.

Tony Welch
P. O. Box 475
5550 W. Bear Canyon Rd.
Huntington, UT. 84528
(435) 687-5454

R645-301-112.300 For each person who own or controls the applicant:

R645-301-112.310 Name and address of each officer, partner, principal, principal shareholder, and director or other person performing a function similar to a director.

See Appendix 1-4 Ownership and Control

R645-301-112.320 The person's ownership and control relationship in the applicant including percentage ownership and location in the organizational structure.

See Appendix 1-4 Ownership and Control

R645-301-112.330 The title of the person's position, date position was assume, and when submitted under R645-300-147.

See Appendix 1-4 Ownership and Control

R645-301-112.340 All names under which the applicant operates or previously operated a coal mine and reclamation operation in the United States within
the 8 years preceding the date of application.

See Appendix 1-4 Ownership and Control

R645-301-112.350 The Application Number or Other Identifier of, and the Regulatory authority for, any other pending coal mine operation permit application
filed by any State in the United States.

See Appendix1-4 Ownership and Control

R645-301-112.400-420 Coal Mining and Reclamation Operations owned or controlled by the Applicant or by persons who own or control the Applicant.

See Appendix 1-4 Ownership and Control, pages

Permit	Issuing Authority	Status
Approval Order (DAQE# 926-91)	Utah Dept. of Environmental Quality, Division of Air Quality	Approved
Certificate of Insurance and Business Authorization	Utah Industrial Development Commission	Approved
Mining and Reclamation Permit (C/015/0025)	Utah Dept. of Natural Resources, Division of Oil, Gas & Mining	Approved

In addition to the permit that CVM is seeking from the Utah Division of Oil, Gas and Mining for operations at the

Deer Creek site, CVM will transfer the existing Air Quality Permit (DAQE# 926-91) for the Deer Creek site. The sedimentation pond at the CVM site is designed as a total-containment Facility (see Section 742.200 of this application). Therefore, CVM will not be seeking a discharge permit from the Utah Division of Water Quality for operations at the site.

R645-301-112.500 Legal or Equitable Owner of Record of the Surface And Mineral Property to be mined

Castle Valley Mining, LLC is the legal and equitable owner of the entire 49.05-acre surface parcel included within the permit area (see Appendix 1-1). C V M right to enter the property and conduct operations. There will be no mining at this facility. Thus, the mineral properties will not be affected by the operation. A property ownership map of the permit and adjacent areas is presented as Plate 1-1. No area within the lands to be affected by the facility is under a real estate contract.

R645-301-112.600 Owner of Record of Property Contiguous to Proposed Permit Area

The following owners of surface lands are contiguous to the permit boundary:

Utah Power and Light Company
1407 West North Temple
Salt Lake City, Utah 84116

U.S. Department of the Interior
Bureau of Land Management
900 North 700 East
Price, Utah 84501

State of Utah
Utah Division of Forestry, Fire and State Lands
319 North Carbondale Road, Suite D Price, Utah 84501

The locations of these lands relative to the permit area are shown on Plate 1-1.

R645-301-112.700 MSHA ID Number

The MSHA number for the operation is: 42-02649

R645-301-112.800 Interest in Lands Contiguous

The applicant neither owns nor controls, directly or indirectly, a legal equitable interest in any lands contiguous to the permit area.

R645-301-113.100-400 Violation Information

Neither CVM nor any major stockholder of CVM having any interest, either legal or equitable, in the CVM site have had a State or Federal mining permit suspended or revoked in the five years preceding the date of submission of this application, or have forfeited a performance bond or similar security deposited in lieu of bond revoked. A summary of Notices of Non-compliance associated with mining, air, or water permits issued to CVM or related entities during the three year period preceding the submission of this application is provided in Appendix 1-3.

R645-301-114.100-300 Right-of-Entry

The Deer Creek site is located on lands that are entirely owned by CVM (see Appendix1-1). Hence, no other right of entry is required.

R645-301-115.100-300 Status of Unsuitability Claims.

The permit area is not located within an area that has been designated as unsuitable for mining and reclamation operations, nor is it within an area under study for designation in an administrative proceeding under R645-103-300, R645-103-400, or 30 CFR Part 769.

R645-301-116.100-220 Permit Term

Operations for CVM site will began as soon as required permits are issued for these operations. Termination of operations will be determined by working conditions. The timing of this termination is, therefore, unknown. The anticipated total acreage to be affected during operations is less than the 49.05-acres surface parcel is included within the permit area.

R645-301-117.100-300 Insurance, Proof of Publication and Facilities or Structures Used in Common

A certificate of Insurance issued to CVM is provided in Appendix 1-2. The following announcement will be published in the Emery County Progress, a newspaper of general circulation in the Huntington area, notification that the Division had determined that this permit application was complete. The notice that will be published is provided in Appendix 1-6.

R645-301-118 Filing Fee

The permit filing fee will be paid upon submittal of the application.

R645-301-120.121.100-123 Permit Application Format and Contents

The permit application contains clear, concise, current information, in the format of the DOGM regulations.

R646-301-130.131-132 Reporting of Technical Data

All technical data submitted in the permit application is accompanied by the names of persons or organizations that collected and analyzed the data. The technical data also contains the dates of collection and analysis of the data, and descriptions of the method used to collect and analyze data, as indicated in subsequent sections of this application. Professionals qualified in the subject planned or directed the technical analyses. These professionals included the following:

- Richard B. White, P.E. – President/Civil and Environmental Engineer, EarthFax Engineering Group, LLC (engineering, soils, hydrology, bonding, alluvial valley
- Patrick Collins, Ph.D.- President, Mt. Nebo Scientific, Inc. (vegetation)
- Val Payne- Wildlife Biologist, Utah Power and Light Company (wildlife)

R645-301-140.121-142.400 Maps and Plans

The maps submitted in this permit application comply with the format required by the regulations. The permit area was developed prior to the initial submittal of this permit application.

The permit area boundary shown on the maps submitted in this permit application is an approximate representation of that boundary. A more complete description of that boundary is provided in Appendix 1-5 as follows:

Beginning at the Northeast comer of Section 6, Township 17 South, Range 8 East, SLB&M, and running thence S 89°52'00" W, 1272.00 feet along Section line; thence S 72°54'35" E, 314.08 feet; thence S 63°06'41" E, 224.51 feet; thence S 48°18'17" E, 268.40 feet; thence S 20°06'29" W, 1066.85 feet; thence S 39°24'03" W, 846.37 feet, more or less tot eh Northerly right-of-way of SR- 31; thence N 89°39'06" E, 139.42 feet along said right-of-way; thence N 43°39'42" E, 1520.19 feet; thence N 31°02'18" E, 412.96 feet; thence N 22°58'45" E, 1322.55 feet to the North line of Section 5, Township 17 South, Range 8 East, SLB&M; thence N 89°44'10" W, 744.58 feet along Section line to the point of beginning.

R645-301-150 Completeness

The Applicant believes the information in this application to be complete and correct.

APPENDIX 1-1
PURCHASE AGREEMENT

RIGHT OF ENTRY AGREEMENT

This RIGHT OF ENTRY AGREEMENT (this "***Agreement***") is made and entered into effective as of June 11, 2018 (the "***Effective Date***"), by and between PACIFICORP, an Oregon corporation, having a mailing address of 1407 W. North Temple, Salt Lake City, Utah 84116 ("***PacifiCorp***"); and CASTLE VALLEY MINING LLC, a Delaware limited liability company, having a mailing address of 424 Lewis Hargett Circle, Suite 250, Lexington, Kentucky 40503 ("***CVM***").

RECITALS

WHEREAS, PacifiCorp is the owner of certain real property located in Emery County, State of Utah, as more particularly described in Exhibit A attached hereto (the "***Property***");

WHEREAS, PacifiCorp holds various permits used in connection with the use and operation of the Property (the "***Permits***");

WHEREAS, PacifiCorp and CVM have entered into that certain purchase agreement (the "***Purchase Agreement***") whereby, subject to the terms and conditions of such agreement, CVM will acquire the Property from PacifiCorp; and

WHEREAS, in connection with the transaction contemplated by the Purchase Agreement, PacifiCorp desires to grant to CVM the right to enter upon the Property for purposes of evaluating the Property and facilitating the transfer of the Permits.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, the parties agree as follows:

1. Right to Enter. PacifiCorp hereby grants CVM and its duly authorized agents, employees and representatives, at their sole risk and expense, access to and the right to enter the Property, for familiarization and orientation purposes, to conduct its due diligence in connection with the transaction contemplated by the Purchase Agreement, and to proceed with the process of the Permits transfer. CVM shall provide to PacifiCorp one (1) days' notice prior to entering the Property.

2. Indemnification. CVM shall indemnify, defend, and hold harmless PacifiCorp and its parent corporation, and their respective directors, officers, agents, representatives, subsidiaries and Affiliates, from and against any and all claims, demands, or suits (by any party including, without limitation, any governmental agency), losses, liabilities, damages, obligations, payments, costs and expenses (including, without limitation, the original costs of defending any and all actions, suits, proceedings, demands and assessment which shall include reasonable attorneys' fees and court costs) resulting from, relating to, arising out of or incurred in connection with the access and right of entry rights granted under this Agreement and any actions of CVM or its affiliates on the Property.

3. Termination. If the Purchase Agreement between the parties is terminated, this Agreement shall automatically terminate without further action by the parties.

4. JURY WAIVER. TO THE FULLEST EXTENT PERMITTED BY LAW, EACH OF THE PARTIES HERETO WAIVES ANY RIGHT IT MAY HAVE TO A TRIAL BY JURY IN RESPECT OF LITIGATION DIRECTLY OR INDIRECTLY ARISING OUT OF, UNDER OR IN CONNECTION WITH THIS AGREEMENT. EACH PARTY FURTHER WAIVES ANY RIGHT TO CONSOLIDATE ANY ACTION IN WHICH A JURY TRIAL HAS BEEN WAIVED WITH ANY OTHER ACTION IN WHICH A JURY TRIAL CANNOT BE OR HAS NOT BEEN WAIVED.

5. Governing Law. This Agreement shall be governed by and construed and enforced in accordance with the laws of the State of Utah, without regard to its conflict of laws rules.

The parties hereto have executed this Agreement effective as of the date first set forth above.

PACIFICORP:

PACIFICORP
an Oregon corporation

By: _____
Name: DANA M. RALSTON
Title: SVP THERMAL GEN + MINING

CVM:

CASTLE VALLEY MINING LLC
a Delaware limited liability company

By: _____
Name: R. Chad Hunt
Title: SVP and CAO

LEXLibrary 386900v.1
97171678.2 0076000-02003

Exhibit A

Legal Description of the Property

That certain parcel of real property located in Emery County, State of Utah, as more particularly described below and generally depicted on the attached map.

PROPERTY DESCRIPTION:

Beginning at the Northeast corner of Section 6, Township 17 South, Range 8 East, SLB&M, and running thence S 89°52'00" W, 1272.00 feet along Section line; thence S 00°08'00" W, 610.00 feet; thence S 83°28'43" E, 302.04 feet; thence S 72°54'35" E, 314.08 feet; thence S 63°06'41" E, 224.51 feet; thence S 48°18'17" E, 268.40 feet; thence S 20°06'29" W, 1066.85 feet; thence S 39°24'03" W, 846.37 feet, more or less to the Northerly right-of-way of SR-31; thence N 89°39'06" E, 139.42 feet along said right-of-way; thence N 43°39'42" E, 1520.19 feet; thence N 31°02'18" E, 412.96 feet; thence N 22°58'45" E, 1322.55 feet to the North line of Section 5, Township 17 South, Range 8 East, SLB&M.; thence N 89°44'10" W, 744.58 feet along Section line to the point of beginning.

Containing 49.05 acres more or less

APPENDIX 1-2
INSURANCE

CERTIFICATE OF LIABILITY INSURANCE

6/1/2019

DATE (MM/DD/YYYY) 5/31/2017

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Lockton Companies
Three City Place Drive, Suite 900
St. Louis MO 63141-7081
(314) 432-0500

CONTACT NAME:
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : National Union Fire Ins Co Pitts. PA	19445
INSURER B : Lexington Insurance Company	19437
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
1340392
Castle Valley Mining, LLC
424 Lewis Hargett Circle, Ste 250
Lexington KY 40503

COVERAGES RHIRE **CERTIFICATE NUMBER:** 14108177 **REVISION NUMBER:** XXXXXXX

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY	N	N	3261614	6/1/2018	6/1/2019	EACH OCCURRENCE	$ 2,000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 2,000,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	POLICY X PRO-JECT X LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:							$
A	AUTOMOBILE LIABILITY	N	N	3244251	6/1/2018	6/1/2019	COMBINED SINGLE LIMIT (Ea accident)	$ 2,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$ XXXXXXX
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$ XXXXXXX
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$ XXXXXXX
								$ XXXXXXX
B	X UMBRELLA LIAB X OCCUR	N	N	013136615	6/1/2018	6/1/2019	EACH OCCURRENCE	$ 5,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$ 5,000,000
	DED RETENTION $						Prod. Comp. Ops	$ 5,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			NOT APPLICABLE			PER STATUTE / OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N (Mandatory in NH)	N / A					E.L. EACH ACCIDENT	$ XXXXXXX
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ XXXXXXX
							E.L. DISEASE - POLICY LIMIT	$ XXXXXXX

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

14108177
FOR INFORMATIONAL PURPOSES

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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APPENDIX 1-3

VIOLATION INFORMATION

Action Taken on Existing Citation
Utah Coal Regulatory Program

1594 West North Temple, Salt Lake City, UT 84114
Phone: (801) 538 - 5285 Fax: (801) 359-3940

Action on Citation#:	21177
Permit Number:	C0150025
Date Cit. Issued:	04/28/2016

☐ MODIFICATION of ☑ TERMINATION of ☐ VACATION of

☑ NOTICE OF VIOLATION ☐ CESSATION ORDER (CO) ☐ FAILURE TO ABATE CO

Permittee Name: CASTLE VALLEY MINING LLC	Inspector Number and ID: 1 JHELFRIC
Mine Name: BEAR CANYON MINE	Date and Time of Action: 09/22/2016
Certified Return Receipt Number:	Date and Time of Service:

In accordance with the provisions of the Utah Coal Mining and Reclamation Act, Utah Code Ann. § 40-10-1 et. seq. (Act), the above referenced Citation is:

☐ **Modified as follows:**

Reason for modification:

☑ **Terminated because:**
The required permitting actions were completed and Castle Valley Mining received approval for the access road to catch basin 1 and the coal fines under the conveyor on July 21, 2016

☐ **Vacated because:**

Jaren Jorgensen	**JOE HELFRICH**
(Print) Permittee Representative	(Print) DOGM Representative
	Joseph C. Helfrich 9/22/16
Permittee Representative's Signature - Date	DOGM Representative's Signature - Date

Refer to the "Citation For Non-Compliance" for additional information

Citations Home Page

Citation for Non-Compliance
Utah Coal Regulatory Program

1594 West North Temple, Salt Lake City, UT 84114
Phone: (801) 538-5340 Fax: (801) 359-3940

Citation #: 21177
Permit Number: C0150025
Date Issued: 04/28/2016

☑ NOTICE OF VIOLATION ☐ CESSATION ORDER (CO) ☐ FAILURE TO ABATE CO

Permittee Name: CASTLE VALLEY MINING LLC	Inspector Number and ID:	1	JHELFRIC
Mine Name: BEAR CANYON MINE	Date and Time of Inspection:	04/19/2016	10:30 am
Certified Return Receipt Number: 7014 0150 0000 1193 5038	Date and Time of Service:	04/28/2016	2:00 pm

Nature of condition, practice, or violation:
The permittee had initiated construction of the access road to the conveyor coal spill area prior to obtaining approval from the Division.

Provisions of Act, regulations, or permit violated:
R 645-300-142

☐ **This order requires Cessation of ALL mining activities.** (Check box if appropriate.)

☐ Condition, practice, or violation is creating an imminent danger to health or safety of the public.	☐ Permittee is/has been conducting mining activities without a Permit.
☐ Condition, practice, or violation is causing or can reasonably be expected to cause significant, imminent environmental harm to land, air, or water resources.	☐ Permittee has failed to abate Violation(s) included in ☐ Notice of Violation or ☐ Cessation Order within time for abatement originally fixed or subsequently extended.

☐ **This order requires Cessation of PORTION(S) of mining activities.**

Mining activities to be ceased immediately: ☐ Yes ☑ No	Abatement Times (if applicable).

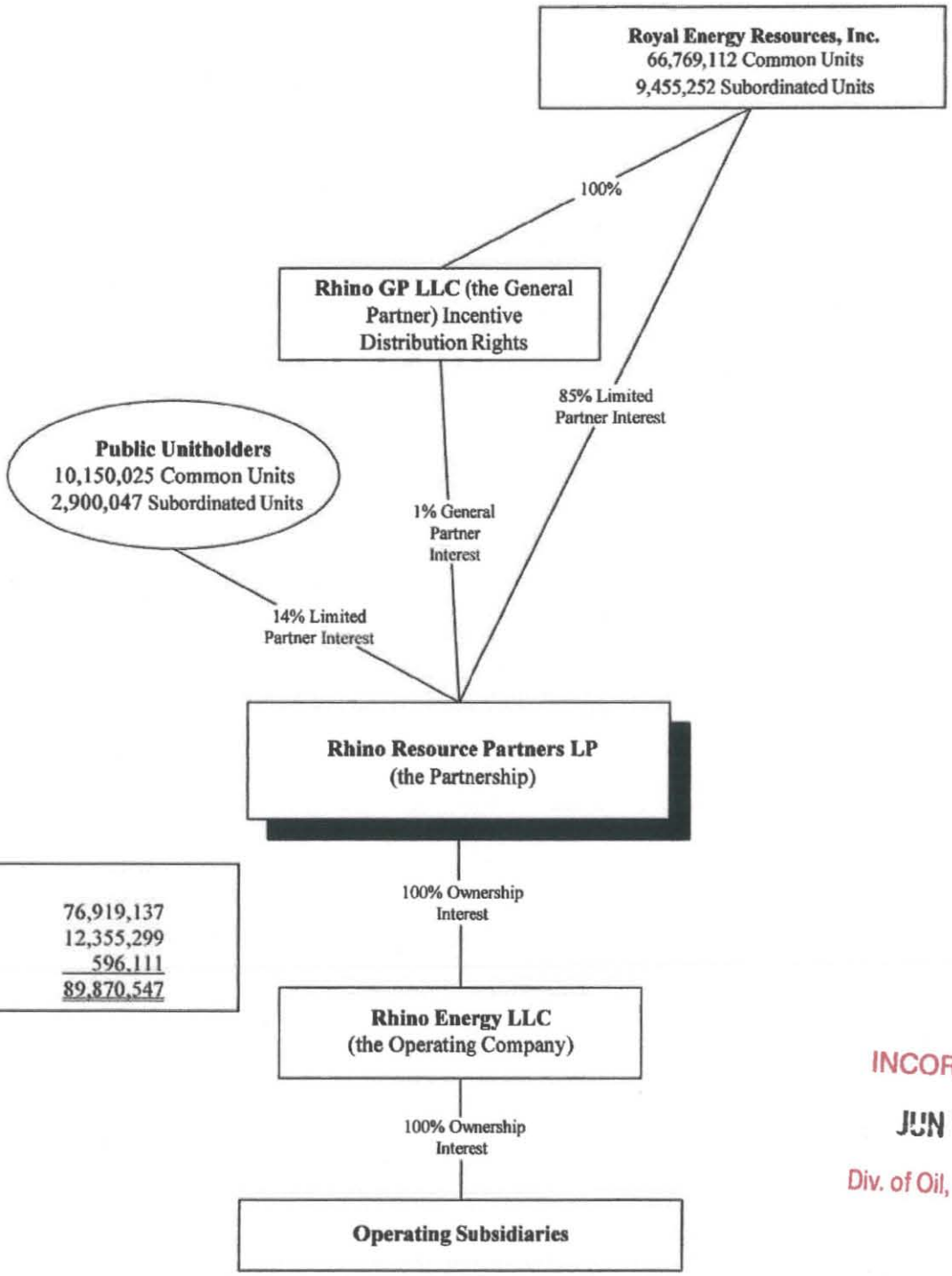
Action(s) required: ☑ Yes ☐ No
1. Obtain Division approval for the access road to the conveyor coal spill by no later than Monday, May 30th. Division review time will not be counted as part of the 90 day abatement period.
2. Provide adequate protection for the topsoil stockpile located upslope from the access road to the coal spill by no later than Monday, May 9th.

Jaren Jorgensen	JOE HELFRICH
(Print) Permittee Representative	(Print) DOGM Representative
	Joseph C. Helfrich 4/28/2016
Permittee Representative's Signature - Date	DOGM Representative's Signature - Date

SEE REVERSE SIDE Of This Form For Instructions And Additional Information

APPENDIX 1-4
OWNERSHIP AND CONTROL

Rhino Organizational Structure Chart
March 31, 2016



Total Units:	
Common	76,919,137
Subordinated	12,355,299
GP Notional	596,111
Total	89,870,547

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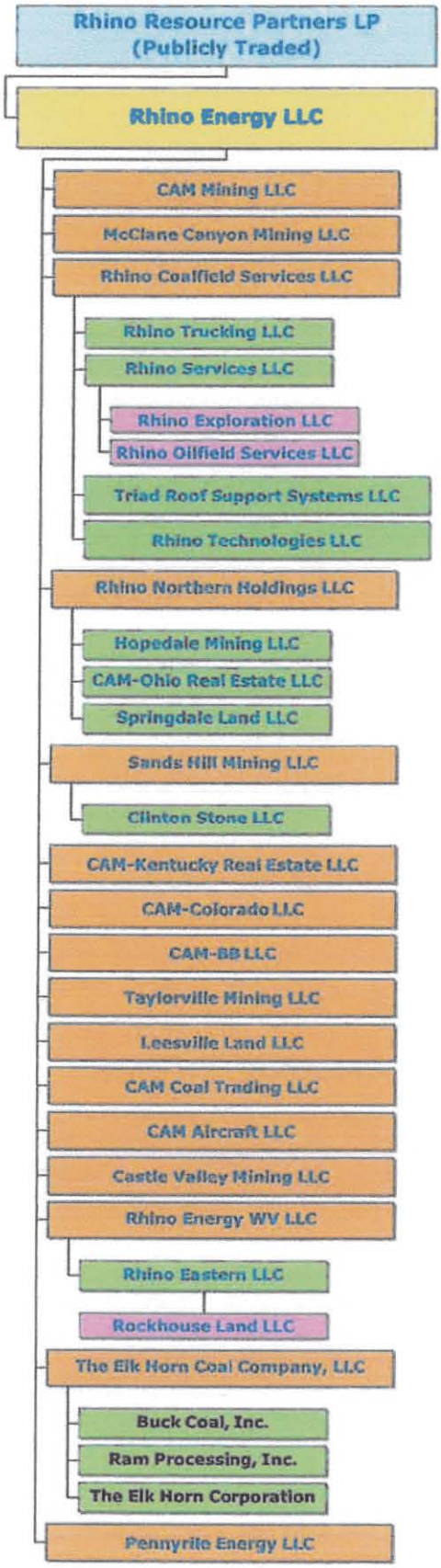

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Royal Energy Resources, Inc. Owner and Controller information

Name	Relationship	
William L. Tuorto	Director, CEO, and Treasurer Start date – 3-6-2015	
Brian Hughs	Director and VP Start date – 10-13-2015	
Douglas C. Holsted	CFO Start date – 6-8-2015	
Ian Ganzer	COO Start date – 6-10-2015	
Ronald Phillips	President and Secretary Start date – 10-13-2015	
William L. Tuorto	Equity Owner - 5.54%	
E-Starts Money Co. (sole owner and officer is William L. Tuorto, with a start date of 1-13-2015)	Equity Owner - 47.41%	

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LIST OF OFFICERS FOR RHINO GP LLC, RHINO ENERGY LLC, AND SUBSIDIARIES

Rhino GP LLC

William Turoto	-	Director, Chairman of the Board
Joseph Funk	-	Director
Ronald Phillips	-	Director
Ian Ganzer	-	Director
Douglas Holsted	-	Director
Brian Hughs	-	Director
David Hanig	-	Director
Michael Thompson	-	Director

Audit Committee

David Hanig	-	Member
Michael Thompson	-	Member

Conflicts Committee

David Hanig	-	Member
Michael Thompson	-	Member

Compensation Committee

William Tuorto	-	Chairman
Joseph Funk	-	Member

Executive Committee

William Tuorto	-	Chairman
Joseph Funk	-	Member

Joseph Funk	-	President & Chief Executive Officer
Richard A. Boone	-	Executive Vice President and Chief Financial Officer
Brian Aug	-	Vice President of Sales
R. Chad Hunt	-	Senior Vice President of Business Development
Elizabeth Branham	-	Vice President, Controller & Assistant Secretary
Whitney Kegley	-	Vice President, Secretary & General Counsel

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Div. of Oil, Gas & Mining

Rhino Energy LLC

Joseph Funk	-	President & Chief Executive Officer
Richard Boone	-	Executive VP, Chief Financial Officer & Treasurer
Whitney Kegley	-	Vice President, Secretary & General Counsel
Elizabeth Branham	-	Vice President, Controller, Assistant Secretary
Brian Aug	-	Vice President Sales
R. Chad Hunt	-	Senior Vice President of Business Development
Scott Morris	-	Vice President of Finance

Castle Valley Mining LLC

Joseph Funk	-	President & Chief Executive Officer
R. Chad Hunt	-	Vice President
Richard Boone	-	Executive VP, Chief Financial Officer & Treasurer
Whitney Kegley	-	Vice President, Secretary & General Counsel
Elizabeth Branham	-	Vice President, Controller, Assistant Secretary
Brian Aug	-	Vice President of Sales
Scott Morris	-	Vice President of Finance

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Div. of Oil, Gas & Mining

Castle Valley Mining LLC

P O Box 1169
265 Hambley Boulevard
Pikeville, KY 41502

FEIN 27-2909495
Phone 606-432-3900

Officers and Directors

OFFICER	TITLE	BEGIN DATE OWNERSHIP	BEGIN DATE AFFILIATION	END DATE
Joe Funk	President & CEO	N/A	11/14/2014	
David Zatezalo	Chief Executive Officer	N/A	9/4/2009	8/19/2013
Christopher I. Walton	President	N/A	4/11/2012	11/14/2014
R. Chad Hunt	Vice President	N/A	9/4/2009	
Richard Boone	Senior Vice President, CFO & Treasurer	N/A	1/1/2007	
Whitney Kegley	Vice President, Secretary & General Counsel	N/A	7/16/2012	
Elizabeth Branham	Vice President, Controller, Assistant Secretary	N/A	1/1/2007	
Brian Aug	Vice President of Sales	N/A	8/5/2013	
Corey Heaps	Vice President	N/A	9/8/2010	7/31/2015
Jefff Quatman	Vice President	N/A	3/31/2011	6/12/2015
Scott Morris	Vice President of Finance	N/A	2/4/2016	
Mark Zand	Chairman	N/A	6/10/2010	10/5/2010
Chad Hunt	President	N/A	6/10/2010	3/2/2012
Christopher N. Moravec	Senior Vice President, Business Development	N/A	6/10/2010	3/2/2012
Joseph Miller	Vice President & Asst. Secretary	N/A	6/10/2010	7/16/2012
Andrew Cox	Vice President Sales	N/A	6/10/2010	8/2/2013
Arthur Amron	Vice President and Assistant Secretary	N/A	6/10/2010	10/5/2010
Jay Maymudes	Vice President, Secretary and Treasurer	N/A	6/10/2010	10/5/2010
Paul Jacobi	Vice President	N/A	6/10/2010	10/5/2010
Gary Isaac	Vice President and Assistant Secretary	N/A	6/10/2010	2/28/2013
		N/A		
Rhino Energy LLC	Member, Shareholder - 100%	N/A	6/10/2010	

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Rhino Energy LLC

424 Lewis Hargett Circle, Suite 250
Lexington, KY 40503

FEIN 59-3762498
Phone 859-389-6500

Officers and Directors

OFFICER	TITLE	BEGIN DATE OWNERSHIP	BEGIN DATE AFFILIATION	END DATE
Joe Funk	President & CEO	N/A	11/14/2014	
David Zatezalo	President & CEO	N/A	9/4/2009	8/19/2013
Christopher I. Walton	Senior VP & Chief Operating Officer	N/A	4/11/2012	11/14/2014
Richard Boone	Senior Vice President, CFO & Treasurer	N/A	2/1/2005	
Whitney Kegley	Vice President, Secretary & General Counsel	N/A	7/16/2012	
Elizabeth Branham	Vice President, Controller and Assistant Secretary	N/A	1/1/2007	
Brian Aug	Vice President of Sales	N/A	8/5/2013	
R. Chad Hunt	Vice President of Technical Services	N/A	8/28/2008	
Jeff Quatman	Vice President	N/A	1/1/2011	6/12/2015
Scott Morris	Vice President of Finance	N/A	2/4/2016	
Andrew Cox	Vice President of Sales	N/A	1/22/2007	8/2/2013
Joseph Miller	Vice President and Secretary	N/A	1/3/2007	7/16/2012
Arthur Amron	Vice President and Assistant Secretary	N/A	6/26/2003	10/5/2010
Jay Maymudes	Vice President, Secretary and Treasurer	N/A	6/26/2003	10/5/2010
Paul Jacobi	Vice President	N/A	6/26/2003	10/5/2010
Corey Heaps	Vice President of Western Operations	N/A	9/1/2010	7/31/2015
Wexford Capital LLC	Member, Manager 0%	N/A	4/30/2003	10/5/2010
Taurus Investors LLC	Member, Shareholder <10%	N/A	4/30/2003	10/5/2010
Valentis Investors LLC (Class A)	Member, Shareholder >10%	N/A	4/30/2003	10/5/2010
Artis Investors LLC (Class A)	Member, Shareholder <10%	N/A	4/30/2003	10/5/2010
Artis Investors LLC (Class B)	Member, Shareholder <10%	N/A	4/30/2003	10/5/2010
Callidus Investors, LLC	Member, Shareholder <10%	N/A	10/1/2003	10/5/2010
Solitar Corporation	Member, Shareholder >10%	N/A	7/15/2003	10/5/2010
Wexford Spectrum Investors LLC	Shareholder >10%	N/A	11/1/2004	10/5/2010
Mark Zand	Chairman	N/A	6/26/2003	10/5/2010
Christopher N. Moravec	Senior Vice President, Business Development	N/A	3/23/2007	3/2/2012
Nick Glancy	CEO & President	N/A	10/4/2005	3/5/2009
David Zatezalo	Senior Vice President & COO	N/A	3/1/2007	9/4/2009
Thomas Hanley	Senior Vice President	N/A	9/1/2007	9/4/2009
Royal Energy Resources Inc	Member, Shareholder - 100%	N/A	1/1/2016	

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Div. of Oil, Gas & Mining

CASTLE VALLEY MINING LLC
MINE IDENTIFICATION NUMBERS

MINE	ADDRESS	MSHA	ISSUANCE DA	STATE
CASTLE VALLEY #3	5550 WEST BEAR CANYON RD. HUNTINGTON, UT 84528	42-02263	12/15/1999	C/015/025
CASTLE VALLEY #4	5550 WEST BEAR CANYON RD. HUNTINGTON, UT 84528	42-02335	3/20/2002	C/015/025
BEAR CANYON LOADOUT FACILITY	5550 WEST BEAR CANYON RD. HUNTINGTON, UT 84528	42-02395	11/21/2004	C/015/025

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Div. of Oil, Gas & Mining

APPENDIX 1-5

PERMIT DESCRIPTION

NOTICE OF PERMIT APPLICATION

CASTLE VALLEY MINING, LLC

Notice is hereby given the Castle Valley Mining, LLC,
P. O. Box 475, 5550 W. Bear Canyon RD.
Huntington, UT 84528 has submitted an application to
The Division of Oil, Gas and Mining ("the Division") to
Permit the Deer Creek waste rock site (Formally owned
And permitted by PacifiCorp) locatedapproximately
6 miles northwest of Huntington, Utah.
The permit area for this facility is located in Section 5
and 6, Township 17 S., Range 8E., SLBM and contains
approximately 49.05 acres.

The division has determined that this application is
administratively complete. A copy of the permit
application is available for public inspection at the
following locations:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

Emery County Recorder Office
75 East Main, Room 104
Castle Dale, UT 84513

Written comments, objections, or a request for an
informal conference regarding the above application
should be directed to the Division at the above
address within the next 30 days.

APPENDIX 1-6
PROOF OF PUBLICATION

NOTICE OF PERMIT APPLICATION

CASTLE VALLEY MINING, LLC

Notice is hereby given the Castle Valley Mining, LLC,
P. O. Box 475, 5550 W. Bear Canyon RD.
Huntington, UT 84528 has submitted an application to
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Permit the Deer Creek waste rock site (Formally owned
And permitted by PacifiCorp) locatedapproximately
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and 6, Township 17 S., Range 8E., SLBM and contains
approximately 49.05 acres.

The division has determined that this application is
administratively complete. A copy of the permit
application is available for public inspection at the
following locations:

Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

Emery County Recorder Office
75 East Main, Room 104
Castle Dale, UT 84513

Written comments, objections, or a request for an
informal conference regarding the above application
should be directed to the Division at the above
address within the next 30 days.

R645-301-200

SOILS

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Appendix 2-1 NRCS Soil Survey Information

Appendix 2-2 Site-Specific Soil Data

R645-301-200 SOILS

R645-301-210 Introduction

This chapter contains pertinent information relating to identification, management, and reclamation activities associated with the soil resources present in the disturbed area of the Castle Valley Mining, LLC waste rock site (the "CVM site" or the "site").

R645-301-220 Environmental Description

The CVM site lies in central Utah near the mouth of Huntington Canyon. The dominant surficial geologic formation at the site is the Mancos Shale, of which the Masuk member is present at the surface. The Masuk member consists of light- to medium-gray marine gypsiferous mudstones. Surface elevations in the permit area range from about 6,240 to about 6,420 feet above mean sea level.

Soils in the area have formed primarily from residual, weathered shale. Soils are typically shallow to very shallow, well drained and consist predominantly of gravelly to cobbly loam, clay loam, and sandy loam. The soil is generally saline with a high erosion hazard (see Section 222).

R645-301-221 Prime Farmland Investigation

Data provided by the Natural Resources Conservation Service Web Soil Survey [1] indicate that prime farmland is not located within the permit area (see Appendix 2-1).

R645-301-222 Soil Survey

Soil survey data obtained from the NRCS Web Soil Survey are presented in Appendix 2-1, and are summarized herein. Survey data include the following information: taxonomic classification, typical pedon descriptions, ranges of selected chemical properties, and productivity

[1] http://websoilsurvey.nrcs.usda.gov/app/, accessed 20 Jan 2015.

ratings. In addition to the information downloaded from the NRCS web site, Appendix 2-2 contains data from samples collected from the permit area prior to disturbance of the site. These data are summarized below.

R645-301-222.100 Soils Map

Appendix 2-1 delineates the soil types present in the permit and adjacent areas. Subsequent discussions presented herein are restricted primarily to soil that occurs within the permit area.

R645-301-222.200 Soil Identification

According to the NRCS Web Soil Survey, the CVM site is located on soils classified as the Gerst-Strych-Badland complex, 30 to 70 percent slopes. This is further indicated on Appendix 2-1.

R645-301-222.300 Soil Description

As indicated in Appendix 2-1, the Gerst soil consists of very shallow and shallow, well drained soils. The typical Gerst pedon is described as follows:

A--0 to 5 inches; very pale brown (1OYR 7/3) parachannery loam, pale brown (1OYR 6/3) moist; weak very fine, fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, and slightly plastic; common fine, very fine, few medium roots; many fine and very fine, common medium pores; 20 percent parachanners; slightly effervescent, (13 percent calcium carbonate equivalent) carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary. (1 to 7 inches thick)

Cl--5 to 9 inches; pale brown (10YR 6/3) parachannery loam, brown (10YR 5/3) moist; moderate very thin and thin platy geogenic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine, few medium roots; common very fine and fine pores; 30 percent parachanners; strongly effervescent, (35 percent carbonate equivalent) carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary. (4 to 10 inches thick)

Bk3--25 to 48 inches; pale brown (lOYR 6/3) very stony loam, yellowish brown (10YR 5/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common very fine tubular pores; 20 percent cobbles; 20 percent stones and 5 percent boulders; strongly calcareous, carbonates are in few fine veins and as coatings on rock fragments; strongly alkaline (pH 8.8); clear smooth boundary. (0 to 25 inches thick)

C--48 to 60 inches; light yellowish brown (lOYR 6/4) stony sandy loam, yellowish brown (1OYR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine and medium roots; 10 percent stone and 5 percent gravel; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4).

The soil survey contains no typical pedon description of Badland soils. However, the map unit description provided in Appendix 2-1 indicates that Badland soil typically consists of 2 inches of clay overlying bedrock. This soil tends to have a very high runoff potential, a high calcium carbonate content, and a high gypsum content. The Badland soil is generally slightly to strongly saline with a moderately high sodium adsorption ratio.

Data provided in Appendix 2-2 were obtained from the Energy West Mining and Reclamation Plan for the site. These data represent analyses of 32 soil samples collected in April 1987 prior to disturbance of the CVM site at the locations shown on Plate 2-1. Based on these data, the soil at the site is slightly to moderately alkaline, with pH values ranging from 7.35 to 8.50 and averaging 7.94. The electrical conductivity of the soil ranges from 0.57 to 17.80 millimhos/cm, averaging 6.84 millimhos/cm. The calcium carbonate content of the soil averages 18.96%, ranging from a low of 4.03% to a high of 47.19%. The sodium adsorption ratio varies widely across the site, averaging 12.03 with a minimum of 0.50 and a maximum of 35.80.

R645-301-222.400 Soil Productivity

Under favorable conditions, the NRCS Web Soil Survey indicates that Gerst-Strych- Badland soils can produce only 63 pounds of rangeland vegetation per acre

annually. These production values drop to 44 lb./acre/yr. Under normal and 19 lb./acre/yr. under unfavorable conditions (see Appendix 2-1). As a result, these soils are categorized as having a Class 8 capability, which indicates that they have limitations that preclude commercial plant production and restricting their use to recreational purposes wildlife habitat, watershed, or esthetic purposes.[1]

R645-301-223 Prime Farmland Soil Characterization

The NRCS Web Soil Survey indicates that soil within the permit area does not qualify as prime farmland.

R645-301-224 Substitute Topsoil

Energy West segregated topsoil and subsoil from the site prior to disturbance of the area. Therefore, Castle Valley Mining, LLC ("CVM") does not propose to use substitute topsoil during reclamation. Since the use of substitute topsoil is not anticipated, no field trials or other tests of suitability are anticipated.

R645-301-230 Operation Plan

R645-301-230.231 General Requirements

R645-301-230-231.100 Removing and Storing Soil Methods

The CVM site has been used for the disposal of waste rock since the late 1980s. Prior to site disturbance, topsoil and subsoil were segregated by Energy West and stored in stockpiles located within the permit area. The approximate depths to which soil was stripped and the locations of the stockpiles in which it was stored are shown on Plate 2-1. Topsoil was placed on the upper foot of the berms, with the remainder of the berms constructed of subsoil.

In areas where additional disturbance occurred due to upgrading the site access road, the upper 6 inches of soil was removed and temporarily stockpiled as topsoil. Subsoil was then graded as needed to form the base for the roadway. Following completion of the subgrade work, the material that was temporarily stockpiled as topsoil was evenly spread over the embankment out slopes. This topsoil was then revegetated and subsequently evaluated for revegetation success (See Appendix 3-2 of this application).

Topsoil and subsoil will similarly be removed and segregated prior to any new disturbances, if they occur as a result of operations required to recover coal from the CVM site. All soil that is stripped in the future will be segregated into separate stockpiles as subsoil and topsoil.

R645-301-230-231.200 Suitability of Topsoil Substitutes/Supplements

No topsoil substitutes or supplements are planned for use during reclamation of the site.

R645-301-230-231-300 Testing of Topsoil Handling and Reclamation Procedures

During site reclamation, CVM will exercise care to guard against over-compaction and erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on reclaimed areas. Prior to reclamation, CVM will inspect soil stockpiles at least annually and fill, regrade, or otherwise stabilize any rills or gullies deeper than 9 inches which form in the stockpiles. The areas adjacent to any rills or gullies which have been filled, regraded, or otherwise stabilized will be reseeded or stabilized appropriately.

R645-301-230-231.400 Construction, Modification, Use, and Maintenance of Topsoil Stockpiles

The subsoil/topsoil stockpiles at the site were constructed by Energy West prior to other disturbance of the site. Surveys indicate that the stockpiles contain approximately 33,900 cubic yards of subsoil and 2,300 cubic yards of topsoil stripped from the area prior to placing waste rock. These stockpiles are divided as shown on Plate 2-1. The stockpiled materials were placed on stable surfaces and protected from off-pile erosion through the installation of silt fences. Markers have been placed on the piles to indicate that they contain topsoil. It is not anticipated that stockpiled topsoil will be moved or disturbed again until required for redistribution during final reclamation.

R646-301-232 Topsoil and Subsoil Removal

R645-301-232.100 Topsoil Removal and Segregation

If additional soil disturbances occur at the site, all topsoil thicker than 6 inches will be removed prior to disturbance, segregated, and stockpiled. Topsoil less than 6 inches thick will be removed according to Section 232.300.

R645-301-232.200 Poor Topsoil

Topsoil that is of an insufficient quantity or of sufficiently poor quality (for sustaining vegetation) will be removed as a separate layer and segregated. Such operations will be done with approval of the Division of Oil, Gas and Mining and in compliance with R614-301-233.100.

R645-301-232.300 Thin Topsoil

Topsoil to be removed that is less than 6 inches thick will be removed with the immediately underlying unconsolidated materials. This material mixture will be treated as topsoil.

R645-301-232.400 Minor Disturbances Not Requiring Topsoil Removal

Small Structures. Topsoil will not be removed prior to construction resulting in only minor disturbances. Such construction activities may include work on small structures such as power poles, signs, fence lines, and other small structures.

Vegetation. CVM will not remove topsoil for minor disturbances where such activity will not destroy vegetation or cause erosion.

R645-301-232.500 Subsoil Segregation

Due to the poor quality of soil at the site, the B and C soil horizons will not be individually segregated and stockpiled.

R645-301-232.600 Timing

Soil removal will take place after all vegetation has been removed that could interfere with soil salvage. Future removal of soil intended for site reclamation will occur prior to other surface disturbance activities.

R645-301-232.700 Topsoil and Subsoil Removal Under Adverse Conditions

In areas of future surface disturbance where sufficient topsoil is present, topsoil and subsoil will be removed separately and segregated, except where natural conditions render such operations hazardous.

Conventional Machines. In localities where steep grades, adverse terrains, severe rockiness, limited depth of soils, or other adverse conditions exist that render soil removal and segregation activities using conventional machines hazardous, soils will not be salvaged and stockpiled.

Substitute Topsoil. Importing of substitute topsoil is not anticipated at this site.

R645-301-233 Topsoil Substitutes and Supplements

R645-301-233.100 Overburden Materials Supplementing and/or Replacing Topsoil

No overburden materials will be used in site reclamation.

R645-301-233.200 Suitability of Topsoil Substitutes and Supplements

No topsoil substitutes or supplements are planned for use at the site.

R645-301-233.300 Physical and Chemical Analyses

No topsoil substitutes or supplements are planned for use at the site. Hence, no physical or chemical analyses of substitute material are anticipated.

R645-301-233.400 Testing of Substitute Topsoil

Since it will not be used at the site, no testing of substitute topsoil is anticipated.

R645-301-234 Topsoil Storage

R645-301-234.100 Topsoil Stockpiling

Topsoil that was removed from the area during site grading is stored in the upper 12 inches of the on-site stockpiles shown on Plate 2-1. Any topsoil removed from the site in the future will be stockpiled for later use in reclamation operations when it is impractical to promptly redistribute the topsoil on regraded areas.

R645-301-234.200 Stockpiled Topsoil

Stable Stockpile Site. The topsoil removed from the site is stored in the stockpiles shown on Plate 2-1. These stockpiles were located in a stable area. Future stockpiles (if any) will be similarly located in stable areas.

Protection from Contaminants and Compaction. Stockpiled topsoil is located in areas away from traffic that might introduce contaminants and unnecessary compaction. Future stockpiles (if any) will be similarly located in protected areas.

Wind and Water Erosion Protection. The topsoil stockpiles are protected from wind and water erosion by silt fences that have been installed at the base of the stockpiles. Vegetative cover have also been established to the extent allowed by the poor quality of stockpile soil.

Redistribution. No stockpiled topsoil will be moved until redistributed during reclamation operations unless approved by DOOM.

R645-301-234.300 Topsoil Stockpile Relocation

Stockpiled topsoil in jeopardy of being detrimentally affected in terms of its quantity and quality by site operations may be temporarily relocated if approved by the Division.

Host Site. Topsoil relocation may occur provided that such action does not permanently adversely affect topsoil of the host site.

Topsoil Suitability. Topsoil relocation may occur provided the topsoil is retained in a condition more suitable for redistribution than if stockpiled.

R645-301-240 Reclamation Plan

R645-301-240-241 General Requirements

Topsoil redistribution, amendments, and stabilization are discussed below.

R645-301-240-242 Soil Redistribution

R645-301-240-242.100 Soil Redistribution Practices

Once the Phase I waste rock site is full, all disturbed areas will be reclaimed. As indicated in Section 231.100, the upper foot of the soil stockpile berms consists of topsoil. For any section of the stockpile planned for soil removal, the topsoil will first be scraped from the stockpile using dozers, loaders, or trackhoes. This topsoil will be temporarily stored within the disturbed area at a location that will not receive traffic. The subsoil will then be removed and placed on the prepared surface, following which the recently-scraped topsoil will be placed.

The subsoil and topsoil will be redistributed from the stockpiles in a manner that achieves a stable thickness consistent with the post-mining land use, contours, and surface-water drainage systems. When placing topsoil, track-mounted equipment will be used where feasible to prevent excess compaction of the materials. Due to the high clay content and sodicity of the soils, no redistribution of topsoil will occur when the soil is too wet to adequately handle. The redistributed topsoil will be roughened during redistribution and prior to revegetation to protect the material from wind and water erosion before and after seeding.

R645-301-242.200 Regrading

Regraded areas will be scarified before redistribution of topsoil to reduce potential slippage of the redistributed material and to promote root penetration.

R645-301-242.300 Topsoil Redistribution on Impoundments and Roads

No on-site storm water impoundments or roads will be left in place after site reclamation.

R645-301-243 Soil Nutrients and Amendments

Fertilizer will be applied by broadcasting or as a separate operation of hydroseeding in conjunction with topsoil redistribution and revegetation. This fertilizer will consist of:

- Ammonium nitrate (applied at a rate of 50 lb./acre)
- Triple superphosphate (applied at a rate of 75 lb./acre)

R645-301.244 Soil Stabilization

Two practices will be implemented to control erosion and air pollution attendant to erosion during site reclamation. First, during redistribution of subsoil and topsoil, the area of newly

exposed stockpile surfaces will be minimized to the extent feasible. Second, redistributed topsoil will be roughened as it is placed prior to final revegetation. This roughening will minimize the distance that runoff can travel and will also create small depressions that will hold water and enhance the potential for revegetation success.

R645-301-244.200 Mulch Application

Mulch will be applied to the redistributed topsoil either in the form of hydromulch or shredded alfalfa hay mulch. If used, hay mulch materials will only be obtained from fields that are certified by the County Extension Agent as noxious weed free.

If hydromulch is used, it will be applied to the surface of the topsoil at a rate of at least 2,000 lb./acre with an added tackifier. If alfalfa hay mulch is used, it will be applied at a rate of 4,000 lb./acre and mechanically crimped into the soil.

R645-301-244.300 Rills and Gullies

Surface roughening of the redistributed topsoil will greatly minimize the potential for rills and gullies to form following reclamation. However, rills and gullies that form in areas that have been regraded and topsoiled will be filled, regraded, or otherwise stabilized. As required, topsoil in these areas will be replaced and the areas will be reseeded.

R645-301-250 Performance Standards

R645-301-251 Topsoil, Subsoil, and Topsoil Supplements Management

All topsoil, subsoil, and topsoil supplements will be managed as outlined in Sections 230 and 240.

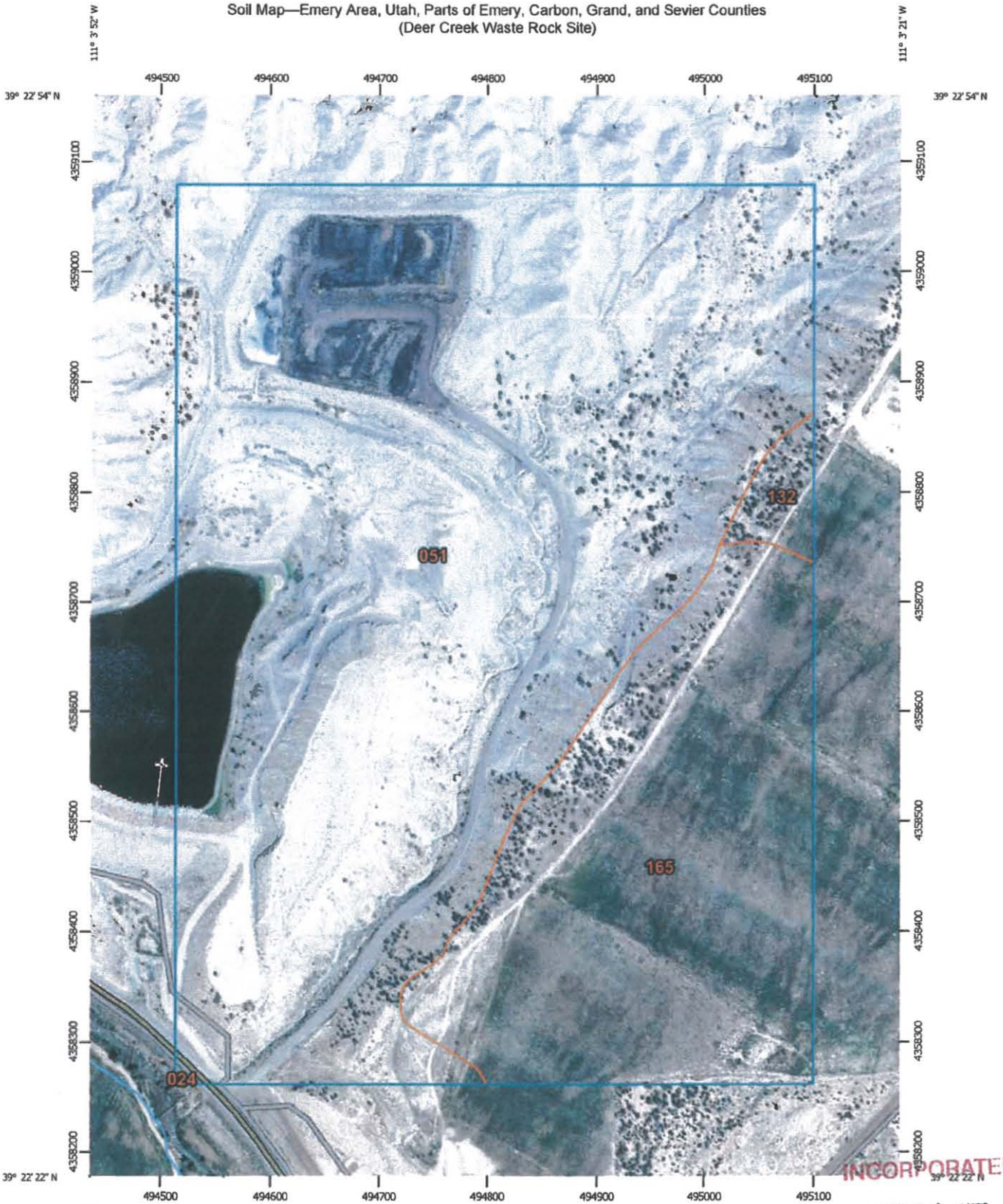
R645-301-252 Stockpiled Topsoil and Subsoil

All stockpiled topsoil and subsoil will be managed according to plan outlines in Sections 230 and 240.

APPENDIX 2-1

NRCS SOIL SURVEY INFORMATION

Soil Map—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
Survey Area Data: Version 4, Aug 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2011—Sep 28, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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Map Unit Legend

Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	30.7	25.9%
Totals for Area of Interest		**118.8**	**100.0%**

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Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties

051—Gerst-Strych-Badland complex, 30 to 70 percent slopes

Map Unit Setting

National map unit symbol: jyd5
Elevation: 5,100 to 8,050 feet
Mean annual precipitation: 9 to 12 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Gerst and similar soils: 40 percent
Strych and similar soils: 25 percent
Badland: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gerst

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium and/or slope alluvium over residuum weathered from sandstone and shale

Typical profile

A - 0 to 5 inches: very stony loam
C - 5 to 12 inches: clay loam
Cr - 12 to 22 inches: bedrock

Properties and qualities

Slope: 30 to 70 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 8 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)

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Sodium adsorption ratio, maximum in profile: 9.0
Available water storage in profile: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8e
Hydrologic Soil Group: D
Ecological site: Semidesert very steep shallow clay (utah juniper) (R034XY255UT)

Description of Strych

Setting

Landform: Hillslopes
Landform position (two-dimensional): Footslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from limestone, sandstone, and shale

Typical profile

A - 0 to 3 inches: very cobbly fine sandy loam
Bw - 3 to 11 inches: very cobbly fine sandy loam
Bk1 - 11 to 20 inches: very cobbly fine sandy loam
Bk2 - 20 to 35 inches: very cobbly sandy loam
C - 35 to 60 inches: very gravelly fine sandy loam

Properties and qualities

Slope: 30 to 70 percent
Percent of area covered with surface fragments: 15.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 45 percent
Gypsum, maximum in profile: 3 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 6.0
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Semidesert very steep loam (utah juniper - pinyon) (R034XY253UT)
Other vegetative classification: Semidesert Stony Loam (Utah Juniper-Pinyon) (034XY247UT_2)

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Description of Badland

Setting

Landform: Erosion remnants, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Shale and siltstone

Typical profile

C - 0 to 2 inches: clay
Cr - 2 to 12 inches: bedrock

Properties and qualities

Slope: 45 to 80 percent
Depth to restrictive feature: 0 to 2 inches to paralithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Calcium carbonate, maximum in profile: 15 percent
Gypsum, maximum in profile: 10 percent
Salinity, maximum in profile: Very slightly saline to strongly saline (4.0 to 20.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 30.0
Available water storage in profile: Very low (about 0.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D

Minor Components

Molen

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Semidesert loam (salina wildrye) (R034XY209UT)

Rock outcrop

Percent of map unit: 5 percent
Landform: Cliffs, erosion remnants, escarpments, ledges
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Gerst

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex

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Ecological site: Semidesert very steep shallow clay (utah juniper) (R034XY255UT)

Rubble land

Percent of map unit: 2 percent
Landform: Talus slopes
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Data Source Information

Soil Survey Area: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
Survey Area Data: Version 4, Aug 8, 2014

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LOCATION GERST UT+WY

Established Series
Rev GWL/CSW/JWB
04/2011

GERST SERIES

The Gerst series consists of very shallow and shallow, well drained soils that formed in slope alluvium and colluvium over residuum derived from shale and sandstone. Gerst soils are on hillslopes, cuestas, hills, mountain slopes and escarpments on structural benches. Slopes range from 2 to 70 percent. Mean annual precipitation is about 10 inches and the mean annual temperature is about 45 degrees F.

TAXONOMIC CLASS: Loamy, mixed, superactive, calcareous, mesic, shallow Ustic Torriorthents

TYPICAL PEDON: Gerst parachannery loam, on a northwest facing, convex-concave, 6 percent slope in black sagebrush-shadscale rangeland at an elevation of 6,320 feet. (Colors are for air-dry soil unless otherwise noted) The surface is covered by 55 percent angular parachanners.

A--0 to 5 inches; very pale brown (10YR 7/3) parachannery loam, pale brown (10YR 6/3) moist; weak very fine, fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, and slightly plastic; common fine, very fine, few medium roots; many fine and very fine, common medium pores; 20 percent parachanners; slightly effervescent, (13 percent calcium carbonate equivalent) carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary. (1 to 7 inches thick)

C1--5 to 9 inches; pale brown (10YR 6/3) parachannery loam, brown (10YR 5/3) moist; moderate very thin and thin platy geogenic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine, few medium roots; common very fine and fine pores; 30 percent parachanners; strongly effervescent, (35 percent calcium carbonate equivalent) carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary. (4 to 10 inches thick)

C2--9 to 13 inches; pale brown (10YR 6/3) parachannery loam; brown (10YR 5/3) moist; weak thick and medium platy geogenic structure; hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; 25 percent parachanners; strongly effervescent, (33 percent calcium carbonate equivalent) carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary. (3 to 8 inches thick)

Cr--13 to 23 inches; highly fractured shale.

TYPE LOCATION: Uintah County, Utah; about 20 miles southwest of Ouray; 1,200 feet north and 100 feet west of the southeast corner of sec. 12, T. 13 S., R. 18 E., SLBM; Dog Knoll, Utah USGS quad. Latitude 39 degrees 41 minutes 46 seconds N. and longitude 109 degrees 50 minutes 31 seconds W. NAD 27.

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RANGE IN CHARACTERISTICS:

Soil moisture: The soil moisture control section is affected by precipitation that peaks from July to October and falls evenly throughout the remainder of the year; aridic moisture regime bordering on ustic
Mean annual soil temperature: 47 to 52 degrees F.
Depth to paralithic contact: 6 to 20 inches to weathered bedrock

Particle-size control section:
Clay content: 18 to 35 percent clay
Rock fragments: 15 to 35 percent indurated and/or parafragments
Gypsum content: 0 to 5 percent

A horizon:
Hue: 10YR to 5Y
Value: 5 to 7 dry, 3 to 6 moist
Chroma: 2 to 4 dry or moist
Texture: gravelly loam, parachannery loam, channery loam, very stony loam, extremely stony loam, very channery loam, cobbly loam, loam, very bouldery loam, very cobbly clay loam
Reaction: moderately alkaline or strongly alkaline

C horizon:
Hue: 10YR to 5Y
Value: 5 to 7 dry, 4 to 6 moist
Chroma: 1 to 4 dry or moist
Texture: loam, clay loam, parachannery clay loam, parachannery silt loam, parachannery loam, channery loam, parachannery clay loam, channery clay loam or parachannery silty clay loam
Reaction: moderately alkaline or strongly alkaline.

COMPETING SERIES: These are the Canyon (NE), Epping (NE), Eslendo (NM), Picante (CO), Quarteles (NM), Redarrow (WY), Remorris (UT), Sandoval (NM), Shingle (WY), Simel (UT), Taluce (WY), Tassel (NE) and Tesihim (AZ)(T) series.
Canyon, Epping, Eslendo, Picante, Sandoval and Shingle soils have less than 15 percent rock fragments in the particle-size control section.
Quarteles, Redarrow, Remorris and Simel soils have hue of 7.5YR or redder.
Taluce, Tassel and Tesihim soils contain less than 18 percent clay in the particle-size control section.

GEOGRAPHIC SETTING:
Parent material: slope alluvium and colluvium over residuum derived from shale and sandstone
Landform: structural benches, mesas, terraces, cuestas, mountain slopes and hillslopes
Slopes: 2 to 70 percent
Elevation: 4,600 to 7,000 feet
Mean annual air temperature: 44 to 50 degrees F.
Mean annual precipitation: 8 to 14 inches
Frost-free period: 110 to 150 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Denco, Mikim, Milok, and Strych soils
Denco soils are on hillslopes, have a fine particle-size control section and are moderately deep
Mikim, Milok , and Strych soils are on alluvial flats and fan remnants and very deep

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DRAINAGE AND PERMEABILITY: Well drained; high runoff; moderate or moderately slow

permeability.

USE AND VEGETATION: The major uses are rangeland, wildlife habitat, and recreation. Potential native vegetation is black sagebrush, shadscale, bluegrass, Utah juniper, and pinyon. This soil has been correlated to the Semidesert Shallow Loam (Utah Juniper-Pinyon) - 034XY227UT range site at the type location in Utah.

DISTRIBUTION AND EXTENT: Northeastern and central Utah. LRR D, MLRA 34B. This soil is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: Carbon County, Utah, 1983.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon: the zone from the surface to 5 inches (A horizon).

Paralithic contact: the contact with fractured shale at 13 inches (Cr horizon).

The cation exchange activity class was inferred from laboratory data in the Uintah Area Soil Survey.

Taxonomic version: Eleventh Edition, 2010.

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LOCATION STRYCH UT+AZ CO NM WY

Established Series
Rev. DTH/CSW/JWB
04/2011

STRYCH SERIES

The Strych series consists of very deep, well drained, moderately or moderately rapidly permeable soils that formed in mixed alluvium and colluvium derived from sandstone, shale and conglomerate. Strych soils are on fan piedmonts, highly dissected alluvial fans, fan remnants, hill toeslopes, and footslopes of cuestas, mesas, terraces, and escarpments on structural benches. Slopes are 1 to 70 percent. The average annual precipitation is about 11 inches, and the mean annual temperature is about 48 degrees.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, mesic Ustic Haplocalcids

TYPICAL PEDON: Strych stony fine sandy loam--rangeland. (Colors are for air-dry soil unless otherwise stated)

A--0 to 1 inch; yellowish brown (10YR 5/4) stony fine sandy loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, and slightly plastic; few very fine roots; common very fine and fine interstitial pores; 10 percent gravel and 5 percent stones on soil surface; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary. (1 to 4 inches thick)

Bw--1 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine, few medium interstitial pores; 10 percent gravel; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary. (0 to 21 inches thick)

Bk1--6 to 11 inches; pale brown (10YR 6/3) gravelly loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky and slightly plastic; few very fine, fine, and medium tubular pores; 15 percent gravel; 5 percent stones and 5 percent cobbles; moderately calcareous; carbonates are disseminated and as thin coatings on undersides of rock fragments; strongly alkaline (pH 8.6); clear smooth boundary. (4 to 36 inches thick)

Bk2--11 to 25 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 5/3) moist; massive; very hard, firm, slightly sticky and slightly plastic; few very fine, fine, medium and coarse roots; few very fine tubular pores; 20 percent gravel, 15 percent stones, and 5 percent cobbles; strongly calcareous; carbonates are in common fine veins and as coatings on rock fragments; strongly alkaline (pH 8.6); clear smooth boundary. (0 to 55 inches thick)

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Bk3--25 to 48 inches; pale brown (10YR 6/3) very stony loam, yellowish brown (10YR 5/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common very fine tubular pores; 20 percent cobbles; 20 percent stones and 5 percent boulders; strongly calcareous, carbonates

are in few fine veins and as coatings on rock fragments; strongly alkaline (pH 8.8); clear smooth boundary. (0 to 25 inches thick)

C--48 to 60 inches; light yellowish brown (10YR 6/4) stony sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine and medium roots; 10 percent stone and 5 percent gravel; strongly calcareous, carbonates are disseminated; moderately alkaline (pH 8.4).

TYPE LOCATION: Grand County, Utah, about 2 miles northeast of the mouth of Nash Wash Canyon in the Book Cliffs, about 500 feet south and 2,500 feet west of the northeast corner of sec. 11, T. 20 S., R. 21 E.; Calf Canyon USGS quad; lat. 39 degrees 5 minutes 10 seconds N. and long. 109 degrees 33 minutes 59 seconds W., NAD 27.

RANGE IN CHARACTERISTICS:

Soil moisture: soils are dry 50 to 65 percent of the time cumulative when the soil temperature is greater than 41 degrees F. but are not moist for 90 consecutive days when the soil temperature is greater than 47 degrees F. The moist period occurs during the first 4 months following the summer solstice. Aridic moisture regime bordering on ustic.

Mean annual soil temperature is about - 47 to 52 degrees F.

Depth to calcic horizon - 7 to 39 inches

Particle-size control section (weighted average):
Clay content: 6 to 18 percent
Rock fragments: 35 to 75 percent.

A horizon
Hue: 5YR to 10YR.
Value: 4 or 6 dry, 3 to 5 moist,
Chroma: 3 to 6 dry or moist.
Reaction: slightly alkaline, to strongly alkaline.

Bw horizon
Hue: 5YR to 10YR.
Value: 4 to 6 dry or moist
Chroma: 3 to 6 dry or moist.
Texture: fine sandy loam, gravelly fine sandy loam, cobbly fine sandy loam, stony fine sandy loam, cobbly loam, very stony sandy clay loam, very stony loam, very cobbly fine sandy loam or very stony fine sandy loam
Reaction: moderately alkaline or strongly alkaline.

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Bk horizon
Hue: 7.5YR to 10YR
Value: 4 to 8 dry
Chroma: 2 to 8 dry or moist
Texture: very stony loam, gravelly fine sandy loam, very gravelly fine sandy loam, very gravelly sandy loam, very cobbly loam, very cobbly fine sandy loam, cobbly fine sandy loam, very stony fine sandy loam,

extremely cobbly sandy loam, extremely cobbly fine sandy loam, very cobbly sandy loam, gravelly loam, extremely gravelly loam and very stony sandy loam.
Reaction: slightly alkaline to very strongly alkaline
Calcium carbonate equivalents: 8 to 45 percent; control section averages less than 40 percent

BCky or Bky horizon, where present
Hue: 5YR to 10YR
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 6 dry and moist
Texture: very gravelly fine sandy loam, very cobbly loam, gravelly fine sandy loam
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 10 to 30 percent
Gypsum content: 1 to 4 percent

C horizon, where present
Hue: 5YR to 10YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 3 to 6 dry or moist
Texture: stony sandy loam, gravelly fine sandy loam very cobbly loam, extremely cobbly clay loam, very gravelly fine sandy loam
Reaction: slightly alkaline to strongly alkaline
Calcium carbonate equivalent: 5 to 25 percent
Gypsum content: 0 to 4 percent

COMPETING SERIES: These are the Buffcreek (WY), Clapper (UT), Claprych (WY), Ildefonso (NM), Placitas (NM), Raydawn (NM) and Seis (NM) series.
Buffcreek soils have calcic horizon at 3 to 9 inches.
Clapper soils have 18 to 27 percent clay in the particle-size control section.
Buffcreek and Claprych soils have a different moisture pattern affecting the soil moisture control section; moist during May and late June and dry during July, August and September.
Ildefonso soils are moist in some part at least 25 percent of the time the soil temperature exceeds 41 degrees F. The driest month is November and contain Bw horizon.
Placitas and Seis soils are less than 40 inches deep to bedrock or paralithic contact.
Raydawn soils overlie shale-derived residuum and have hue 2.5YR in the substratum.

GEOGRAPHIC SETTING: Strych soils are on fan piedmonts, highly dissected alluvial fans, fan remnants, hill toeslopes, and footslopes of cuestas, mesas, terraces, and escarpments on structural benches. Slopes are 1 to 70 percent. These soils formed in mixed alluvium and colluvium from sandstone, shale, and conglomerate. Some areas have a mantle of basalt fragments up to boulder size as volcanic bombs on the soil surface and extending into the cambic horizon. Elevations range from 4,500 to 9,000 feet. Mean annual air temperature is 45 to 50 degrees F. and the average annual precipitation is 9 to 13 inches. The precipitation is distributed evenly throughout the year with a slight increase in July, August, September, and October. The driest months are April, May and June. The freeze-free period is about 100 to 160 days. At elevations above 7,000 feet Strych soils are mainly on south facing slopes.

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GEOGRAPHICALLY ASSOCIATED SOILS: These are the Barx and Shalako soils.
Barx soils have an argillic horizon and do not have rock fragments in the particle-size control section.
Shalako soils have bedrock within 20 inches of the surface.

DRAINAGE AND PERMEABILITY: Well drained; medium runoff; moderate or moderately rapid permeability; moderately high or high saturated hydraulic conductivity.

USE AND VEGETATION: Used mainly for rangeland. The potential vegetation is Utah juniper, Salina wildrye, Indian ricegrass, and needleandthread.

DISTRIBUTION AND EXTENT: Eastern Utah, northern Arizona, northwest New Mexico, and western Colorado and southwestern Wyoming. The series is of moderate extent. MLRAs 34A, 34B, 35 & 36. In the future the Strych series will be limited to Central and North Eastern Utah with the MAST: 47 to 52 degrees F., MAP: 9 to 13 inches, and FFP: 100 to 160, jwb 04/2011.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Bozeman, Montana

SERIES ESTABLISHED: Henry Mountains Area, Utah, 1985.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Series control section - the zone from 0 to 59 inches (150 cm)

Ochric epipedon - the zone from the surface of the soil to 1 inch. (A horizon)

Cambic horizon - the zone from 1 to 11 inches. (Bw, Bk1 horizons)

Calcic horizon - the zone from 11 to 48 inches. (Bk1, Bk2, Bk3 horizons)

Classified according to Keys to Soil Taxonomy Eleventh Edition, 2010.

Ownership was transferred from Phoenix, Arizona to Lakewood, Colorado, 04/2011.

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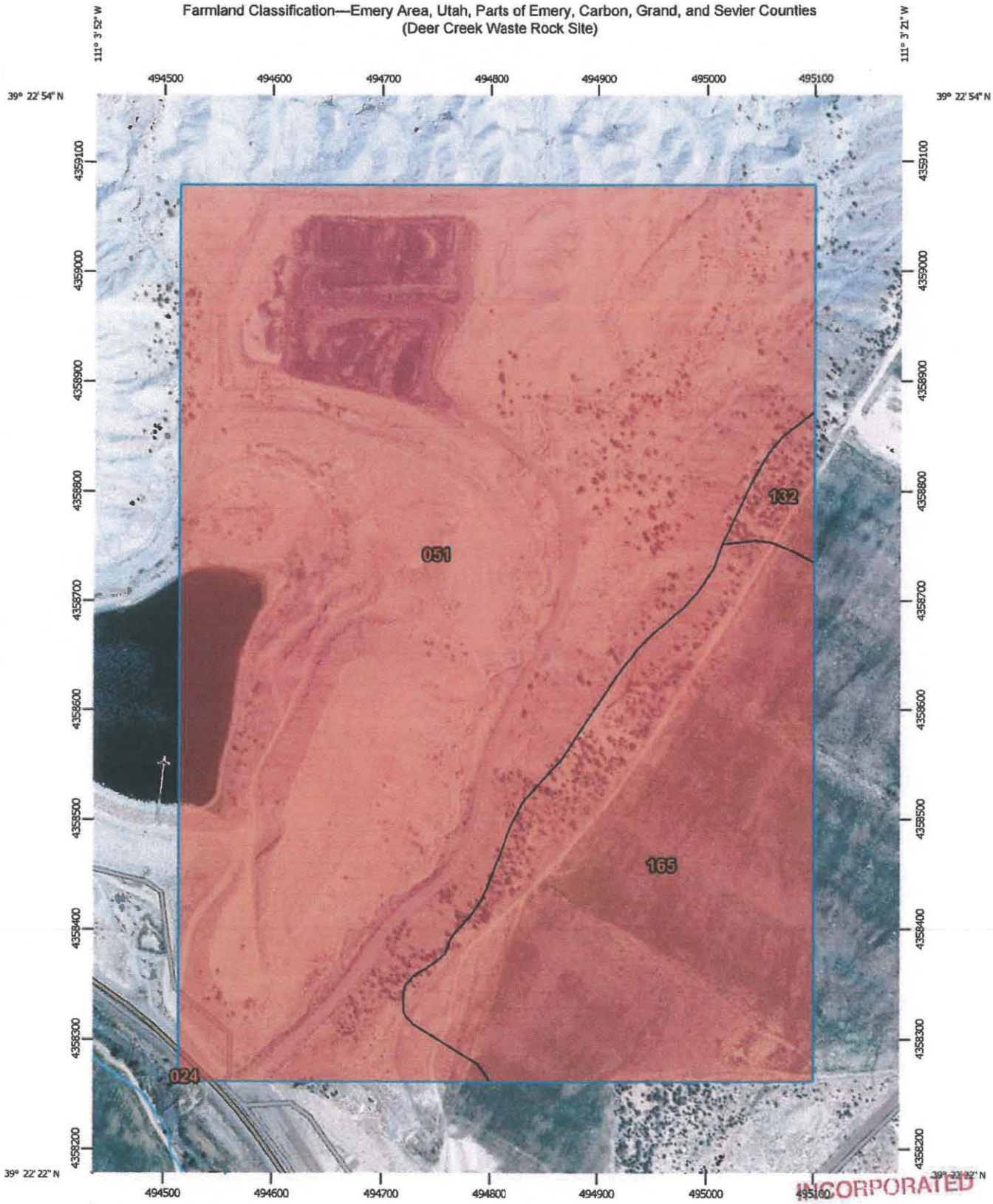
Farmland Classification—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

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MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
Survey Area Data: Version 4, Aug 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2011—Sep 28, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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Farmland Classification

Farmland Classification— Summary by Map Unit — Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	Not prime farmland	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	Not prime farmland	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	Not prime farmland	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	Not prime farmland	30.7	25.9%
Totals for Area of Interest			**118.8**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

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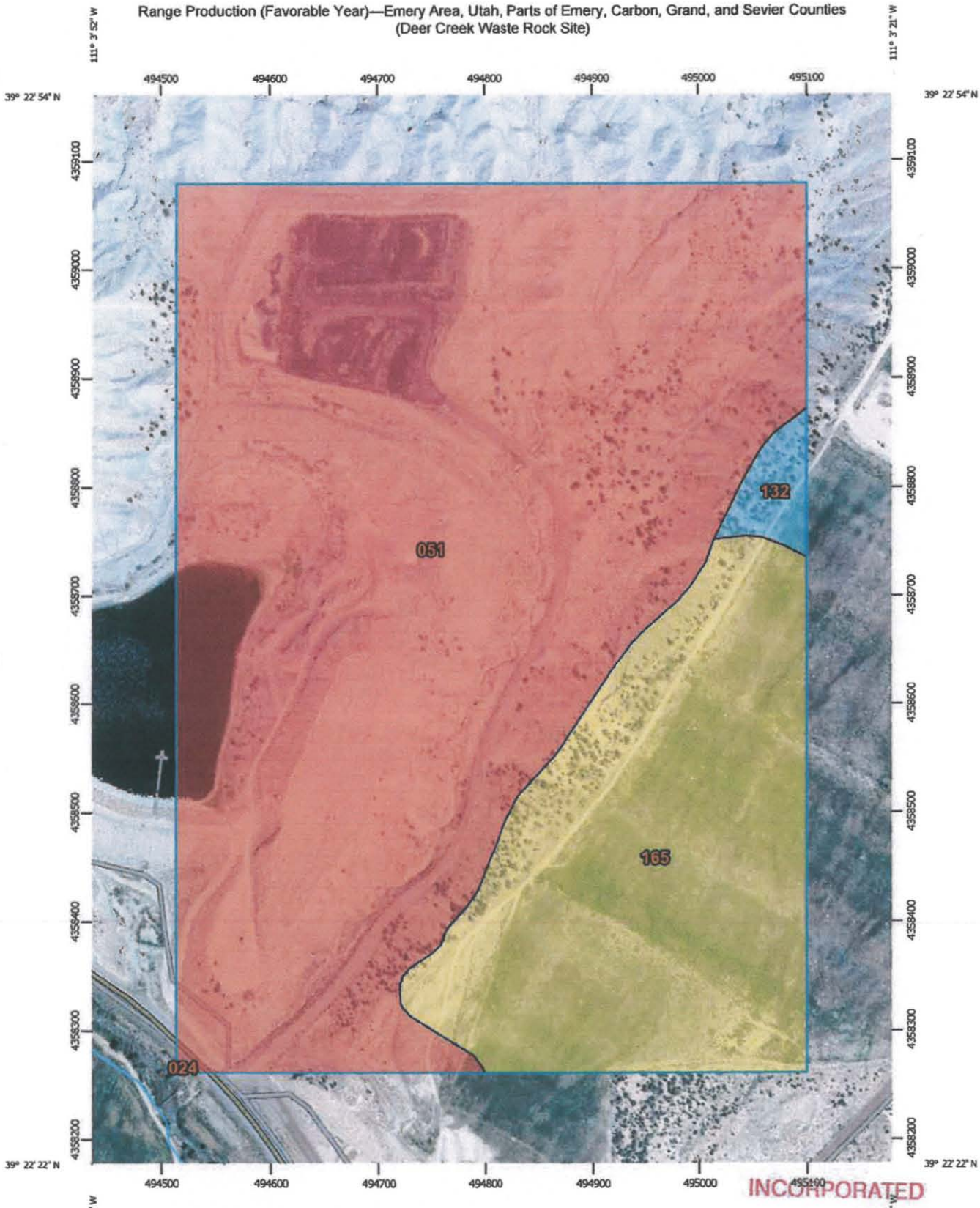
Range Production (Favorable Year)—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- <= 63
- > 63 and <= 727
- > 727 and <= 998
- > 998 and <= 2285
- Not rated or not available

Soil Rating Lines

- <= 63
- > 63 and <= 727
- > 727 and <= 998
- > 998 and <= 2285
- Not rated or not available

Soil Rating Points

- <= 63
- > 63 and <= 727
- > 727 and <= 998
- > 998 and <= 2285
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
Survey Area Data: Version 4, Aug 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2011—Sep 28, 2011

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Range Production (Favorable Year)

Range Production (Favorable Year)— Summary by Map Unit — Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)				
Map unit symbol	**Map unit name**	**Rating (pounds per acre per year)**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	2285	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	63	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	998	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	727	30.7	25.9%
Totals for Area of Interest			**118.8**	**100.0%**

Description

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rating Options

Units of Measure: pounds per acre per year

Aggregation Method: Weighted Average

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Interpret Nulls as Zero: Yes

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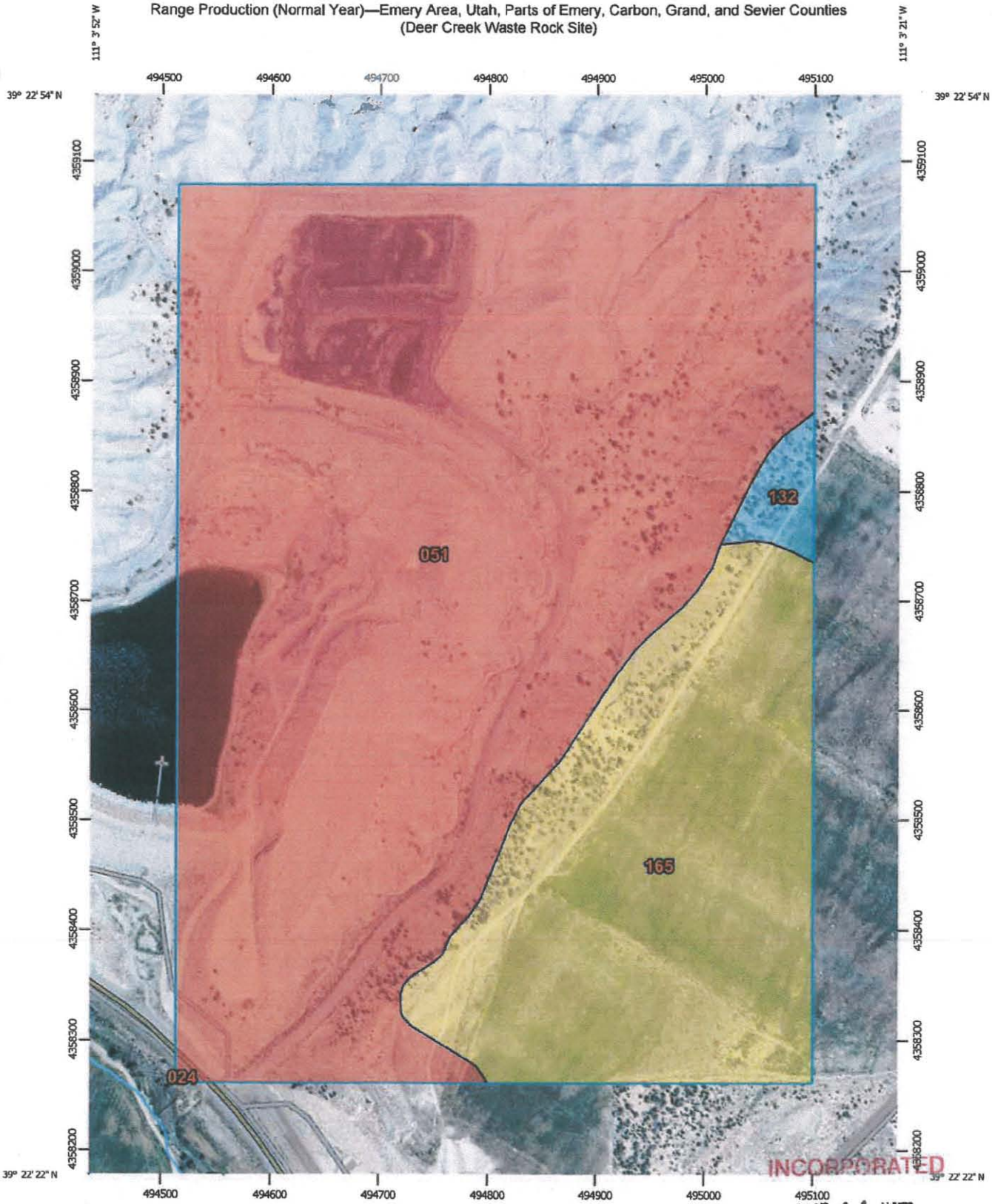
Range Production (Normal Year)—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 44
- > 44 and <= 525
- > 525 and <= 753
- > 753 and <= 1517
- Not rated or not available

Soil Rating Lines
- <= 44
- > 44 and <= 525
- > 525 and <= 753
- > 753 and <= 1517
- Not rated or not available

Soil Rating Points
- <= 44
- > 44 and <= 525
- > 525 and <= 753
- > 753 and <= 1517
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 4, Aug 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2011—Sep 28, 2011

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Range Production (Normal Year)

Range Production (Normal Year)— Summary by Map Unit — Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)				
Map unit symbol	**Map unit name**	**Rating (pounds per acre per year)**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	1517	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	44	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	753	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	525	30.7	25.9%
Totals for Area of Interest			**118.8**	**100.0%**

Description

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation. In a normal year, growing conditions are about average. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rating Options

Units of Measure: pounds per acre per year

Aggregation Method: Weighted Average

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Interpret Nulls as Zero: Yes

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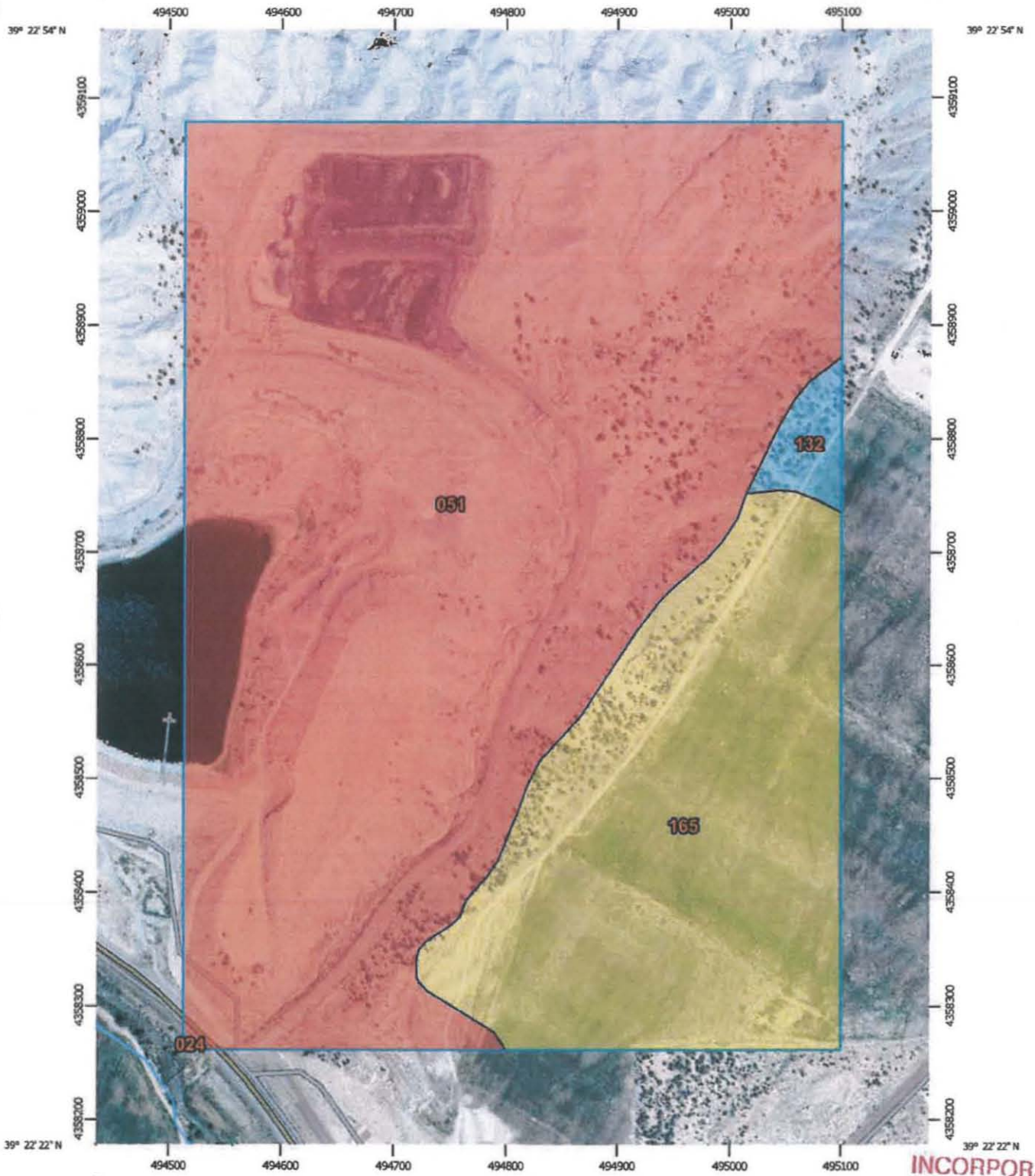
Range Production (Unfavorable Year)—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- <= 19
- > 19 and <= 327
- > 327 and <= 403
- > 403 and <= 828
- Not rated or not available

Soil Rating Lines

- <= 19
- > 19 and <= 327
- > 327 and <= 403
- > 403 and <= 828
- Not rated or not available

Soil Rating Points

- <= 19
- > 19 and <= 327
- > 327 and <= 403
- > 403 and <= 828
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
Survey Area Data: Version 4, Aug 8, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 24, 2011—Sep 28, 2011

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Range Production (Unfavorable Year)

Range Production (Unfavorable Year)— Summary by Map Unit — Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)				
Map unit symbol	**Map unit name**	**Rating (pounds per acre per year)**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	828	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	19	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	403	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	327	30.7	25.9%
Totals for Area of Interest			**118.8**	**100.0%**

Description

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rating Options

Units of Measure: pounds per acre per year

Aggregation Method: Weighted Average

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Interpret Nulls as Zero: Yes

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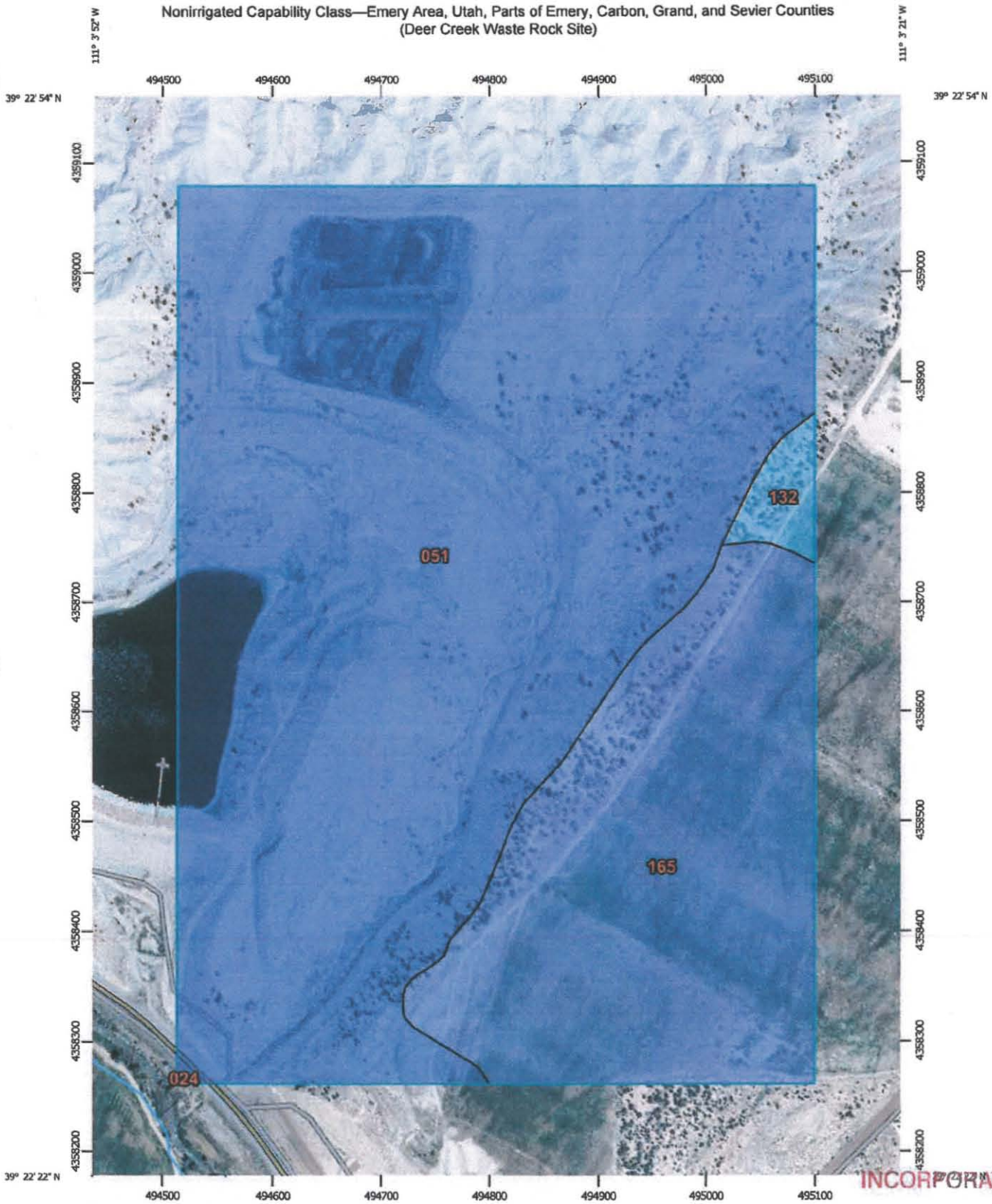
Nonirrigated Capability Class—Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties
(Deer Creek Waste Rock Site)



Map Scale: 1:4,790 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Soil Rating Lines

- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Soil Rating Points

- Capability Class - I
- Capability Class - II
- Capability Class - III
- Capability Class - IV
- Capability Class - V
- Capability Class - VI
- Capability Class - VII
- Capability Class - VIII
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 4, Aug 8, 2014

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Nonirrigated Capability Class

Nonirrigated Capability Class— Summary by Map Unit — Emery Area, Utah, Parts of Emery, Carbon, Grand, and Sevier Counties (UT623)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
024	Castledale-Colorow-Pherson complex, 1 to 5 percent slopes	7	0.0	0.0%
051	Gerst-Strych-Badland complex, 30 to 70 percent slopes	8	86.5	72.8%
132	Porser very stony fine sandy loam, 3 to 20 percent slopes	6	1.6	1.3%
165	Strych very stony fine sandy loam, 3 to 30 percent slopes	7	30.7	25.9%
Totals for Area of Interest			**118.8**	**100.0%**

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Description

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels-capability class, subclass, and unit. Only class and subclass are included in this data set.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Rating Options

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Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

APPENDIX 2-2

SITE-SPECIFIC SOIL DATA

APPENDIX 2-2

Site-Specific Soil Data

Sample Name	pH	EC (mmho/cm)	%$CaCO_3$	P (ppm)	K (ppm)	Ca (meq/L)	Mg (meq/L)	Na meq/L)	SAR	% Sand	% Silt	% Clay	Texture Class	No_3N (ppm)
Sec 5, Site 1 Sample 1, 6"	7.47	1.31	26.75	0.8	72	11.7	4.4	3.3	1.2	23.1	40.0	36.9	CL	2.2
Sec 5, Site 1 Sample 2, 12"	7.53	2.18	25.50	0.8	64	22.0	3.5	3.3	0.9	29.1	36.0	34.9	CL	2.2
Sec 5, Site 1 Sample 3, 18"	7.60	2.57	21.15	0.8	61	20.2	4.3	9.6	2.7	25.1	40.0	34.9	CL	2.2
Sec 5, Site 1 Sample 4, 24"	7.56	3.0	22.60	0.8	70	22.1	12.7	7.7	1.8	49.1	30.0	20.9	L	2.2
Sec 5, Site 2 Sample 1, 6"	8.05	9.82	17.10	0.8	131	3.9	41.1	119.6	25.2	9.1	36.0	54.9	C	2.2
Sec 5, Site 2 Sample 2, 12"	7.99	11.43	16.54	0.8	130	3.5	39.2	143.5	31.0	9.1	38.0	52.9	C	2.2
Sec 5, Site 3 Sample 1, 6"	7.72	1.88	23.10	0.8	153	13.9	8.9	3.8	1.1	23.1	36.0	40.9	C	2.2
Sec 5, Site 3 Sample 2, 12"	7.85	0.57	24.81	0.8	92	4.0	2.4	1.9	1.1	33.1	32.0	34.9	CL	2.2
Sec 5, Site 3 Sample 3, 18"	7.68	2.73	20.26	0.8	106	16.5	25.7	2.9	0.6	23.1	38.0	38.9	CL	2.2
Sec 6, Site 4 Sample 1, 6"	7.63	2.07	19.49	0.8	63	22.7	4.1	1.9	0.5	29.	40.0	30.9	CL	2.2
Sec 6, Site 4 Sample 2, 12"	7.35	2.27	18.19	0.8	57	23.3	2.1	2.9	0.8	35.1	44.0	20.9	L	2.2
Sec 6, Site 4 Sample 3, 18"	7.50	2.18	21.02	0.8	48	20.7	3.4	2.4	0.7	37.1	34.0	28.9	CL	2.2
Sec 6, Site 5 Sample 1, 6"	7.74	2.50	47.19	0.8	111	20.4	6.4	3.9	1.0	33.1	42.0	24.9	L	2.2
Sec 6, Site 5 Sample 2, 12"	7.98	6.05	17.16	0.8	109	11.6	50.8	57.4	10.3	15.1	48.0	36.9	SiCL	2.2
Sec 6, Site 5 Sample 3, 18"	8.05	9.04	22.05	0.8	100	5.0	95.3	57.4	8.1	15.1	46.0	38.9	SiCL	2.2
Site 6 Sample 1, 6-9"	7.75	1.85	29.75	0.8	138	18.3	3.5	2.4	0.7	26.6	34.6	38.9	CL	2.2

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Sample Name	pH	EC (mmho/cm)	%$CaCO_3$	P (ppm)	K (ppm)	Ca (meq/L)	Mg (meq/L)	Na meq/L)	SAR	% Sand	% Silt	% Clay	Texture Class	No_3N (ppm)
Site 6 Sample 2, 14"	7.83	1.74	32.04	0.8	128	16.9	5.4	3.3	1.0	34.6	28.6	36.9	CL	2.2
Site 6 Sample 3, 18-20"	7.90	2.27	27.07	0.8	111	20.3	8.5	3.8	1.0	28.6	30.6	40.9	C	2.2
Site 7 Sample 1, 0-6"	7.90	1.88	31.84	0.8	115	18.6	5.3	2.4	0.7	34.6	26.6	38.9	CL	2.2
Site 7 Sample 2, 16"	7.97	3.02	4.03	0.8	92	18.9	7.4	12.4	3.4	30.6	36.6	32.9	CL	2.2
Site 8 Sample 1, 0-1'	8.3	12.7	8.4	3.0	28.9	22.5	19.2	140.0	30.7	6	43	51	SiC	1.0
Site 9 Sample 1, 0-0.3'	8.0	2.9	15.4	1.5	37.9	30.6	8.0	3.4	0.77	10	52	38	SiCL	6.0
Site 9 Sample 2, 0.3-1'	8.4	11.4	15.3	<0.1	24.6	21.1	19.2	125.0	27.8	10	53	37	SiCL	1.0
Site 9 Sample 3, 1.0-1.7'	8.5	16.4	14.3	0.5	35.2	21.6	39.0	197.0	35.8	10	54	36	SiCL	4.0
Site 9 Sample 4, 1.7-2.5'	8.2	16.2	11.6	2.5	50.8	22.0	45.7	187.0	32.1	8	51	41	SiC	46.5
Site 10 Sample 1, 0-0.5'	8.0	5.9	7.3	2.5	50	24.5	22.2	37.3	7.7	10	48	42	SiC	4.0
Site 10 Sample 2, 0.5-2.0'	8.0	17.1	7.8	1.8	37.2	21.4	71.4	189.0	27.8	15	50	35	SiCL	1.0
Site 10 Sample 3, 2.0-2.5'	8.2	17.8	8.7	1.2	45.4	21.4	71.7	199.0	29.2	16	51	33	SiCL	1.0
Site 11 Sample 1, 0-0.3'	8.1	4.3	12.0	1.2	27.8	27.2	7.3	26.6	6.4	24	46	30	CL	6.0
Site 11 Sample 2 0.3-1.7'	8.4	13.4	12.2	0.7	38.7	21.9	26.9	150.0	30.4	21	50	29	CL	2.0
Site 11 Sample 3, 1.7-2.4"	8.4	15.5	12.8	0.3	45	21.2	36.1	180.0	33.6	20	51	29	CL/SiCL	5.0
Site 11 Sample 4, 2.4-2.9"	8.4	14.6	13.3	1.0	39.5	21.0	37.7	157.0	29.0	22	50	28	CL	6.0

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Appendix 2-2 Notes:

1. See Plate 2-1 for sample locations.

2. All samples collected in April 1987, prior to site disturbance.

3. All samples analyzed by:

NPI Soil Testing/Plant Tissue Analysis Lab
417 Wakara Way
Salt Lake City, UT 84108

4. Texture class designations:

CL	=	Clay Loam
L	=	Loam
C	=	Clay
SiCL	=	Silty Clay Loam

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R645-301-300

BIOLOGY

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R645-301-300 BIOLOGY

R645-301-300.100 Introduction

This chapter provides a general description of the biological resources found in the vicinity of the Castle Valley Mining, LLC waste rock site (the "CVM site" or the "site"), and describes measures that will be taken to protect biological resources within and adjacent to the permit area.

R645-301-311 Vegetative, Fish and Wildlife Resources

Vegetative, fish, and wildlife resources in the vicinity of the CVM site are discussed in Section 320. Additional information regarding vegetative resources is provided in Appendices 3-1 and 3-2.

R645-301-312 Potential Impacts to Vegetative, Fish and Wildlife Resources

Potential impacts to vegetative, fish and wildlife resources and the associated mitigation plans are presented in Sections 330 and 340 of this application.

R645-301-313 Description of Reclamation Plan

The plan to reclaim vegetative, fish and wildlife resources to a condition suitable for the post-operations land use is presented in Section 340.

R645-301-320 Environmental Description

R645-301-321 Vegetation Information

R645-301-321.211 Plant Communities Within the Proposed Permit and Adjacent Areas

A vegetation survey of the permit area was performed by Mt. Nebo Scientific in 1987 prior to site disturbance. The results of this survey are provided in Appendix 3-1. As indicated, vegetation in the permit area is characterized primarily as a Gardner Saltbush/Mat Saltbush plant community, with Pinyon/Juniper communities within the larger community. Dominant species in these smaller plant communities consist of pinyon and juniper trees, black sagebrush, and shadscale. The general pre-disturbance distribution of vegetation in the permit area is shown on Plate 3-1.

From data presented in Appendix 3-1, the vegetative species within the Gardner Saltbush/ Mat Saltbush community in the permit area consist of the following:

Shrubs:

- Black sagebrush *(Artemisia nova)*
- Castle Valley saltbrush *(Atriplex gardneri var. cuneate)*
- Shadscale *(Atriplex corifertifolia)*
- Mat saltbush *(Atriplex corrugata)*
- Rubber rabbitbrush *(Chrysothamnus nauseosus)*
- Low rabbitbrush *(Chrysothamnus viscidiflorus)*
- Mormon tea *(Ephedra viridis)*
- Corymb buckwheat *(Eriogonum corymbosum)*
- Utah juniper *(Juniperus osteosperma)*
- Greasewood *(Sarcobatus vermiculatus)*
- Cottonthom horsebrush *(Tetradymia spinosa)*

Forbs

- Cryptantha (*Cryptantha flava)*
- Spring parsley (*Cymopterus purpureus)*

- Gordon's buckwheat *(Eriogonum gordonii)*
- James wild buckwheat *(Eriogonumjamesii)*
- Buckwheat *(Eriogonum sp.)*
- Goldenweed *(Haplopappus ep.)*
- Parthenium *(Parthenium sp.)*
- Phacelia *(Phacelia crenulata)*
- Phacelia *(Phacela sp.)*

Grasses:

- Salina wildrye *(Elymus salinus)*
- Indian ricegrass (*Orizopsis hymenoides)*
- Squirreltail *(Sitanion hystrix)*

R645-301-321.212 Land Productivity Prior to Mining

A reference area with representative slope, soil, exposure, species composition, and other environmental factors was chosen in 1987 as a standard for future reclamation of the site. The mean percent cover in the reference area was calculated as follows at the time of the 1987 survey:

- Living cover= 38.93%
- Litter= 8.40%
- Rock= 7.50%
- Bare ground = 45.33%

Information presented in Section 224 of this application indicates that, under favorable conditions, the soils in the permit area can produce only 63 pounds of rangeland vegetation per acre annually. These production values drop to 44lb/acre/yr. under normal and 19lb/acre/yr. under unfavorable conditions (see Appendix 2-1).

Appendix 3-2 presents the results of an evaluation conducted by Mt. Nebo Scientific wherein the mean percent cover of the reference area (as measured in 1987) was compared with the mean percent cover of the reclaimed fill along the site access road (as measured in 1995). As

indicated, the mean percent live vegetative cover for the reference area and the access road fill were 38.93% and 38.33%, respectively. Total ground cover (which includes live vegetation, litter, and rock) was 54.67% on the reference area and 74.17% on the fill slopes. Thus, it is reasonable to assume that land productivity following reclamation will be similar to pre-disturbance conditions in the permit area.

R645-301-322 Fish and Wildlife Information

Undisturbed lands in the area generally support wildlife habitat. The generally poor soil and sparse vegetation of the area limit the degree to which wildlife frequent the area. Given the lack of perennial and intermittent surface water, there is no fish habitat within the permit area.

R645-301-322.221 Level of Detail

The scope and level of detail for identification of fish and wildlife resources are considered sufficient to design a protection and enhancement plan consistent with the requirements of R645-301-333.

R645-301-322.222 Site-specific Resource Information

A site-specific evaluation of wildlife within the permit and adjacent areas was conducted on the permit area in 1988 prior to disturbance of the site. The results of this survey, which was conducted by Val Payne of Utah Power and Light Company in consultation with Larry Dalton of the Utah Division of Wildlife Resources, are provided on Plate 3-2. As indicated, portions of the permit area serve as critical winter habitat for mule deer *(Odocoileus hemionus)* and elk *(Cervus canadensis)*. Specific wildlife use areas associated with the site include migration routes, open areas, and bedding areas as indicated on Plate 3-2.

A review of information maintained by the Utah Conservation Data Center[1] indicates that no threatened or endangered species, nor habitat for such species, are present within the permit area. However, this site indicates that the following species of concern may be present within the USGS quadrangle in which the CVM site is located (i.e., the Hiawatha 7.5 minute quadrangle):

- Ferruginous Hawk *(Buteo regalis):* According to the Utah Conservation Data Center. this species of concern was last observed in the Hiawatha quadrangle on December 13. 2008. It is identified as a Utah species of concern. with a global status rank of G4 (indicating that it is a species that is widespread, abundant, and apparently secure, though it may be quite rare in parts of its range, especially at the periphery) and a State status rank of S3B (indicating that it is a species that is either very rare and local throughout its range or found locally [even abundantly at some of its locations[within a restricted range, or vulnerable to extinction or extirpation because of other factors, particularly during breeding season).
- Colorado River Cutthroat Trout *(Oncorhynchus calrkii pleuriticus):* According to the Utah Conservation Data Center, this species was last observed in the Hiawatha quadrangle on October 19. 2005. This species is receiving special management under a Conservation Agreement in order to preclude the need for Federal listing. It has a global status rank of 04T3 (indicating that some infraspecific taxa of the species may warrant a global numeric ranking of 3 rather than 4) and a State status rank of S3.
- Western Toad *(Bufo boreas):* According to the Utah Conservation Data Center, this species of concern was last observed in the Hiawatha quadrangle on July 25, 1964. It is identified as a Utah species of concern. with a global status rank of 04 and a State status rank of S3.

Although the Ferruginous Hawk may be present in the general area of the CVM site, its preferred nesting sites (cliffs, buttes, and creek banks) do exist within the area where waste rock storge operations will be conducted. Furthermore, dust will be suppressed during operations, thereby minimizing the potential for impacts from this source. Therefore, no significant impacts are anticipated to Ferruginous Hawks in the area from the planned site activities.

No perennial streams occur within the permit area. Furthermore, site activities will be conducted in a manner that minimizes contributions of sediment and other pollutants to the closest perennial source of water (Huntington Creek). Therefore, waste rock storage operations at the site should not adversely impact Colorado River Cutthroat Trout in the region.

[1] http://dwrcdc.nr.utah.gov/ucdc/, accessed 21 Jan 2015.

The Western Toad habitat consists primarily of slow-moving streams, wetlands, and other perennial sources of water. Since these sources are absent within the permit area and protected from contributions of sediment and other pollutants outside of the permit area, waste rock storage operations at the site should not adversely impact Western Toads in the region.

Additional information regarding the potential for important biological resources to be present in the permit area was obtained from the "IPaC Information for Planning and Construction" web site maintained by the U.S. Fish and Wildlife Service. The IPaC Trust Resource Report and associated Section 7 letter obtained from this web site are provided in Appendix 3-4. The Resource Report and the Section 7 letter indicate that the following threatened or endangered species may occur in the region of the permit area:

- Birds:
  - Mexican Spotted Owl *(Strix occidentalis lucida)*
  - Southwestern Willow Flycatcher *(Empidonax traillii extimus)*
  - Yellow-billed Cuckoo *(Coccyzus americanus)*
- Fishes:
  - Bonytail Chub *(Gila elegans)*
  - Colorado Pikeminnow *(Ptychocheilus lucius)*
  - Humpback Chub *(Gila cypha)*
  - Razorback Sucker *(Xyrauchen texanus)*
- Flowering Plants:
  - Bameby Reed-mustard *(Schoenocrambe barnebui)*
  - Jones Cycladenia *(Clycladenia humilis var.jonesii)*

The report and letter further state that no critical habitats occur within the permit area for these threatened or endangered species. None of these species are known to exist in the permit area.

According to information provided in the CVM Mine mining and reclamation plan, the nearest known raptor nests are approximately 1.3 miles northeast of the site. Golden eagles have been observed in flight above the general area where the site is located. Furthermore, as

indicated above, the absence of perennial and intermittent water indicates that no fish habitat exists within the permit area.

Under the U.S. Fish and Wildlife Service Windy Gap Process, projects within the Upper Colorado River Basin may be assessed a one-time conservation fee, depending on annual water usage, to study and protect endangered fish species. The conservation fee is generally assessed only if the annual water consumption exceeds 100 acre-feet. The applicant acknowledges that the assessment of the conservation fee must be decided by the U.S. Fish and Wildlife Service, with this assessment potentiully being independent of the 100 acre-foot value.

Calculations provided in Appendix 3-5 estimate that less than 2 acre-feet of water will be used for dust-suppression and moisture conditioning purposes during the course of this project. This water may be obtained from the sedimentation pond (if available and practical) but more likely will be obtained from nearby municipal or industrial sources. As indicated in Section 724.200 of Chapter 7, the average annual flow of Huntington Creek near the permit area is 109.0 cubic feet per second (78,900 acre-feet per year). Assuming that all of the project water is obtained from Huntington Creek and/or from the sedimentation pond (i.e., water that theoretically could have reached Huntington Creek), the total estimated project water usage (1.16 acre-feet) represents just 0.002% of this annual flow.

Stream gaging records are developed by correlating the depth (or "stage") of streamflow with the measured streamflow at a gaging station. Rantz et al. (1982) indicate that current-meter methods (the standard approach used to measure streamflow) are accurate to within approximately 2.2 percent if properly used. Additional error is introduced in the stage measurements. Thus, the potential decrease in streamflow in Huntington Creek due to project water usage is at least 1000 times less than the accuracy of the methods used to measure streamflow, indicating that the amount of project water usage is insignificant compared to the flow of Huntington Creek. This impact will be even less if the project water is obtained from a supplier that uses groundwater as its source.

Given the minimal amount of water to be used on the project, it is concluded that impacts to fish habitat will also be insignificant and not practically measurable.

As indicated above, project water will likely be obtained (purchased) from nearby municipal or industrial water sources. Rights for the use of this water will be the responsibility of the seller. In the case of water obtained from the sedimentation pond, water rights are normally not filed for ephemeral sources due to their unreliability. If used, this water will be applied at or adjacent to the ground from which it flowed.

R645-301-322-300 Fish and Wildlife Service Review

If requested, the applicant authorizes the release of information pertaining to Section 322 and 333 to the U.S. Fish and Wildlife Service Regional and Field office for their review.

R645-301-323 Maps and Aerial Photographs

The results of vegetation and wildlife surveys in the permit area are provided on Plates 3-1 and 3-2, respectively. The location of the reference area for determining revegetation success is shown on Plate 3-1. This map also shows the general pre-disturbance boundaries of plant communities and vegetation sample areas. No monitoring stations have been established to gather ongoing data for fish and wildlife or any special habitat features.

R645-301-300-330 Operation Plan

R645-301-300.331 Measures Taken to Disturb the Smallest Practicable Area

No disturbance will occur beyond the permit area boundary. New disturbances (if they occur) will be kept to the smallest practicable area. All currently-disturbed areas may be used for active operations. Thus, interim revegetation of the site is not feasible.

R645-301-300-332 Description of Anticipated Impacts of Subsidence

No underground mining operation will occur within the permit area. Thus, the planned actions will not result in subsidence of renewable resource lands.

R645-301-300-333 Plan to Minimize Disturbances and Adverse Impacts

The fence surrounding the permit area was designed to be compatible with wildlife migration. This fence will be maintained during operations. No disturbance will occur outside of that fenced area. Furthermore, runoff control measures will be maintained to preclude off-site surface-water impacts. Other protective measures within the disturbed area boundary will include adhering to clean industrial hygiene procedures, properly disposing of all waste (papers, cans, bottles, etc.), and instructing employees not to hunt or harass wildlife in the permit and adjacent areas. Thus, measures will be implemented to minimize adverse impacts to fish and wildlife and related environmental resources.

R645-301-340 Reclamation Plan

Information regarding final revegetation of disturbed ground within the permit area is provided below. The extent of site restoration following operations is discussed more fully in Section 540 of this permit application.

R645-301-341 Revegetation

Disturbed areas will be revegetated, following completion of site activities, in a manner that complies with the biological protection standards of the State of Utah Coal Mining Rules as promulgated in R645.

R645-301-341.100 Schedule and Timetable

Revegetation of disturbed areas will begin after the topsoil has been redistributed. To the extent feasible, seeding will occur in the late fall, just prior to the onset of snow fall. If this schedule is not feasible, grasses and forbs will be planted in the late spring (May or early June), while shrubs will be planted in the late summer through early fall (late August through early October). A detailed schedule for implementation of the revegetation plan is discussed in Section 542.100 of this permit application.

R645-301-341.200 Descriptions

Species and Amounts of Seed. All revegetated areas will be planted with the seed mix specified in Table 3-1. This seed mix was developed in consultation between Lisa Reinhart of the Utah Division of Oil, Gas and Mining and Makeda Trujillo Hanson of the Utah Division of Wildlife Resources (see Appendix 3-3). At the recommendation of Ms. Reinhart, the non-native forb substitutes recommended by Ms. Hanson were not included in Table 3-1.

Method Used for Planting and Seeding. Revegetation will be performed using broadcast, hydroseed, or drill seed methods. If drill seeding is used, the application rates of the grasses and forbs in Table 3-1 will be reduced by 50 percent.

Mulching Techniques. Mulch will be applied to seeded areas in accordance with Section 244.200 of this application.

Irrigation, Pest, and Disease Control. No persistent pesticides will be used in the permit area unless previously approved by DOOM.

Measures Proposed for Revegetation Success. Revegetation success will be monitored in accordance with the requirements of R645-301-356. These measures are discussed in Section 356 of this permit application.

R645-301-341.300 Greenhouse Studies, Field Trials or Other Equivalent Studies

If DOGM requires additional testing for the purpose of demonstrating that reclamation as required by the State Program can be accomplished according to information given in this document, the applicant will comply.

R645-301-342 Fish and Wildlife

R645-301-342.100 Enhancement Measures

Wildlife habitat will be enhanced during reclamation through the use of runoff controls to prevent excessive erosion and through the use of a seed mix that includes plants that are indigenous to the area and that serve as valuable wildlife forage.

R645-301-342.200 Plants Used for Wildlife Hapitat

The reclamation plan has been specifically developed to support post-operation land use for wildlife. In particular, the plant species presented in Table 3-1 include those that will provide adequate nutritional value for big game as well as cover for small game (see Appendix 3-3). Plant species that are native to the area (and thereby appropriately adapted to local soils, climate, etc.) were selected to ensure long-term survival following the release of performance bonds.

R645-301-342.300 Cropland

Cropland is not a post-operation land use.

R645-301-342.400 Residential, Public Service and Industrial Land Use

Neither residential, public service, nor industrial post-operation land uses are anticipated for the permit area.

R645-301-350 Performance Standards

R645-301-351 General Requirements

The Applicant commits to conduct all operations in accordance with Sections R645-301-330 through R645-301-340 of the regulations.

R645-301-352 Contemporaneous Reclamation

Given the anticipated long duration of waste rock storage operations at the CVM site,

site, contemporaneous reclamation is not considered practical.

R645-301-353 Revegetation: General Requirements

The revegetation plan presented herein complies with the requirements that a vegetative cover be established on all reclaimed areas. The vegetative cover will be established in accordance with the approved permit and reclamation plan.

R6445-301-353.100 Vegetative Cover

The seed mix presented in Table 3-1 is intended to provide vegetative cover that will be diverse, effective, and permanent. The seed mix is comprised of species native to the area recommended by the Utah Division of Wildlife Resources for enhancement of wildlife habitat.

The seed mix was selected with to be compatible with the climate, potential seedbed quality, and drought tolerance.

Native Species. The vegetative mixture is primarily comprised of species native to the area. The seeds will be purchased from suppliers who will certify their purity, germination, hard seed, and percentages of maximum weed seed contents.

Extent of Cover. The seed mix presented in Table 3-1 has been designed to result in vegetative cover that will be at least equal in extent to the natural vegetation as measured in an adjacent reference area at the time of revegetation.

Stabilizing. The area to be revegetated will be mulched during reclamation. This mulching, together with the vegetative cover mixture and surface roughening of the redistributed topsoil, will provide erosional stability at least equivalent to that of adjacent undisturbed areas.

R645-301-353.200 Reestablished Plant Species

Compatible. The plant species proposed for revegetation have been selected to be compatible with the intended post-operation land use of wildlife habitat.

Seasonal Characteristics. Because the reclamation seed mix is dominated by native species, the revegetation plant species will have the same growing season as the native vegetation.

Self-generation. The revegetation seed mix consists of species capable of self-generation and plant succession.

Compatibility. The seed mix proposed for revegetation contains plants native to the area and compatible with the plant and animal species of the permit area.

Federal and Utah Laws or Regulations. The seed mixture purchased to revegetate the waste rock area will contain neither poisonous nor noxious plant species. The mix will also be compatible with introduced species laws and regulations.

R645-301-353.300 Vegetative Exception

The applicant does not require vegetative exception at this time.

R645-301-353.400 Cropland

The permit area contains no land designated as cropland for post-operation land use.

R645-301-354 Revegetation: Timing

Reclaimed areas will be revegetated during the first favorable period for planting, as discussed in Section 341.100.

R645-301-355 Revegetation: Mulching and Other Soil Stabilizing Practices

Areas to be revegetated will be mulched as described in Section 341.200. The redistributed topsoil will also be left in a roughened state prior to revegetation, as described in Section 542 of this application. If excessive erosion occurs following revegetation and prior to bond release, those affected areas will be repaired using a method approved by DOGM.

R645-301-356 Revegetation: Standards for Success

R645-301-356.100 Success of Revegetation

The success of revegetation will be judged on the effectiveness of the vegetation for post-operation land use and the standards outlined in Section 353. Success of the revegetation effort in the permit area will be determined by use of and in comparison, to data obtained from the reference area shown on Plate 3-1.

Final comparisons will involve random sampling of both the reference area and the revegetated site. All sampling will be done in the late summer to insure maximum plant growth. Estimates of ground cover and density of woody plant species will be made for the revegetated areas and the reference areas using the following methods:

- Quantitative and qualitative data will be collected on the reclaimed areas. Information to be recorded during field surveys will include not only vegetation data but also observations concerning recent precipitation, slope, exposure, wildlife use, and other appropriate notes
- Bi-directional random placement of sampling plots will be used to provide unbiased accuracy of the data compiled.
- Cover estimates will be made using ocular methods with meter square quadrats.
- Density of woody plant species will be estimated using the point quarter distance method (Cottam and Curtis, 1956). In this method, random points will be placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species will then be recorded in each quarter. The average point-to-individual distance will be calculated as the square root of the mean area per individual.
- Sampling adequacy for cover and woody species density will be sufficient to ensure that the required statistical confidence is achieved. This will be evaluated using formulas from Snedocor and Cochran (1980), ensuring that 80% of the samples are within 10% of the true mean for the shrub communities of the area. Student's t-tests will be employed to compare the proposed disturbance and reference areas of all sites for cover and woody plant species density.
- Jaccard's Community Coefficients will be used to make species composition comparisons.

R645-301-356.200 Standards for Success

Standards of success will be applied in accordance with the approved post-operation wildlife habitat land use. Revegetation efforts will be considered successful if the total ground cover in the reclaimed areas is at least 90% of the total ground cover in the reference area, with 90% statistical confidence at the time of the comparison. The species diversity of the revegetated areas will be considered successful if there is a 50% or greater similarity in the life forms present between the reference area and the reclaimed plant community.

R645-301-356.300 Siltation Structure Maintenance

Siltation structures will be maintained until removal is authorized by the Division and the disturbed areas have been stabilized and revegetated. For additional details on siltation structures, see Section 542.

R645-301-356.400 Removal of Siltation Structures

Upon removal of siltation structures at the site, the land on which the siltation structure was located will be revegetated in accordance with this plan.

R645-301-357 Revegetation: Extended Responsibility Period

Castle Valley Mining, LLC (CVM) will be responsible for revegetation success during the extended responsibility period. The period of extended responsibility will begin after the last year of augmented seeding, fertilization, irrigation, or other revegetation work, excluding husbandry as approved by the Division. Vegetation parameters will equal or exceed the approved success standard during the last two years of the responsibility period. The success standards are outlined in Sections 356.100 and 356.200 of this application.

If required to enhance revegetation efforts, CVM may implement husbandry practices on reclaimed area, but only if approved beforehand by the Division. These husbandry practices, if needed, would consist of normal conservation practices within the region of the operation. These practices may include disease, pest, and vermin control; pruning; reseeding; and transplanting. CVM acknowledges that any such work must be conducted in accordance with R645-301-357.300 and may affect the timing of bond release as stipulated in that rule.

R645-301-358 Protection of Fish, Wildlife, and Related Environmental Values

This plan is designed to minimize disturbances and adverse impacts on fish, wildlife and their related environments. CVM will periodically educate their employees about wildlife needs and their importance. The mitigation requirements of Section 333 of this application will also be discussed with existing employees during periodic staff meetings and with new employees during initial orientation. Given the lack of permanent surface water in the permit and adjacent areas, there are no fisheries within the permit area.

R645-301-358.100 Existence of Endangered or Threatened Species

There are no known endangered or threatened species within the permit area. Therefore, facility operations will not result in the destruction or adverse modification of critical habitats. If State- or Federally-listed endangered or threatened species are discovered in the permit area in the future, the presence of these species will be reported to the Division upon their discovery. Operations thereafter, including site reclamation, will proceed in accordance with appropriate Division stipulations to protect those species.

R645-301-358.200 Bald and Golden Eagles

No suitable bald or golden eagle habitat exists in the permit and adjacent areas. The nearest known raptor nests are approximately 1.3 miles northeast of the site. Golden eagles are occasionally observed in flight above the general area but none are known to inhabit the permit or adjacent areas.

If bald or golden eagle habitat is discovered in the permit or adjacent area in the future, CVM will promptly report such habitat to the Division and will proceed with operations thereafter in accordance with appropriate Division stipulations to avoid impacts to that habitat. CVM will also make employees aware of the species and their prey base during periodic staff meetings in accordance with Section 350 of this plan.

R645-301-358.300 Taking of Endangered or Threatened Species

The applicant understands that there is no permission implied by these regulations for taking of endangered or threatened species, their nests, or eggs.

R645-301-358.400 Replacement of Wetland and Riparian Vegetation

No wetland or riparian habitat exists in the permit area, nor has any such habitat been disturbed by this operation. The closest riparian habitat is located along Huntington Creek approximately 0.4 mile southwest of the waste rock pile and about 200 feet southwest of the southwest edge of the permit area. All operations associated with this application will be conducted in a manner that avoids disturbances to wetlands and riparian vegetation along Huntington Creek.

R645-301-358.500 Manmade Wildlife Protection Measures

Electric Power Lines. No electric power lines exist within the permit area.

Potential Barriers. Fences that surround the permit area have been design to allow crossing by big game.

Pond Protection. No site ponds contain hazardous concentrations of toxic-forming materials.

REFERENCES CITED

Cottam, G. and J.T. Curtis. 1956. The Use of Distance Measures in Phytosociological Sampling. Ecology. Volume 37, No.3, pp. 451-460.

Rantz, S.E. et al. 1982. Measurement and Computation of Streamflow: Volume 1. Measurement of State and Discharge. U.S. Geological Survey Water-Supply Paper 2175. Washington, D.C.

Snedecor, G. W. and W.G. Cochran, W. G. 1980. Statistical Methods. Iowa State University Press. Ames, Iowa.

TABLE 3-1

Revegetation Seed Mixture

Scientific Name	Common Name	Application Rate (pis lb/acre)
	Shrubs	
Artemisia tridentata	Wyoming big sagebrush	1.0
Atriplex canescens	Fourwing saltbush	1.0
	Forbs	
Acillea millefolium	Western yarrow	0.01
Cleame serrulata Pursh	Rocky Mountain Beeplant	1.0
Helianthus annus	Annual sunflower	1.0
Linum lewisii	Lewis flax	1.0
Penstemon palmeri	Palmer's penstemon	0.5
Sphaeraicea coccinea	Scarlet globemallow	0.5
	Grasses	
Agropyron dasystachyum	Thickspike wheatgrass	1.0
Hilaria jamesii	Galleta	0.5
Leymus	Great Basin wildrye	0.5
Oryzopsis hymenoides	Indian ricegrass	1.0
Poa sandbergii	Sandburg bluegrass	1.0
TOTAL (pls lb./acre)		**9.02**

APPENDIX 3-1

VEGETATION SURVEY OF THE PERMIT AREA

VEGETATION OF THE PROPOSED

DEER CREEK MINE

WASTE ROCK STORAGE FACILITY

INCORPORATED

AUG 1 1 2010

Div. of Oil, Gas & Mining

Prepared by

MT. NEBO SCIENTIFIC RESEARCH & CONSULTING
Post Office Box 337
Springville, Utah 84663
(801) 489-6937

for

UTAH POWER AND LIGHT COMPANY
Mining Division
Post Office Box 310
Huntington, Utah 84528

Report: Patrick D. Collins, Ph.D.

Fieldwork: Patrick D. Collins
P. Dean Collins

Date: June 1987

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SCOPE

The following is a report of the vegetation of the proposed Deer Creek Waste Rock Storage Facility for the Deer Creek Mine, Emery County, Utah. The primary purpose of this report is to supply meaningful and scientific data that will provide accurate standards for future reclamation of this area. Proposed disturbance areas and reference areas similar to the proposed disturbance areas, were studied on the site. Studies were performed in accordance to the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM).

A METHODS section is included in this report to provide the reviewers with all methodologies used to obtain the data. Within the INTRODUCTION of the report, a General Site Description section is provided to give an overview of the entire site. The RESULTS section specifically describes each proposed disturbed plant community, reference areas and also supplies results of data analyses and statistical testing from ecological sampling. A VEGETATION MAP of each area is also included in this report. (See map # CM-10777 DR, Map Packet 8-1)

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INTRODUCTION

General Site Description

The study site for the Deer Creek Waste Rock Storage Facility for the Deer Creek Mine is located in Huntington Canyon, West of Huntington, Utah. The area is located on the north side of Huntington Canyon, northeast of the power plant, and north of the Utah Power & Light agricultural farms. Elevation ranges around 6,300 ft above sea level.

The major vegetation type proposed to be disturbed on this site is a Gardner Saltbush/Mat Saltbush community. It is comprised, however, of several, relatively small, isolated plant communities. The area has many small slopes ranging from 2 to 21 degrees. The aspects are nearly as variable with exposures to the east, west and south. The variations in slope and aspect provide variable habitats for plant species. For example, there is a small area on the border of the disturbed area that supports a small stand of pinyon and juniper trees. There are also fingers on the ridges and on the more gently sloped areas that support nearly monocultures of mat saltbush (Atriplex corrugata). Moreover, the steeper slopes, often with east exposures, are dominated by Gardner saltbush. Furthermore, some of the more gentle slopes and part way up the west facing steeper slopes, stands of black sagebrush (Artemisia nova) and shadscale (Atriplex confertifolia) are the dominant plant species.

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METHODS

Quantitative and qualitative data were taken on and adjacent to the proposed disturbed areas. Bi-directional random placement of sampling plots were designed to provide unbiased accuracy of the data compiled. Cover estimates were made using ocular methods with meter square quadrats. Also recorded on data sheets were estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes.

Density of woody plant species were recorded using the point quarter distance method (Cottom and Curtis 1956). In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

The areas were surveyed on a grid system for threatened and endangered plant species. Voucher specimens for many on the species will be filed at the Brigham Young University herbarium. Plant nomenclature follows Welch et al. (1987).

Sampling adequacy for cover and woody species density was achieved using formulas from Snedocor and Cochran (1980), insuring that 80% of the samples were within 10% of the true mean for the shrub communities of the area. Student's t-tests were also employed to compare the proposed disturbance and reference areas of all sites for cover and woody plant species density. Jaccard's Community Coefficient's were used to make species composition comparisons. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to apply further statistical tests if desired.

Productivity was estimated and range condition was evaluated by Soil Conservation Service personnel. (See attached letter from George S. Cook - following Table #8, page 8-17)

Vegetation mapping was done by walking the area and using aerial photos and contour maps. Sampling locations are also shown on these maps. (See maps number CM-10777 DR, located in map packet # 8-1)

RESULTS

Proposed Disturbed Gardner Saltbush/Mat Saltbush Community

Because of the variability and diversity of habitats in this area, and because these areas were often relatively small and isolated, long transects were randomly placed on the area to insure that vegetation sampling would include a representation of the community type as a whole.

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The community is identified as a Gardner Saltbush/Mat Saltbush Community. Woody plant species and grasses dominate this community comprising 78.89% and 19.70% of the living cover, respectively (Table 1). Total cover was estimated at 39.05%. Dominant shrub species of the community were Gardner Saltbush (Atriplex gardneri) and mat saltbush (Atriplex corrugata). Dominant grass species are salina wildrye (Elymus salinus) and Indian ricegrass (Oryzopsis hymenoides). For a listing of cover by species, refer to Table 2. Density of woody plants was estimated at 5,894.45 individuals per acre (Table 3).

Reference Area for the Gardner Saltbush/Mat Saltbush Community.

A reference area with similar slope, soils, exposure, species composition, precipitation, elevation and other environmental variables was chosen as a standard for future reclamation of the site. For total cover and species composition of this reference area, refer to Table 4. For cover estimated by species, refer to Table 5. For total woody species density and density by species, refer to Table 6. A combined species list for the two areas is shown on Table 7.

Statistical analyses indicated that the proposed disturbed and reference areas to be 74.07% similar by species. The two communities were not significantly different by cover or densities when compared by t-tests. For a summary on the statistics employed, refer to Table 8.

Threatened and Endangered Plant Species

No threatened or endangered plant species were found during the course of the study. As mentioned previously, voucher specimens will be donated to the herbarium at Brigham Young University.

Supplemental Vegetation Sampling

Supplemental vegetation sampling will be conducted in the Pinyon-Juniper community during the 1988 growing season, prior to disturbance. Data similar to that found in this report will be generated for the proposed disturbed and reference areas in this community. This information will be forwarded to the Division for inclusion in the existing permit.

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TABLE 1 The proposed disturbed area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover and composition with standard deviations and sample sizes.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZES
Total Living Cover*	39.05	12.34	20
Litter	4.35	4.18	20
Rock	8.45	12.25	20
Bareground	48.65	15.12	20
COMPOSITION			
Shrubs	78.89	32.60	20
Forbs	1.41	4.10	20
Grasses	19.70	30.01	20

* Sample size insures 80% accuracy within 10% of the true mean.

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TABLE 2 The proposed disturbed area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover, standard deviation, sample size and relative frequency by species.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
SHRUBS				
Artemisia nova	3.40	8.86	20	20.00
Atriplex gardneri	17.00	16.46	20	75.00
Atriplex confertifolia	3.25	11.50	20	10.00
Atriplex corrugata	4.35	11.29	20	20.00
Chrysothamnus viscidiflorus	1.10	1.92	20	30.00
Sarcobatus vermiculatus	.75	2.45	20	10.00
FORBS				
Cryptantha flava	.25	.91	20	10.00
Cymopterus purpureus	.05	.22	20	5.00
Eriogonum gordonii	.25	1.12	20	10.00
GRASSES				
Elymus salinus	4.60	10.96	20	20.00
Oryzopsis hymenoides	3.10	7.79	20	30.00
Sitanion hystrix	.60	1.57	20	15.00

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TABLE 3 Woody species densities of the proposed disturbed area of the Gardner Saltbush/Mat Saltbush Community.

	NUMBER/ACRE*
Artemisia nova	343.89
Atriplex gardneri	2,406.90
Atriplex confertifolia	785.93
Atriplex corrugata	1,277.13
Chrysothamnus nauseosus	49.12
Chrysothamnus viscidiflorus	687.69
Sarcobatus vermiculatus	49.12
Suaeda torreyana	245.60
Tetradymia spinosa	49.12
TOTAL	5,894.45

* Sample size was 30 (n=30) and insured that 80% accuracy within 10% of the true mean.

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TABLE 4 The reference area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover and composition with standard deviations and sample sizes.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZES
Total Living Cover*	38.93	14.79	30
Litter	8.40	5.01	30
Rock	7.50	6.63	30
Bareground	45.33	17.21	30
COMPOSITION			
Shrubs	84.09	24.91	30
Forbs	1.13	3.05	30
Grasses	14.78	24.70	30

* Sample size insures 80% accuracy within 10% of the true mean.

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TABLE 5 The reference area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover, standard deviation, sample size and relative frequency by species.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
SHRUBS				
Artemisia nova	6.50	11.23	30	30.00
Atriplex gardneri	11.37	17.17	30	46.67
Atriplex confertifolia	4.23	7.85	30	36.67
Atriplex corrugata	.57	3.10	30	3.33
Chrysothamnus nauseosus	.17	.91	30	3.33
Chrysothamnus viscidiflorus	6.10	6.82	30	53.33
Ephedra viridis	.50	2.74	30	6.67
Eriogonum corymbosum	2.33	5.86	30	26.67
FORBS				
Cryptantha flava	.07	.25	30	10.00
Cymopterus purpureus	.17	.91	30	6.67
Phacelia crenulata	.07	.25	30	6.67
GRASSES				
Elymus salinus	3.50	8.11	30	16.67
Oryzopsis hymenoides	2.70	5.53	30	30.00

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TABLE 6 Woody species densities of the reference area of the Gardner Saltbush/Mat Saltbush Community.

	NUMBER/ACRE*
Artemisia nova	893.32
Atriplex gardneri	1,914.25
Atriplex confertifolia	1,148.55
Atriplex corrugata	723.16
Chrysothamnus nauseosus	127.62
Chrysothamnus viscidiflorus	1,744.10
Ephedra viridis	42.54
Eriogonum corymbosum	127.62
Suaeda torreyana	85.08
TOTAL	6,806.25

* Sample size was 40 (n=40) and insured that 80% accuracy within 10% of the true mean.

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TABLE 7 Species list for the Gardner Saltbush/Mat Saltbush Community.

SCIENTIFIC NAME	COMMON NAME
SHRUBS	
Artemisia nova	Black sagebrush
Atriplex gardneri var. cuneata	Castle Valley saltbrush
Atriplex confertifolia	Shadscale
Atriplex corrugata	Mat saltbush
Chrysothamnus nauseosus	Rubber rabbitbrush
Chrysothamnus viscidiflorus	Low rabbitbrush
Ephredra viridis	Mormon tea
Eriogonum corymbosum	Corymb buckwheat
Juniperus osteosperma	Utah juniper
Pinus edulis	Pinyon pine
Sarcobatus vermiculatus	Greasewood
Tetradymia spinosa	Cottonthorn horsebrush
FORBS	
Cryptantha flava	Cryptantha
Cymopterus purpureus	Spring parsley
Eriogonum gordonii	Gordon's buckwheat
Eriogonum jamesii	James wild buckwheat
Eriogonum sp.	Buckwheat
Haplopappus sp.	Goldenweed
Parthenium sp.	Parthenium
Phacelia crenulata	Phacelia
Phacelia sp.	Phacelia
GRASSES	
Elymus salinus	Salina wildrye
Oryzopsis hymenoides	Indian ricegrass
Sitanion hystrix	Squirreltail

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TABLE 8 Statistical summary sheet for the Gardner Saltbush/Mat Saltbush Community.

PROPOSED DISTURBED				
Total Living Cover	x = 39.05	s = 12.34	n = 20	NMin = 16.36
Density	x = 28.71	s = 15.76	n = 30	NMin = 49.06
Aspect	E,W,S			
Slope	2 - 21 deg.			
REFERENCE AREA				
Total Living Cover	x = 38.93	s = 14.79	n = 30	NMin = 23.49
Density	x = 27.51	s = 13.00	n = 40	NMin = 36.59
Aspect	E,W,S			
Slope	2 - 21 deg.			

Jaccards Similarity Coefficient = 80.77%

Student's t-value (cover) = 0.030
Degrees of freedom = 48
Significance level = N.S.

Student's t-value (density) = 0.349
Degrees of freedom = 68
Significance level = N.S.

x = sample mean, s = sample standard deviation,
n = sample size, NMin = Minimum sample size for statistical adequacy,
p = significance level, N.S. = nonsignificant

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United States Department of Agriculture

Soil Conservation Service

350 North 4th East
Price, Utah 84501

Huntington Power Plant
Huntington Canyon
Huntington, Utah

Dear Sir:

proposed waste rock storage facility (RC)

On June 4, 1987, I visited your reference areas for the ~~ash stockpiles~~ with Patrick Collins to determine production and range condition.

The chained reference area is in fair condition and the production of the site is about 800 lbs. per acre.

The reference area east of the chained area in the sagebrush grass area is in fair condition and producing about 500 pounds. The mature P.J. slope is in good condition and is producing about 75 to 100 lbs. of understory vegetation and about 800 to 900 lbs. of Pinyon Juniper.

The Mat Saltbush, Gardner Saltbush site is producing about 250 lbs. of vegetation and is in a low good condition.

George S. Cook

George S. Cook
Range Conservationist
Soil Conservation Service
Price, Utah

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APPENDIX 3-2

SURVEY OF VEGETATION

MAR 28 1997

COVER COMPARISONS: DEER CREEK WASTE ROCK ACCESS ROAD VS. REFERENCE AREA

APPENDICE XIII

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COVER COMPARISONS:
DEER CREEK WASTE ROCK
ACCESS ROAD VS. REFERENCE AREA

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Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
Post Office Box 337
Springville, Utah 84663
(801) 489-6937

by
Patrick Collins Ph.D.

for

PACIFICORP
Post Office Box 310
Huntington, Utah 84528

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March 22, 1997

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COVER COMPARISONS:
DEER CREEK WASTE ROCK
ACCESS ROAD VS. REFERENCE AREA

INTRODUCTION

A request was made by representatives from Pacificorp to compare the vegetation of a native plant community with the reseeded "fill" slopes created by construction of the access road at the Deer Creek Waste Rock Site. The purpose of the comparison may be to evaluate whether or not the revegetated fill slopes of the road is equal-to-or-greater-than a given standard. If the vegetation of the two areas were comparable, consideration could be made for the removal of the existing erosion control structures that are maintained in the area.

METHODS

Two data sets from earlier reports both done by *MT. NEBO SCIENTIFIC, INC.* were used to make comparisons. First, quantitative sampling results were taken from the "Pacificorp Vegetation Monitoring" (1995) report. The second data set used was from the original report of the vegetation communities before the waste rock site was constructed. This report was called "Vegetation of the Proposed Waste Rock Storage Areas" (1987). When the vegetation was sampled on the area that was proposed for

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disturbance for construction of the waste rock site in 1987, a reference area was also sampled to be used as a standard for future revegetation success. Sampling methods between data sets were similar, so comparisons could easily be made.

RESULTS

Data summaries for the vegetation of the access road of the Deer Creek Waste Rock Site and a Gardner Saltbush/Mat Saltbush Reference Area are shown on Tables A through E. Table A is a spreadsheet that shows all the cover data from the roadside, including both "cut" and "fill" slopes. Table B is a summary showing only the fill slopes. From Table B, one can see that the total living cover of the fill slopes is 32.44%. The total ground cover, or that cover that contributes to erosion control, was 74.17%. Total ground cover included total living cover, litter and rock (excluded bareground).

Tables D and E are data summaries taken from the aforementioned 1987 report for the Gardner Saltbush/Mat Saltbush Reference Area. From Table D, the total living cover of the reference area was 38.93%, whereas the total ground cover was 54.83%.

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The total ground cover of the revegetated cut slopes of the access road at the waste rock site was obviously much greater than the cover of the reference area. It is therefore probable that erosion of the reseeded fill slopes does not exceed the erosion from the adjacent undisturbed slopes of the native plant communities.

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TABLE A - DEER CREEK-WASTE ROCK SITE
Access Road Slope
1989 Interim Reveg Area
Acreage: part of 5 acres
Slope: 20-25 deg
Exposure: variable
Sample Date: 28 Aug 1995

	Fill 1.00	Cut 2.00	Fill 3.00	Cut 4.00	Fill 5.00	Cut 6.00	Fill 7.00	Cut 8.00
SHRUBS								
Chrysothamnus nauseosus	20.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	5.00	10.00	0.00	0.00	0.00
Atriplex canescens	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
FORBS								
Medicago sativa	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Kochia scoparia	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
Iva axillaris	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola pestifer	0.00	0.00	0.00	30.00	0.00	0.00	0.00	5.00
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	20.00	0.00	5.00
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES								
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus cinereus	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sitanion hystrix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	10.00	30.00	25.00	0.00	20.00	5.00	30.00	0.00
COVER								
Total Living Cover	40.00	60.00	40.00	35.00	40.00	25.00	40.00	25.00
Litter	5.00	5.00	5.00	5.00	5.00	3.00	5.00	2.00
Bareground	25.00	30.00	20.00	55.00	40.00	70.00	10.00	70.00
Rock	30.00	5.00	35.00	5.00	15.00	2.00	45.00	3.00
% COMPOSITION								
Shrubs	50.00	8.33	12.50	14.29	50.00	0.00	25.00	60.00
Forbs	12.50	41.67	25.00	85.71	0.00	80.00	0.00	40.00
Grasses	37.50	50.00	62.50	0.00	50.00	20.00	75.00	0.00

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DEER CREEK-WASTE ROCK
Access Road Slope
1989 Interim Reveg Area
Acreage: part of 5 acres
Slope: 20-25 deg
Exposure: variable
Sample Date: 28 Aug 1995

Fill 9.00	Cut 10.00	Fill 11.00	Cut 12.00	Mean	SDev	
						SHRUBS
15.00	0.00	5.00	0.00	4.17	6.40	Chrysothamnus nauseosus
0.00	0.00	0.00	0.00	1.25	2.98	Ceratoides lanata
0.00	10.00	0.00	0.00	1.67	3.73	Atriplex canescens
0.00	0.00	0.00	0.00	0.83	2.76	Atriplex gardneri
0.00	0.00	0.00	0.00	1.25	4.15	Eriogonum corymbosum
						FORBS
0.00	0.00	0.00	0.00	0.83	1.86	Medicago sativa
0.00	0.00	0.00	0.00	0.83	2.76	Kochia scoparia
0.00	0.00	0.00	0.00	1.67	5.53	Iva axillaris
0.00	0.00	25.00	20.00	6.67	10.87	Salsola pestifer
0.00	0.00	0.00	0.00	2.08	5.57	Halogeton glomeratus
10.00	0.00	0.00	0.00	0.83	2.76	Penstemon palmeri
0.00	10.00	0.00	0.00	0.83	2.76	Machaeranthera canescens
						GRASSES
10.00	0.00	0.00	0.00	0.83	2.76	Stipa hymenoides
0.00	0.00	0.00	0.00	0.42	1.38	Elymus cinereus
0.00	0.00	5.00	0.00	0.42	1.38	Sitanion hystrix
0.00	0.00	0.00	0.00	10.00	12.08	Elymus lanceolatus
				23.33 (excluding annuals)		
						COVER
35.00	20.00	35.00	20.00	34.58	10.70	Total Living Cover (11.25% from annuals)
5.00	10.00	5.00	5.00	5.00	1.78	Litter
40.00	65.00	20.00	70.00	42.92	21.36	Bareground
20.00	5.00	40.00	5.00	17.50	15.31	Rock
						% COMPOSITION
42.86	50.00	14.29	0.00	27.27	20.96	Shrubs
28.57	50.00	71.43	100.00	44.57	32.20	Forbs
28.57	0.00	14.29	0.00	28.15	25.57	Grasses

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TABLE B - DEER CREEK-WASTE ROCK SITE
Access Road Slope
1989 Interim Reveg Area
Acreage: part of 5 acres
Slope: 20-25 deg
Exposure: variable
Sample Date: 28 Aug 1995

	Fill 1.00	Fill 3.00	Fill 5.00	Fill 7.00	Fill 9.00	Fill 11.00	Mean	SDev
SHRUBS								
Chrysothamnus nauseosus	20.00	5.00	0.00	0.00	15.00	5.00	7.50	7.50
Ceratoides lanata	0.00	0.00	10.00	0.00	0.00	0.00	1.67	3.73
Atriplex canescens	0.00	0.00	0.00	10.00	0.00	0.00	1.67	3.73
Atriplex gardneri	0.00	0.00	10.00	0.00	0.00	0.00	1.67	3.73
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS								
Medicago sativa	5.00	0.00	0.00	0.00	0.00	0.00	0.83	1.86
Kochia scoparia	0.00	10.00	0.00	0.00	0.00	0.00	1.67	3.73
Iva axillaris	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola pestifer	0.00	0.00	0.00	0.00	0.00	25.00	4.17	9.32
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Penstemon palmeri	0.00	0.00	0.00	0.00	10.00	0.00	1.67	3.73
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES								
Stipa hymenoides	0.00	0.00	0.00	0.00	10.00	0.00	1.67	3.73
Elymus cinereus	5.00	0.00	0.00	0.00	0.00	0.00	0.83	1.86
Sitanion hystrix	0.00	0.00	0.00	0.00	0.00	5.00	0.83	1.86
Elymus lanceolatus	10.00	25.00	20.00	30.00	0.00	0.00	14.17	11.70
								5.84 cover from annual
COVER							32.49	
Total Living Cover	40.00	40.00	40.00	40.00	35.00	35.00	38.33	2.36
Litter	5.00	5.00	5.00	5.00	5.00	5.00	5.00	0.00
Bareground	25.00	20.00	40.00	10.00	40.00	20.00	25.83	10.96
Rock	30.00	35.00	15.00	45.00	20.00	40.00	30.83	10.57
% COMPOSITION								
Shrubs	50.00	12.50	50.00	25.00	42.86	14.29	32.44	15.85
Forbs	12.50	25.00	0.00	0.00	28.57	71.43	22.92	24.32
Grasses	37.50	62.50	50.00	75.00	28.57	14.29	44.64	20.41
COVER (TLC+L+R)*	75.00	80.00	60.00	90.00	60.00	80.00	74.17	10.96

*
TLC = Total Living Cover
L = Litter
R = Rock

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TABLE C - DEER CREEK-WASTE ROCK SITE
Access Road Slope
1989 Interim Reveg Area
Acreage: part of 5 acres
Slope: 20-25 deg
Exposure: variable
Sample Date: 28 Aug 1995

	Cut 2.00	Cut 4.00	Cut 6.00	Cut 8.00	Cut 10.00	Cut 12.00	Mean	SDev
SHRUBS								
Chrysothamnus nauseosus	5.00	0.00	0.00	0.00	0.00	0.00	0.83	1.86
Ceratoides lanata	0.00	5.00	0.00	0.00	0.00	0.00	0.83	1.86
Atriplex canescens	0.00	0.00	0.00	0.00	10.00	0.00	1.67	3.73
Atriplex gardneri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	15.00	0.00	0.00	2.50	5.59
FORBS								
Medicago sativa	5.00	0.00	0.00	0.00	0.00	0.00	0.83	1.86
Kochia scoparia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iva axillaris	20.00	0.00	0.00	0.00	0.00	0.00	3.33	7.45
Salsola pestifer	0.00	30.00	0.00	5.00	0.00	20.00	9.17	11.70
Halogeton glomeratus	0.00	0.00	20.00	5.00	0.00	0.00	4.17	7.31
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	10.00	0.00	1.67	3.73
GRASSES								
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus cinereus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sitanion hystrix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	30.00	0.00	5.00	0.00	0.00	0.00	5.83	10.96
COVER								
Total Living Cover	60.00	35.00	25.00	25.00	20.00	20.00	30.83	13.97
Litter	5.00	5.00	3.00	2.00	10.00	5.00	5.00	2.52
Bareground	30.00	55.00	70.00	70.00	65.00	70.00	60.00	14.43
Rock	5.00	5.00	2.00	3.00	5.00	5.00	4.17	1.21
% COMPOSITION								
Shrubs	8.33	14.29	0.00	60.00	50.00	0.00	22.10	23.95
Forbs	41.67	85.71	80.00	40.00	50.00	100.00	66.23	23.33
Grasses	50.00	0.00	20.00	0.00	0.00	0.00	11.67	18.63
COVER (TLC+L+R)*	70.00	45.00	30.00	30.00	35.00	30.00	40.00	14.43

*
TLC = Total Living Cover
L = Litter
R = Rock

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TABLE D - The reference area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover and composition with standard deviations and sample sizes.

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZES
Total Living Cover*	38.93	14.79	30
Litter	8.40	5.01	30
Rock	7.50	6.63	30
Bareground	45.33	17.21	30
COMPOSITION			
Shrubs	84.09	24.91	30
Forbs	1.13	3.05	30
Grasses	14.78	24.70	30

* Sample size insures 80% accuracy within 10% of the true mean.

COVER (TLC+L+R) = 54.83

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TABLE E - The reference area of the Gardner Saltbush/Mat Saltbush Community. The table shows the mean percent cover, standard deviation, sample size and relative frequency by species.

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
SHRUBS				
Artemisia nova	6.50	11.23	30	30.00
Atriplex gardneri	11.37	17.17	30	46.67
Atriplex confertifolia	4.23	7.85	30	36.67
Atriplex corrugata	.57	3.10	30	3.33
Chrysothamnus nauseosus	.17	.91	30	3.33
Chrysothamnus viscidiflorus	6.10	6.82	30	53.33
Ephedra viridis	.50	2.74	30	6.67
Eriogonum corymbosum	2.33	5.86	30	26.67
FORBS				
Cryptantha flava	.07	.25	30	10.00
Cymopterus purpureus	.17	.91	30	6.67
Phacelia crenulata	.07	.25	30	6.67
GRASSES				
Elymus salinus	3.50	8.11	30	16.67
Oryzopsis hymenoides	2.70	5.53	30	30.00

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MT NEBO SCIENTIFIC, INC.
research & consulting

May 23, 1996

Val Payne
ENERGY WEST MINING COMPANY
P.O. Box 310
Huntington, Utah 84528

RE: Deer Creek Waste Rock Site

Dear Val:

Enclosed please find a spreadsheet showing the cover data of the Deer Creek Waste Rock Access Road. I have shown which of the quadrats were "fill" and which were "cut" slopes. At the bottom of the page you may note that the mean total cover (vegetation, litter & rock) was 74.17% for the fill slopes and 40.00% for the cut slopes.

I hope this information is what you needed. Please do not hesitate to call if you have questions or need further assistance.

Sincerely,

Patrick D. Collins, Ph.D.

Enclosure

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330 East 400 South, Ste. 6, P.O. Box 337, Springville, Utah 84663
(801) 489-6937, (fax) 489-6779

MT. NEBO SCIENTIFIC/ ENERGY WEST RAW DATA SUMMARY 1995

EER CREEK-WASTE ROCK SITE

cess Road Slope

1989 Interim Revag Area

Acreage: part of 5 acres

Slope: 20-25 deg

Exposure: variable	Fill	Cut	Fill	Cut	Fill	Cut	Fill	Cut	Fill	Cut	Fill	Cut
Sample Date: 28 Aug 1995	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
SHRUBS												
Chrysothamnus nauseosus	20.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	5.00	0.00
Ceratoides lanata	0.00	0.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Atriplex canescens	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	10.00	0.00	0.00
Atriplex gardneri	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00
FORBS												
Medicago sativa	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kochia scoparia	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iva axillaris	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola pestifer	0.00	0.00	0.00	30.00	0.00	0.00	0.00	5.00	0.00	0.00	25.00	20.00
Halogeton glomeratus	0.00	0.00	0.00	0.00	0.00	20.00	0.00	5.00	0.00	0.00	0.00	0.00
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
RASSES												
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Elymus cinereus	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sitanion hystrix	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
Elymus lanceolatus	10.00	30.00	25.00	0.00	20.00	5.00	30.00	0.00	0.00	0.00	0.00	0.00
COVER												
Total Living Cover	40.00	60.00	40.00	35.00	40.00	25.00	40.00	25.00	35.00	20.00	35.00	20.00
Litter	5.00	5.00	5.00	5.00	5.00	3.00	5.00	2.00	5.00	10.00	5.00	5.00
Bareground	25.00	30.00	20.00	55.00	40.00	70.00	10.00	70.00	40.00	65.00	20.00	70.00
Rock	30.00	5.00	35.00	5.00	15.00	2.00	45.00	3.00	20.00	5.00	40.00	5.00
% COMPOSITION												
Shrubs	50.00	8.33	12.50	14.29	50.00	0.00	25.00	60.00	42.86	50.00	14.29	0.00
Forbs	12.50	41.67	25.00	85.71	0.00	80.00	0.00	40.00	28.57	50.00	71.43	100.00
Grasses	37.50	50.00	62.50	0.00	50.00	20.00	75.00	0.00	28.57	0.00	14.29	0.00
Total Cover	75.00	70.00	80.00	45.00	60.00	30.00	90.00	30.00	60.00	35.00	80.00	30.00
Bareground	25.00	30.00	20.00	55.00	40.00	70.00	10.00	70.00	40.00	65.00	20.00	70.00

Mean Total Cover: Fill Slopes **74.17** Std.Dev. **10.96**

Mean Total Cover: Cut Slopes **40.00** Std.Dev. **14.43**

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DEER CREEK-WASTE R
Access Road Slope
1989 Interim Reveg Area
Acreage: part of 5 acres
Slope: 20-25 deg
Exposure: variable
Sample Date: 26 Aug 1995

Mean	SDev	Freq	
			SHRUBS
4.17	6.40		Chrysothamnus nauseosu
1.25	2.96		Ceratoides lanata
1.67	3.73		Atriplex canescens
0.83	2.76		Atriplex gardneri
1.25	4.15		Eriogonum corymbosum
			FORBS
0.83	1.86		Medicago sativa
0.83	2.76		Kochia scoparia
1.67	5.53		Iva axillaris
6.67	10.87		Salsola pestifer
2.08	5.57		Halogeton glomeratus
0.83	2.76		Penstemon palmeri
0.83	2.76		Machaeranthera canescen
			GRASSES
0.83	2.76		Stipa hymenoides
0.42	1.38		Elymus cinereus
0.42	1.38		Sitanion hystrix
10.00	12.08		Elymus lanceolatus
			COVER
34.58	10.70		Total Living Cover
5.00	1.78		Litter
42.92	21.36		Bareground
17.50	15.31		Rock
			% COMPOSITION
27.27	20.96		Shrubs
44.57	32.20		Forbs
28.15	25.57		Grasses
57.08	21.36		
42.92	21.36		

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APPENDIX 3-3

CORRESPONDENCE FROM THE UTAH DIVISION OF WILDLIFE RESOURCES REGARDING THE REVEGATION SEED MIX

STATE OF UTAH
NATURAL RESOURCES
Wildlife Resources

1596 West North Temple • Salt Lake City, UT 84116-3154 • 801-533-9333

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
William H. Geer, Division Director

June 10, 1988

Dr. Dianne R. Nielson, Director
Utah Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

Attn: John Whitehead

Dear Dianne:

The Division has evaluated Utah Power and Light Company's plans titled "Deer Creek Waste Rock Storage Facility". The development operation and mitigation strategy adequately addresses impacts to wildlife. It is recommended that the interim revegetation seed list (page 3-6) and the final revegetation seed list (page 3-8) be modified to include ladak alfalfa (1 lb./acre) and Great Basin sagebrush (0.5 lb/acre). Also, the streambank wheatgrass should be replaced with Basin wildrye. These vegetation species will likely establish under the reclaimed conditions and will enhance the site for big game use.

Thank you for an opportunity to review the MRP and provide comment.

Sincerely,

William H. Geer
Director

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From: **Makeda Hanson** <makedatrujillo@utah.gov>
Date: Fri, Nov 13, 2015 at 11:31 AM
Subject: Re: Deer Creek Waste Rock Pile
To: Lisa Reinhart <lreinhart@utah.gov>

Hi Lisa,

Below is a list of plants and pounds/acre that I would use for a reseeding in this area.

Indian Ricegrass (cool-season)	1 lb
Thickspike Wheatgrass (cool-season)	0.5 lb
Salina Wildrye (cool-season)	0.5 lbs
Galleta (warm-season)	0.5 lbs
Sanberg blue grass (cool-season)	1 lb

Globemallow	0.5 lbs
Western Yarrow (seed tiny-seed low rate)	0.01 lbs
Annual sunflower	1 lb
Lewis Flax (or blue flax (non-native))	1 lb
Rocky Mountain Bee Plant	1 lb
Palmer Penstemon	0.5 lbs

Winter fat	0.5 lbs
Four wing saltbush	1 lb
Wyoming big sagebrush	1 lb

Non-native forb subsitutues	
Forage kochia	0.5 lbs
Alfalfa	1 lb
Yellow sweetclover	0.5 lb

Makeda Trujillo Hanson
Impact Analysis Biologist
Utah Division of Wildlife Resources
319 N. Carbonville Rd. Suite A
Price, UT 84501
Cell: 435-630-0805
Fax: 435-613-3704

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APPENDIX 3-4

IPAC RESOURCE REPORT AND SECTION 7 LETTER

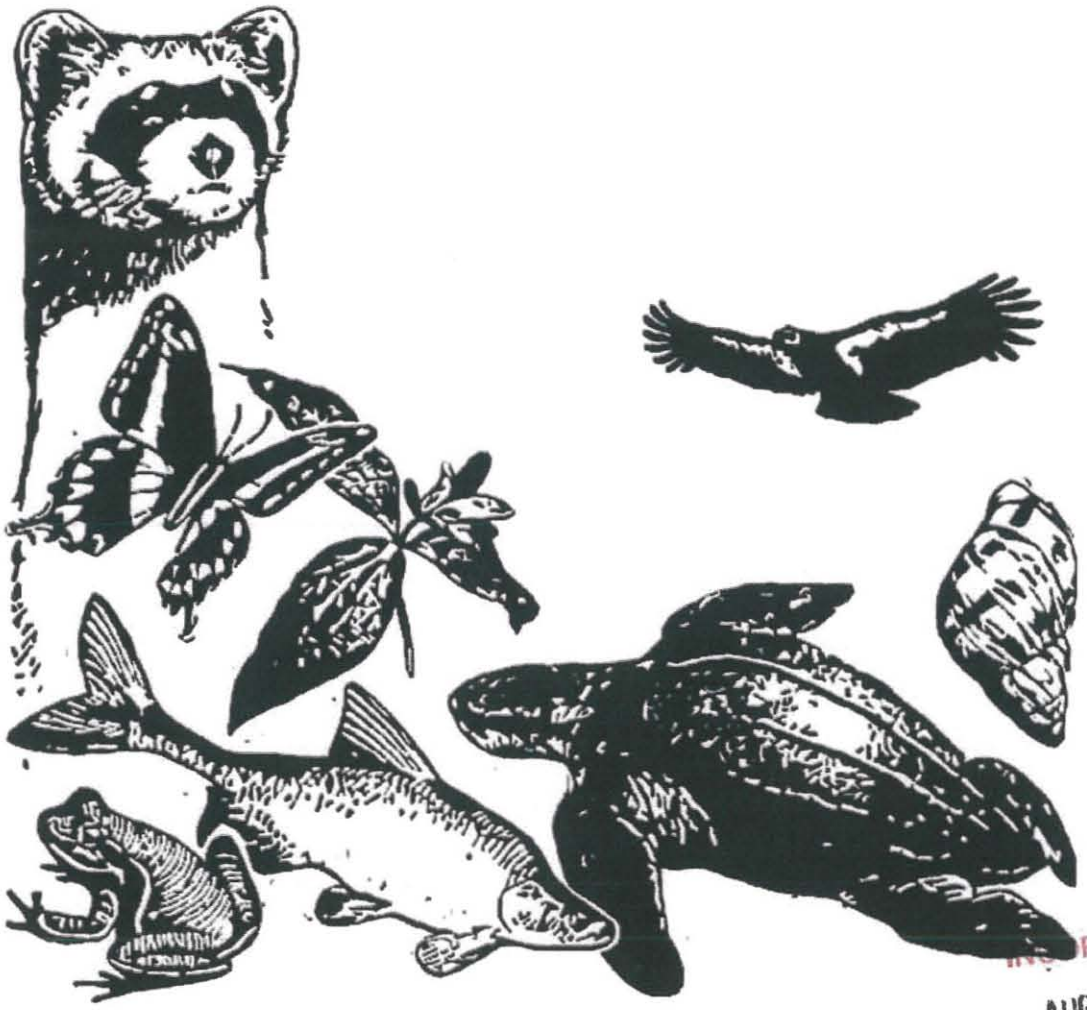
U.S. Fish & Wildlife Service

Deer Creek Waste Rock Site

IPaC Trust Resource Report

Generated November 10, 2015 04:44 PM MST

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



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US Fish & Wildlife Service

IPaC Trust Resource Report

Project Description

NAME

Deer Creek Waste Rock Site

PROJECT CODE

JCAUO-KW2Y5-B25M5-RBH4V-UZVWOY

LOCATION

Emery County, Utah

DESCRIPTION

Deer Creek Waste Rock Site- Coal recovery from waste

U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

Utah Ecological Services Field Office
2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603
(801) 975-3330

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Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

Birds

Mexican Spotted Owl Strix occidentalis lucida — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B074

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B094

Yellow-billed Cuckoo Coccyzus americanus — Threatened

CRITICAL HABITAT
There is **proposed** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06R

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Fishes

Bonytail Chub Gila elegans — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E020

Colorado Pikeminnow (=squawfish) Ptychocheilus lucius — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E006

Humpback Chub Gila cypha — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E000

Razorback Sucker Xyrauchen texanus — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E054

Flowering Plants

Barneby Reed-mustard Schoenocrambe barnebyi — Endangered

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q2QU

Jones Cycladenia Cycladenia humilis var. jonesii — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1V7

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

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Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

Black Rosy-finch Leucosticte atrata — Bird of conservation concern
Year-round

Brewer's Sparrow Spizella breweri — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HA

Burrowing Owl Athene cunicularia — Bird of conservation concern
Season: Breeding

Cassin's Finch Carpodacus cassinii — Bird of conservation concern
Year-round

Ferruginous Hawk Buteo regalis — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06X

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Breeding

Golden Eagle Aquila chrysaetos — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DV

Juniper Titmouse Baeolophus ridgwayi — Bird of conservation concern
Year-round

Lewis's Woodpecker Melanerpes lewis — Bird of conservation concern
Year-round

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FY

Long-billed Curlew Numenius americanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06S

Olive-sided Flycatcher Contopus cooperi — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0AN

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Peregrine Falcon Falco peregrinus — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

Pinyon Jay Gymnorhinus cyanocephalus — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0I0

Prairie Falcon Falco mexicanus — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0ER

Sage Thrasher Oreoscoptes montanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0ID

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HD

Swainson's Hawk Buteo swainsoni — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B070

Williamson's Sapsucker Sphyrapicus thyroideus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FX

Willow Flycatcher Empidonax traillii — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F6

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Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

There are no refuges within this project area

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Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

There are no wetlands identified in this project area

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Utah Ecological Services Field Office
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UT 84119
PHONE: (801)975-3330 FAX: (801)975-3331
URL: www.fws.gov; www.fws.gov/utahfieldoffice/

Consultation Code: 06E23000-2016-SLI-0037 November 10, 2015
Event Code: 06E23000-2016-E-00081
Project Name: Deer Creek Waste Rock Site

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

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A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

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United States Department of Interior
Fish and Wildlife Service

Project name: Deer Creek Waste Rock Site

Official Species List

Provided by:

Utah Ecological Services Field Office
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UT 84119
(801) 975-3330
http://www.fws.gov
http://www.fws.gov/utahfieldoffice/

Consultation Code: 06E23000-2016-SLI-0037
Event Code: 06E23000-2016-E-00081

Project Type: MINING

Project Name: Deer Creek Waste Rock Site
Project Description: Deer Creek Waste Rock Site- Coal recovery from waste

Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

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United States Department of Interior
Fish and Wildlife Service

Project name: Deer Creek Waste Rock Site

Project Location Map:

Project Coordinates: MULTIPOLYGON (((-111.05633638487454 39.38117899369903, -111.05816338306447 39.37788066354506, -111.05892741192856 39.37690373356715, -111.06294101642708 39.373671433359796, -111.06316867307744 39.37388265707028, -111.061240598567 39.375686393957814, -111.05994597384931 39.37838974291772, -111.05996027991043 39.378456175961944, -111.06061756129677 39.378915125396055, -111.06154436561637 39.37925645868107, -111.06246012509035 39.37946955655784, -111.06345594854263 39.37956173378352, -111.06345692980231 39.380385762391825, -111.06338380980878 39.381209309799175, -111.05633638487454 39.38117899369903)))

Project Counties: Emery, UT

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United States Department of Interior
Fish and Wildlife Service

Project name: Deer Creek Waste Rock Site

Endangered Species Act Species List

There are a total of 9 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	**Status**	**Has Critical Habitat**	**Condition(s)**
Mexican Spotted owl *(Strix occidentalis lucida)* Population: Entire	Threatened	Final designated	
Southwestern Willow flycatcher *(Empidonax traillii extimus)* Population: Entire	Endangered	Final designated	
Yellow-Billed Cuckoo *(Coccyzus americanus)* Population: Western U.S. DPS	Threatened	Proposed	
Fishes			
Bonytail chub *(Gila elegans)* Population: Entire	Endangered	Final designated	
Colorado pikeminnow *(Ptychocheilus lucius)* Population: Entire, except EXPN	Endangered	Final designated	
Humpback chub *(Gila cypha)* Population: Entire	Endangered	Final designated	
Razorback sucker *(Xyrauchen*	Endangered	Final designated	

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texanus) Population: Entire			
Flowering Plants			
Barneby reed-mustard *(Schoenocrambe barnebyi)*	Endangered		
Jones Cycladenia *(Cycladenia humilis var. jonesii)*	Threatened		

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Fish and Wildlife Service

Project name: Deer Creek Waste Rock Site

Critical habitats that lie within your project area

There are no critical habitats within your project area.

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APPENDIX 3-5

ESTIMATED PROJECT WATER USAGE

Estimated Water Usage for Dust Suppression (Windy Gap Process)

Site: Castle Valley Waste Rock

Equation:

$$C = 100 - \frac{0.8\ p\ d\ t}{l}$$

Where:
C = Average control efficiency (%)
p = Potential average hourly daytime evaporation rate (mm/hr)
(0.0065) x (annual pan evaporation rate for summer conditions)
d = Average hourly daytime traffic rate (trips/hr)
t = Time between application (hr)
l = Application intensity (L/m^2)

Source of equation and pan evaporation data:
Cowherd, C., G. E. Muleski, and J. S. Kinsey, 1988 Control of Open Fugitive Dust Sources: Final Report. EPA-4150/3-98-008. U. S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina.

Mean annual Class A pan evap. =	55 inches	
Potential average hourly daytime evap. Rate =	0.3575 mm/he	
Average hourly daytime traffic rate =	2 trips/hr	
Water application intensity =	1 L/m^2 =	0.025 gal/ft^2
Time between applications =	5 hr	
Average control efficiency =	97.1%	

Water Requirement:

Area	Length (ft)	Width (ft)	Area (ft^2)	Water Required (gal) Per App	Daily
Work area	50	25	1,250	31.25	62.50
Road	400	15	6,000	150	300

TOTAL DAILY WATER REQUIREMENT = 363 gal/day

Yearly (52 weeks) of operation at 4 days/wk = 75,504 gallons
= 0.23 acre-feet

Assure 5 times as much water usage during Reclamation (for dust suppression and Compaction moisture conditioning) = 377,520 gallons
= 1.16 acre-feet

R645-301-400

LAND USE AND AIR QUALITY

TABLE OF CONTENTS

R645-301-411 Environmental Description 4-1

R645-301-412 Reclamation Plan 4-3

R645-301-413 Performance Standards 4-4

R645-301-414 Alternative Land Use 4-4

R645-301-420 Air Quality 4-5

Appendix 4-1 Emery County Zoning Boundaries

Appendix 4-2 Cultural Resource Inventory

Appendix 4-3 1988 DOGM Approval of the Deer Creek Waste Rock Facility

Appendix 4-4 Utah Division of Air Quality Approval

R645-301-400 LAND USE AND AIR QUALITY

R645-301-411 Environmental Description

R645-301-411.110 Pre-Mining Land Use

Prior to disturbance of the area by Energy West for use as a waste rock disposal facility, land within the permit area was used as wildlife habitat. Since the late 1980s the land has been used for mining purposes (i.e., disposal of waste rock generated from the Deer Creek Mine).

Land Use Map. Zoning boundaries in Emery County are provided on the map contained in Appendix 4-1. Zoned land use north of State Route 31 in the permit and adjacent areas is M&G-1 (mining and grazing). Land on the south side of State Route 31 near the permit area is zoned A-1 (agricultural).

Land Capability. Information presented in Chapter 2 of this application indicates that soils in the permit area are generally saline and are categorized as having a Class 8 capability, which indicates that they have limitations that preclude commercial plant production and restricting their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes. Information presented in Chapter 3 of this application indicates that vegetative cover is generally sparse in the area.

Land Use Description. The Emery County Zoning Ordinance[1] indicates that the M&G-1 zone *"generally covers the dry mountain and desert areas of the County. Because of the limitations imposed by climate, topography, soil capability, inadequate water supply*

[1] http://www.emerycounly.com/b&z/index.htm, downloaded 22 Jan 2015

the presence of economically significant mineral deposits, this area has historically been utilized as a place for the grazing of livestock on the open range and as the location of numerous mining and mineral exploration sites. The peculiar characteristics and conditions present in this area make the land most appropriately suited for a continuation of these uses."

Cultural and Historic Resources Information. A cultural resource inventory of the permit area was conducted in April 1987 prior to disturbance of the site for waste rock disposal. The results of this survey, conducted by F.R. Hauck, Ph.D. of Archeological-Environmental Research Corporation are provided in Appendix 4-2. The survey included on-site evaluations, a search of the National Register of Historic Places, a search of the files of the Price Area office of the U.S. Bureau of Land Management, and a search of records on files with the Utah State Historic Preservation Office. Dr. Hauck concluded that "no cultural resources or site were observed or recorded during the evaluation." The State Historic Preservation Office reviewed their files, including the information prepared by Dr. Hauck, and concluded that "there appears to be a low probability for impacting any historic resources as a result of this project" (see Appendix 4-2).

R645-301-411.120 Previous Mining Activity

Mining activity, in the form of waste-rock disposal, has occurred in the permit area since the late 1980s. This activity has been conducted in accordance with a permit issued by the Utah Division of Oil, Gas and Mining to PacifiCorp and/or its predecessors or agents. The original approval for disposing of waste rock at the site was issued on September 13, 1988 (see Appendix 4-3).

Additional information regarding past mining activities at the site is available in the files of the Division under Permit No. ACT/015/018. The permit area has been used only for the disposal of waste rock. No coal has been mined in the permit area. Land in the permit area was used prior to mining activities primarily for wildlife habitat.

R645-301-412 Reclamation Plan

R645-301-412.100 Postmining Land Use Plan

As indicated in Section 222.400 of this application, the soil at the site is poorly suited for agricultural use. Even under favorable conditions, the soils in the permit area can produce only 63 pounds of rangeland vegetation per acre annually. As a result, these soils are categorized as having a Class 8 capability, which indicates that they have limitations that preclude commercial plant production and restricting their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes. Given these conditions, the reclamation plan has been designed to support a post-mining land use of wildlife habitat (i.e., the same as the pre-disturbance land use). This use is consistent with local zoning as indicated in Section 411.110 of this application. This post-mining land use will be achieved through the following actions:

- Regrading of the area in a manner that provides a roughened, final soil surface, thereby minimizing the potential for erosion, maximizing the retention of water, and substantially improving revegetation success; and
- Reseeding the area with an appropriate mix of native and introduced plant species that will provide forage for big-game animals.

The methods to be employed during site reclamation, following operations, are discussed more fully in Section 540 of this permit application. In developing the reclamation plan, consideration has been given to ensuring that the plan is consistent with county zoning and compatible with adjacent land uses.

R645-301-412.200 Land Owner or Surface Manager Comments

Castle Valley Mining, LLC (CVM) owns and will conduct operations at the site. Thus, surface land owner comments are not required. All operations will be conducted in accordance with applicable local, State, and Federal regulations.

R645-301-412.300 Suitability and Capability

Final fills will not contain excess spoils.

R645-301-413 Performance Standards

R645-301-413.100 Postmining Land Use

The proposed post-operations land use will be wildlife habitat. The land is capable of supporting such a land use as evidenced by that fact that it supported this land use prior to disturbance.

R645-301-413.200 Determining Premining Uses of Land

The pre-mining land use within the permit area was for wildlife habitat.

R645-301-413.300 Criteria for Alternative Postmining Land Uses

No alternative post-mining land uses are anticipated.

R645-301-414 Alternative Land Use

No alternative post-mining land uses are anticipated.

R645-301-420 Air Quality

This section includes descriptions of plans to comply with the Clean Air Act and applicable Utah or federal statutes and regulations pertaining to air quality standards.

R645-301-421 Air Quality Standards

CVM will conduct operations at the site in compliance with the requirements of the Clean Air Act and the Utah Air Quality Regulations.

R645-301-422 Compliance Efforts

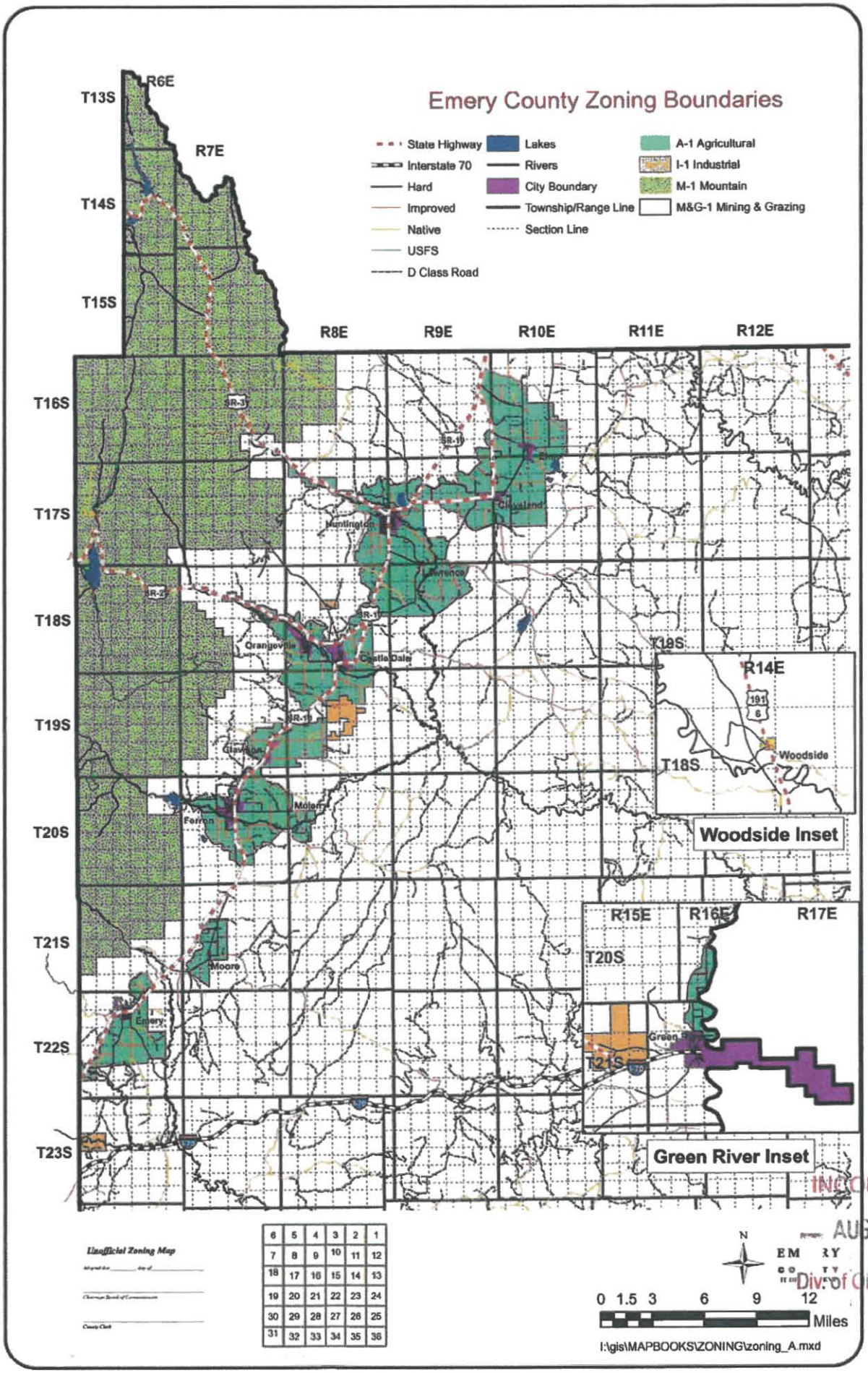
Approval by the Utah Division of Air Quality is provided in Appendix 4-4 for the operations that will be conducted at the site. Controls will be implemented at the site to suppress dust through such actions as watering roadways, material-handling operations, and loading operations. Storage piles will also be sprayed with water as necessary to minimize dust emissions.

R645-301-423 Monitoring Program

Air quality monitoring at the site will be conducted in accordance with requirements established by the Utah Division of Air Quality, following their review of site operation plans, as discussed in Appendix 4-4. These monitoring requirements were promulgated by the Utah Division of Air Quality to comply with applicable Utah and federal air quality standards.

APPENDIX 4-1

EMERY COUNTY ZONING BOUNDARIES



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APPENDIX 4-2

CULTURAL RESOURCE INVENTORY

Bureau of Land Management
Utah State Office
(AERC FORMAT)

Summary Report of
Inspection for Cultural Resources

1 10

Report Acceptable Yes __ No __

Mitigation Acceptable Yes __ No __
Comments:_____

WASTE ROCK DISPOSAL SITE

Report Title . . . . . .
11 Utah Power & Light Co., Parcel in Huntington Canyon

2. Development Company_____

0 4 1 5 1 9 8 7 87-UT-54937

3. Report Date . . . _____ . . . . . 4. Antiquities Permit No. _____
41 42 43 46

AERC UPL-87-2 Emery

5. Responsible Institution . . . . . County _____
47 61

6. Fieldwork 1 7 S 0 8 E 0 5 0 6
Location: TWN . . . . . RNG . . . . . Section. . .|. . .|. . .|. . .|
62 65 66 69 70 71 72 73 74 75 76 77

7. Resource
Area TWN . . . . . RNG . . . . . Section. . .|. . .|. . .|. . .|
.P.M. 78 81 82 85 86 87 88 89 90 91 92 93
110 111 TWN . . . . . RNG . . . . . Section. . .|. . .|. . .|. . .|
94 97 98 101 102 104 106 108

8. Description of Examination Procedures:
The archeologist, F.R. Hauck, walked a series of 15 to 20 meter wide transects within the large parcel. The existing access road was also examined on each flank by walking 15 meter wide transects. As a result this roadway can be upgraded for 50 additional feet on either side of the existing road.

9. Linear Miles Surveyed . 5 . . . . . 10. Inventory Type I . .
and/or 112 117 130
Definable Acres Surveyed . . . . . R = Reconnaissance
and/or 118 123 I = Intensive
Legally Undefinable 7 0 S = Statistical Sample
Acres Surveyed . . . . . .
124 129

11. Description of Findings:
No cultural resources or sites were observed or recorded during the evaluation.

12. Number Sites Found .0. . . . .
(No sites = 0) 131 135
13. Collection: .N.
Y = Yes, N = No) 136

14. Actual/Potential National Register Properties Affected:
The National Register of Historic Places (NRHP) has been consulted and no registered properties will be affected by the proposed development.

15. Literature Search, Location/ Date: Utah SHPO - 4-13-87
Price Area BLM Office - 4-14-87

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16. Conclusion/ Recommendations:
AERC recommends that a cultural resource clearance be granted to Utah Power & Light Company based upon adherence to the following stipulations: (see next page)

17. Signature of Administrator & Field & Field Supervisor

Administrator F. R. Hauck

Field Supervisor F. R. Hauck

UT 8100-3
(2/85)

16. continued:

1. All vehicular traffic, personnel movement, and construction should be confined to the locations examined as referenced in this report, and to the existing roadways and/or evaluated access routes.

2. All personnel should refrain from collecting artifacts and from disturbing any cultural resources in the area.

3. The authorized official should be consulted should cultural remains from subsurface deposits be exposed during construction work or if the need arises to relocate or otherwise alter the location of the construction area.

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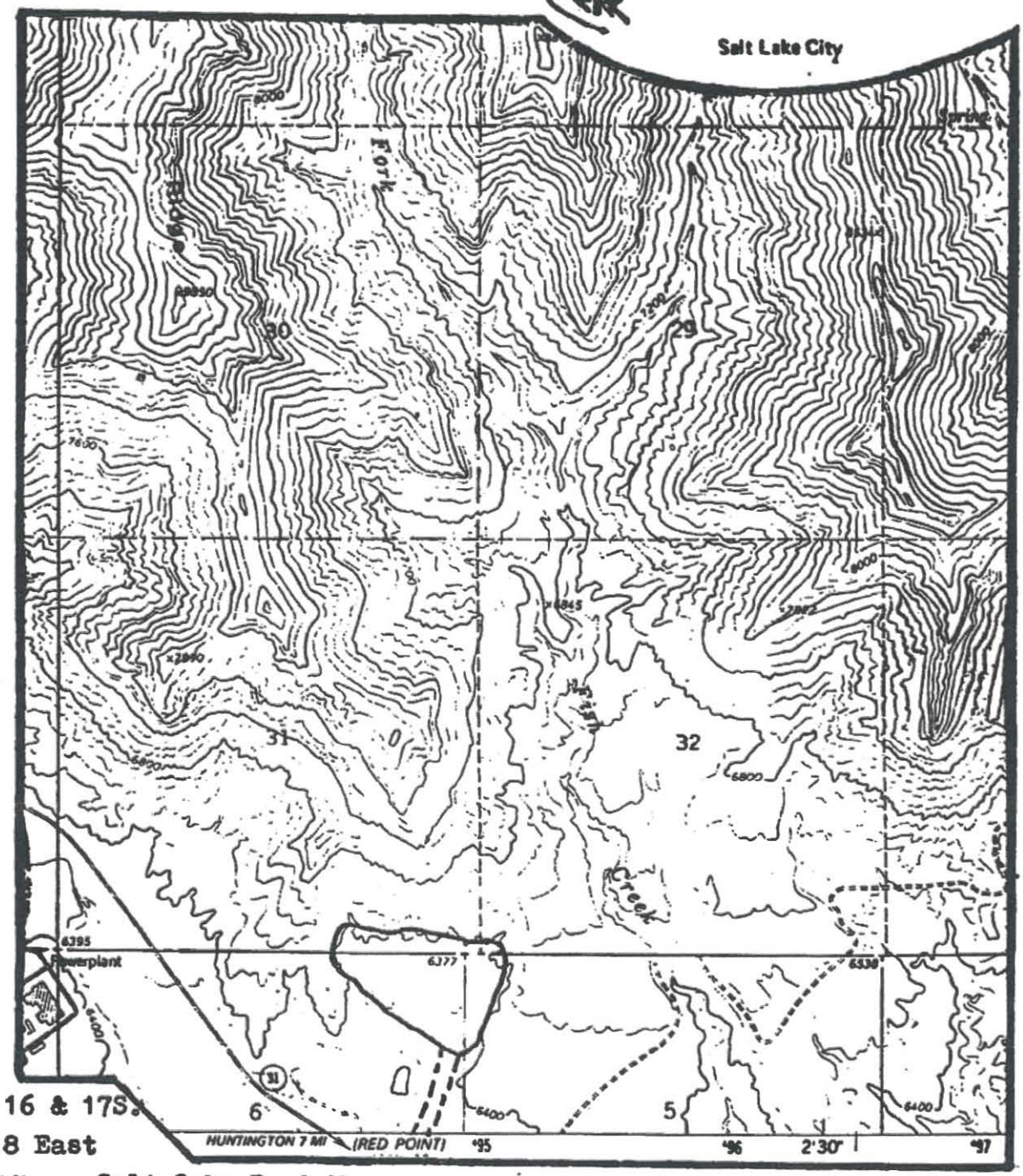
ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH CORPORATION

Salt Lake City



T. 16 & 17S.

R. 8 East

Meridian: Salt Lake B. & M.

Quad: Hiawatha, Utah 7.5 minute-USGS

Project: UPL-87-2

Series: Central Utah

Date: 4-15-87

Cultural Resource Survey of a Waste Rock Disposal Location in the Huntington Canyon Locality of Emery County, Utah

Legend:

Intensive Survey Area

Access Corridor

2.64" = 1 mile

Scale

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0041

State of Utah
Division of State History
(Utah State Historical Society)
Department of Community and Economic Development

Norman H. Bangerter
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182

file A/7/015/018 #2

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AUG 3 1988
DIVISION OF
OIL, GAS & MINING

August 1, 1988

Mr. L. P. Braxton
Administration
Division of Oil, Gas and Mining
355 West North Temple, Suite 350
Salt Lake City, Utah 84180-1203

RE: Determination of Completeness, Waste Rock Disposal Site, Utah Power and Light Company, Deer Creek Mine, (ACT/015/018, Folder No. 2), Emery County, Utah (UT880630-020)

In Reply Please Refer to Case No. L470

Dear Mr. Braxton:

The staff of the Utah State Historic Preservation Office has received the above referenced project. Following a review of our files, it appears as if a portion of the current waste rock disposal site for UP&L was surveyed for historical and archaeological resources in 1987, with negative results. If the current proposal is an expansion of the existing waste rock disposal site, there appears to be a low probability for impacting any historic resources as a result of this project, based on the results of previous surveys in the vicinity. The Division of Oil, Gas and Mining, or Utah Power and Light, can use this information in making any further recommendations regarding the project.

The above is provided on request as outlined by 36 CFR 800 or Utah Code, Title 63-18-37. If you have questions or need additional assistance, please contact me at (801) 533-7039, or 533-6017.

Sincerely,

Diana Christensen
Regulation Assistance Coordinator

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Div. of Oil, Gas & Mining

DC:L470/5846V

cc: Chairperson, Resource Development Coordinating Committee, State Planning Office, 118 State Capitol, Salt Lake City, Utah 84114

Board of State History: Thomas G. Alexander, Chairman • Dean L. May, Vice Chairman • Douglas D. Alder
Phillip A. Bullen • Ellen G. Callister • J. Eldon Dorman • Hugh C. Garner • Dan E. Jones • Leonard J. Arrington • Amy Allen Price • Sunny Redd

APPENDIX 4-3

1988 DOGM APPROVAL OF THE DEER CREEK WASTE ROCK FACILITY

0022

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

October 12, 1988

Emery County Progress
Box 1870
76 West Main Street
Price, Utah 84501

Ladies and Gentlemen:

Re: Notice of Permit Approval, Utah Power and Light Company, Waste Rock Disposal Site, Deer Creek Mine, ACT/015/018, Folder #3, Emery County, Utah

Enclosed is a Notice of Permit Approval rendered by the Division of Oil, Gas and Mining, Department of Natural Resources, state of Utah.

It is requested that this notice be published ONCE ONLY, as soon as possible.

Upon completion of this request, please send proof of publication and statement of cost to the Division of Oil, Gas and Mining, 3 Triad Center, Suite 350, 355 West North Temple, Salt Lake City, Utah 84180-1203.

Sincerely,

Lowell P. Braxton
Administrator
Mineral Resource Development
and Reclamation Program

JJW/djh
Enclosure
A7/67

INCORPORATED
AUG 11 20
Div. of Oil, Gas & Mining

an equal opportunity employer

Norman H. Bangerter
Governor
Dee C. Hansen
Executive Director
Dianne R. Nielson, Ph.D.
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340

October 12, 1988

Newspaper Agency Corporation
Legal Advertising
143 South Main Street-Mezzanine Floor
Salt Lake City, Utah 84110

Ladies and Gentlemen:

Re: Notice of Permit Approval, Utah Power and Light Company, Waste Rock Disposal Site, Deer Creek Mine, ACT/015/018, Folder #3, Emery County, Utah

Enclosed is a Notice of Permit Approval rendered by the Division of Oil, Gas and Mining, Department of Natural Resources, state of Utah.

It is requested that this notice be published ONCE ONLY, as soon as possible.

Upon completion of this request, please send proof of publication and statement of cost to the Division of Oil, Gas and Mining, 3 Triad Center, Suite 350, 355 West North Temple, Salt Lake City, Utah 84180-1203.

Sincerely,

Lowell P. Braxton
Administrator
Mineral Resource Development
and Reclamation Program

JJW/djh
Enclosure
A7/68

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AUG 11 2011
Div. of Oil, Gas & Mining

an equal opportunity employer

NOTICE OF PERMIT APPROVAL

To Whom It May Concern:

Pursuant to the Utah Coal Mining and Reclamation Act (Utah Code Annotated 1953, Section 40-10-1 et seq), and the "Regulations Pertaining to Surface Effects of Underground Coal Mining Activities" (Final Rules of the Utah Board of Oil, Gas and Mining), the Utah Division of Oil, Gas and Mining has issued a permit for a Waste Rock Disposal Site to Utah Power and Light Company for its permit application No. ACT/015/018. The Company will conduct mining activities in accordance with the approved Mining and Reclamation Plan for the Waste Rock Disposal Site associated with the following lands:

Township 17 South, Range 8 East, SLBM

Section 5: NW NW Lot 4
SW NW Lot 5

Section 6: NE NE Lot 1
SE NE
SW NE

The permit was issued by the Utah Division of Oil, Gas and Mining on September 13, 1988. A copy of the permit, the Decision Document and Technical Analysis is on file at the following location:

Division of Oil, Gas and Mining
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Anyone having comments pertaining to the Deer Creek Mine should contact Dr. Dianne R. Nielson, Director, Utah Division of Oil, Gas and Mining, at the address referenced above.

JJW/djh
A7/69

INCORPORATED
AUG 1 1 20
Div. of Oil, Gas & Mining

APPENDIX 4-4

UTAH DIVISION OF AIR QUALITY APPROVAL

Utah Division of Air Quality
New source Review Section

Ownership Change/Company Name Change Notification

The following information is necessary before the Division will be able to make the name change you have requested. Please return this document within 30 days of receipt.

Please be aware that all records associated with this company will change to the new name unless you specifically indicate otherwise. The fee assessed for making these changes is authorized by the legislature for the actual time spent by the reviewer.

Note: If this name change is the result of a sale or acquisition, **both the buyer & the seller must sign this document** as proof of the closure of the agreement.

Reason for Ownership Change/Company Name Change - Property Transfer

Company Name

Current	Previous
Castle Valley Mining LLC	PacifiCorp (formerly Utah Power & Light Company)
Parent Company: Rhino Resource Partners	Parent Company:

Company Address

Current	Previous
PO Box 475 5550 W. Bear Canyon Rd. Huntington, UT 84528	1407 W. North Temple, Suite 110 Salt Lake City, UT 84116

Approval Orders Affected and Sites For Each Approval Order

Approval Order # (DAQE-ANxxxxxxxxxx-xx)	Site Name & Address (for each Approval Order)
DAQE-926-91	Deer Creek Waste Rock Storage Site State Hwy 31 near Huntington Power Plant, Emery County, Utah

The undersigned, as an authorized representative of the company, acknowledges that the above information is correct, and requests that the company name change be made in all Air Quality records.

Present Owner Castle Valley Mining LLC

Signature

R. Chad Hunt
Name (please print)

SVP & CAO
Title

Jaren Jorgensen
Contact Name (Please print)

(435) 687 - 5454
Phone Number

jjorgensen@rhinolp.com
E-mail

Previous Owner Same as above

Signature

DANA M. RALSTON
Name (please print)

SVP THERMAL - GEN + MOWING
Title

Return this form to:

State of Utah
Division of Air Quality
Attn: NSR – Ownership/Name Change Notification
195 North 1950 West
PO Box 144820
Salt Lake City, Utah 84114-4820

Norman H. Bangerter
Governor
Kenneth L. Alkema
Executive Director
F. Burnell Cordner
Director

State of Utah
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

1950 West North Temple
Salt Lake City, Utah
(801) 536-4000
(801) 536-4099 Fax

Reply to: State of Utah
Division of Air Quality
Department of Environmental Quality
Salt Lake City, Utah 84114-4820

DAQE-926-91

December 5, 1991

Guy Davis
Utah Power & Light Company
Mining Division
P. O. Box 310
Huntington, Utah 84528

Re: Approval Order for Deer Creek Mine, Waste Rock Storage Facility
Emery County CDS B ATT

Dear Mr. Davis:

The above-referenced project has been evaluated and found to be consistent with the requirements of the Utah Air Conservation Rules (UACR) and the Utah Air Conservation Act. A 30-day public comment period was held and all comments received were evaluated. The conditions of this Approval Order (AO) reflect any changes to the proposed conditions which resulted from the evaluation of the comments received. This air quality AO authorizes the project with the following conditions and failure to comply with any of the conditions may constitute a violation of this order:

1. Utah Power & Light Company, with offices located at P. O. Box 310, Huntington, Utah, shall install and operate the Deer Creek Waste Rock Storage Facility in Emery County according to the information submitted in the Notice of Intent dated October 19, 1989, and additional information submitted to the Executive Secretary to the date of this AO.

   A copy of this AO shall be posted on site and shall be available to the employees who operate the air emission producing equipment. All employees who operate the air emission producing equipment shall receive instruction as to their responsibilities in operating the equipment in compliance with all of the relevant conditions.

2. The approved installations shall consist of the following equipment:

   A. Bulldozer
   B. Two Diesel Trucks

      1) 24 ton capacity
      2) 15 ton capacity

3. This AO shall replace the AO dated December 9, 1988.

4. Visible emissions from any point or fugitive emission source associated with the installation or control facilities shall not exceed 20% opacity. Opacity observations of emissions from

ROUTE
☑ GUY DAVIS
☑ VAL PRINE
☐ JERRY POLLOCK
☐ DEBRA WARRINGTON

Printed on recycled paper

7. Visible emissions from haul road traffic shall not exceed 20% opacity. Visible emissions determinations for traffic sources shall use procedures similar to Method 9, but the requirement for observations to be made at 15 second intervals over a six minute period shall not apply. Six points, distributed along the length of the haul road, shall be chosen by the Executive Secretary or his representative. An opacity reading shall be made at each point when a vehicle passes the selected points. Opacity readings shall be made ½ vehicle length behind the vehicle. The accumulated six readings shall be averaged for the compliance value.

8. The amount of disturbed area at any time shall not exceed 15 acres without prior approval in accordance with R446-1-3.1, UAC.

9. The moisture content of the material shall be maintained at a value of no less than 7.0% by weight until the material is in place and stabilized. The moisture content shall be tested if directed by the Executive Secretary using the appropriate ASTM method.

10. The silt content of the waste rock material shall not exceed 10% by weight without prior approval in accordance with R446-1-3.1, UAC. The silt content shall be determined if directed by the Executive Secretary using the appropriate ASTM method. The silt content is defined as all material passing a #200 U. S. Standard Sieve.

11. Emissions from the exposed areas shall be minimized through the operating practice of watering and revegetation. During the operation of waste rock storage facility, the disturbances of exposed areas shall be minimized as much as possible, and water shall be applied to exposed areas to the extent necessary to prevent the generation of fugitive dusts as dry conditions warrant or as determined necessary by the Executive Secretary. Once the waste rock facility is filled to capacity or mining operations have ceased, natural area vegetation shall be placed as soon as possible to prevent the generation of fugitive dusts.

12. All records referenced in this AO which are required to be kept by the owner/operator, shall be made available to the Executive Secretary or his representative upon request.

13. All installations and facilities authorized by this Approval Order shall be adequately and properly maintained. The owner/operator shall comply with R446-1-3.5 and 4.7, UAC. R446-1-3.5, UAC addresses emission inventory reporting requirements. R446-1-4.7, UAC addresses unavoidable breakdown reporting requirements. The owner/operator shall calculate/estimate the excess emissions whenever a breakdown occurs. The sum total of excess emissions shall be reported to the Executive Secretary for each calendar year no later than January 31 of the following year.

14. The Executive Secretary shall be notified in writing upon start-up of the installation, as an initial compliance inspection is required. Eighteen months from the date of this Approval Order the Executive Secretary shall be notified in writing of the status of construction/installation if construction/installation is not completed. At that time the Executive Secretary shall require

documentation of the continuous construction/installation of the operation and may revoke the Approval Order in accordance with R446-1-3.1.5, UAC.

Any future modifications to the equipment approved by this order must also be approved in accordance with R446-1-3.1.1, UAC.

This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including the Utah Air Conservation Rules.

Annual emissions for this source (the waste rock hauling and storage) are currently calculated at the following values:

Particulate	11.4 ton/yr
PM_{10}	6.2
SO_2	0.3
NO_x	3.7
CO	1.5
VOC non meth	0.3
VOC meth	0.0

These calculations are for the purposes of determining the applicability of PSD and nonattainment area major source requirements of the UACR.

Sincerely,

F. Burnell Cordner, Executive Secretary
Utah Air Quality Board

FBC:HGN:cl

cc: EPA Region VIII, Mike Owens
SouthEastern Utah District Health Department

645-301-500

ENGINEERING

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R645-301-500 ENGINEERING

R645-301-510 Introduction

This chapter provides a discussion of general engineering aspects, an operation plan, a reclamation plan, design criteria, and performance standards related to the Deer Creek Waste Rock Site (the "Deer Creek site" or the "site") as proposed by Castle Valley Mining, LLC ("CVM"). The existing and proposed facilities have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

It should be noted that this application is for storage of waste rock and not for operation of a surface or underground coal mine. Thus, several of the sections in this chapter that refer to mining operations are not applicable and have been noted as such.

R645-301-511 General Requirements

This permit application includes descriptions of the proposed operations for storage of waste rock at the CVM site together with the appropriate maps, plans, and cross sections. Methods and calculations utilized to achieve compliance with the design criteria are also presented.

R645-3301-512 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 people were assisted by experts in the fields of hydrology, geology, biology, etc.

R645-301-512.100 Cross Sections and Maps

Previously Mined Areas. There are no previously mined areas near the facility.

Surface Facilities. A general site map is shown on Plate 5-1. This map includes the locations of topsoil and waste rock piles, runoff control structures, and sedimentation pond. Except for the sedimentation pond, no other water treatment facilities exist at the site. Other surface facility maps provided in this application are similarly certified.

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

- Excess spoil,
- Durable rock fills, and
- Disposal of non-coal (non-waste rock) waste

Surface Configurations. The topography noted on Plate 5-1 is based on a survey of the site performed in September 2014.

Hydrology. Certified maps and cross sections associated with the hydrology of the Deer Creek site are provided in Chapter 7.

Geology. A certified map and cross sections associated with the geology of the site is provided as Figure 6-1 of this application.

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

Excess Spoil. No excess spoil will be generated from the permit area.

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

Coal Mine Waste. The waste rock pile at the CVM site was designed by a professional engineer with experience in the design of similar structures (see the Mining and Reclamation Plan for the Deer Creek Mine, DOGM identification number C0150018). Waste rock will be stored and finally placed as indicated in Sections 528.300 and 536. Final compaction and reclamation of the waste rock material will occur as outlined in Section 542.200.

Impoundments. One impoundment is present at the site, located immediately west of the waste rock pile (see Plate 5-l). This impoundment (a sedimentation pond) was designed and certified by a professional engineer using current, prudent, engineering practices. The details of this design are presented in Chapter 7 of this application.

Primary Roads. The site access road is considered a primary road as defined in R645-301-527.120. This road has been certified by a professional engineer as meeting the requirements of R645-301-534.200 and R645-301-742.420 (see Appendix 5-1).

Variance from Approximate Original Contour. The placement of waste rock at the site, since the late 1980s has resulted in a change to the original contour of the site. It is the understanding of CVM that a variance from the Approximate Original Contour requirements of the regulations is not required for waste rock sites due to the nature of such sites. Therefore, no variance request is submitted with this application.

R645-301-513 Compliance with MSHA Regulations and MSHA Approvals

R645-301-513.100 Coal Processing Waste Dams and Embankments

No coal processing waste dams or embankments exist within the permit area.

R645-301-513.200 Impoundments and Sedimentation Ponds

No impoundments or sedimentation ponds in the permit area meet the size criteria of 30 CPR 77.216(a).

R645-301-513.300 Underground Development Waste, Coal Processing Waste, and Excess Spoil

No underground development waste, coal processing waste, or excess spoil will be disposed of in underground mine workings the permit area.

R645-301-513.400 Refuse Piles

The CVM waste rock pile was designed and constructed in accordance with the requirements of the Mine Safety and Health administration as promulgated in 30 CPR 77.214 and 77.215. Future waste rock pile constructed by CVM will meet the same requirements of 30 CFR 77.214 and 77.215

R645-301-513.500 Underground Openings to the Surface

There are no underground openings within the permit area.

R645-301-513.600 Discharges to Underground Mines

No discharges occur from the surface to underground mine workings in the permit area.

R645-301-513.700 Surface Coal Mining and Reclamation Activities

The regulatory definition of "surface coal mining and reclamation activities" includes the "recovery of coal from a deposit that is not in its original geologic location" (see R645-l00-200). None of the waste rock storage operations within the permit area will occur within 500 feet of an active underground mine.

R645-301-513.800 Coal Mine Waste Fires

If any coal-related fires occur within the permit area, these will be reported immediately to MSHA and DOGM. Immediate remedial action will be taken as deemed necessary by CVM to protect public health and safety as well as the environment. Following initial remedial efforts, a long-term plan will be formulated in discussion with MSHA and DOGM to extinguish any existing fires and prevent future fires.

R645-304-514 Inspections

R645-301-514.100 Excess Spoil

Excess spoil does not exist in the permit area.

R645-301-514.200 Refuse Piles

The CVM waste rock pile has been inspected at least quarterly by Energy West since construction of the pile began. Quarterly inspections of the pile will continue during

additional waste rock storage operations and through the period of final grading and revegetation. A report of each inspection will be prepared by a qualified individual and provided to the Division after each inspection.

R645-301-514.300 Impoundments

The sedimentation pond at the CVM site has been inspected at least quarterly by Energy West since construction of the pond. Quarterly inspections of the pond will continue during additional waste rock operations and through the period of final grading and revegetation. A report of each inspection will be prepared by *a* qualified individual and provided to the Division after each inspection. This report will indicate whether or not the impoundment has been maintained as designed and in accordance with the approved plan and the R645 rules. The report will also include a discussion of any apparent instability, structural weakness or other hazardous conditions, approximate depth of impounded waters, existing storage capacity, existing or required monitoring procedures and instrumentation, and any other aspects of the structure affecting stability, as noted during the inspection. A copy of the inspection report will be maintained at the CVM office.

No impoundments that are subject to 30 CFR 77.216 currently exist or are planned within the permit area. If impoundments subject to 30 CFR 77.216 are constructed in the future, these impoundments will be inspected in accordance with 30 CPR 77.216-3.

R645-301-515 Reporting and Emergency Procedures

R645-301-515.100 Slides

The potential for slides to occur in the permit area is extremely minimal. However,

following discovery of the slide and will comply with any remedial measures required by the Division.

R645-301-515.200 Impoundment Hazards

If any examination or inspection of the sedimentation pond discloses that a potential hazard associated with that impoundment may have an adverse effect on the public, property, health, safety, or the environment, the person who examined the impoundment will promptly inform the Division of the finding and of the emergency procedures formulated for public protection and remedial action. If adequate procedures cannot be formulated or implemented, the Division will be notified immediately.

R645-301-515.300 Temporary Cessation of Operations

Prior to a temporary cessation of operations within the permit area that will last for a period of 30 days or more or as soon as it is known that a temporary cessation will extend beyond 30 days, CVM will submit to the Division a notice of intention to cease or abandon operations. This notice will include the following:

- A statement of the exact number of surface acres in the permit area prior to cessation of operations,
- A discussion of the extent and kind of reclamation activities which will have been accomplished prior to cessation of operations, and
- An identification of the regrading, revegetation, environmental monitoring, and water treatment activities that will continue during the temporary cessation.

During the temporary cessation, CVM will support and maintain all surface access and will also secure all facilities. The gate at the entry to the site and the fence surrounding the site will be maintained. The gate will be closed and locked to prevent unauthorized access to the site.

R645-301-520 Operation Plan

R645-301.521 General

R645-301-521.100 Cross Sections and Maps

Previously Mined Areas. There are no active, inactive, or abandoned underground workings, including openings to the surface, within the permit and adjacent areas. No previously surface-mined areas exist within the permit area.

Existing Surface and Subsurface Facilities and Features.

Plate 5-l depicts the following information:

- Each public road located in or within 100 feet of the permit area,
- The location of soil stockpiles,
- The location of existing waste rock piles,
- The location of roads and drainage ditches, and
- The location of the sedimentation pond within the permit area.

Information regarding the dimension of the sedimentation pond is provided on Plate 7-1. Typical dimensions of drainage ditches UD-1 through UD-4 are noted on Plate 7-3. Buildings located within 1,000 feet of the permit area are noted on Plate 5-1, including an identification of the current use of the buildings. No major electric transmission lines, pipelines, agricultural drainage tile fields, or similar surface and subsurface man-made features exist within, passing through, or passing over the permit area. No areas of spoil, non-coal waste disposal, permanent water impoundments, water treatment facilities, air pollution control facilities, coal processing waste dams, or coal processing embankments exist within the permit area. The only coal development waste located within the permit area is the waste rock pile noted on Plate 5-1.

Landowner, Right-of-Entry, and Public Interest.

Plate 1-1 shows the boundaries of lands and the names of present owners of record of those lands, both surface and subsurface, included in or contiguous to the permit area. CVM is the owner of all lands within the permit area, as indicated on the legal description provided on the warranty deeds in Appendix 1-1, and therefore has the legal right to enter the property and continue to add to the waste rock pile. The permit area consists of approximately 49.05 fee acres. No Federal or State land exists within the permit area. As the owner of the property, CVM has a legal right to operate on all of the lands within the permit area.

The only activity associated with this plan to be conducted within 100 feet of a public road (State Route 31) will be where the site access road joins that right-of-way.

Mining Sequence and Planned Subsidence. No underground mining will occur at this site. Therefore, no subsidence is anticipated. All land proposed to be affected by operations and reclamation at the waste rock site is shown on Plate 5-1. Reclamation of the site will begin as soon as practical following the completion of refuse stockpiling. An estimate of the reclamation timetable for Phase 1 is provided in Table 5-1 and this table will be revised when Phase II is started. It is not currently anticipated that additional permits will be sought from the Division for this operation.

Land Surface Configuration. The surface contour data presented in Plate 5-1 were developed by an aerial survey conducted on September 26, 2014 by Aero-graphics. The 2-foot contour interval of this map is sufficient to clearly show surface topography and slope within the permit and adjacent areas.

Surface Facilities. Plate 5-1 shows the locations of the following surface facilities:

- Sedimentation pond,
- Roads, and
- Soil stockpile areas.

No buildings, utility corridors, or similar facility exist or will he installed within the permit area. No coal processing waste banks, dams, or embankments exist in the permit area. Similarly, no spoil or coal preparation waste sites exist in the permit area. The permit area shown on Plate 5-1 is the same as the land area for which a performance bond or other guarantee has been posted.

General refuse that is generated on site will be regularly removed from the site. This waste will consist predominantly of daily miscellaneous garbage (e.g., food wrappers, drink bottles, etc.) that will be the responsibility of the individuals that generate the waste. A waste container will be provided for larger items of garbage that may be generated at the site. This waste will be disposed of (before the container is full) at an off-site location that is permitted to accept such waste.

Transportation Facilities. Energy West constructed an access road to the waste rock pile at the beginning of site operations. This road, which will be used and maintained by CVM during waste rock storage and reclamation activities, is shown on Plate 5-1. Typical cross sections for the access road are also shown on Plate 5-1. A temporary roadway accessing the top of the waste rock pile is also shown on Plate 5-1. No permanent conveyors do or will exist in the permit area.

The general location of the site access road was disturbed by activities associated with the Utah Power and Light Research Farm prior to construction of the waste rock site. The access road was upgraded in the late 1980s, following issuance of the waste rock facility permit, to a typical road width of 24 feet. The road subgrade was prepared by scarifying the ground to a

depth of 6 inches and compacting the soil to 90% of standard Proctor density. The road subgrade consists of approximately 10 inches of bottom ash supplied from the Huntington Power Plant. This material was moisture-conditioned and compacted to 95% of standard Proctor density.

The untreated road base consists of 1-inch minus crushed gravel, with approximately 9% fines. The material was moisture conditioned and compacted to 95% of standard Proctor density. The final surface lift of the access road consists of a 3-inch thick layer of compacted, rotomilled asphalt.

The gradient of the access road averages approximately 3.3%, ranging from about 1.7% to 4.2%. The road surface slopes at a grade of about 1% toward roadside drainage channels. Road cut and fill slopes were typically constructed at angles of 5H:1V. Cuts into rock were constructed at slopes of approximately 0.5H:1V. A locking gate has been installed on the access road near its intersection with State Route 31 to control unauthorized access to the site.

The locations of culverts and drainage ditches associated with the permit-area roads are shown on Plate 5-1. These drainage structures are discussed in Section 752.200 of this application.

R645-301-521.200 Signs and Markers

Permit Identification Signs. A permit identification sign will be placed so that it is visible from the location where the site access road joins State Route 31. The sign will be of a design that can be easily seen and read, will be made of durable material and will conform to local laws and regulations. The sign will contain the following information:

- The name, business address, and telephone number of the permittee and
- The permanent program permit number as obtained from the Division.

The sign will be retained and maintained until after the release of all bonds for the permit area.

Perimeter Markers. The perimeter of the facility (disturbed area boundary) is marked with a fence.

Buffer Zone Markers. Since the facility is not located near a perennial or intermittent stream channel, there are no stream buffer zone markers at the site.

Topsoil Markers. Markers have been placed on each soil stockpile indicating that they contain topsoil.

R645-301-522 Coal Recovery

No coal will be recovered from this site.

R645-301-523 Mining Methods

No underground or surface mining of naturally in-place coal will occur at the CVM site.

R645-301-524 Blasting and Explosives

Blasting and explosives will not be stored or used at the site.

R645-301-525 Subsidence

There will be no underground mining or subsidence at this facility. Hence, no pre subsidence survey will be conducted, no areas require protection from subsidence, no subsidence control plan will be developed, no subsidence control measures will be implemented, no subsidence damage repair will be performed, and no public notice of underground mining activities will be required.

R6445-301-526 Mine Facilities

Although no underground or surface coal mining will occur at the CVM site, mobile equipment will be used to create the waste rock pile. The equipment and associated processes that are planned for use at the site are detailed in the following sections.

R645-301-526.100 Mine Structures and Facilities

Waste rock site has been active since the late 1980s. No permanent structures (e.g., buildings, utilities, processing equipment, etc.) were present at the site prior to the submittal of this application. No permanent structures will be installed as part of the operations planned herein.

R645-301-526.200 Utility Installation and Support Facilities

Utility Installations. No electric lines, telephone transmission lines, water lines, sewer lines, water wells, oil wells, or other utilities currently pass over, under, or through the permit area. Operations at the site will use temporary utilities only (i.e., water transported to the site via tankers etc.). All operations will be conducted to prevent damage or destruction of utility services in the general area. There is no planned subsidence on site and no utilities are located within permit area subsidence zones.

Support Facilities. Support facilities at the CVM site will consist only of mobile equipment. No permanent equipment or utilities will be constructed at the site. All equipment will be operated in accordance with the permit issued for this operation. 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 operations in accordance with the reclamation plan discussed in Section 540.

Water Pollution Control Facilities. Water pollution control facilities at the CVM site consist of one sedimentation pond (with its appurtenant structures), silt fences, and straw wattles. Sanitary waste at the site will be handled via portable toilets. The sedimentation pond will be reclaimed and the portable toilet will be removed following completion of operations at the site. Site reclamation is discussed in Section 540.

The sedimentation pond and appurtenant structures have been constructed as discussed in Chapter 7 and will be used and maintained as discussed in Section 533.700 of this application.

R645-301-527 Transportation Facilities

R645-301-527.100 Road Classification

The access road that leads to the facility from State Route 31 will be used to transport waste rock is classified as a primary road. Interior roads at the site are considered ancillary.

R645-301-527.200 Description of Transportation Facilities

No surface conveyors or rail systems have been or will be constructed, used, or maintained within the permit area.

Road Specifications. Cross sections are provided on Plate 5-3 and 5-4 for the access road that will be used and maintained by CVM. Information regarding road drainage is presented in Chapter 7. Additional information regarding the site access road is provided in Section 521.100.

The access road will be maintained and repaired as needed prior to reclamation. Maintenance work will be performed to ensure that the road and the associated drainage structures (ditches and culverts) meet the design standards and to ensure the safety and proper functioning of trucks and equipment. Road maintenance may include repairs to potholes and other defects that affect the normal operability of the road. Drainage system maintenance may include cleaning of ditches and culverts as needed to maintain design capacities. Roads within the permit area that are damaged by a catastrophic event, such as a flood or earthquake, will be repaired as soon as practical after the damage has occurred.

Drainageway Alterations. No alterations or relocations of natural drainage ways are required within the permit area to accommodate the needs of transportation systems.

R645-301-528 Handling and Disposal of Coal, Excess Spoil, and Coal Mine Waste

R645-301-528.100 Coal Handling and Transportation

Any acid-forming or toxic-forming materials encountered during construction will be hauled to the CVM waste rock storage facility and buried by at least 4 feet of non-toxic or acid forming material. The vegetative material removed prior to topsoil removal will be broken up and used as mulch during interim reclamation. Any materials left over will be disposed of in an approved sanitary landfill

R645-301-528.200 Overburden

No overburden will be removed, handled, stored, or transported within the permit area.

R645-301-528.300 Spoil, Coal Processing Waste, Non-Coal Waste, and Mine Development Waste

Excess Spoil. No spoil will be generated at the CVM site.

Coal Processing Waste. Coal processing wastes from the Bear Canyon Mine could be stored at this site.

Non-Coal Mine Waste. No non-coal mine waste will be disposed of within the permit area. No non-coal waste that is defined as hazardous in 40 CFR 261 will be generated at the site. If such waste is generated in the future, it will be handled in accordance with the requirements of Subtitle C of the Resource Conservation and Recovery Act and any implementing regulation.

Underground Development Waste. No new underground development waste will be generated at the site. Additional information regarding the placement of this refuse is provided in Section 536 of this application.

Minimization of Acid, Toxic, and Fire Hazards. Data presented in Section 623 and Appendix 6-1 of this application indicate that the waste rock is non-acid nor toxic-forming.

R645-301-528.400 Dams, Embankments, and Impoundments

No dams, embankments, or impoundments will be used for the handling or disposal of coal, overburden, excess spoil, or coal mine waste in the permit area.

R645-301-529 Management of Mine Openings

There are no mine openings at the CVM site.

R645-301-530 Operational Design Criteria and Plans

R645-301-531 General

This application contains a general plan for the sedimentation pond located in the permit area. No other water impoundments or coal processing waste banks, dams, or embankments exist in the permit area. Since subsidence will not occur at the site, and no underground mining has occurred beneath the site, no damage will occur to surface operations due to subsidence.

R645-301-532 Sediment Control

Sediment-control measures for the CVM site are described in Section 732 of this application. Sediment-control structures at the site consist of a sedimentation pond located adjacent to the west side of the waste rock pile, silt fences and straw wattles installed in areas that do not flow to the sedimentation pond, and drainage ditches and culverts that convey disturbed- area runoff to the sedimentation pond and undisturbed-area runoff away from disturbed areas. Runoff-control structures have been designed to convey runoff in a non-erosive manner.

Sediment is retained behind the silt fences and straw wattles that have been installed in areas that do not flow to the sedimentation pond, thereby precluding discharge of this sediment to undisturbed areas. Additional information regarding sediment-control measures at the site is provided in Section 732.

In addition to the use of a sedimentation pond, silt fences, straw wattles, and properly designed runoff-control facilities, sediment yields in the permit area will be further minimized by:

- Disturbing the smallest practicable area during operations,
- Contemporaneously reclaiming areas suitable for such reclamation,
- Roughening of the surface soil during topsoil redistribution, and
- Construction of a stable site entrance at the northern extent of the asphalt roadway, thereby minimizing the potential for off-site transport of sediment via vehicle tires.

R645-301-533 Impoundments

R645-301-533.100 Slope Stability

The sedimentation pond located immediately west of the waste rock pile was constructed by excavating approximately 6 feet of soil, thereby creating a below-grade impoundment. The resulting depression has the required storage capacity with the design elevation of water primarily below the natural grade line. Appendix 5-3 contains a stability analysis of the waste rock pile. According to these analyses, the minimum calculated factors of safety for the waste rock pile is 1.80. These values exceed the minimum safety factor of 1.3 required for pond embankment by R645-301-533.100.

R645-301-533.200 Foundation Considerations

The sedimentation pond was constructed below grade in stable, natural soil. Cross sections of the sedimentation pond are presented in Chapter 7 of this document.

R645-301-533.300 Slope Protection

The outslopes and inslopes of the sedimentation pond are periodically inspected for signs of surface erosion. The inlets and outlets of the pond are armored with rip rap.

R645-301-533.400 Embankment Faces

The soil stockpiles that surround the sedimentation pond have been revegetated to protect against erosion. Riprap has also been placed to protect pond slopes and embankments near the discharge structures.

R645-301-533.500 Highwalls

No highwalls are located within the permitted boundary.

R645-301-533.600 MSHA Criteria

The site sedimentation pond does not meet the size criteria of 30 CFR 216(a).

R645-301-533.700 Pond Operation and Maintenance Plans

The sedimentation pond was designed in accordance with R645-301-740. Details of this design are presented in Chapter 7.

The sedimentation pond is designed as a total containment structure, with an emergency spillway to discharge water in the event that a storm generates sufficient runoff to exceed the design capacity. Since the pond was designed to contain the runoff resulting from 24-hour storm events, the probability of exceeding the storage capacity of the pond is small. Water held in the pond evaporates or infiltrates into the ground. Water may also be pumped from the pond for use in dust suppression at the site.

Inspections of the sedimentation pond will be conducted on a quarterly basis (see Section 514.300). Maintenance that is required to keep the pond in good working condition will be performed on an as-needed basis.

Sediment will be removed from the pond when it accumulates to 60 percent of the design sediment storage volume. Non-coal sediment will be placed with the waste rock from the coal recovery operations.

R645-301-534 Roads

R645-301-534.100 Location, Design, Construction, Reconstruction, Use, Maintenance, and Reclamation

Control of Damage to Public or Private Property. All roads used by CVM were designed in accordance with applicable County and facility-use requirements. By designing according to these standards, the potential for damage to public or private property has been minimized.

Road Surfacing. The site access road is surfaced with rotomilled asphalt that was compacted during placement (see Section 521.100). No acid- or toxic-forming materials have been or will be used in the road surfaces.

Slope Stability. The site access road was constructed in the late 1980s and has been used for site operations for over 25 years. No road slope stability issues have been observed during this frame.

R645-301-534.200 Environmental Protection and Safety

Safety and environmental protection were primary concerns during the design and construction of the access road. The grade, width, and surface materials used for the road was selected to be appropriate for the planned duration and use of the road.

R645-301-534.300 Primary Roads

The site access road was designed, constructed, and will be maintained to meet the requirements of Utah Administrative Rules R645-301-358, R645-301-527.100, R645-301-527.230, R645-301-534.100, R645-301-534.200, R645-301-542.600, R645-301-542.600, and R645-301-762. Furthermore, the road has the following characteristics:

- It is located on a stable surface,
- It was constructed with a sufficiently durable surface for the traffic volume and vehicle speeds on the road,
- It is maintained as needed, and
- Culverts have been designed, constructed, and are maintained to withstand the loads imparted by the vehicle traffic on the road.

R645-301-535 Spoil

No spoil is generated in the permit area.

R645-301-536 Coal Mine Waste

Information regarding placement of the waste rock material is provided below.

R645-301-536.100 Design

A geotechnical evaluation of the waste rock and the foundation beneath the pile was conducted in 1988 prior to construction of the pile. The results of this evaluation are provided in Appendix 5-2. As part of that investigation, two holes were drilled in the vicinity of the waste rock pile, one to a depth of 80 feet and the other to a depth of 82 feet. These holes encountered low plasticity clay to sandy-gravelly clay (i.e., weathered shale) to a depth of 15 to 16 feet at the site. This material was described as cohesive and in a medium-stiff condition. The in-place density of the soil was 108 to 117 lb. /ft... The unweathered shale at depth was defined as competent. Thus, the foundation upon which the waste rock rests is considered stable.

Stability analyses presented in Appendix 5-2 indicate that the minimum static safety factor against mass failure of the pile is 1.80 for a pile outslope of 2H:1V. These safety factors were calculated assuming conservative values for soil strength, based on the results of field and laboratory analyses of soils at the site, as outlined in Appendix 5-2. These safety factors meet or exceed the minimum requirements of R645-536.110.

R645-301-536.200 Waste Emplacement

Waste rock operations will be placed with outslopes of approximately 2H:1V, thereby enhancing the stability of the waste pile. The waste rock will be placed in horizontal lifts that do not exceed 2 feet in thickness. The geotechnical evaluation provided in Appendix 5-2

indicates that placement of the waste rock in this manner will be structurally stable, with a minimum factor of safety against failure of 1.8 if the ground immediately below the waste rock is saturated, and a higher safety factor if the underlying ground is not saturated (as is expected). The material will be dumped from haul trucks. A dozer will be used to rework and initially compact the dumped material. Additional compaction of each lift will be accomplished by routing the loaded equipment over the prior lift surface.

R645-301-536.300 Excess Spoil Fills

No excess spoil fills exist in the permit area.

R645-301-536.400 Impounding Structures Constructed of Coal Mine Waste

No impounding structures have been or will be constructed of coal mine waste in the permit area.

R645-301-536.500 Disposal of Coal Mine Waste in Special Areas

No coal mine waste has been or will be disposed of in special areas in the permit area.

R645-301-536.600 Underground Development Waste

A description of pre-disturbance soil resources at the waste-rock disposal site is provided in Chapter 2 of this application. Methods used to stockpile topsoil at the site are also discussed in Chapter 2.

As indicated in Section 623 of this application, the material in the waste rock pile is neither acid- nor toxic-forming. Furthermore, as discussed in Sections 536.100 and 536.200 above,

the waste rock pile will be stable following placement. Therefore, waste rock material is considered suitable for reclamation.

R645-301-536.700 Coal Processing Waste

No coal processing waste generated within the permit area will be returned to abandoned underground workings.

R645-301-536.800 Coal Processing Waste Banks, Dams, and Embankments

No coal processing waste banks, dams, or embankments exist within the permit area.

R645-3001-536.900 Refuse Piles

A description of the anticipated waste rock pile is provided elsewhere in this application. Specifically:

- A description of the pre-disturbance soils is provided in Chapter 2.
- A discussion of the suitability of the waste rock for reclamation is provided in Section 536.600.
- Certification of all designs and plans is provided in the chapters where those designs and plans are first presented.
- A description of proposed inspection activities is provided in Section 514.200.
- A description of the design, stability, operation, and reclamation of the final waste rock disposal site is provided in various subparts of Section 536.
- A discussion of runoff and sediment control plans associated with the site is provided in Chapter 7.

All designs and plans presented in this application were prepared in compliance with applicable MSHA regulations.

This application deals with Phase I of the operation. As Phase I is filled to capacity it will be necessary to begin construction on Phase II. Phase II will be east of Phase I. Diversion ditches will be constructed to divert runoff around the area. The disturbed drainage system of this area will flow into a sediment basin designed for this area. The size of the basin and ditches will be designed before Phase II is started. Topsoil will be removed according to this application. Maintenance work on the ditches, sediment basin and other runoff controls will be done as the need arises.

R645-301-537 Regraded Slopes

Reclamation of this site will not involve significant regrading of slopes.

R645-301-540 Reclamation Plan

R645-301-541 General

Prior to disturbance of the area by Energy West for use as a waste rock disposal facility, land within the permit area was used as wildlife habitat. CVM intends to reclaim the site in a manner that returns the site to a condition that will serve as wildlife habitat. This is consistent with the pre-mining land use and also the capability of the soil as defined in Section 222.400 of this application (Class 8 capability, indicating that the soil cannot support agricultural and other high- use activities but can support recreational uses, wildlife habitat, watershed, or esthetic uses). A post-mining land use of wildlife habitat is also consistent with current zoning ordinances (see Section 411.100 of this application).

R645-301-541.100 Commitment

Upon the permanent cessation of waste rock operations at the CVM site, it will be reclaimed so that it is compatible with use for wildlife habitat. Stockpiled soil will be redistributed over the disturbed area and this area will be revegetated using the approved seed mix.

R645-301-541.200 Surface Coal Mining and Reclamation Activities

No underground openings, equipment, structures, or other facilities exist in the permit area.

R645-301-541.300 Underground Coal Mining and Reclamation Activities

No surface equipment, structures, or other facilities exist in the permit area.

R645-301-541.400 Environmental Protection Performance Standards

The plan presented herein is designed to meet the requirements of R645-301 and the environmental protection performance standards of the State Program.

R6445-301-542 Narratives, Maps, and Plans

R645-301-542.100 Reclamation Timetable

A timetable for the completion of each major step in the reclamation plan is presented in Plate 2. Although significant precedence has been set in Utah for the reclamation of mine sites using a method known as deep gouging, CVM will retain the sedimentation pond during initial site reclamation and implement reclamation of the CVM site in a phased manner to satisfy the requirements of R645-31-763.100. It is anticipated that reclamation of the site will proceed in the following general order:

1. Install temporary sediment controls (silt fences, straw wattles, etc.) in areas not otherwise controlled.
2. Grade the waste rock pile to achieve the final configuration within the Phase I area noted on Plate 5.2
3. Construct temporary berms and diversion channels as needed along the edges of the regraded waste rock pile to convey runoff from the waste rock pile to the sedimentation pond.
4. Remove the upper foot of soil from the soil stockpiles adjacent to the waste rock pile and temporarily segregate this for use as topsoil. Initially maintain the soil stockpiles that form the embankments for the sedimentation pond for later reclamation use.
5. Place subsoil from the soil stockpiles onto the regraded waste rock pile.
6. Place topsoil on the subsoil that has been placed on the regraded waste rock pile.
7. Incorporate mulch and gouge the topsoil.
8. Revegetate the topsoil that was placed on the regraded waste rock pile.
9. Wait for 2 years to satisfy the requirements of R645-301-763.100.
10. Remove asphalt from the site access road and place this asphalt within the sedimentation pond.
11. Construct final reclamation channels RC-1 through RC-6 and regrade the surface of the reclaimed waste rock pile where disturbed by Phase II reclamation.
12. Regrade the areas of the current undisturbed-area diversions as needed to allow free drainage of off-site areas through the reclamation channels.
13. Place the material excavated for construction of the final reclamation channels in the area of the sedimentation pond and grade this material as needed.
14. Segregate the remaining topsoil from the berm of the sedimentation pond. Place the subsoil and topsoil from this berm on the waste rock exposed during construction of the reclamation channels and on the graded waste rock within the current boundaries of the sedimentation pond.
15. Incorporate mulch and gouge the topsoil.
16. Revegetate the topsoil that was placed during Phase II as well as previously revegetated areas that were disturbed during construction of the reclamation channels and Phase II grading activities.
17. Recontour the access road, construct the associated reclamation channels, and revegetate the area of the access road. This work will proceed from north to south in a manner that allows the efficient use of equipment.

CVM acknowledges that the Utah Coal Regulatory Program calls for sedimentation ponds to be retained for a period of at least 2 years after the last augmented seeding following the initiation of reclamation activities (see R645-301-356.300 and R645-301-763). Although, as indicated in Figure 5-3, this rule would prevent final reclamation and/or cause re-disturbance of at least 6.01 acres of the 14.69 acre total disturbed area following the waiting period after the last augmented seeding, CVM will reclaim the site in a phased approach as indicated above to comply with the rule.

The proven surface-roughening technique known as deep gouging retains essentially all of the precipitation that falls on a site. Nonetheless, temporary diversion ditches will be installed at the locations shown on Plate 5-2 to provide an extra measure of assurance that runoff from the disturbed area will report to the sedimentation pond during the period between Phase I and Phase II reclamation. The design of these temporary diversions is Discussed in Chapter 7. The temporary sediment controls installed at the beginning of Phase I reclamation will be retained to control sediment yield from areas not otherwise controlled.

R645-301-542.200 Plan for Backfilling, Soil Stabilization, Compacting, and Grading

Prior to beginning reclamation operations, erosion and sediment yield from all areas to be affected by these operations will be controlled by installation of silt fences, straw wattles, or soil berms, except for breaks for vehicle access. The ground at any such breaks will be graded to prevent off-site transport of sediment.

The waste rock pile will be regraded to slope generally from east to west and north to south, as shown on Plate 5-2. This will be accomplished using dozers and/or other equipment as needed. The material will be compacted using a sheepsfoot roller or other appropriate equipment to achieve approximately 90% of standard Proctor density.

A cap consisting of subsoil overlain by topsoil will be placed on the surface of the regraded waste rock pile. It is currently anticipated that topsoil will be removed first from the upper 12 inches of the north soil stockpile, to approximately the northwest edge of the Phase I reclamation area, and placed in a temporary stockpile located in an area of convenient access. The subsoil from that portion of the north stockpile will then be spread in 12-inch (maximum) uncompacted lifts over the northern portion of the regraded waste rock pile. Spreading of the soil will be accomplished using loaders, dozers, trackhoes, and/or other equipment as needed. This subsoil will be compacted to achieve approximately 90% of standard Proctor density. The upper layer of the redistributed subsoil will be minimally compacted and scarified to promote bonding with topsoil. The topsoil material from the temporary stockpile will then be distributed over the redistributed subsoil layer. The topsoil will be spread using track-mounted minimize compaction so as not to interfere with plant root development.

Reclamation of the western and southern portions of the regraded waste rock pile will occur as outlined above. Topsoil will be removed from the upper 12 inches of the adjacent soil stockpiles, to approximately the southwest comer of the Phase I reclamation area, and temporarily stored in an area of convenient access. Subsoil will then be spread over the remainder of the regraded area, leaving the top layer of subsoil in a less-compacted state. The topsoil will then be placed on the reclaimed surface.

Mulch will be applied to the redistributed topsoil at the rates identified in Section 244.200 of this application. Following application of the mulch, the mulch will be crimped into the topsoil and the soil surface will be gouged to promote moisture retention and minimize erosion. Surface gouging will be accomplished using a trackhoe bucket or dozer blade to create small depressions throughout the soil surface. The reclaimed area will then be seeded as indicated in Section 341.200 of this application.

In accordance with R645-301-763.100, two years following the completion of Phase I reclamation operations, the asphalt surface will be scraped from the site access road and placed within the basin of the sedimentation pond. This will be accomplished using dozers, loaders, haul trucks, and/or other equipment as needed. The road surface will be graded and watered as needed following removal of the asphalt to allow efficient access to the site and to suppress dust during reclamation operations.

Reclamation channels will then be cut through the previously-reclaimed waste rock pile into the underlying soil (see Plate 5-2). These channels will be lined with riprap and have the dimensions described in Section 761 and Appendix 7-9 of this application. Materials removed during excavation of the reclamation channels will be placed within the basin of the sedimentation pond and compacted as outlined above. The Phase I reclamation channels will also be removed using trackhoes and dozers as appropriate. Topsoil will then be stripped from the upper 12 inches of the sedimentation pond berms and set aside. The subsoil that comprises the remainder of the sedimentation pond berms will then be pushed onto the material that was

placed in the pond basin, as outlined above. Subsoil will also be placed on the waste rock that was exposed during excavation of the reclamation channels and removal of the Phase I reclamation channels. The segregated topsoil will then be placed on the subsoil and the topsoil will be mulched. All areas that were disturbed during Phase II reclamation of the waste rock pile will then be seeded as indicated above.

Information presented on Plate 2-1 indicates that the soil stockpiles adjacent to the current waste rock pile contain 33,898 yd^3 of subsoil and 2,303 yd^3 of topsoil. This is sufficient to place an average of approximately 35 inches of subsoil over the area of the former waste rock pile and sedimentation pond (to be occupied at that time by the waste rock pile), and 2.5 inches of topsoil over the reclaimed area. This thickness of cover over the waste rock is considered sufficient, given that the waste rock is neither acid- nor toxic-forming (see Section 623 of this application).

Final reclamation of the site access road will occur after the remainder of the site has been reclaimed (i.e., after access to the site by heavy equipment is no longer needed). The gravel road surface material and bottom ash road subgrade material will be graded against the inside cut slopes of the road cross-section. The topsoil on the embankment outslopes will be removed and temporarily stockpiled where it will not be damaged by subsequent reclamation efforts. The subsoil material from the embankment slopes will be spread over the redistributed road base. The topsoil material from the temporary stockpiles will then be spread over the area, mulched, gouged, and seeded as outlined above. This will be accomplished in phases as needed to allow equipment access to areas along the road requiring mulching and seeding.

R645-301-542.300 Final Surface Configuration Maps and Cross Sections

The anticipated final surface configuration and associated cross sections of the waste rock pile and along the site access road are shown on (Plates 5-2, 5-3 and 5-4).

These volumes were then used for the sake of determining reclamation costs. Reclamation cross sections are shown on Plates 5-4 and 5-5. No structures will remain on the site following reclamation.

R645-301-542.400 Removal of Temporary Structures

All equipment required for coal recovery operations will be removed from the site prior to reclamation.

R645-301-542.500 Removal of Sedimentation Ponds

The sedimentation pond will be backfilled during Phase I reclamation. Surface roughening during final reclamation will create a condition that minimizes the potential for erosion of reclaimed areas.

R645-301-542.600 Roads

All roads within the permit area will be removed during reclamation of the site.

R645-301-542.700 Final Abandonment of Mine Openings and Disposal Areas

There are no mine openings, areas of excess spoil, or areas for disposal of non-coal waste in the permit area. The waste rock from coal recovery operations will be reclaimed as described in Section 542.200 above.

R645-301-542.800 Estimated Cost of Reclamation

The estimated cost to reclaim the CVM site is provided in Chapter 8. Quantities of materials involved in reclamation are also provided in Chapter 8.

R6445-301-550 Reclamation Design Criteria and Plans

R645-301-551 Casing and Sealing of Underground Openings

There are no underground openings within the permit area.

R645-301-552 Permanent Features

R645-301-553.100 Small Depressions

As indicated in Section 542.200, several small depressions (i.e., gouges) will be left in the reclaimed soil to retain moisture, minimize erosion, and enhance revegetation. This, in tum, will improve wildlife habitat following reclamation.

R645-301-552.200 Permanent Impoundments

No impoundments will be permanently retained on the site following reclamation.

R645-301-553 Backfilling and Grading

Plans for backfilling and grading of the site upon reclamation have been presented in Section 542.200 above. This plan was designed to comply with the applicable requirements of R645-301-500 and R645-301-700. As indicated in Section 542.200, backfilling and grading operations will be conducted in a controlled manner.

R645-301-553.100 Disturbed Area Backfilling and Grading

Approximate Original Contour. As indicated in Section 512.200 of this plan, non-coal rock and unrecoverable coal will remain at the site. However, due to the nature of such sites, no variance is being requested from the Approximate Original Contour requirements of the regulations.

Elimination of Highwalls, Spoil Piles, and Depressions. No highwalls or spoil piles exist at the site. The sedimentation pond will be removed during site reclamation. Cut slopes along the access road will be backfilled to extent feasible.

Slope Stability. Waste rock will be placed at a slope that provides a minimum static safety factor of 1.80 (see Section 536.100 of this plan). Cut slopes on the site access road will be backfilled during reclamation at a slope no steeper than the angle of repose of the backfill material.

Erosion and Water Pollution. As indicated in Section 542.200, the reclaimed soil surface will be left in a roughened state. This will improve moisture retention, promote revegetation, and minimize erosion potential, thereby minimizing water pollution both on and off the site.

Post-Mining Land Use. The disturbed area will be reclaimed in a manner that supports the post-mining wildlife-habitat land use.

R645-30-553.200 Spoil and Waste

Spoil. No spoil is generated within the permit area.

Refuse Piles. As indicated in Section 536.200 of this application, waste rock will be compacted as it is placed. As further indicated in that section, the waste rock will be

Placed at a slope that provides an adequate static safety factor. Hence, the pile will be stable following reclamation.

Coal Processing Waste. Coal processing wastes from the Bear Canyon Mine could be stored at this site.

R645-301-553.300 Exposed Coal Seams, Acid- and Toxic-Forming Materials, and Combustible Materials

Exposed Coal Seams. No coal seams will be exposed as part of this operation.

Acid- and Toxic-Forming Materials. No acid-forming materials exist at the site.

Combustible Materials. No combustible materials will be exposed or permanently stored at the site as part of coal recovery operations.

R645-301-553.400 Cut-and-Fill Terraces

Cut and fill sections that currently exist along the access road will be regraded during reclamation.

R645-301-553.500 Highwalls From Previously Mined Areas

No highwalls from previously mined areas exist within the permit area.

R645-301-553.600 Previously Mined Areas Special Compliance Measures

No previously mined areas exist within the permit area.

R645-301-553.700 Backfilling and Grading - Thin Overburden

No surface coal mining and reclamation activities involving thin overburden occur within the permit area.

R645-301-553.800 Backfilling and Grading - Thick Overburden

No surface coal mining and reclamation activities involving thick overburden occur within the permit area.

R645-300-553.900 Regrading of Settled and Revegetated Fills

No regrading of settled and revegetated fills is anticipated in the permit area.

R645-301-560 Performance Standards

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

TABLE 5-1

Reclamation Timetable

Activity	Approximate Time (Wks.)
Install temporary sediment controls	1 Week
Grade waste rock pile to interim final configuration	2 Weeks
Construct diversion channels as needed to direct from the waste rock pile to the sedimentation pond	1 Week Runoff
Segregate topsoil and place subsoil and topsoil on the waste rock pile	2 Weeks
Mulch and revegetate waste rock pile and complete Phase I reclamation	1 Week
Wait for 2 years in order to satisfy the requirements of R645-301-763.100.	2 Years
Remove asphalt from the site access road and place this material within the sedimentation pond.	1 Week
Construct final reclamation channels across the waste rock pile and place this material in the area of the sedimentation pond, grading as needed to achieve final configuration and to construct final reclamation channels. Regrade undisturbed area diversions.	2 Weeks
Segregate the remaining topsoil and place subsoil and topsoil from the berm of the sedimentation pond on the area of the backfilled sedimentation pond.	1 Week
Mulch and revegetate the area of the backfilled sedimentation pond and areas re-affected by construction of final reclamation channels across the waste rock pile.	1 Week
Recontour access road, construct associated reclamation channels and revegetate access road.	2 Weeks
APPROXIMATE TOTAL TIME	14 Weeks + 2 years

APPENDIX 5-1

ROAD CERTIFICATION

EarthFax Engineering Group, LLC
7324 South Union Park Avenue, Suite 100, Midvale, Utah 84047 • 801.561.1555 • FAX 801.561.1861

EarthFax

January 26, 2015

Mr. Kyle Edwards
Bowie Refined Coal
1865 West Ridge Road
Wellington, UT 84654

Subject: Deer Creek Waste Rock Site
Road Certification

Dear Mr. Edwards:

I have examined the access road associated with the Deer Creek waste rock site in Emery County, Utah. Based on my field evaluation and understanding of operations planned for the site, it is my opinion that the road, as constructed, provides adequate environmental protection and safety appropriate for its planned life and use. If the type and size of equipment that is planned for coal recovery operations at the site is operated in a safe manner, it is my opinion that the roadway grades, widths, and surface materials will adequately serve site needs.

It is further my opinion that the roadway has been constructed to provide adequate drainage control. I have reviewed the hydrologic calculations associated with these structures and believe that their design is sufficient to pass the peak runoff safely from the 100-year, 6-hour precipitation event.

Based on my review, I hereby certify that the roads meet the requirements of R645-301-534.200 and R645-301-742.420.

Please contact me if you have any questions.

Sincerely,

Richard B. White, P.E.
President
EarthFax Engineering Group, LLC

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
26 Jan 2015
STATE OF UTAH

INCORPORATED
AUG 11 20[illegible]
Div. of Oil, Gas & Mining

APPENDIX 5-2

WASTE ROCK SITE
GEOTECHNICAL EVALUATION

ROLLINS,
BROWN AND
GUNNELL,
INC.
1435 WEST 820 NORTH
PROVO, UTAH 84601
(801) 374-5771

WASTE ROCK STORAGE FACILITY

Deer Creek Coal Mine

Utah Power & Light Co.
Emery County

August 1988

Soil & Foundation Investigation

4-33

ROLLINS,
BROWN AND
GUNNELL,
INC.
1435 WEST 820 NORTH
PROVO, UTAH 84601
(801) 374-5771

August 9, 1988

Utah Power & Light Company
Mining Division
P.O. Box 310
Huntington, Utah 84528

Attn: Greg Cowan

Gentlemen:

In accordance with your request, we have completed a geotechnical investigation for the proposed waste rock storage facility at the Deer Creek Coal Mine in Huntington Canyon, Utah. The primary purpose of the investigation was to define the characteristics of the subsurface material throughout the soil profile in the waste rock storage area and to determine the slopes at which the rock pile could be safely constructed. The work has been completed in accordance with a modified proposal submitted to your organization for the work and the results of the investigation along with recommendations for constructing the slopes are outlined in the following sections of this report.

The information contained in the report is discussed under the following headings: (1) Existing Site Conditions, (2) Subsurface Soil and Water Conditions, (3) Slope Stability Considerations, and (4) The Results of Field and Laboratory Tests.

1. EXISTING SITE CONDITIONS

The proposed waste rock storage facility is located on the northeast side of State Highway 31, approximately 6 miles west of Huntington, Utah. The general features of the site are presented in Figure No. 1. The areas are designated as Area No. 1 and Area No. 2 and it

will be noted that the vegetative cover throughout the area is sparse and that the topography has generally rolling characteristics. A storage reservoir constructed to serve the power plant is located immediately southwest of the rock storage site. The soils throughout the proposed site are residual materials formed from the weathering of the shale which exists throughout the area. The area where the storage facility will be located is virgin terrain and no man-made fill exists throughout the site.

An irrigated area is located on the bench land north of the site which could effect the ground water in the area. Although some drainage channels exist throughout the general area, no water conveyance facilities other than the Huntington River appear to exist at this site which would affect the ground water level in the area. It is possible that some seepage could occur into the area from the reservoir located southwest of the site. The proposed site is located in seismic zone 2 according to the Uniform Building Code.

Other than the information provided above, no environmental factors appear to exist at this site which would affect the performance of the proposed structure.

2. SUBSURFACE SOIL AND WATER CONDITIONS

The characteristics of the subsurface material throughout the proposed site were defined by drilling two test holes to depths of approximately eighty feet at the approximate locations as shown in Figure No. 1. It will be observed that Test Hole No. 1 was drilled in Area No. 1 while Test Hole No. 2 was drilled in Area No. 2. The logs for these two test holes are presented in Figures 2 and 3 and it will be noted that the overburden material extends to a depth of approximately 15 to 16 feet in both test holes. The overburden material in Test Hole No. 1 generally consisted of a sandy gravel in a matrix of clay while in Test Hole No. 2, the subsurface material consisted of a gray weathered shale. Below a depth of 15 to 16 feet, the subsurface material throughout the depth investigated consisted of a dark gray shale.

In the upper 15 to 16 feet of the soil profile, sampling was performed at three-foot intervals throughout the depth investigated. Both disturbed and undisturbed samples were obtained during the field investigations. Disturbed samples were obtained by driving a 2-inch, split-spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped from a distance of 30 inches. The number of blows to drive the sampling

spoon through each 6 inches of penetration is shown on the boring logs. The sum of the last two blow counts which represents the number of blows to drive the sampling spoon through 12 inches is defined as the standard penetration value. The standard penetration value provides a reasonable indication of the in-place density of sandy material; however, it only provides an indication of the relative stiffness of cohesive material since the penetration resistance in materials of this type is a function of the moisture content.

The standard penetration test only provides a good indication of the in-place density of gravelly-type material when the spoon can be driven through a distance of 18 inches with a reasonably good core recovery. The results of the standard penetration test performed in the drill holes at this site indicate that the cohesive material is in a medium stiff condition.

Undisturbed samples are obtained in Test Hole No. 2 by pushing a 2.5 inch, thin-walled shelby tube into the subsurface material using the hydraulic pressure on the drill rig. The locations where the undisturbed samples were obtained are shown on the boring logs. The in-place density and the natural moisture content were determined for the cohesive material in Test Hole No. 2 and the results of these tests are shown on the boring logs. It will be observed that the in-place density varies about 108 pounds pcf to 117 pounds pcf. In-place unit weights of this magnitude is compatible with the density of these materials indicated by the standard penetration value.

Each sample obtained in the field was classified in the laboratory according to the Unified Soil Classification System. The symbol designating the soil type according to this system is presented on the boring logs. A description of the Unified Soil Classification System is presented in Figure No. 4 and the meaning of the various symbols shown on the boring logs can be obtained from this figure. It will be observed that the cohesive material in the upper portion of the soil profile is generally classified as a CL-1 or CL-2 type material. This means that the cohesive material throughout the development area is low plasticity silts and clays.

Continuous cores were obtained in the bedrock in both test holes. Parameters used to characterize the bedrock throughout each test hole included the percent core recovery and the rock quality designation. The rock quality designation gives the percent of core which has a length greater than 4 inches. It

will be observed from Figures 1 and 2 that the percent core recovery was nearly 100% in both test holes. The rock quality designation was a little less than this value and generally varied from about 85% to 100%. Based upon the percent core recovery and the rock quality designation, the shale throughout the proposed site would be considered as competent rock.

Field permeability tests were performed at approximately ten-foot intervals throughout the depth drilled in each test hole. The field permeability tests were performed in accordance with designation E-18 of the U.S. Bureau of Reclamation Earth Manual. The permeability coefficient expressed in feet per year is tabulated on the boring logs for the various test intervals. It will be observed that in Test Hole No. 1, the subsurface material was relatively impervious in the upper 43 feet of the soil profile. Below this depth, however, the permeability coefficient varied from 347 fpy to 763 fpy. In Test Hole No. 2, the subsurface material was relatively impervious in the upper 38 feet of the soil profile. The interval from 38 to 48 feet below the ground surface indicated a permeability coefficient of 263 fpy. Below this interval, the permeability coefficient for the shale material is relatively low. A 3-inch ID Perforated PVC Pipe was installed in each test hole.

During the subsurface investigation, ground water was encountered in Test Hole Nos. 1 and 2 at approximately 33 feet and 28 feet respectively below the existing ground surface. The equilibrium ground water level at the end of drilling is shown on the boring logs. It will be noted that the ground water level existed at about 23 feet below the ground surface in Test Hole No. 1 and about 7 feet below the ground surface in Test Hole No. 2. Following the completion of each test hole, the water in the drill hole was blown out several times using an air compressor. The ground water level recovered within a period of about two hours and reached the equilibrium position shown on the boring logs.

It is our opinion that water is entering the drill hole in Test Hole No. 1 below a depth of 43 feet while the ground water is entering the profile in Test Hole No. 2 at a depth between 38 and 48 feet below the ground surface. The source of the artesian flow in each of the Test Holes are not known as of the preparation of this report. Several possible sources exist where the water could be coming from. A possible source would be the Huntington River upstream from the site. The high water level in the pond south of the site is several feet below the ground surface at each of the drill holes and it is doubtful that this is the source of water in the drill holes. The topography rises

upward to the north and west of the site and the source of the water could come from this direction. An irrigated farm is located on a plateau north of the site and is a possible source of the underground flow.

3. SLOPE STABILITY CONSIDERATIONS

It is our understanding that the waste rock storage facility will eventually cover both Areas 1 and 2 as shown in Figure No. 1. The maximum height of the rock storage facility will be approximately 60 feet and it is anticipated that this material will have a gradation curve defined approximately by Figure No. 5. It is expected that the rock material will be placed in the fill in lifts not exceeding two feet and that it will be densified to at least 95% of the maximum laboratory density as determined by ASTM D-698. Triaxial shear tests were performed on the minus one-half inch fraction of the waste rock materials densified to nearly 100% of the maximum laboratory density as determined by ASTM D-1557 indicated this material had a friction angle of 40.5 degrees. Since the actual density of the in-place material will be somewhat lower than the density at which the triaxial shear test was performed, and inasmuch as it is known that the friction angle of granular materials decreases as the particle size increases, stability computations performed during this investigation used a friction angle of 36 degrees for the waste rock material.

As indicated earlier in this report, the soil profile where the waste rock facility will be located consists of 15 feet of weathered shale underlain by a competent shale material which extended to the depth at which the borings where terminated in the vicinity of 80 feet below the ground surface. The results of consolidated drained direct shear tests and consolidated drained triaxial tests indicate that the friction angle for the weathered shale varies from about 25 degrees to 32 degrees and that the cohesion varies from about 4 psi to 9 psi. The results of the shear test performed on the shale material underlying the surface cohesive zone indicates that the unconfined compressive strength of this material is in excess of 1600 pounds psi.

A computer model of Spencer's method known as UTexas 2 was used in performing the stability computations for this site. Spencer's method satisfies both force and moment equilibrium and is currently a standard method used by the Corps of Engineers. An effective stress analysis was used in performing the stability computations for the proposed waste storage facility. The analysis was first performed assuming that the piezometric line existed at the ground surface. The factor of safety for various

side slopes using a range in the shear strength parameters was performed for this condition. The results of the analysis are summarized below in Table No. 1.

Table 1

Summary of Stability Analysis
Utah Power & Light Waste Pile

Case	Rock Waste Properties		Foundation Properties		Slope	F.S.
UPL.1*	ϕ =36°	C=0	ϕ=26°	C=50psf	1.75H:1V	1.39
UPL.2*	ϕ =36°	C=0	ϕ=26°	C=50psf	2.0H:1V	1.46
UPL.3*	ϕ =36°	C=0	ϕ=26°	C=50psf	2.25H:1V	1.50
UPL.4*	ϕ =36°	C=0	ϕ=32°	C=0psf	1.75H:1V	1.48
UPL.5*	ϕ =36°	C=0	ϕ=32°	C=0psf	2.0H:1V	1.62
UPL.6*	ϕ =36°	C=0	ϕ=32°	C=0psf	2.25H:1V	
UPL.7**	ϕ =36°	C=0	ϕ=26°	C=50psf	2.0H:1V	1.46 1.62
UPL.8**	ϕ =36°	C=0	ϕ=26°	C=50psf	1.75H:1V	1.50

* water table at ground surface
** water level well below the surface of the shale

It will be observed from this table that a factor of safety of 1.5 is obtained for side slopes of 2 to 1 using a friction angle of 26 degrees and a cohesion of 50 psf for the foundation material. The critical failure surface along with the side slopes and the shear strength parameters are presented in Figure No. 6.

While it is possible that the piezometric surface may exist at the ground surface at some time throughout the life of this structure, it is our opinion that this assumption is unduly conservative and that the factor of safety should be determined for the rock storage facility assuming that the piezometric surface is well below the surface of the shale zone. A stability analysis has therefore been performed assuming the shear strength parameters shown in Figure No. 6 for side slopes of 2 horizontal, 1 vertical and 1.75 horizontal, 1 vertical. With the piezometric surface below the surface of the shale, the factor of safety for side slopes of 1.75 horizontal to 1 vertical is equal to 1.5. The critical failure surface for this condition is shown in Figure No. 6. It is our recommendation, therefore, that the waste rock storage facility be constructed using side slopes of 1.75 horizontal to 1 vertical. The top of the waste rock facility should be covered with compacted cohesive material and sloped so that surface drainage will readily occur.

4. THE RESULTS OF FIELD AND LABORATORY TESTS

Field and laboratory tests performed during this investigation to define the characteristics of the subsurface material included: standard penetration test, in-place permeability test, in-place unit weight, natural moisture content, Atterberg Limits, unconfined compressive strength, consolidated drain direct shear tests, and consolidated drain triaxial shear tests. The standard penetration test and the field permeability test have been previously discussed and the results of these tests are shown on the boring logs. A summary of all other test data performed during the investigation with the exception of the direct shear test and the triaxial shear test are presented in Table No. 2, Summary of Test Data.

It will be observed that the plastic index of the weathered shale material in the upper portion of the soil profile varies from about 17.5 to 21.1 and that this material classifies as a CL-2 type material according to the Unified Soil Classification System. It should also be noted that the natural moisture content is within a few percentage points of the plastic limit. The plastic index of the shale material underlying the surface weathered zone varies from about 6.5 to 12 indicating that this material has low plasticity characteristics. This material classifies as a CL-1 type soil according to the Unified Soil Classification System.

Several unconfined compression tests were performed on samples of the shale throughout the soil profile and the results of these tests indicate that the unconfined compressive strength increases with depth and that it varies from about 1600 pounds psi to as high as 3300 pounds psi.

In order to obtain an indication of the shearing strength of the cohesive material overlying the shale, six direct shear tests were performed on representative samples obtained from a depth of 5 feet and 10 feet below the existing ground surface. The results of these tests are expressed in the form of a mohr envelope in Figure Nos. 7 and 8. These tests indicate a friction angle of about 25 degrees and a cohesion of about 4 psi.

Three consolidated drain triaxial shear tests were performed on the weathered shale at a depth of about 6 feet below the existing ground surface. The triaxial shear tests are expressed in the form of a mohr envelope as shown in Figure No. 9. These tests indicate a friction angle of 32 degrees and a cohesion of 9 psi, which is somewhat larger than the value obtained in the direct shear test.

The conclusions and recommendations presented in this report are based upon the results of the field and laboratory tests which in our opinion define the characteristics of the subsurface material throughout the site in a satisfactory manner. If there are any questions relative to the information contained herein, please advise us.

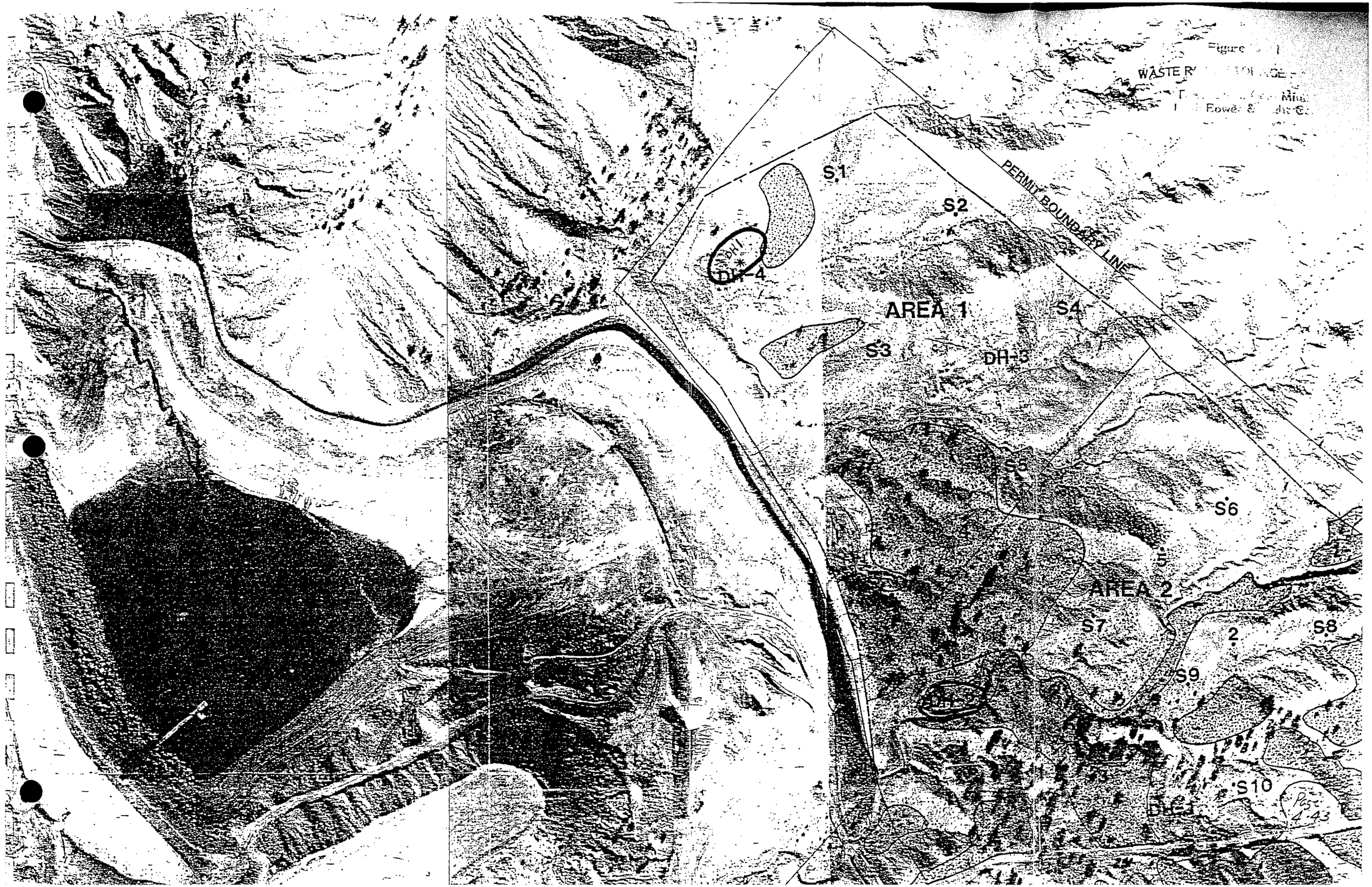
Yours truly,

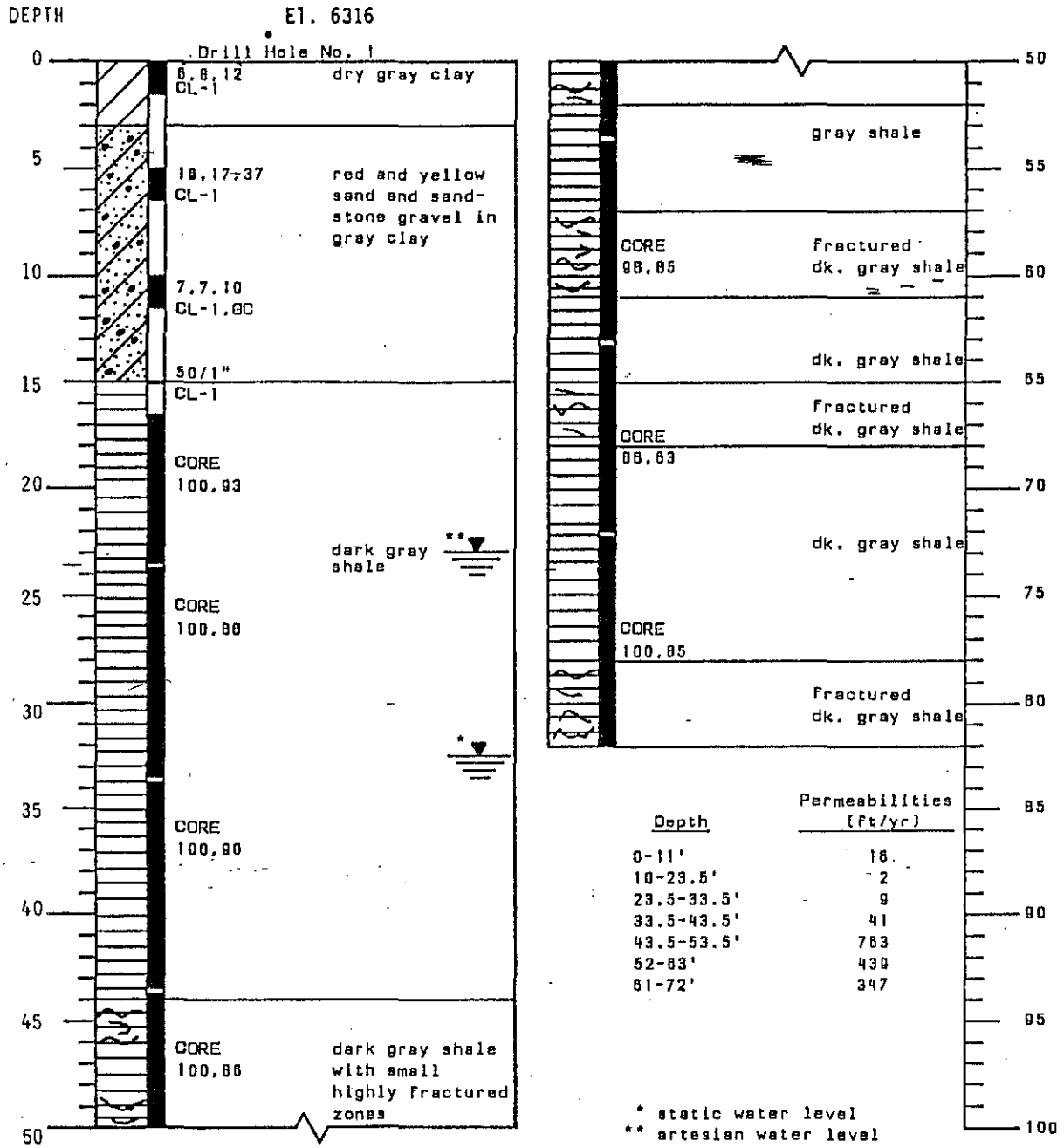
ROLLINS, BROWN AND GUNNELL, INC.

Ralph L. Rollins

Ralph L. Rollins

RLR:jsh


WASTE R
Figure
Power &
PERMIT BOUNDARY LINE
S1
S2
DH-4
AREA 1
S4
S3
DH-3
S5
S6
5
AREA 2
S7
2
S8
S9
DH-2
S10
DH-1
Page 4-43



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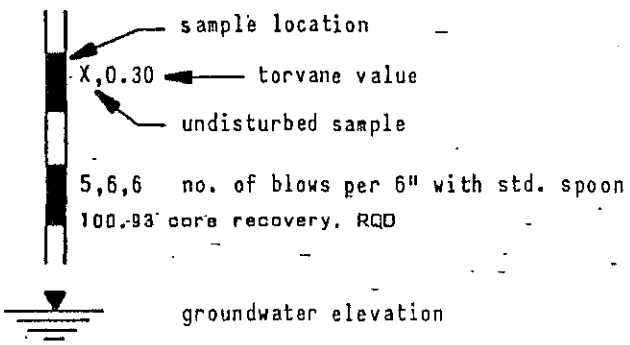

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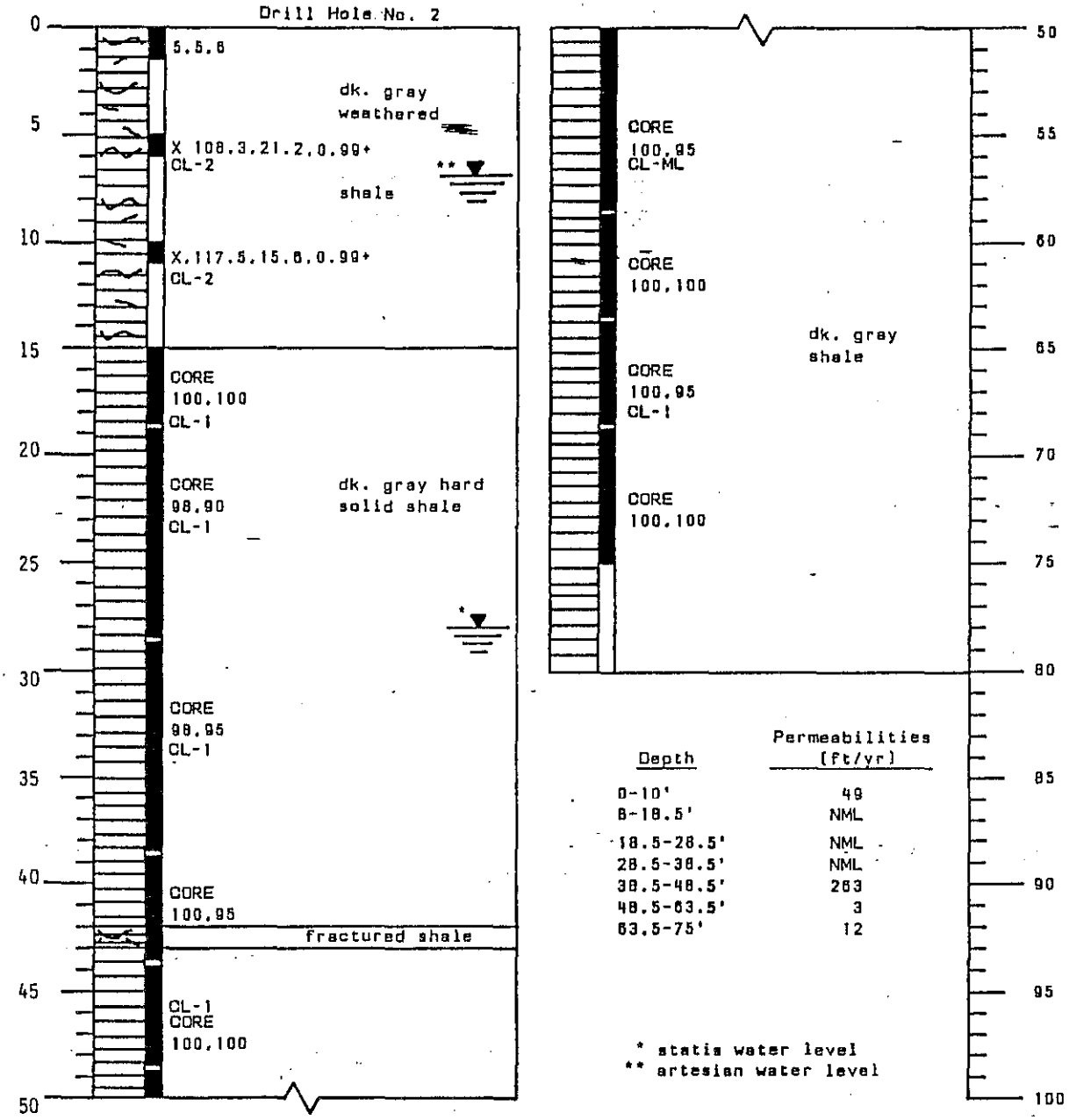
PROFESSIONAL ENGINEERS

Log of Borings for:
Deer Creek Mine Waste Pile
Utah Power & Light

Figure No. 2



ROLLINS, BROWN AND GUNNELL, INC.

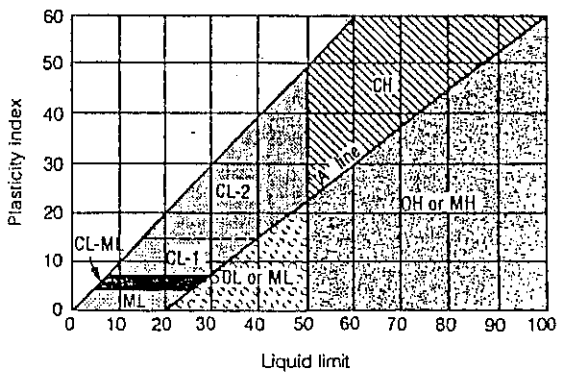
PROFESSIONAL ENGINEERS

Log of Borings for:
Deer Creek Mine Waste Pile
Utah Power & Light

Figure No. 3

Unified Soil Classification System

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria		
Coarse-grained Soils More than half of material is larger than No. 200 sieve	Gravels More than half of coarse fraction is larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Determine percentage of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5% ..... GW, GP, SW, SP More than 12% ..... GM, GC, SM, SC 5% to 12% ..... Borderline cases requiring use of dual symbols**	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM* d u	Silty gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, or PI greater than 7	
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines.		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM* d u	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols
			SC	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits above "A" line, or PI greater than 7	
Fine-grained Soils More than half of material is smaller than No. 200 sieve	Silt and Clays Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity			
			CL 1 2	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silt-clays of low plasticity			
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
Highly Organic Soils			Pt	Peat and other highly organic soils			

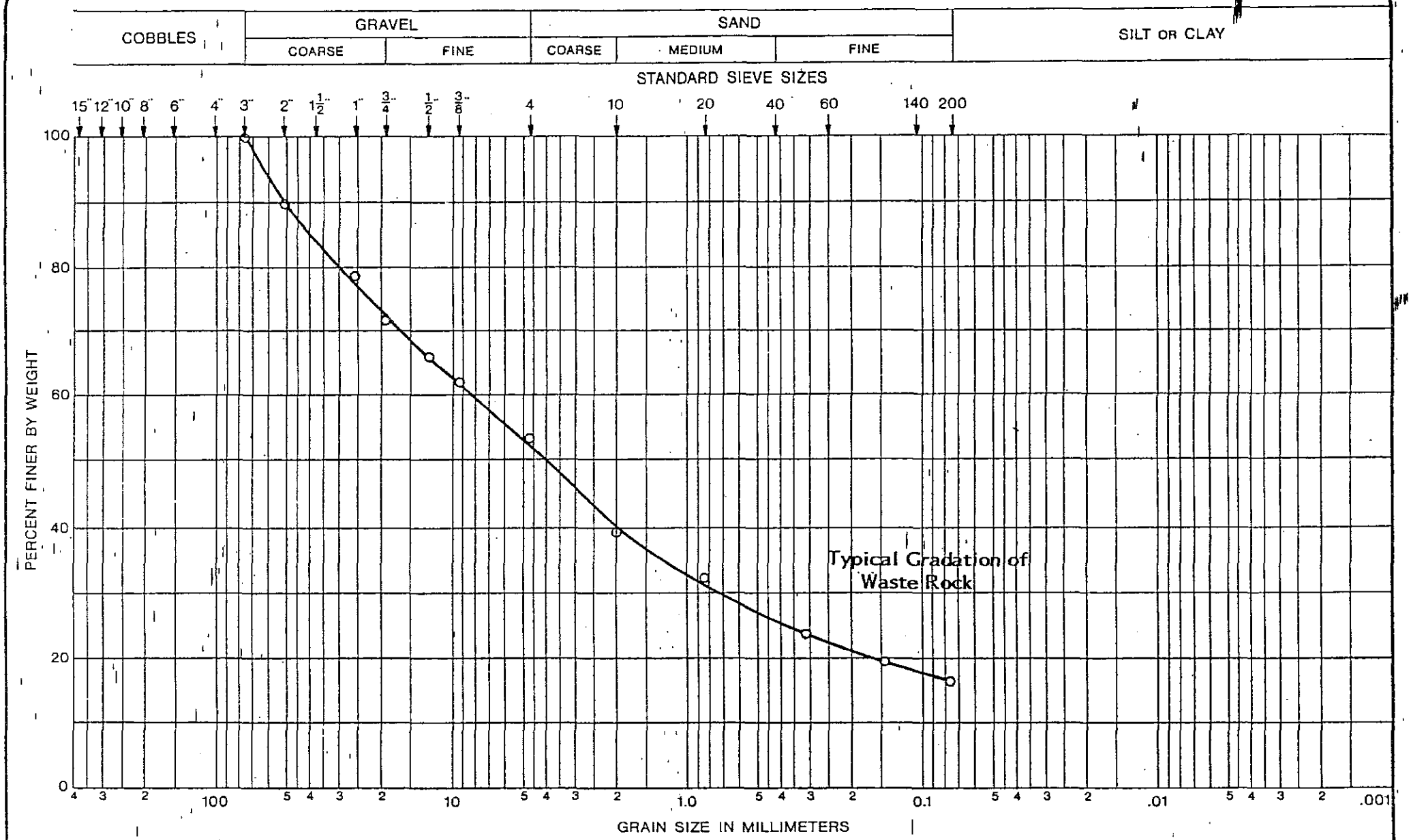


Plasticity Chart
For laboratory classification of fine-grained soils

*Division of GM and SM groups into subdivisions of d and u for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when liquid limit is 28 or less and the PI is 6 or less, the suffix u used when liquid limit is greater than 28.

**Borderline classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.

Figure No. 4



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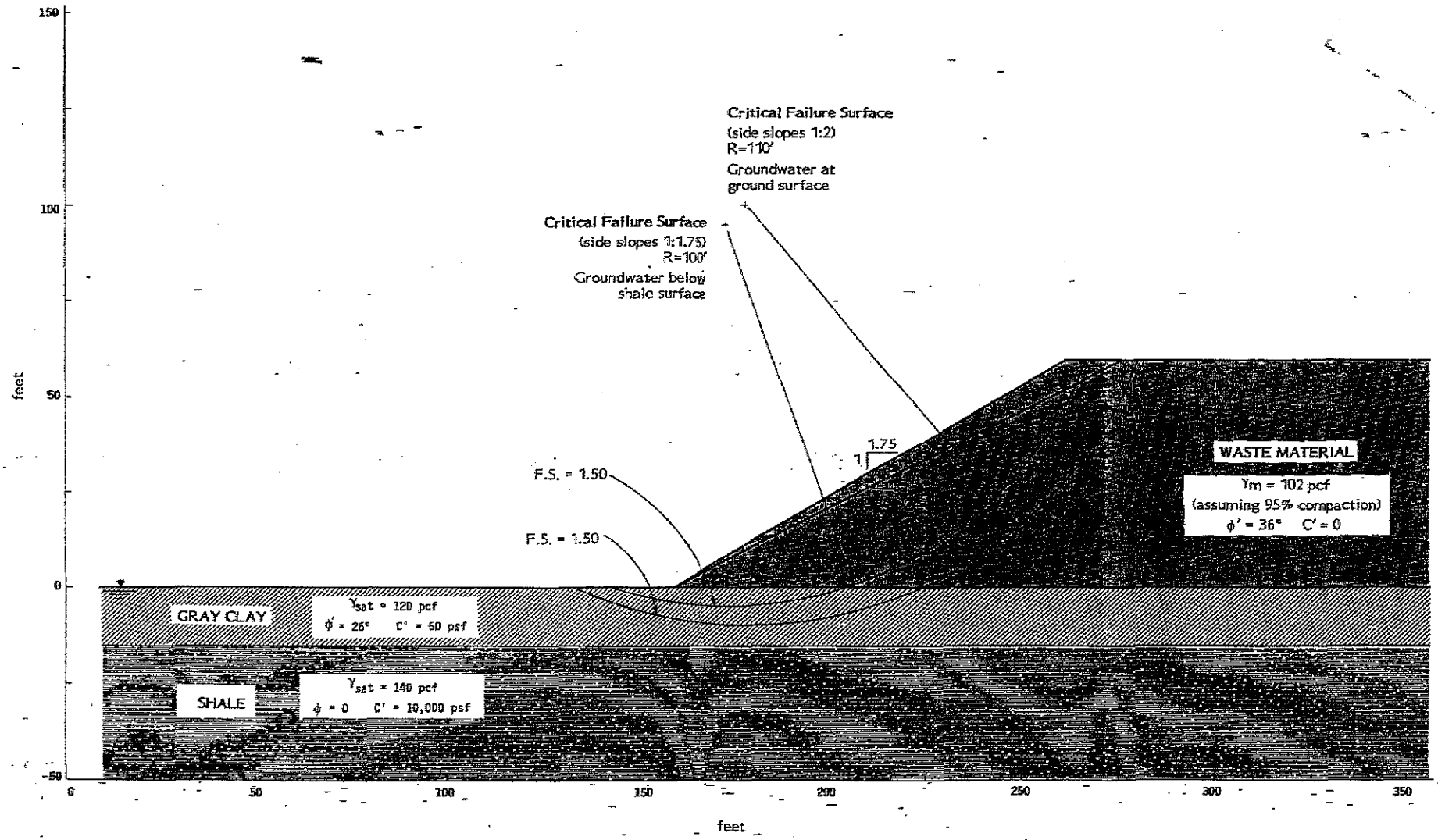
GRAIN SIZE DISTRIBUTION CURVE

Project: Waste Rock Storage Facility
Location: Huntington Canyon

Sample No. 1

FIGURE NO. 5



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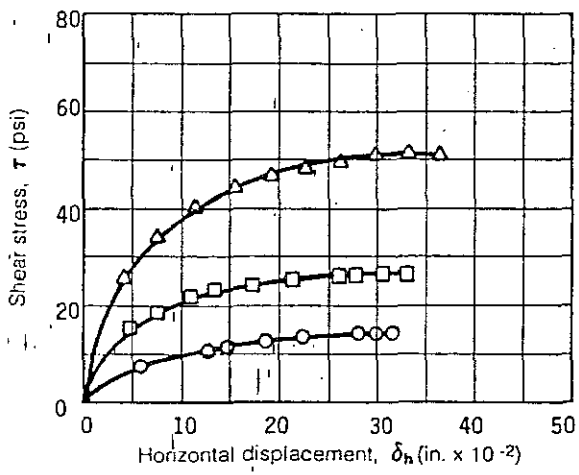
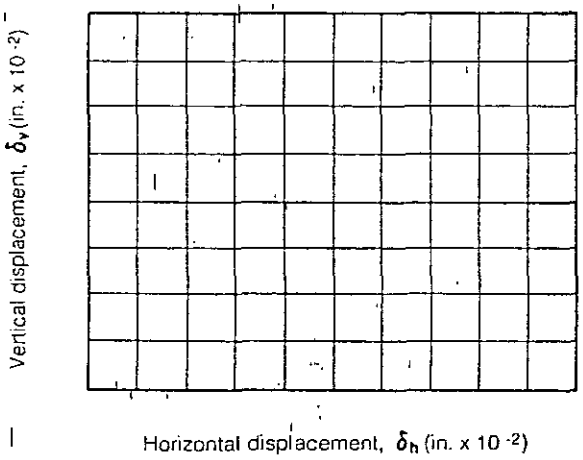
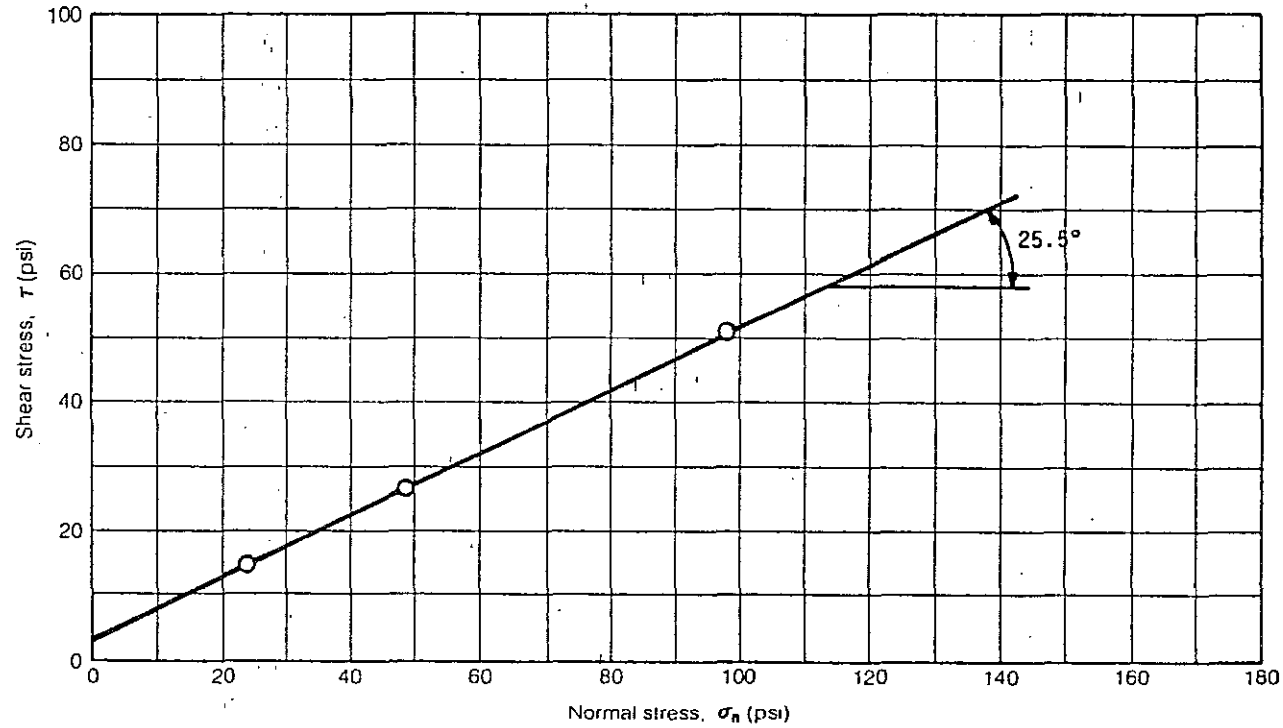
PROFESSIONAL ENGINEERS

SLOPE STABILITY SUMMARY
Deer Creek Coal Mine

FIGURE NO. 6







Test no. or symbol	Sample size (inches)	Sample data		Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters	
		Dry density (pcf)	Moisture content (%)					Friction angle ϕ (degrees)	Cohesion (c / psi)
○	2.375	108.3	21.2	100	23.7	14.4	0.0006	25.5°	3
□	2.375	106.8	22.7	100	48.2	26.8	0.0006		
△	2.375	108.3	20.8	100	97.8	51.0	0.0006		

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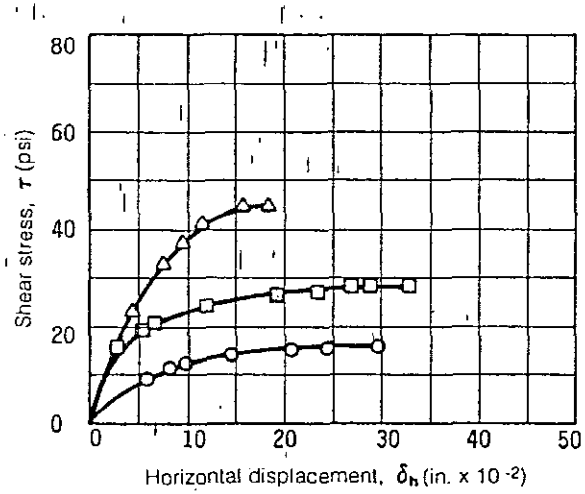
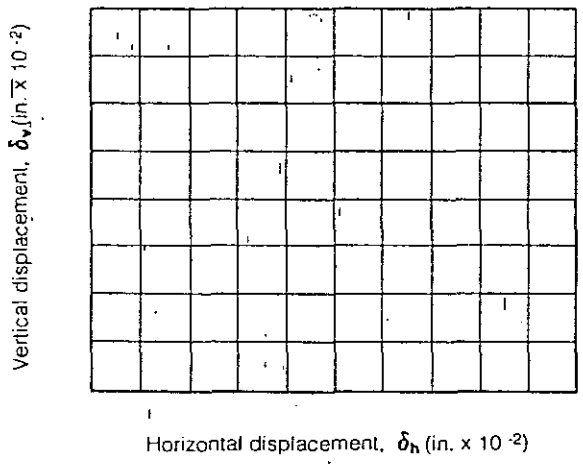
DIRECT SHEAR TEST

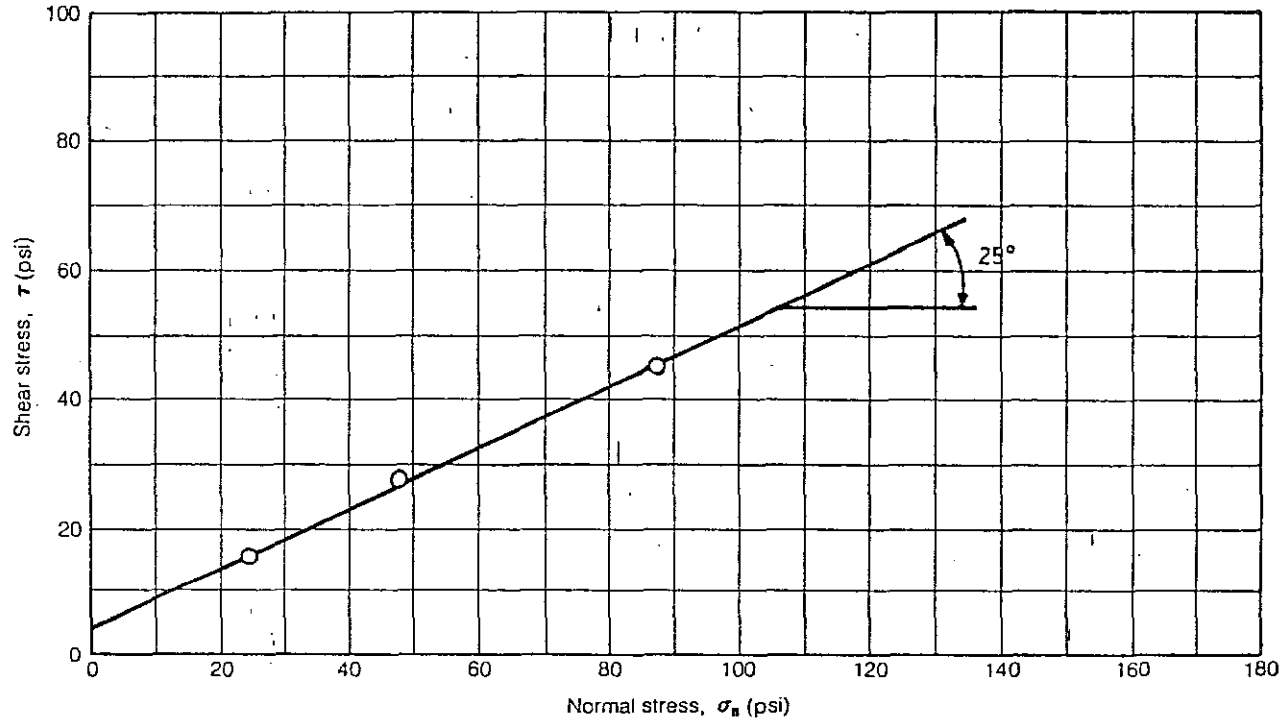
Project: Deer Creek Mine Waste Pile
Utah Power & Light

HOLE NO. 2
DEPTH: 5'

FIGURE NO. 7







Test no. or symbol	Sample size (inches)	Sample data		Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters	
		Dry density (pcf)	Moisture content (%)					Friction angle ϕ (degrees)	Cohesion (c / psi)
○	2.375	117.6	14.4		23.7	15.9	.0006	25°	4
□	2.375	117.4	15.9		48.2	28.7	.0006		
△	2.375	117.5	16.6		87.9	45.2	.0006		

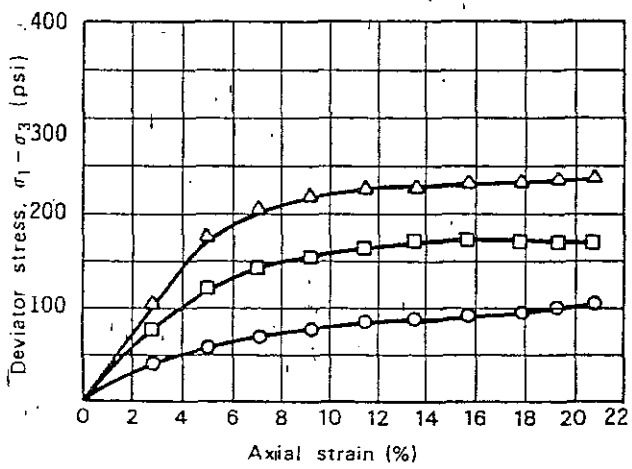
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

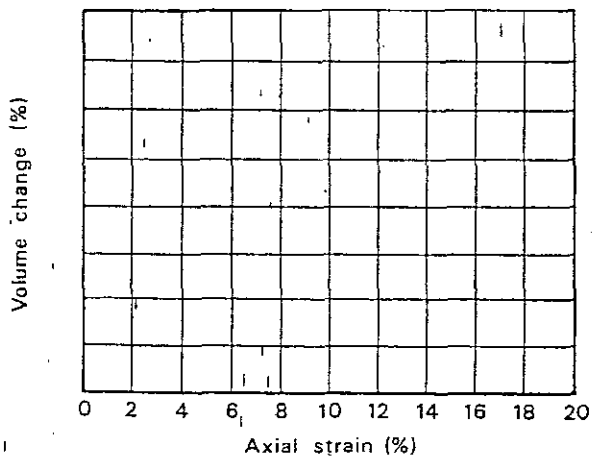
DIRECT SHEAR TEST

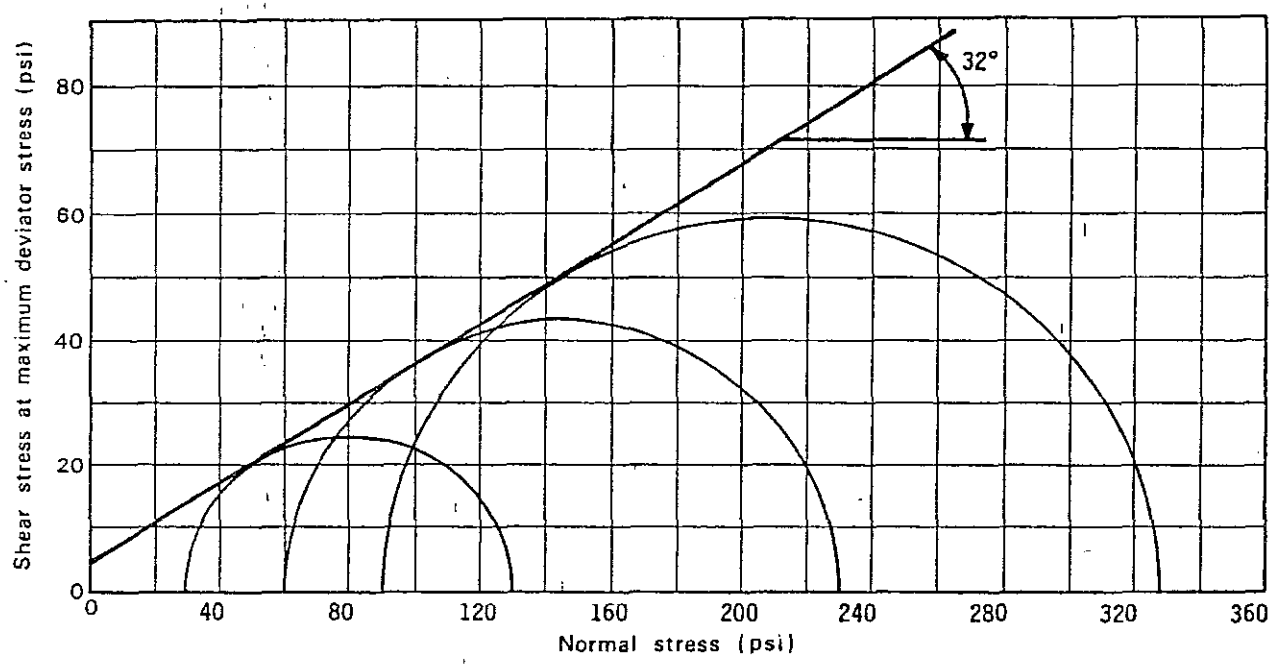
Project: Deer Creek Mine Waste Pile
Utah Power & Light

HOLE NO. 2
DEPTH: 10-11'

FIGURE NO. 8







Test no. or symbol	Boring no. or depth	Sample data		Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure		Sample size, L/D (inches)	Strain rate (inches/minute)
		Dry density (pcf)	Moisture content (%)				Friction angle ϕ (degrees)	Cohesion (c/psi)		
○	1	108.3	21.2		30	133	32	9	1.32	.002
□	2	108.3	21.2		60	232				.002
△	3	108.3	21.2		90	327				.002

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

TRIAXIAL SHEAR TEST
Project: Deer Creek Mine Waste Pile
Utah Power & Light

HOLE NO. 2
DEPTH: 6'

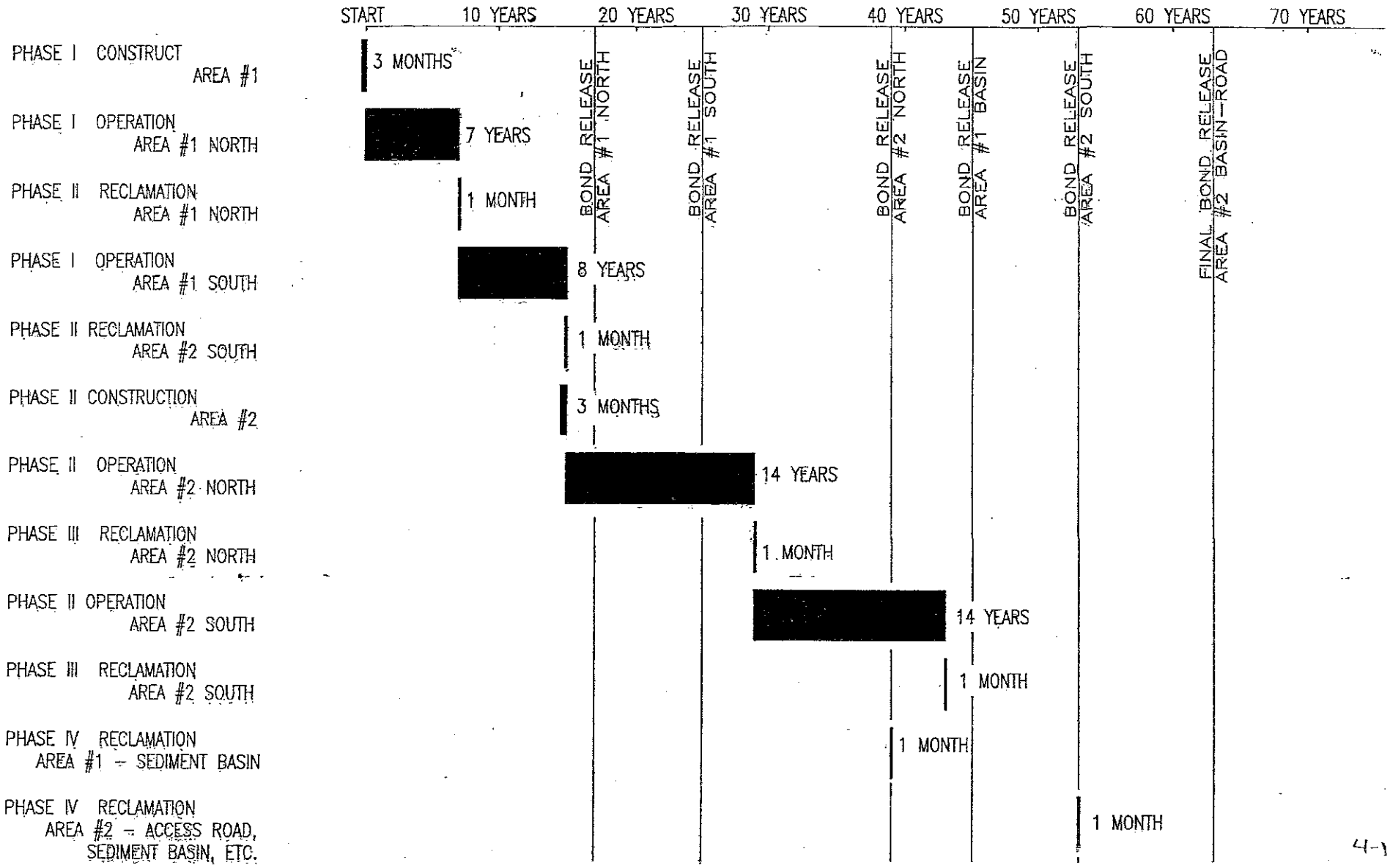
FIGURE NO. 9

Table No. 2 SUMMARY OF TEST DATA

Project Deer Creek Mine Waste Pile Feature _____ Location Near: Huntington, Utah

HOLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE			UNCONFINED COMPRESSIVE STRENGTH (lb/ft²)	FRICTION ANGLE ϕ	CONSISTENCY LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM
			Unit Weight (lb/ft³)	Moisture (%)	Void Ratio			L.L. (%)	P.L. (%)	P.I. (%)	% Gravel	% Sand	% Silt & Clay	
2	5-6.5′		108.3	21.2				38.9	17.8	21.1				CL-2
	10-11.5′		117.5	15.6				39.6	22.1	17.5				CL-2
	15					1612		27.3	15.3	12.0				CL-1
	25					2287		22.5	14.5	8.0				CL-1
	35					2897		22.1	14.2	7.9				CL-1
	45					2954		23.5	15.3	8.2				CL-1
	55					3023		21.4	14.9	6.5				CL-ML
	65					3338		20.7	11.6	9.1				CL-1

WASTE ROCK STORAGE SITE – SCHEDULE



APPENDIX 5-3
SLOPE STABILITY ANALYSIS

Section VI WASTE MATERIAL PILE - SLOPE STABILITY ANALYSIS

The waste material to be deposited in the Deer Creek Waste Rock Storage Facility will be placed in compacted lifts of two feet with side slopes of 2 h to 1 v. The stability analysis of these slopes is based on the following soil strength parameters:

Density - 98.2 pounds per cubic foot

Angle of Internal Friction - 40.5 degrees

Cohesion - 0

(See Soils Report, Exhibit V)

Because the material is free draining and adequate drainage will be provided, it is assumed that no portion of the slope will be saturated with ground water.

The safety factor for this slope is 1.80 and is taken from figure 1.4, page 15, FACTOR OF SAFETY CHARTS FOR ESTIMATING THE STABILITY OF SATURATED AND UNSATURATED TAILINGS POND EMBANKMENTS, D.R. Tesavik and P.C. McWilliams, Report of Investigations 8564, Bureau of Mines, United States Department of the Interior.

The foregoing analysis is based on lab tests performed on a sample of the waste material. This sample was obtained from the existing waste material piles on the current waste disposal site. Because the material in the waste piles is not homogeneous, samples were taken from eight different locations representing as many different types of material as were present. These samples were mixed to achieve one total sample of approximately 60 pounds. This method of gathering accurately represents the typical material to be found on the waste pile for the following reasons:

First, as the waste material is transported from underground to the waste site, it is loaded, dumped and reloaded at least three times, creating a blended material.

Secondly, the material is deposited in two foot lifts, where it is spread out and compacted in place. The thickness of each layer is small in comparison to the total height of the waste pile.

Because there is a possibility that the type of material being deposited may change, that is, the soil strength parameters may change due to grain size, clay content, etc., Utah Power and Light will sample the waste material every five years to determine the strength of the material. If it is found that the strength of the material has decreased, a stability analysis will be performed to determine the proper slope for construction to maintain the minimum required factor of safety.

ROLLINS, BROWN and GUNNELL, INC. professional engineers

March 15, 1988

Tom Faucheux
Utah Power and Light Company
Mining Division
P.O. Box 310
Huntington, Utah 84528

Dear Mr. Faucheux:

We have completed the requested laboratory testing for the soil sample submitted to our office as per P.O. JS-301606. The results are enclosed herein on the appropriate figures. The soil moisture density relationship resulted in a maximum density of 98.2 pcf at an optimum moisture content of 10.7 percent. The results of the grain-size analysis indicate the following:

Sieve Size	% Passing
3"	100
2"	89.9
1"	78.9
3/4"	71.6
1/2"	66.0
3/8"	61.9
No. 4	53.3
No. 10	39.4
No. 20	32.1
No. 50	23.6
No. 100	19.8
No. 200	16.4

The triaxial shear test envelope indicates a friction angle of 40.5 degrees and a cohesion of 0 psi.

If you have any further questions, please notify us.

Yours truly,

ROLLINS, BROWN AND GUNNELL, INC.

Ralph L. Rollins

Ralph L. Rollins

SLS/sly

1435 WEST 820 NORTH
POST OFFICE BOX 711
PROVO, UTAH 84603

PROVO 374-5771
SALT LAKE CITY 521-5771
AREA CODE 801

Exhibit V

ROLLINS, BROWN and GUNNELL, INC. professional engineers

1435 WEST 820 NORTH
POST OFFICE BOX 711
PROVO, UTAH 84603
(801) 374-5771 Provo
(801) 521-5771 SLC

SOIL MOISTURE DENSITY RELATIONSHIP

Project: Utah Power and Light
Feature:
Job technician: S. Ahmad
Project no.:
Test date: March 4, 1988
Mailing date: March 11, 1988

ASTM D 1557-78

Maximum dry density = 98.2 lbs/ft³

Optimum moisture = 10.7 %

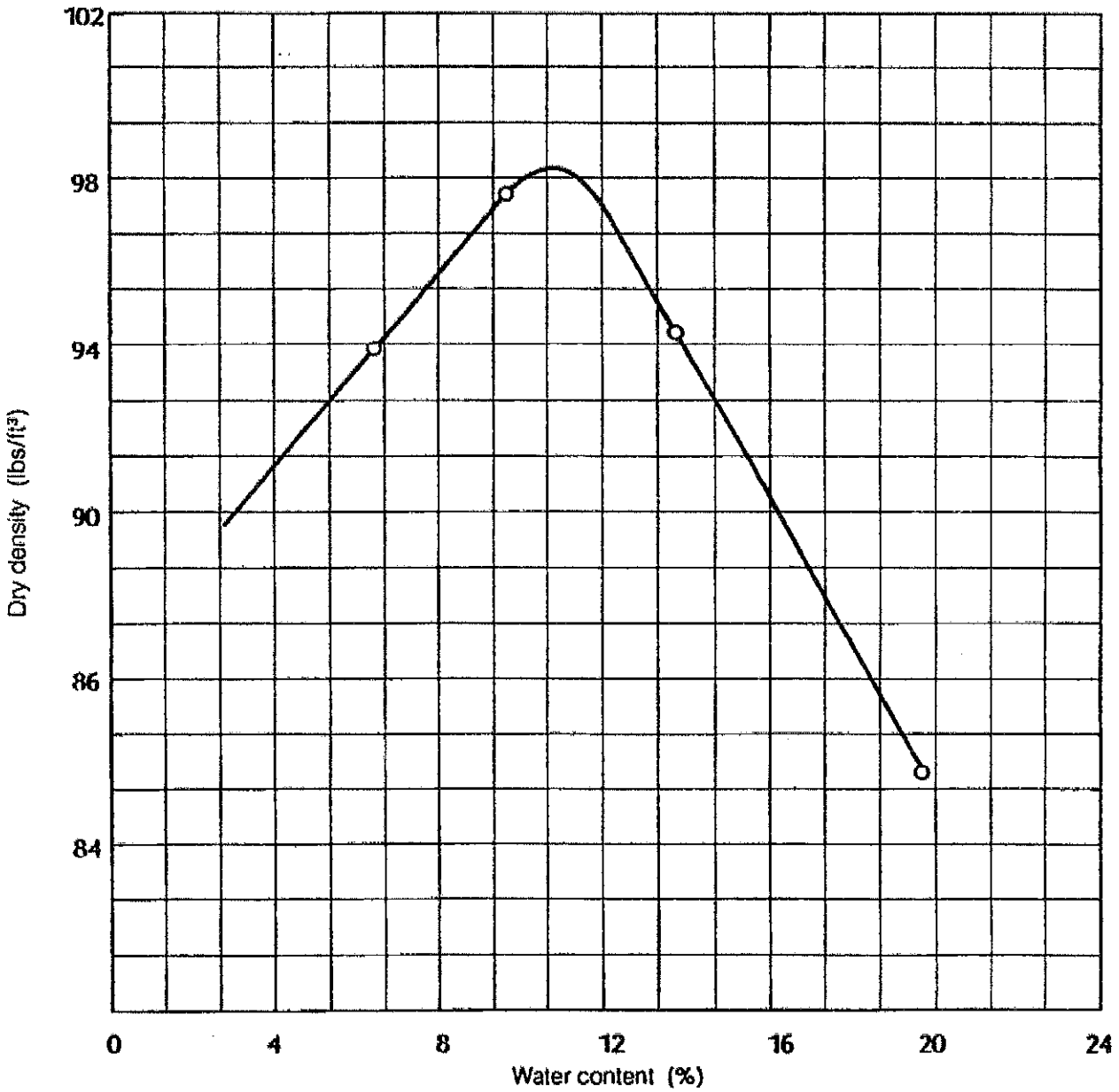
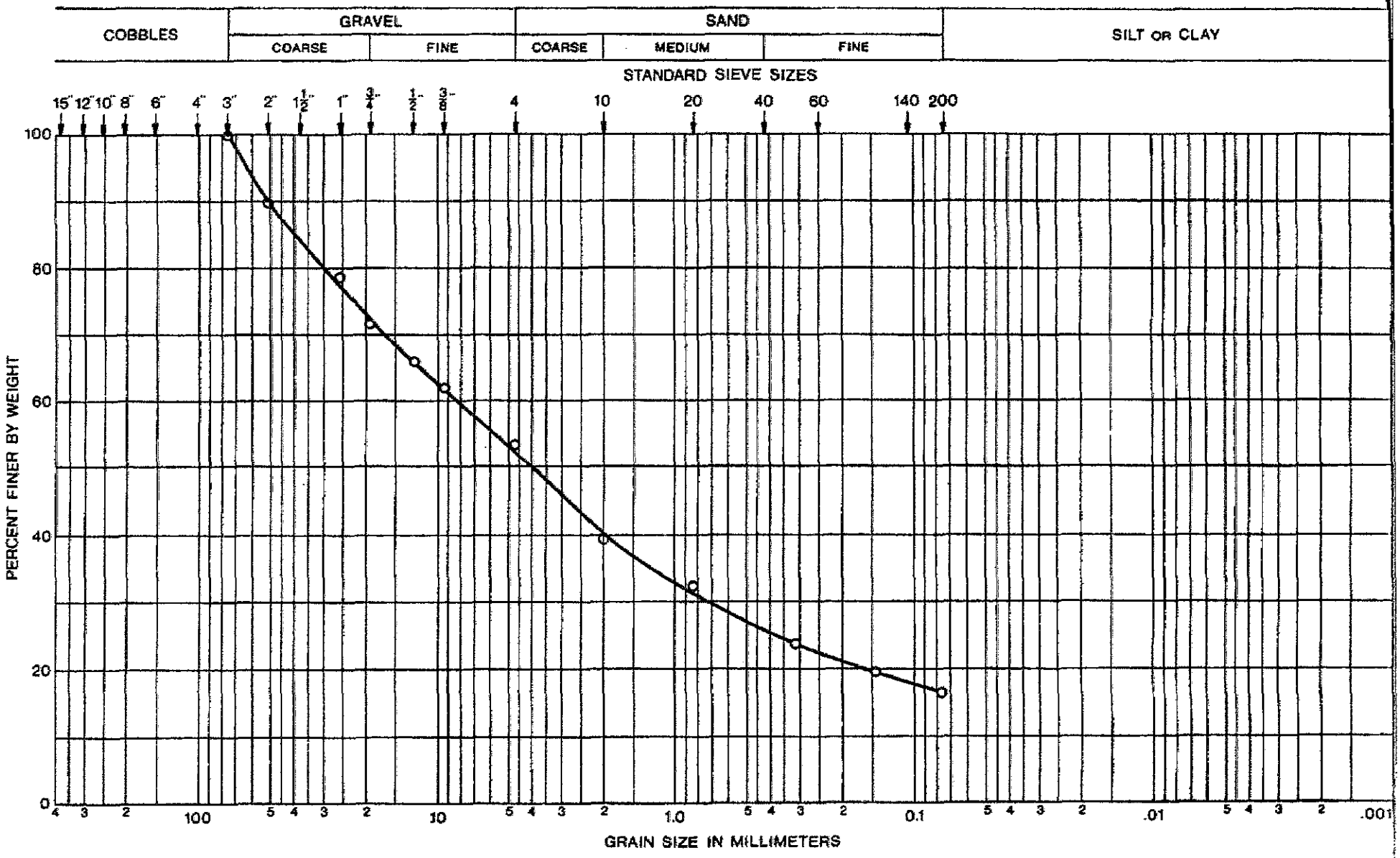


Exhibit A-2



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

GRAIN SIZE DISTRIBUTION CURVE

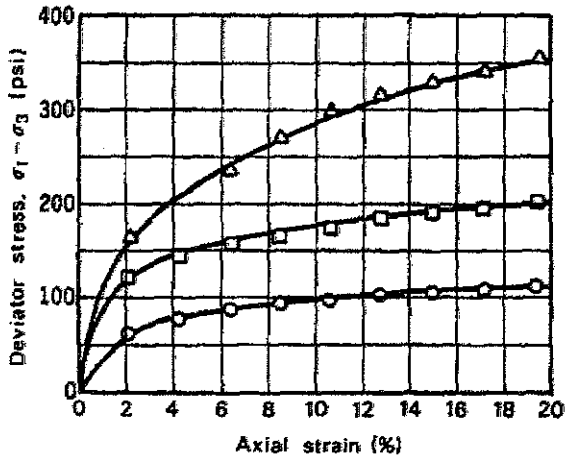
Project: Utah Power & Light

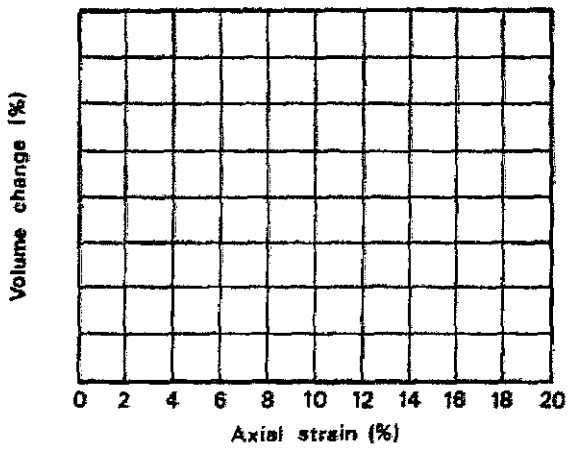
Location:

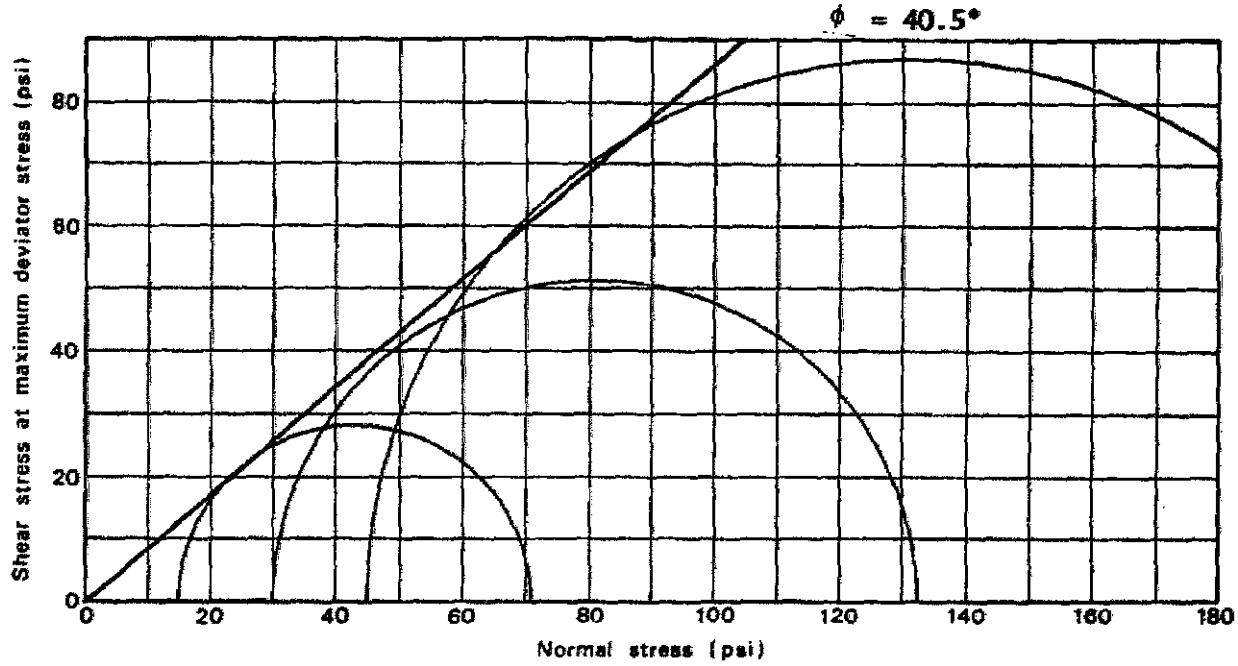
Sample No. 1

FIGURE NO.

Exhibit A-3







Test no. or symbol	Boring no. or depth	Sample data		Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure		Sample size, L/D (inches)	Strain rate (inches/minute)
		Dry density (pcf)	Moisture content (%)				Friction angle ϕ (degrees)	Cohesion (c/psi)		
○		98	10.7		30	111				
□		97.7	10.7		60	205	40.5	0	2.8/ 1.32	.0024
△		98.1	10.7		90					

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

TRIAXIAL SHEAR TEST
Project: Utah Power and Light

HOLE NO.
DEPTH:

FIGURE NO.

Exhibit A-4

R645-301-600

GEOLOGY

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Appendix 6-1 Summary of Prior Waste Rock Analysis

R645-301-600 GEOLOGY

R645-301-610 Introduction

This chapter presents a description of the geologic resources in the area of the Castle Valley Mining, LLC waste rock site ("CVM site" or the "site"). Since no coal is being mined and no exploration activities are being conducted in the permit area, this chapter includes only general geologic information compiled from previously published documents.

R645-301-611 General Requirements

The geologic resources in the CVM site are discussed in Sections 621 through 627 of this chapter.

R645-301-612 Certification

All maps, plans, and cross-sections presented in this chapter, as required by the Utah Administrative Rules have been certified by a professional engineer.

R645-301-620 Environmental Description

This section presents a description of the geologic resources in the area of the CVM site.

R645-301-621 General Requirements

This section presents information concerning the regional and site-specific geology of the CVM site.

R645-301-622 Cross Sections, Maps and Plans

Plate 6-1 presents a map of the geology of the site area. The data used to prepare Plate 6-1 were obtained from Witkind et al. (1987). Since there no coal mining or exploration will occur at the site, coal seam data such as outcrop lines, bedding plane orientations, and drill hole information are not shown.

No oil or gas wells exist within the permit area.

R645-301-623 Geologic Determinations

Since no mining will occur at the site, no samples have been collected concerning the acid- or toxic- forming characteristics of the site strata. However, Energy West evaluated data collected from over 130 outcrop and core samples to assess the potential acid- or toxic-forming characteristics of the waste rock that was disposed of at the site. These data are summarized in Appendix 6-1.

Comparison of these data with guidelines published by the Division of Oil, Gas and Mining[1] indicates the following: CVM waste rock testing is covered in the Bear Canyon M&RP.

- The pH of the waste rock is moderately alkaline and should not hinder reclamation.
- The electrical conductivity of the waste rock is less than 4 mS/cm and should, therefore, not hinder reclamation.
- The sodium adsorption ratio of the waste rock is generally less than 4, indicating that this factor should not hinder site reclamation.
- The boron concentration of the waste rock is less than 5 m/kg, indicatingthat concentrations of this element should not hinder site reclamation.

Energy West submitted one composite sample for analyses of soluble selenium and calcium carbonate content. The soluble selenium concentration of the sample was 0.098 mg/kg,

[1] Utah Division of Oil, Gas and Mining. 2008. Guidelines for Management of Topsoil and Overburden. Downloaded from https://fs.ogm.utah.gov/pub/MINES/Coal Related/soil guide.pdf on 22 Jan 2015.

which is an acceptable concentration according to the Division guideline. The calcium carbonate concentration of the sample was 26.3%. This, together with the alkaline nature of the rock, suggests that the acid/base potential of the waste rock is acceptable.

The geologic information required by DOGM to make a determination as to whether the reclamation plan can be accomplished is presented in Section 624. Since no mining will occur at the site, no subsidence control program has been prepared.

R645-301-624 Geologic Information

R645-301-624.100 Regional Setting

The CVM site is located near the mouth of Huntington Canyon, about 6 miles northwest of the town of Huntington, Utah. The site is located on the southern flank of Gentry Mountain just south of Wild Horse Ridge. Rocks exposed in the area are marine-derived mudstones in the lower portion of the Masuk Member of the Mancos Shale. The Masuk Shale on the bench which adjoins the site on the east and west is covered by a 5 to 20 foot thick layer of terrace gravel of Quaternary age. North-south trending normal faults have disrupted the strata in the region. However, no faults are known to exist within the permit area.

Stratigraphy.

The oldest rocks exposed in the region are part of the marine Mancos sequence deposited in Late Cretaceous time. This formation contains several alternating units of off-shore marine mudstones near-shore marine sandstones.

The upper unit of the Mancos is the Masuk Member, which underlies the site. The Masuk Member consists of shale and shaly siltstone that is thin to medium bedded with a few thin interlayered sandstone beds (Witkind et al., 1987). The Masuk Member is generally devoid of significant water.

The benches on the west and east sides of the permit area are covered by a Quaternary pediment mantle. These materials are highly variable, of fluvial origin, and consist of a poorly bedded mixture of silt, sand, pebbles, cobbles, and boulders derived from adjacent uplands (Witkind et al., 1987). In the vicinity of the permit areas, these materials are generally 5 to 20 feet thick.

Structure. The strata in the permit area dip west-northwest at an angle of 2 to 3 degrees into the Straight Canyon Syncline. The nearest known fault to this area plotted by Witkind et al. (1987) is located approximately 2 miles to the west. No faults are known to exist in the permit area. Regionally, the strata contain vertical joints trending in both a northwest and northeast direction. It is hard to identify jointing in the weathered Masuk shale outcrops, but in fresh cuts the joints appear to be wide spaced. Very limited amounts of ground water migrate down these fractures because the clays present in the rock swell when in contact with water, thus sealing the fractures.

Surface and Groundwater Impact. Potential surface and groundwater impacts are discussed in Chapter 7 of this application.

R645-301-624.200 Test Boring and Drillhole Data (overburden removed)

No mining or coal exploration will occur in the permit area.

R645-301-624.300 Test Boring and Drillhole Data (overburden removed)

No mining or coal exploration will occur in the permit area.

R645-301-625 Additional Geologic Information

It is not anticipated that any additional geologic data will need to be collected at this site.

R645-301-626 Sampling Waivers

CVM does not request a sampling waiver for this site.

R645-301-627 Description of the Overburden Thickness and Lithology

No mining or coal exploration will occur in the permit area.

R645-301-630 Operation Plan

R645-301-631 Casing and Sealing of Exploration Holes

No exploration holes will be drilled in the permit area.

R645-301-632 Subsidence Monitoring

Since there will be no mining or exploration at the CVM site, subsidence will not occur as a result of site operations. Therefore, a subsidence monitoring program is not required.

R645-301-640 Performance Standards

R645-301-641 Exploration and Drillholes

No coal exploration will occur in the permit area.

R645-301-642 Monuments and Surface Markers of Subsidence Monitoring Points

Since there will be no mining or exploration at the CVM site, subsidence will not occur as a result of existing site operations. Therefore, no subsidence monuments or surface markers are required.

REFERENCES

Witkind, I.J., M.P. Weiss, and T.L. Brown. 1987. Geologic Map of the Manti 30' x 60' Quadrangle, Carbon, Emery, Juab, Sanpete, and Sevier Counties, Utah. U.S. Geological Survey Miscellaneous Map Series I-1631. U.S. Geological Survey. Denver, Colorado.

APPENDIX 6-1

SUMMARY OF PRIOR WASTE ROCK ANAYLSIS

WASTE ROCK CHEMICAL AND PHYSICAL PROPERTIES

Lithology	Chemical Test	Physical Test	Ca Meq/L	Mg Meq/L	Na Meq/L	SAR[1]	Fe ppm	Zn ppm	SO_4 ppm	Mo ppm	B ppm	pH Paste	E.C.[2] mhos/cm	Sat. %	Pyrite FeS_2	Sand %	Silt %	Clay %	Rock Texture
	CHEMICAL TESTS													PHYSICAL TESTS					
Blackhawk Formation:																			
Sandstone:	26	2																	~~Sandy~~
Mean			4.37	8.18	2.13	1.05	8874	11.47	409.6	.1	.06	8.0	1.55	21.7	-	84.5	11.0	4.5	Loamy sand
S.D.			3.91	5.13	1.08	0.69	6672	9.7	353.1	0.0	.06	0.96	0.89	3.36	-	0.71	1.41	2.12	
Siltstone:	24	5																	Sandy
Mean			3.06	6.24	2.30	1.69	14512.88	38.26	464.41	.1	0.18	7.88	1.41	20.81	2.3	71.6	17.8	10.6	Loam
S.D.			2.63	7.23	2.78	3.72	8782.4	21.29	1222.63	0.0	0.16	1.08	1.72	1.82	0.0	23.5	16.57	7.7	
Mudstone:	24	4																	Sandy
Mean			3.12	3.13	4.70	4.28	11074.13	70.31	233.96	.1	0.28	8.0	1.10	23.99	-	71.5	20.5	8.0	Loam
S.D.			2.36	2.89	12.76	12.58	5350.17	79.99	275.10	0.0	0.23	0.31	1.12	4.88	-	13.77	15.2	3.56	
Interbeds:	15	3																	Loamy
Mean			4.34	7.98	2.79	1.30	10982.13	21.58	346.95	.1	0.12	8.05	1.58	20.56	-	75.33	17.00	7.67	Sandy
S.D.			3.13	6.37	1.85	1.36	6584.59	9.97	359.46	0.0	0.11	0.23	0.92	1.33	-	7.64	9.54	3.06	
Carb-mudstone:	25	3																	Sandy
Mean			6.19	6.51	3.7	2.4	9933.76	58.04	438.86	.1	0.42	7.53	1.54	34.76	2.3	73.33	18.00	5.76	Loam
S.D.			4.85	8.42	4.85	3.98	6112.12	38.94	378.81	0.0	0.34	0.85	1.14	9.94	3.29	20.60	16.82	3.53	
Coal (Blind Canyon)	8	0																	
Mean			1.55	1.81	1.68	1.63	2089.38	10.19	103.88	.1	.06	8.0	.36	60.66	0.44				
S.D.			0.59	2.88	1.35	1.27	2557.56	8.82	66.88	0.0	.05	0.25	.05	18.59	0.06				
Coal (Hiawatha)	2	0																	
Mean			1.52	2.85	1.41	1.58	2532.41	10.82	97.32	.1	0.12	7.95	0.34	60.24	0.51				
S.D.			0.66	3.64	0.95	1.18	2718.02	8.41	72.14	0.0	0.21	0.24	0.07	16.84	0.06				
Starpoint Sandstone																			
Sandstone	11	4																	Sandy ~~Loam~~
Mean			5.14	8.58	3.42	3.57	3798	9.47	1457.0	.1	0.11	6.76	2.49	30.46	-	90.75	4.75	4.50	
S.D.			3.89	4.69	2.97	5.18	2965.0	6.98	2578.0	0.0	0.24	1.54	1.20	4.8	-	4.80	3.50	1.91	

1 SAR = Sodium Absorption Ration
2 EC - Electrical Conductivity

Div. of Oil, Gas & Mining
AUG 1 1 '00
INCORPORATED

DEER CREEK MINE
WASTE ROCK MATERIAL
ANALYSIS[1]

SAMPLE	pH	EC	% $CaCO_3$	SAR	% SAND	% SILT	% CLAY	TEXTURE CLASS	BORON (mg/kg)	SELENIUM (mg/kg)	% ROCK FRAGMENTS	SATURATION %	% SULFUR NON-SULFATE	% SULFUR PYRITIC	ORGANIC
1-82988[2]	7.43	5.12	26.3	5.0	55.3	23.3	21.4	SCL	1.2	0.098	88.8	30.6	0.31	0.03	0.28

1- Analysis completed according to methods identified in DOGM Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining.

2- Sample is a representative sample composited from five (5) sample sites.

INCORPORATED
AUG 11 '
Div. of Oil, Gas & Mining

NPI Soil Testing/Plant Tissue Analysis Lab
417 Wakara Way, Salt Lake City, Utah 84108
Von Isman (801) 582-0144

TOTAL P. 2

R645-301-700
HYDROLOGY
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R645-301-700 HYDROLOGY

R645-301-710 Introduction

R645-301-711 General Requirements

This chapter was prepared by the applicant, Castle Valley Mining, LLC ("CVM"), and presents a description of:

- Existing hydrologic resources within the permit and adjacent areas;
- Proposed operations and the potential impacts to the hydrologic balance;
- Methods of compliance with design criteria;
- Applicable hydrologic performance standards; and
- Hydrologic reclamation plans for the CVM waste rock site (the "CVM site" or the "site").

R645-301-712 Certification

All appropriate maps, plans, and cross sections presented in this chapter have been certified by a qualified, registered professional engineer.

R645-301-713 Inspection

Impoundments associated with the operations discussed herein will be inspected as described in Section 514.300 of this application.

R645-301-720 Environmental Description

R645-301-721 General Requirements

This section presents a description of the pre-operational hydrologic resources within the permit and adjacent areas that may be affected or impacted by the operation and reclamation of the site.

R645-301-722 Cross Sections and Maps

R645-301-722.100 Location and Extent of Subsurface Water

A generalized hydrostratigraphic cross section of the region is presented in Figure 7-1. As indicated in Chapter 6 of this application, Rocks exposed on the surface of the permit area are marine-derived mudstones in the lower portion of the Masuk Member of the Mancos Shale. A test hole drilled at the site of the existing waste rock pile encountered groundwater at a depth of 33 feet below ground surface (see Appendix 5-3). The static water level was reported at a depth of 23 feet below ground surface in this hole. The subsurface material at this location was report as being "relatively impervious" in the upper 43 feet of the boring, with a hydraulic conductivity that ranged from 347 to 763 feet per year (1.0 to 2.1 ft/day) in the zone from 43 to 82 feet below ground surface).

It is assumed that groundwater occurs continuously beneath the site. Groundwater in the area is recharged by infiltration of local precipitation. However, given the low permeability of the shale that occurs on the surface, this groundwater is not available for beneficial use. Energy West installed a monitoring well at the site in 1989 at the location indicated on Plate 7-2 and has monitored this well continuously since that time. A completion log of this well is provided in Appendix 7-1. Additional information regarding the data collected from that well is provided in Section 724.100 of this application.

R645-301-722.200 Location of Surface Water Bodies

A map showing the location of surface water bodies in the area is provided in Plate 7-4. No surface water bodies exist within the permit area. However, the map shows the following nearby surface water bodies:

- An evaporation pond located southwest of the permit area and maintained by Rocky Mountain Power Company in conjunction with the nearby Huntington Power Plant.
- A small evaporation pond located east of the permit area adjacent to the coal-blending site operated by Rocky Mountain Power Company. This pond is located approximately 100 feet higher in elevation than the existing waste rock site and is, therefore, not in an area that could be impacted by site operations.
- Huntington Creek, which flows from northwest to southeast immediately south of the permit area.

R645-301-722.300 Locations of Monitoring Stations

Energy West installed a monitoring well in 1989 at the location shown on Plate 7-2 to monitor groundwater near the waste rock pile. The location of this monitoring well was selected in consultation with DOOM.

No perennial surface water bodies exist in the permit area. Thus, no surface water monitoring stations have been established for this site.

As indicated in Section 742.200, a sedimentation pond has been constructed on the west side of the existing waste rock pile. This pond was designed as a total containment structure, with the ability to contain twice the amount of runoff expected from a 100-year, 24-hour event. Hence, since discharge from the pond does not occur, the pond is not monitored.

R645-301-722.400 Location and Depth of Water Wells

No water-supply wells currently exist in the permit area. A search of files maintained by the Utah Division of Water Rights also indicated that no water-supply wells are located in Sections 5 and 6 of T. 17 S., R. 8 E. (i.e., the general vicinity surrounding the permit area).

R645-3001-722.500 Surface Topography

Surface topographic features in the permit and adjacent areas are shown on Plate 5-1. The surface contour data presented on this plate were developed by an aerial survey conducted on September 26, 2014 by Aero-graphics. The 2-foot contour interval of this map is sufficient to clearly show surface topography and slope within the permit and adjacent areas.

R645-301-723 Sampling and Analysis

The monitoring well located in the permit area was installed by Energy West in 1989 and has been monitored on a quarterly basis since that time. All samples have been collected and analyzed in accordance with standard procedures and in accordance with the requirements of R645-301-723. Given the extensive data base generated by monitoring this well over a 25-year period, continued quarterly monitoring of this well is considered unnecessary. However, at the request of the Division, CVM will continue to monitor this well quarterly prior to abandonment of the well at the beginning of site reclamation. Proposed parameters to be analyzed are listed in Table 7-1.

R645-301-724 Baseline Information

Surface water, groundwater, and climatic resource information is presented in this section to assist in determining the baseline hydrologic conditions which exist in the permit area. This information provides background data on the hydrologic balance of the area.

R645-301-724.100 Groundwater Information

Groundwater in the permit area exists in shale weathered from the Masuk Member of the Mancos Shale. Groundwater in the area is recharged by infiltration of local precipitation. Data collected from the on-site monitoring well, as downloaded from the Division of Oil, Gas and Mining web site, are provided in Appendix 7-2. As indicated therein, groundwater at the site is saline, with an average total dissolved solids concentration of approximately 18,400 mg/l during the 25-year monitoring period. As would be expected for groundwater occurring in gypsiferous shale, the predominant anion in groundwater at the site is sulfate. The dominant cation is sodium.

Appendix 7-2 shows concentration trends for sulfate, sodium, and total dissolved solids during the period of record. As indicated, concentrations of these constituents have been generally decreasing during the past 25 years. Hence, it is reasonable to conclude that storage of waste rock at the site has not adversely impacted groundwater quality.

As indicated in Section 722.100, the Masuk Member is only minimally permeable. Given the low permeability of the shale in which groundwater occurs and the saline nature of this groundwater, groundwater in the permit area is poorly suited for domestic, irrigation, or other beneficial uses.

R645-301-724.200 Surface Water Information

The CVM site is located on land that drains to the south toward Miller Creek, located approximately 3,000 feet south of the waste rock pile. No perennial streams are located in the permit area. Drainage in the area occurs as overland flow or in ephemeral washes that flow only in direct response to precipitation events.

Huntington Creek is a perennial tributary of the San Rafael River. The U.S. Geological Survey maintained a stream gaging station on Huntington Creek from May 1909 to October 1979 at location approximately 800 feet south of the intersection of the site access road with State Route 31. Data downloaded from the USGS National Water Information System[1] collected from this gaging station are provided in Appendix 7-3. These data indicate that the average annual streamflow of Huntington Creek during the 70-year period of record was 109.0 cubic feet per second ("cfs"). Average monthly streamflow during this period of record ranged from a low of 28 cfs (during the months of December and January) to a high of 33 cfs (during the month of May). The peak flow recorded at this gaging station was 2,500 cfs on August 2, 1930. Annual peak flows on Huntington Creek generally occurred in May/June due to snowmelt runoff or in August/ September due to high-intensity thunderstorms.

Published water quality data for the San Rafael River basin indicate that the quality of surface water decreases as it flows from the Wasatch Plateau toward the Green River. This decrease is attributed to the presence of soluble minerals in the surrounding rocks (principally the Mancos Shale), saline soils, and irrigation return flows. Typical TDS values are 150 to 300 mg/L in the upper reaches of Huntington Creek, 2,000 to 2,600 mg/L near Huntington, and 4,000 to 5,500 mg/L at the confluence with the San Rafael River, approximately 20 miles downstream from the permit area (Mundorff and Thompson, 1982).

http://nwis.waterdata.usgs.gov/nwis

R645-301-724.300 Geologic Information

Geologic information related to the permit and adjacent areas is presented in Chapter 6 of this document.

R645-301-724.400 Climatological Information

Data obtained from the Western Regional Climate Center indicate that average annual precipitation at Castle Dale (located about 12 miles south-southeast of the site) was 7.89 inches for the 115-year period of record from February 1899 through December 2014 (see Appendix 7-4). Nearly one-fourth of this precipitation normally occurs in the months of August and September due to summer thunderstorms. Annual precipitation at Castle Dale has ranged from a low of 3.29 inches in 1934 to a high of 14.28 inches in 1965. The maximum recorded daily precipitation occurred on August 28, 2007 with a rainfall depth of 2.15 inches.

The average annual temperature at the Castle Dale station during the period of record was 46.8° F. Seasonally, this temperature has varied from an average monthly minimum of 6.7° F in January to an average monthly maximum of 88.5° F in July. The lowest temperature recorded at Castle Dale (-35° F) was measured on February 10, 1933. This highest recorded temperature (107° F) was measured on July 13, 2002.

The station closest to the site that reports wind data is located at the Price-Carbon County Airport, Utah (approximately 23 miles northeast of the site). The average annual wind speed at this location between September 1998 and September 2008 was 6.9 mph (see Appendix 7-4). A maximum wind gust of 71 mph was recorded at the Price station on May 30, 1999.

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[2] www.wrcc.dri.edu

R645-301-724.500 Supplemental Information

No supplemental information is required at this time.

R645-301-724.600 Survey of Renewable Resource Lands

The existence and recharge of aquifers in the permit and adjacent areas is discussed in Sections 722.100 and 724.100 of this document.

R645-301-724.700 Alluvial Valley Floor Requirements

Information regarding the presence or absence of alluvial valley floors in the permit and adjacent areas is presented in Chapter 9 of this document.

R645-301-725 Baseline Cumulative Impact Area Information

Information concerning the hydrology of the region is available in various publications, including Mundorff and Thompson (1982), Waddell etal. (1981), and Gloyn et al. (2003). Since the hydrologic impact of the operations will be insignificant, it is not anticipated that revisions will be needed to the Cumulative Hydrologic Impact Assessment of the area.

R645-301-726 Modeling

No numerical groundwater or surface water modeling was conducted in support of this document.

R645-301-727 Alternative Water Source Information

No surface mining has been or will be conducted in the permit and adjacent areas. Therefore, this section does not apply to the CVM site.

R645-301-728 Probable Hydrologic Consequences

This section addresses the probable hydrologic consequences of waste rock storage and reclamation operations in the permit and adjacent areas. Mitigating measures are discussed generally in this section and as well as in Section 730 of this document.

R645-301-728.100 Potential Impacts to Surface and Groundwater

It is anticipated that waste rock storage and reclamation operations at the site will not adversely impact the quality and quantity of surface and groundwater in the area. This conclusion is based on the facts that no perennial surface-water sources exist within the permit area, that erosion and sediment yield are adequately controlled through on-site practices, and that the natural quality and quantity of groundwater in the area precludes its beneficial use. Additional information regarding the potential hydrologic impacts of coal recovery and reclamation operations at the site is addressed in the following sections of this document.

R645-301-728.200 Baseline Hydrologic and Geologic Information

Baseline geologic information is presented in Chapter 6 of this document. Baseline hydrologic information is presented in Sections 724.100 and 724.200 of this document.

R645-301-728.300 PHC Determination

Potential Impacts to the Hydrologic Balance. Potential impacts to the hydrologic balance are addressed in the following subsections of this document.

Acid- or Toxic- Forming Materials. As noted in Section 623 of this application, the waste rock is neither acid- nor toxic-forming. Thus, no impacts will occur at the site due to the presence of acid- or toxic-forming materials.

Sediment Yield. The potential impact of waste rock storage and reclamation on sediment yield is an increase in sediment in the surface waters downstream from disturbed areas. Sediment- control measures (such as a sedimentation pond, silt fencing, drainage ditches, etc.) have been designed and constructed to minimize this impact. All runoff from the facility is directed toward the on-site sedimentation pond, straw wattles, or silt fences, thereby capturing sediment and precluding its off-site discharge. The sedimentation pond is designed as a total containment structure. Nonetheless, this pond contains an emergency spillway to control discharge in the unlikely event that the pond overflow. All runoff controls will be regularly inspected (see Section 514) and maintained.

Planned reclamation practices include leaving the surface of reclaimed areas in a roughened state. This practice will enhance moisture retention and revegetation success, thereby reducing post-reclamation sediment yields to levels that are substantially lower than would naturally occur on the site under pre-operations conditions (see Appendix 7-5). Hence, activities at the site will greatly minimize the potential for off-site impacts from sediment.

Acidity, Total Suspended Solids, and Total Dissolved Solids. Probable impacts of operations on the acidity and total suspended solids concentrations of surface and groundwater in

the permit and adjacent areas were addressed previously in this section. By retaining runoff on site, natural contributions of salinity to regional surface waters will also be reduced.

Flooding or Streamflow Alteration. The disturbed area is isolated from surrounding areas by runoff control structures such as straw wattles, silt fences, diversion ditches, and a sedimentation pond. Runoff from all disturbed areas flows to sediment controls prior to discharge to adjacent undisturbed drainages. Since no mining or exploration will occur at this site, there will be no impacts due to subsidence. Thus, impacts due to flooding or streamflow alteration will not occur.

Groundwater and Surface Water Availability. Runoff controls at the site will minimize impacts to adjacent surface resources. As noted in Section 724.200, impacts to groundwater are also considered to be insignificant due to a combination of limited groundwater resources, poor groundwater quality, and relatively impermeable geologic materials at the site. Furthermore, waste rock storage and reclamation operations will use only limited amounts of water (primarily for dust suppression), thereby further minimizing potential adverse impacts to surface and groundwater.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbon products will be used at the site for equipment operation. Diesel will either be transported to the site in a mobile fueling truck or stored in a temporary above-ground tank that will be provided with secondary containment. Spills onto the ground have the potential to occur during filling of the storage tank or filling of mobile equipment. Similarly, spills of grease and oil may potentially occur during use at the site.

The probable future extent of the contamination caused by diesel and oil spillage is expected to be small for four reasons. First, any on-site storage will be temporary. Second, any tanks or drums stored on site will be provided with secondary containment structure that prevent leaks from reaching the ground. Third, spills caused by filling operations outside of the secondary containment structures will be minimized due to the

economic value of the product. Fourth, because filling operations and potential on-site storage will all occur above ground, leakage from these operations will be readily detected and mitigated.

Road Salting. No salting of the haul road occurs within the permit area. Hence, no impact will result from this action in the permit or adjacent areas.

Coal Haulage. No, coal will be hauled to this site.

R645-301-729 Cumulative Hydrologic Impact Assessment (CHIA)

Information is provided in this application that will allow DOGM to update a Cumulative Hydrologic Impact Assessment if necessary.

R645-301-730 Operation Plan

R645-301-731 General Requirements

This permit application includes an operation plan which addresses the following:

- Groundwater and Surface Water Protection and Monitoring Plan
- Design Criteria and Plans

- Performance Standards
- Reclamation Plan.

R645-301-731.100 Hydrologic-Balance Protection

Groundwater Protection. As indicated in Section 623, neither acid- nor toxic-forming materials are present in the permit area. Furthermore, groundwater quality data collected from an on-site monitoring well since 1989 indicate that the salinity of groundwater at the site has been decreasing during the past 25 years. Since the operations consist of waste rock pile and eventual reclamation of the site, CVM operations will not adversely impacted groundwater quality.

Surface Water Protection. A runoff control plan has been implemented to minimize, to the extent possible, additional contributions of suspended solids to streamflow outside the permit area, and otherwise prevent water pollution. CVM will maintain adequate runoff- and sediment- control facilities to protect local surface waters during coal recovery and reclamation operations at the site.

R645-301-731.200 Water Monitoring

Groundwater Monitoring. Energy West installed one groundwater monitoring well within the permit area in 1989. Monitoring of this well will occur as outlined in Section 723.

Surface Water Monitoring. No intermittent or perennial streams exist within permit area. The sedimentation pond at the site is designed for total containment. Therefore, no surface water monitoring will be conducted in conjunction with this application.

R645-301-731.300 Acid- and Toxic-Forming Materials

As noted in Section 623 of this application, the waste rock is neither acid- nor toxic-forming. Thus, no acid- or toxic-forming materials exist on the site.

R645-301-731.400 Transfer of Wells

No wells exist at the facility.

R645-301-731.500 Discharges

No discharges will occur into, from, or within underground mines in the permit area. Operations at the site will be conducted in a manner that precludes contamination, diminishment, or interruption of State-appropriated water supplies.

R645-301-731.600 Stream Buffer Zones

No operations in the permit area will be conducted within 100 feet of any perennial or intermittent stream channels. Thus, no buffer zones have been designated.

R645-301-731.700 Cross Sections and Maps

Maps showing the locations of appropriated points of diversion for current users of surface water in the general area are provided in Appendix 7-6. These maps and the associated data were downloaded from the Utah Division of Water Rights web site.[3]

[3] http://www.waterrights.utab.gov/wrinfo/default.asp

Plate 7-1 shows the location and cross sections of the existing sedimentation pond as well as the location of an emergency spillway on the sedimentation pond. It is not anticipated that water will discharge from the sedimentation pond since it is designed as a total containment structure.

The locations of ditches and culverts used to divert water at the site are shown on Plate 7-2. The location of the site monitoring well is noted on Plate 7-2. No other water monitoring stations exist in the permit and adjacent areas.

R645-301-731.800 Water Rights and Replacement

CVM will replace the water supply of an owner of interest in real property who obtains all or part of his or her supply of water for domestic, agricultural, industrial, or other legitimate use from an underground or surface source, where that supply has been adversely impacted by contamination, diminution, or interruption proximately resulting from activities conducted by CVM in the permit area.

R645-301-732 Sediment Control Measures

The existing sediment control measures within the permit area have been designed, constructed, and maintained to prevent additional contributions of sediment to streams or to runoff outside the permit area. In addition, they have been designed to meet applicable effluent limitations, and minimize erosion. The structures that control runoff at the site include diversion channels, a sedimentation pond, containment berms, straw wattles, silt fences, and road diversions and culverts.

R645-301-732.100 Siltation Structures

The siltation structures within the permit area consist of the sedimentation pond described in Section 732.200.

R645-301-732.200 Sedimentation Ponds

A sedimentation pond was constructed by Energy West immediately west of the waste rock pile as indicated on Plate 7-1. This pond was designed as a total-containment structure (see Section 742.200). Thus, runoff collected in this pond is allowed to evaporate or percolate into the ground. Sediment that accumulates in the ponds will be removed as needed. Runoff may be pumped out of the sediment pond and used for dust suppression in accordance with the air quality permit. If used, this water will be applied to non-paved areas within the disturbed-area boundary. As such, any excess water applied for dust suppression will be captured by sediment controls that have been installed at the site (i.e., the sedimentation pond, straw wattles, or silt fences).

Compliance Requirements. The sedimentation pond will be maintained until the site is reclaimed. The sedimentation pond was designed to contain sediment in addition to the runoff resulting from two back-to-hack 100-year, 24-hour storm events. The spillway on the sedimentation pond was designed to adequately pass the peak flow resulting from the 100-year, 24- hour precipitation event.

MSHA Requirements. The sedimentation pond at the site does not meet the size criteria of MSHA requirements defined in 30 CFR 77.216.

R645-301-732.300 Diversions

The objective of the runoff control plan is to isolate, to the maximum degree possible, runoff from disturbed areas. All diversion ditches are maintained with adequate erosion protection in the ditch sections where flow velocities are great enough that a ditch lining is necessary. Adequate ditch capacities are maintained in all ditch sections. Culverts are kept free of debris. Detailed diversion design information is presented in Section 742.

R645-301-732.400 Road Drainage

Road drainage facilities include diversion ditches and culverts. Additional road drainage design information is presented in Section 742. All road drainage systems will be maintained and repaired as needed following the occurrence of a large storm event. Culvert inlets and outlets will be kept clear of sediment and other debris.

R645-301-733 Impoundments

R645-301-733.100 General Plans

One sedimentation pond has been constructed at the site as described above.

Certification. Maps and cross sections of the sedimentation pond have been prepared by or under the direction of and certified by a qualified, registered, professional engineer.

Maps and Cross Sections. The topography and cross sections for the sedimentation pond are located on Plate 7-1.

Narrative. A description of the sedimentation pond is presented in Sections 732.200 and 742 of this document.

Subsidence Survey Results. Since no mining occurs at the site, a subsidence survey is not presented.

Hydrologic Impact. The hydrologic and geologic information required to assess the hydrologic impacts of the impoundments can be found in Section 724 and Chapter 6, respectively.

Design Plans and Construction Schedule. No additional impounding structures are proposed for construction at the site. Designs of all existing structures are described in this document.

R645-301-733.200 Permanent and Temporary Impoundments

Requirements. The only impoundment at the site consists of the one sedimentation pond. This pond is a temporary impoundment. The pond was designed and constructed using current, prudent, engineering practices. Since the pond was constructed below grade, it is considered stable. Specific hydrologic design criteria for this pond are presented in Section 743. The pond will be inspected regularly based on the schedule contained in Section 514.300. The sedimentation pond meets the requirements of the rules concerning temporary impoundments.

Hazard Notifications. The sedimentation pond will be examined for structural weakness and erosion at least four times per year.

R645-301-734 Discharge Structures

The only discharge structure at the site consists of the emergency spillway on the sedimentation pond. Since the pond was designed as a total-containment structure, discharges from the pond are not anticipated. This discharge structure is further described in Section 744.

R645-301-735 Disposal of Excess Spoil

No excess spoil is generated at the facility.

R645-301-736 Coal Mine Waste

The existing waste-rock pile complies with the requirements of R645-301-746.

R645-301-737 Noncoal Mine Waste

Non-coal mine waste is not stored or disposed of on site (see Chapter 5).

R645-301-738 Temporary Casing and Sealing of Wells

The groundwater monitoring well at the site was constructed in compliance with R645-301-748.

R645-301-740 Design Criteria and Plans

R645-301-741 General Requirements

The criteria set forth in R645-301-740 were used to design structures to control drainage from disturbed and undisturbed areas at the CVM site. Details regarding hydrologic design methods and calculations operational period are presented in Appendix 7-7. It should be noted that the design information presented in Appendix 7-7 was prepared by CVM based on the assumption that the waste rock pile would eventually be larger than under its current configuration. Thus, these calculations assumed that two sedimentation ponds and associated drainage structures would be constructed. Therefore, the reviewer should ignore the information provided in Appendix 7-7 concerning structures that were not built.

It should be noted that some of the statements in Appendix 7-7 may leave the reader with the impression that sediment control measures other than the sedimentation pond are not needed at the site. For instance, page 4-11 of Appendix 7-7, speaking of the original Phase 1 site design (i.e., the phase occupied by the existing waste rock pile), states that "all runoff will be drained to the basin on the west end of the site." The use of the word "all" is obviously an over-simplification that refers to runoff from the top of the pile as well as runoff that collects on the inside of the soil storage berm. Runoff from the east side of the waste rock pile and the outside of the soil storage berm is not and never was directed to the sedimentation pond. As a result, alternate sediment controls (straw wattles and silt fences) have been and will continue to be used in these areas to retain sediment within the disturbed area. For these reasons, the reader is encouraged to exercise reasonable judgement when reviewing specific statements in Appendix 7-7. Nonetheless, the design information related to the existing sedimentation pond and the existing diversions is considered applicable to this permit application.

R645-301-742 Sediment Control Measures

R645-301-742.100 General Requirements

Design. Existing sediment control measures have been designed, constructed, and maintained to:

- Prevent additional contributions of sediment to stream flow or to runoff outside the permit area,
- Meet the effluent limitations defined in R645-301-751, and
- Minimize erosion to the extent possible.

Measures and Methods. The sediment control measures at the facility include:

- Retention of sediment within the disturbed area;
- Diversion of runoff using channels or culverts through disturbed areas to prevent additional erosion; and
- Provide riprap, a sedimentation pond, silt fencing, and other measures that reduce overland flow velocities, reduce runoff volumes, or trap sediment.

R645-301-742.200 Siltation Structures

General Requirements. Additional contributions of suspended solids and sediment to stream flow or runoff outside the permit area is being prevented to the extent possible using a sedimentation pond as a siltation structures. This pond located immediately west of the existing waste rock pile. This structure has been certified by a qualified registered professional engineer and was designed, constructed, and will be maintained as described in Chapter 5 and Sections 733 and 743. Sediment yields from areas that do not flow to the sedimentation pond will be controlled using silt fences and straw wattles as indicated below in the subsection entitled "Exemptions."

Sedimentation Ponds. The sedimentation pond was designed to receive runoff from the waste rock pile and its immediate vicinity. The pond is not located in a perennial stream channel.

Sediment Storage Volume. The sedimentation pond was designed to contain 0.1 acre-foot of sediment for each acre drained. Thus, with a design watershed area of 9.8 acres, the pond was constructed with a sediment storage volume of 0.98 acre-foot (42,690 cubic feet). As indicated on Plate 7-1, this sediment storage volume corresponds to an elevation of 6313.45 feet.

Detention Time. The sedimentation pond was designed as a retention pond that will contain all water that flows into it without discharging, thereby meeting applicable effluent limitations. Water may be periodically pumped from the ponds and used for dust suppression within the permit area.

Design Runoff Event. The sedimentation pond is designed to fully contain its inflow. The drainage characteristics, including contributing area, runoff curve number, and hydraulic length for the operational period were calculated as shown in Appendix 7-7. As indicated therein, the runoff storage volume resulting from a 100-year, 24-hour precipitation event was calculated to be 1.11 acre-feet, with the design volume being twice that amount (2.22 acre-feet). However, as indicated on Plate 7-1, the pond was constructed with a runoff storage volume of 3.66 acre-feet above the design maximum sediment storage elevation. Thus, the storm-water storage pool in the pond actually exceeds three times the amount of runoff expected from the 100-year, 24-hour precipitation event.

Sediment Removal. Sediment will be removed from the pond when the sediment level reaches an elevation corresponding to 60% of the total sediment storage volume. As noted on Plate 7-1, the 60% clean-out elevation for the pond is 6312.7 feet. Sediment that contains an insignificant amount of coal will be placed in the waste rock pile.

Excessive Settlement. The sedimentation pond was excavated into natural soil. Excessive settlement has not been observed and, given the excavated construction, is not anticipated in the future.

Embankment Material. The sedimentation pond was excavated into natural soil and does not contain an embankment. The berms adjacent to the pond are soil stockpiles, not pond embankments.

Compaction. The sedimentation pond was excavated into natural soil and does not contain an embankment. Hence, no embankment materials were compacted.

MSHA Sedimentation Ponds. The sedimentation pond at the site does not meet the size criteria of MSHA requirements defined in 30 CFR 77.216.

Sedimentation Pond Spillways. The sedimentation pond is equipped with an emergency spillway to protect the pond in the extremely unlikely event that discharge occurs. The spillway is trapezoidal in cross section and measures approximately 2 feet deep and 3 feet wide with 2H:1V side slopes and a grouted riprap invert. The spillway was designed to safely discharge the peak flow resulting from the 100-year, 24-hour precipitation event (10.77 cfs) without consideration for routing of that flow through the pond (see Appendix 7-7). In the extremely unlikely event that the pond spills, this water will discharge into the unnamed ephemeral drainage adjacent to the south side of the permit area and along the west side of the site access road, eventually reaching Huntington Creek if it does not first infiltrate. Since the sedimentation pond can store sufficient volume to contain several years' worth of sediment yield and the runoff resulting from over three back-to-back-to-back 100-year, 24-hour precipitation events, it is extremely unlikely that the ponds will spill during CVM operations.

Other Treatment Facilities. No other water treatment facilities are located within the permit area.

Exemptions. Two alternate sediment control areas exist at the site (see Plate 7-2). ASCA-1 occupies 3.46 acres and exists on the outslopes of the waste rock pile and the soil stockpiles. Silt fences and straw wattles will be installed and maintained to control sediment yield from these outslopes. These materials will be installed in accordance with manufacturer's recommendations. Where practical, the soil in these areas has also been revegetated. The effectiveness of these methods at reducing sediment yields in ASCA-1 is further discussed in Appendix 7-8. The calculations in this appendix assume that runoff can discharge beyond

the silt fences and straw wattles even though this runoff is retained on the uphill side of those controls. Thus, no sediment is actually yielded from areas protected by these controls.

ASCA-2 consists of 0.73 acre of outslope on the site access road. The effectiveness of revegetation efforts on these outslopes is discussed in Section 321.200 and Appendix 3-2 of this application. The data presented therein indicate that revegetation of the road outslopes has resulted in ground cover that exceeds that in undisturbed areas. In May 2007, the Division of Oil, Gas and Mining acknowledged that vegetation had established to a point that it alone could control erosion and sedimentation. Approval was granted by the Division and the silt fence along the toe of the embankment fill of the access road was removed.

R645-301-742.300 Diversions

General Requirements. The diversions within the permit area consist of drainage ditches and culverts. All diversions within the permit area have been designed to minimize adverse impacts to the hydrologic balance, to prevent material damage outside the permit area, and to assure the safety of the public. They have been designed, located, constructed, maintained, and used to:

- Be stable
- Provide protection against flooding and resultant damage to life and property
- Prevent, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area
- Comply with all applicable local, state, and federal laws and regulations

All drainage ditches at the site were installed to divert undisturbed-area runoff away from disturbed areas. Culverts were installed to safely convey this water beneath the site access road.

Diversion of Perennial and Intermittent Streams. There are no diversions of perennial or intermittent streams in the permit area.

Diversion Ditches and Culverts. All diversion ditches adjacent to the waste rock pile were designed based on the peak flow resulting from the 100-year, 24-hour precipitation event. Those adjacent to the site access road were designed based on the peak flow resulting from the 10- year, 24-hour precipitation event. Manning's equation for open channels was used to determine the design flow depth and velocity in each channel. The designed channels are trapezoidal with 3H:1V side slopes and varying bottom widths. Riprap was sized as needed to ensure that the diversion ditches would be non-erosive (see Haan et al., 1994). A filter layer was constructed under the riprap channel lining materials. This filter consists of 2-inch minus road base material and is placed in a layer equal in thickness to that of the median diameter of the overlying riprap.

Calculations used in the design of drainage ditches for the operational period are presented in Appendix 7-7. A summary table of the geometry, channel slope, peak discharge erosion protection, maximum flow velocity, and minimum depth values for each diversion ditch and culvert at the facility is presented in Table 7-2. Refer to Plate 7-2 for the locations and typical cross section of each diversion ditch.

Ditches UD-1 through UD-4 divert runoff from undisturbed areas around the waste rock pile. Ditch UD-4 discharges into a pre-existing man-made channel that was constructed by Utah Power and Light Company to divert runoff around their evaporation pond located south of the permit area. This pre-existing channel is protected from the erosive forces of discharge from UD-4 by a rock apron consisting of the same size and distribution of rocks as the channel lining used in the ditch itself. The apron is fan shaped, 12 feet wide on the discharge side, and extends 15 feet from the end of the ditch (see Plate 7-2).

Ditches UD-5 through UD-7 are constructed along the east side of the site access road. These ditches drain to culverts that convey runoff beneath the road to the adjacent ephemeral channel. As indicated on Plate 5-1, these ditches were typically constructed with 3H:1V side slopes adjacent to the road and 1.5H:1V side slopes on the opposite bank.

The ditches are generally 1 foot deep.

Six culverts were installed in the permit area along the site access road. Each culvert consists of 18-inch diameter corrugated metal, installed at the locations shown on Plate 7-2. Rock aprons were installed to dissipate energy from the culvert discharge in areas where a table channel does not exist at the culvert outlet. The design of these rock aprons is shown on Plate 7-2.

R645-301-742.400 Road Drainage

Drainage control along the site access road includes the use of diversion ditches and culverts. This road is not located in the channel of an intermittent or perennial stream. As noted on Plate 5-1, the surface of the access road was constructed to drain. All roads have been located to minimize downstream sedimentation and flooding. Diversion ditches and culverts for al1 roads are described in Section 742.300 above.

R645-301-743 Impoundments

The existing impoundment within the permit area consists of one sedimentation pond along the western boundary of the waste rock pile. Pertinent information regarding this pond is presented in Sections 732.200 and 742.200.

R645-301-744 Discharge Structures

R645-301-744.100 Erosion Protection

As indicated in Section 742.200, a spillway was constructed on the sedimentation pond to safely discharge the peak flow resulting from the 100-year, 24-hour precipitation event in the extremely unlikely event that such a discharge would occur (since the pond was

designed as a total containment structure). As noted on Plate 7-1, this spillway was designed with roughness elements to dissipate the energy associated with any outflowing water.

Rock aprons (see Plate 7-3) have been installed where channel UD-4 discharges into a pre- existing man-made channel and at locations where culverts discharge onto unstable areas. The purpose of these rock aprons was to dissipate energy at the points of discharge.

R645-301-744.200 Design Standards

All discharge structures within the permit area were designed and constructed according to standard engineering design procedures.

R645-301-745 Disposal of Excess Spoil

No excess spoil is generated or disposed of within the permit area.

R645-301-746 Coal Mine Waste

R645-301-746.100 General Requirements

Additional waste rock will be placed within the footprint of the existing waste rock pile. By placing this material within the existing footprint (i.e., within the area that is currently designed to control off-site impacts), in a manner that minimizes adverse impacts to surface and groundwater quantity and quality.

R645-301-746.200 Refuse Piles

As indicated on Plate 5-1, a wet-weather seep exists beneath the existing waste rock pile. A drainage system was installed to divert the water from this seep prior to placement of the soil stockpile and the waste rock. This diversion system consists of a 4-inch diameter

perforated drain pipe around which an envelope of 2-inch rock was placed at a thickness of 12 inches. The rock envelope was wrapped in a non-woven filter fabric and then covered with 12 inches of clay prior to placing the waste rock fill.

Runoff from the waste rock pile will either flow to the sedimentation pond or be controlled from off-site discharge by temporary pollution-prevention methods such as silt fences, soil berms, straw wattles, etc. Specifically, a berm will be maintained along the outside of the waste rock pile as it is excavated. This berm will continue to direct surface runoff from the top of the pile toward the sediment pond as indicated in Figure 7-5. Some surface runoff may collect locally in excavations, but the peripheral berm will keep water from discharging from the top of the pile to locations outside of the disturbed area boundary. Silt fences and straw wattles will be maintained during coal recovery operations at the downstream edge of ASCA-1 (shown on Plate 7-2) to continue providing sediment control in areas that cannot flow to the sedimentation pond.

R645-301-746.300 Impounding Structures

No impounding structures will be constructed of coal mine waste or used to impound coal mine waste within the permit area.

R645-301-746.400 Return of Coal Processing Waste to Underground Workings

No underground workings are located at this facility. No reject from coal recovery operations will be returned to underground workings.

R645-301-747 Disposal of Noncoal Mine Waste

Disposal of non-coal waste is discussed in Section 528.300 of this application.

R645-301-748 Casing and Sealing of Wells

The groundwater monitoring well at the site was cased and sealed at the surface to prevent potential acid or other toxic drainage from entering groundwater via the well. A steel cover protects the well and ensures the safety of people, livestock, wildlife, and machinery.

R645-301-750 Performance Standards

All operations and reclamation will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, prevent material damage to the hydrologic balance outside the permit area, and support approved post operations land uses.

R645-301-751 Water Quality Standards and Effluent Limitations

Discharges of water from disturbed areas will be in compliance with all applicable Utah and federal water quality laws and regulations and with applicable effluent limitations for coal mining contained in 40 CFR Part 434.

R645-301-752 Sediment Control Measures

All sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 732, 742, and 760.

R645-301-752.100 Station Structures and Diversions

Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 732, 742, and 763.

R645-301-752.200 Road Drainage

All roads were located, designed, constructed, reconstructed, and will be used, maintained and reclaimed according to plans and designs presented in Sections 732.400, 742.400, and 762. All roads have been designed to:

- Control or prevent erosion and siltation by maintaining or stabilizing all exposed surfaces in accordance with current, prudent engineering practices;
- Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;
- Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under Section 751.
- Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems;
- Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

R645-301-753 Impoundments and Discharge Structures

Impoundments and discharge structures are located, maintained, constructed and will be reclaimed as described in Sections 733, 734, 743, 745, and 760.

R645-301-754 Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste

Handling and disposal of coal mine waste and noncoal mine waste is described in Sections 736, 737, 746, 747, 760 and Chapter 5.

R645-301-755 Casing and Sealing of Wells

When no longer needed, the groundwater monitoring well in the permit area will be abandoned in accordance with R645-301-765 and the requirements of the Utah Division of Water Rights 760 Reclamation.

R645-301-761 General Requirements

A detailed reclamation plan for the facility is presented in Section 540 of this application. CVM will ensure that all temporary structures are removed and reclaimed. Permanent diversions will be maintained properly and will meet the requirements of the approved reclamation plan for permanent structures and impoundments.

The diversion channels that currently convey runoff around the north and west sides of the waste rock pile are subject to frequent maintenance (due to siltation of the channel as runoff is forced to make substantial changes in flow direction). Therefore, these channels will be removed as part of site reclamation. The channels shown on Plate 5-2 will be constructed during reclamation to more efficiently convey across the reclaimed site.

The design of the reclamation channels is detailed in Appendix 7-9 and summarized in Table 7-3. Reclamation channels were designed to safely convey runoff resulting from a 100-year, 24-hour precipitation event, with a trapezoidal shape and bottom widths varying from 0 (triangular) to 10 feet. All reclamation channels were designed with 2H:1V side slopes and a riprapped depth of 2 feet. A filter layer, consisting of minus 2-inch road-base gravel, will be installed in the Phase II reclamation channels between the riprap and the underlying native soil.

R645-301-762 Roads

The site access road will be reclaimed when it is no longer needed for site access. Reclamation of the road will include:

- Restoring natural drainage patterns
- Reshaping cut and fill slopes to be compatible with the post-mining land use and to complement the drainage patterns of the surrounding terrain.

R645-301-763 Siltation Structures

R645-301-763.100 Maintenance of Siltation Structures

The sedimentation pond and other siltation structures (i.e., silt fences, wattles, etc.) will be maintained until removed in accordance with the approved reclamation plan.

R645-301-763.200 Removal of Siltation Structures

The sedimentation pond will be retained until the refuse pile is reclaimed and gauged. Then the sediment pond will be removed.

R645-301-764 Structure Removal

A timetable for the removal of each structure is presented in Table 5-1.

R645-301-765 Permanent Casing and Sealing of Wells

When no longer needed, the groundwater monitoring well in the permit area will be abandoned in accordance with R645-301-765 and the requirements of the Utah Division of Water Rights.

REFERENCES

Gloyn, R.W., D.E. Tablet, B.T. Tripp, C.E. Bishop, C.D. Morgan, J.W. Gwynn, and R.E. Blackett. 2003. Energy, Mineral, and Groundwater Resources of Carbon and Emery Counties, Utah. Bulletin 132, Utah Geological Survey, Utah Department of Natural Resources. Salt Lake City, Utah.

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Mundorff, J.C. and K.R. Thompson. 1982. R connaissance of the Quality of Surface Water in the San Rafael River Basin, Utah. Technical Publication No. 72. Utah Department of Natural Resources. Salt Lake City, Utah.

Waddell, K.M., P.K. Contratto, C.T. Sumsion, and J.R. Butler. lYSl. Hydrologic Reconnaissance of the Wasatch Plateau-Book Cliffs Coal-Fields Area, Utah. Water-Supply Paper 2068. U.S. Geological Survey. Washington, D.C.

TABLE7-1

Proposed Groundwater Analytical List

Parameter
Field Measurements
Depth to water
Temperature
pH
Specific conductance
Laboratory Analyses
Bicarbonate as CaC03
Calcium
Carbonate as CaC03
Chloride
Iron, dissolved
Iron, total
Magnesium
Manganese, dissolved
Manganese, total
Nitrate/Nitrite as N
Potassium
Sodium
Sulfate
Total dissolved solids

TABLE7-2

Summary of Operational Drainage Ditch Design Data

Structure	Description	Peak Design Flow (cfsia)	Design Flow Depth (ft)	Design Flow Velocity (fps)	Design RiprapDso (in)
UD-1	Trapezoidal, 3:1side slopes, 2% channel slope, 1.5' deep, 2' bottom width	8.58	0.62	3.56	3.5
UD-2	Trapezoidal, 3:1side slopes, 2% channel slope, 1.5' deep, 3' bottom width	34.59	1.14	4.72	7
UD-3	Trapezoidal, 3:1side slopes, 2% channel slope, 1.5' deep, 4' bottom width	47.65	1.23	5.03	7
UD-4	Trapezoidal, 3:1side slopes, 4% channel slope, 1.5' deep, 5' bottom width	72.37	1.25	6.59	14
UD-5	Triangular, 3:1side inslope, 1.5: 1 outslope, 2% channel slope, 1' deep	4.29	0.74	3.52	None
UD-6	Triangular, 3:1side inslope, 1.5: 1 outslope, 2% channel slope, 1' deep	4.29	0.69	3.94	None
UD-7	Triangular, 3:1side inslope, 1.5: 1 outslope, 2% channel slope, 1' deep	4.29	0.76	3.33	None

Channels UD-1 through UD-4 were designed based on the peak flow from a 100-yr, 24-hr precipitation event; channels UD-5 through UD-7 were designed based on the peak flow from a 10-yr, 24-hr precipitation event (see Appendix 7-7).

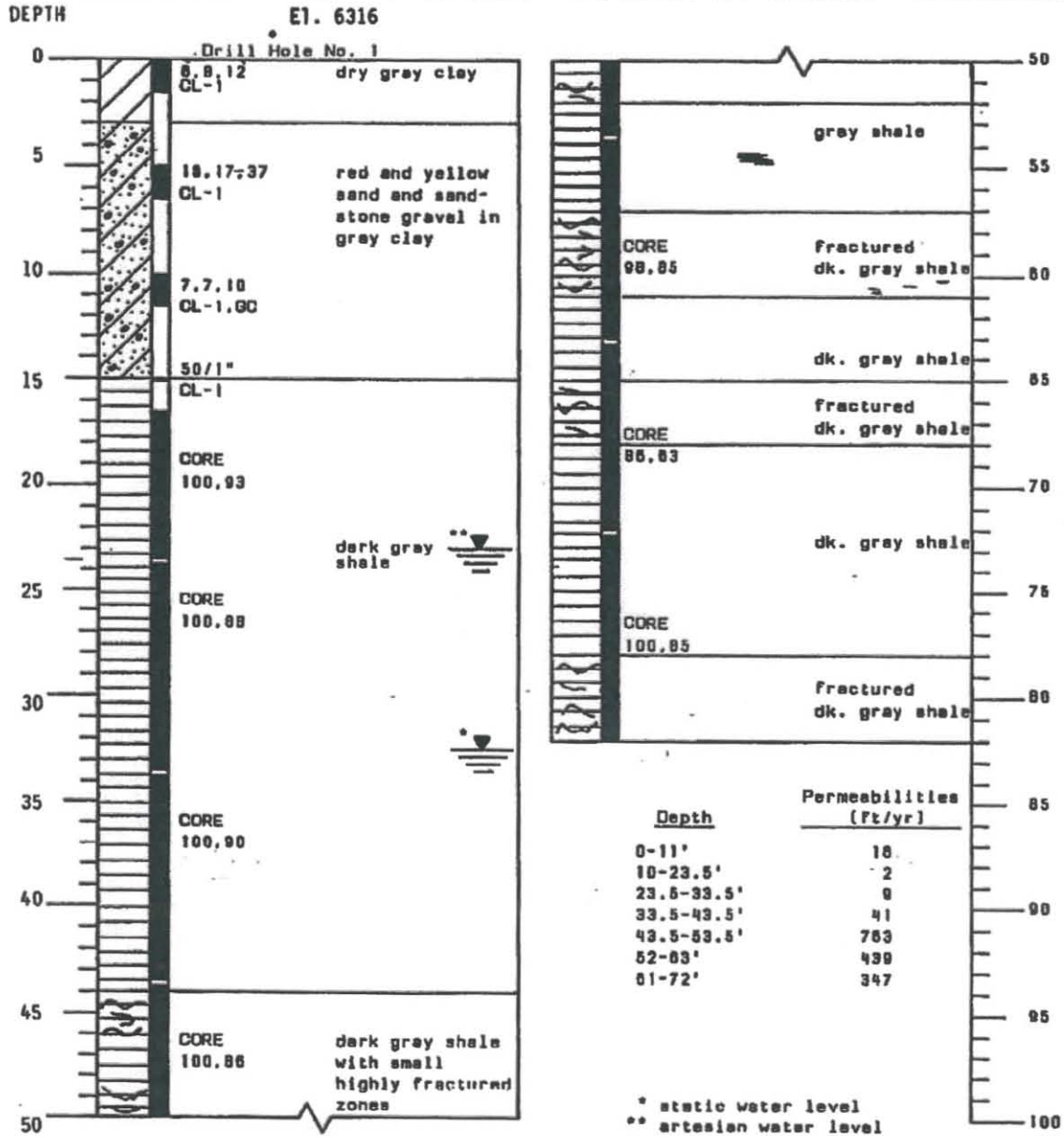
TABLE7-3

Reclamation Channel Design Summary

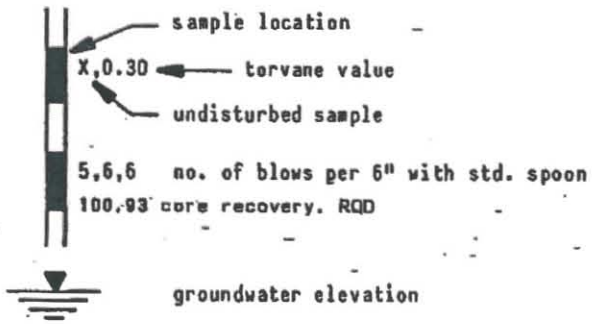
Reclamation Channel	Contributing Watershed (AC)	Bottom Width (ft)	Velocity 100-yr, 24-hr (fps)	Riprap D_{50} (in)
RC-1	1.78	2	1.23	0.75
RC-2	2.56	2	1.36	0.75
RC-3		3	1.04	0.75
RC-4	33.80	2	1.68	0.75
RC-5	32.80	3	1.66	0.75
RC-6	9.40	2	2.46	0.75
RC-7	2.30	3	1.19	0.75
RC-8	1.85	2	1.05	0.75
RC-9	1.85	2	1.05	0.75

APPENDIX 7-1

MONITORING WELL LITHOLOGIC LOG



LEGEND



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Log of Borings for:
Deer Creek Mine Waste Pile
Utah Power & Light

Figure No. 2

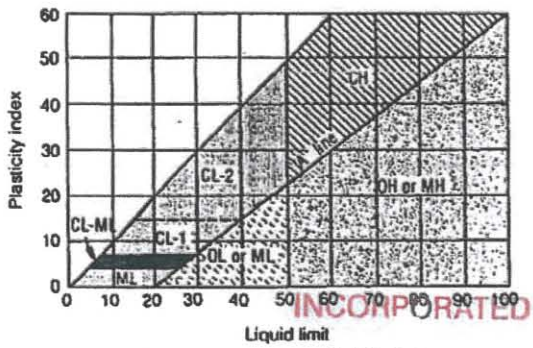
4-44

Unified Soil Classification System

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-grained Soils More than half of material is larger than No. 200 sieve	Gravels More than half of coarse fraction is larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM d u	Silty gravels, poorly graded gravel-sand-clay mixtures	Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures	Atterberg limits above "A" line, or PI greater than 7	
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines.	Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM d u	Silty sands, poorly graded sand-silt mixtures	Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring uses of dual symbols
			SC	Clayey sands, poorly graded sand-clay mixtures	Atterberg limits above "A" line, or PI greater than 7	
Fine-grained Soils More than half of material is smaller than No. 200 sieve	Silt and Clays Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity		
			CL 1 2	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silt-clays of low plasticity		
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
Highly Organic Soils			Pt	Peat and other highly organic soils		

Determine percentage of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

- Less than 5% ..... GW, GP, SW, SP
- More than 12% ..... GM, GC, SM, SC
- 5% to 12% ..... Borderline cases requiring use of dual symbols**



Plasticity Chart

For laboratory classification of fine-grained soils

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*Division of GM and SM groups into subdivisions of d and u for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when liquid limit is 28 or less and the PI is 6 or less, the suffix u used when liquid limit is greater than 28.

**Borderline classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.

Figure No. 4

APPENDIX 7-2

GROUNDWATER QUALITY DATA

SUMMARY OF DATA COLLECTED FROM THE
DEER CREEK WASTE ROCK SITE MONITORING WELL
(Data downladed from the Utah Division of Oil, Gas and Ming web site, 28 Jan 2015)

PARAMETER	FROM	TO	ANALYTICAL RESULTS									
			#	MEASURABLE				STANDARD DEVIATION				
				#	MINIMUM	AVERAGE	MAXIMUM	STD	-2 STD	-1 STD	+1 STD	+2 STD
Acidity as CaCO3	6/9/1998	9/3/2014	59	43	5	20.4	36	8.29	3.85	12.13	28.7	36.99
Ammonia as N	12/6/1989	12/6/2011	24	19	0	2.68	5.6	2.26	1.85-	0.41	4.94	7.2
Bicarbonate as CaCO3	12/14/2004	9/3/2014	40	40	426	649.2	700	46.05	557.1	603.15	695.25	741.3
Bicarbonate as HCO3	12/6/1989	9/9/2004	54	54	626	779.8	935	54.72	670.4	725.11	834.55	889.27
Carbonate as CO3	12/6/1989	9/9/2004	54	9	0	1.89	15	5.29	8.69-	3.40-	7.18	12.46
Carbonate as CaCO3	12/14/2004	9/3/2014	40	3	27	49.3	83	24.26	0.81	25.07	73.6	97.86
Cation/Anion Balance	12/13/2001	9/3/2014	52	52	5.000000-	1.26	10.4	3.03	4.79-	1.76-	4.29	7.32
Chloride	12/6/1989	9/3/2014	94	94	17	776.8	1200	187.92	400.97	588.88	964.72	1152.64
Depth	5/19/1989	9/3/2014	97	97	2.99	9.28	29.40	5.62	1.95-	3.66	14.89	20.51
Dissolved Aluminum	4/2/1996	12/6/2011	16	0	0	0	0	0	0	0	0	0
Dissolved Arsenic	4/2/1996	12/6/2011	16	2	0.011	0.016	0.02	1.68	3.34-	1.66-	1.69	3.37
Dissolved Boron	4/2/1996	12/6/2011	16	16	0.78	0.96	1.3	0.35	0.26	0.61	1.32	1.67
Dissolved Cadmium	4/2/1996	12/6/2011	16	1	0.004	0.004	0.004	0	0	0	0	0
Dissolved Calcium	4/2/1996	9/3/2014	69	69	4	109.8	150	17.01	75.82	92.83	126.84	143.85
Dissolved Chromium	4/2/1996	12/16/1996	4	0	0	0	0	0	0	0	0	0
Dissolved Copper	4/2/1996	12/6/2011	16	4	0.01	0.015	0.03	2.06	4.11-	2.05-	2.08	4.14
Dissolved Iron	12/6/1989	9/3/2014	87	22	0.0011	0.138	0.61	0.33	0.53-	0.19-	0.47	0.8
Dissolved Lead	4/2/1996	12/6/2011	15	0	0	0	0	0	0	0	0	0
Dissolved Magnesium	4/2/1996	9/3/2014	69	69	2	159.2	216	36.64	85.88	122.53	195.82	232.46
Dissolved Manganese	4/2/1996	9/3/2014	69	42	0.002	0.013	0.044	0.93	1.85-	0.97-	0.95	1.88
Dissolved Molybdenum	4/2/1996	12/6/2011	16	4	0.008	0.02	0.03	0.48	0.95-	0.46-	0.5	0.99
Dissolved Oxygen (field)	12/6/1989	12/4/2008	20	20	1.2	3.8	6.8	1.62	0.56	2.19	5.43	7.05
Dissolved Potassium	4/2/1996	9/3/2014	68	68	1	15.2	29.6	4.46	6.29	10.75	19.66	24.12
Dissolved Selenium	4/2/1996	12/6/2011	13	2	0.01	0.016	0.022	1.49	2.97-	1.48-	1.51	3
Dissolved Sodium	4/2/1996	9/3/2014	68	68	517	5181.1	6850	803.49	3574.12	4377.61	5984.6	6788.09
Dissolved Zinc	4/2/1996	12/6/2011	16	10	0.008	0.019	0.07	8.96	17.91-	8.94-	8.98	17.95
Elevation of Wate	5/19/1989	9/3/2014	100	100	4.4	4442.6	20640	4798.75	5154.89-	356.14-	9241.36	14040.11
Field Water Temperature	12/6/1989	9/3/2014	87	87	1.59	12.47	18.2	8.01	3.55-	4.46	20.48	28.49
Fluoride	12/6/1989	12/12/1991	8	8	0.08	0.71	0.91	1.03	1.36-	0.32-	1.74	2.78
NO2+NO3 as N	4/2/1996	12/13/2001	8	0	0	0	0	0	0	0	0	0
Nitrate as N	12/6/1989	12/6/2011	16	11	0	0.16	0.36	0.32	0.48-	0.16-	0.49	0.81
Nitrite as N	12/6/1989	12/6/2011	23	8	0	0.26	1.96	0.67	1.09-	0.42-	0.93	1.61
Oil/Grease	3/6/1990	9/25/1990	3	0	0	0	0	0	0	0	0	0
Ortho. Phosphate	4/2/1996	12/6/2011	16	5	0.02	0.28	1.28	0.62	0.97-	0.34-	0.9	1.52
Settleable Solids	3/6/1990	3/28/1991	3	0	0	0	0	0	0	0	0	0
Sp. Conductivity (fld)	6/11/1991	9/3/2014	82	81	800	16155.8	22700	5900.4	4355	10255.39	22056.19	27956.58
Specific Conductivity (Lab)	12/6/1989	9/3/2014	94	94	2360	21490.2	45000	5267.28	10955.66	16222.94	26757.51	32024.79
Sulfate	12/6/1989	9/3/2014	94	94	600	11135.7	18000	2583.34	5969.02	8552.37	13719.06	16302.4
Sulfide	12/6/1989	12/12/1991	6	5	1	12.3	29	24.98	37.62-	12.64-	37.32	62.3
Total Alkalinity as CaCO3	12/6/1989	9/3/2014	94	94	426	649.3	766	40.77	567.75	608.52	690.05	730.82
Total Aluminum	12/6/1989	12/12/1991	8	4	0	0.67	1.56	3.24	5.81-	2.57-	3.91	7.16
Total Anions	12/6/1989	9/3/2014	93	93	49.52	267.00	415.19	54.66	157.67	212.33	321.66	376.32
Total Arsenic	12/6/1989	12/12/1991	8	3	0	0.015	0.042	4.27	8.52-	4.25-	4.28	8.55
Total Barium	12/6/1989	12/12/1991	8	1	0.17	0.17	0.17	0	0.17	0.17	0.17	0.17
Total Boron	12/6/1989	12/12/1991	8	7	0.00106	0.684437	1.23	0.9	1.11-	0.21-	1.58	2.48
Total Cadmium	12/6/1989	12/12/1991	7	3	0	0.015	0.023	0.55	1.08-	0.53-	0.56	1.11
Total Calcium	12/6/1989	12/16/1996	29	29	141	243.5	880.1	152.4	61.31-	91.09	395.89	548.29
Total Cations	12/6/1989	9/3/2014	93	93	41.01	264.84	425.95	63.99	136.86	200.85	328.84	392.83
Total Chromium	12/6/1989	12/12/1991	8	4	70	110	190	47.6	14.79	62.4	157.6	205.21
Total Copper	12/6/1989	12/12/1991	8	7	0.034	0.053	0.07	2.61	5.16-	2.55-	2.66	5.27
Total Dissolved Solids @ 180 C	12/6/1989	9/3/2014	93	93	11466	18427.9	24189	2715.3	12997.3	15712.6	21143.21	23858.51
Total Hardness as CaCO3	12/6/1989	9/3/2014	94	94	318	1142.3	3351	418.06	306.16	724.22	1560.34	1978.4
Total Iron	12/6/1989	9/3/2014	94	94	0.08	1.51	26.02	3.42	5.33-	1.91-	4.93	8.35
Total Lead	12/6/1989	12/12/1991	8	8	0	0.213	0.373	0.66	1.11-	0.45-	0.87	1.54
Total Magnesium	12/6/1989	12/16/1996	28	28	47	238.6	351	68.52	101.59	170.11	307.15	375.67
Total Manganese	12/6/1989	9/3/2014	94	60	0.009	0.030	0.207	1.07	2.11-	1.04-	1.1	2.17
Total Mercury	12/6/1989	12/12/1991	8	1	0	0	0	0	0	0	0	0
Total Molybdenum	12/6/1989	12/12/1991	8	3	0	0.07	0.11	0.6	1.13-	0.53-	0.67	1.27
Total Nickel	12/6/1989	12/12/1991	8	8	90	261.3	470	149.03	36.82-	112.22	410.28	559.32
Total Phosphorus	12/6/1989	12/12/1991	8	3	0	0.02	0.06	7.05	14.07-	7.02-	7.07	14.12
Total Potassium	12/6/1989	12/16/1996	28	28	13	21.0	37.76	7.09	6.81	13.9	28.09	35.18
Total Selenium	12/6/1989	12/12/1991	8	4	0	2.75	5	2.34	1.92-	0.41	5.09	7.42
Total Sodium	12/6/1989	12/16/1996	29	29	71.39	6308.90	8876	2232.02	1844.86	4076.88	8540.92	10772.95
Total Suspended Solids	12/6/1989	12/14/1995	25	25	10	81.9	227	68.22	54.52-	13.7	150.14	218.36
Total Zinc	12/6/1989	9/10/1991	6	6	0.03	0.08	0.15	3.37	6.66-	3.29-	3.46	6.83
Turbidity (Lab)	3/28/1991	3/28/1991	1	1	25	25	25	0	25	25	25	25
pH (fld)	12/6/1989	9/3/2014	85	85	4.86	7.60	9.4	0.67	6.26	6.93	8.28	8.95
pH (lab)	12/6/1989	9/3/2014	94	94	7.30	7.73	8.47	0.19	7.34	7.54	7.93	8.11

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HISTORIC DATA COLLECTED FROM WELL DCWR1
(Data downloaded from the Utah Division of Oil, Gas and Mingin web site, 28 Jan 2015)

DATE	Field pH pH units	Cond (Field) umhos/cm	Depth feet	WL feet	TSS mg/l	D-Ca mg/l	D-Mg mg/l	D-Mn mg/l	D-K mg/l	D-Na mg/l	Bicarb mg/l	Carb mg/l	Cl mg/l	SO4 mg/l	TDS mg/l	T-Fe mg/l
9/3/2014	6.45	18900	17.04	6296.36		96.83	146.13	0.008	18.41	5107.6			850	8832	15707	1.29
6/5/2014	6.75	18340	16.1	6297.3		92.16	136.84	0.01	19.99	4555.7			762	8988	15507	0.4
3/18/2014	8.05	19430	15.68	6297.72		95.01	144.27	0.009	12.83	4369.7			772	8015	15450	0.56
12/5/2013	7.72	19880	15.5	6297.9		96.81	145.75	0.01	14.06	4447.5			837	8849	15378	1.34
9/6/2013	8.17	19000	15.3	6298.1		91.84	134	0.009	16.69	4630.1			897	9615	15410	0.99
6/6/2013	7.14	16920	15.3	6298.1		96.27	141.67	0.008	15.36	4755.3			813	8841	15456	0.32
3/13/2013	6.97	17730	15.38	6298.02		99.98	151.81	0.009	17.17	4697.8			753	8829	15442	0.44
12/4/2012	7.6	17300	14.62	6298.78		98.42	151.56	0.01	25.11	4780.8			829	9159	15415	0.36
9/10/2012	6.45	16450	14.04	6299.36		104.09	151.87	< .002	15.11	5010.9			758	9030	15633	1.11
6/14/2012	7.64	17000	13.4	6300		106.74	160.45	0.01	13.31	4695.9			747	8546	15490	1.65
3/13/2012	4.86	15760	12.81	6300.59		107.29	158.22	0.01	13.32	4933.1			753	8616	15819	0.18
12/6/2011	6.19	16140	12.9	6300.5		103.47	164.86	< .002	16.11	4990.7			784	9854	15800	1.06
9/7/2011	6.52	17260	12.2	6301.2		105.62	160.5	0.013	15.67	4775.7			813	10058	15952	2.6
6/20/2011	7.9	16950	12.1	6301.3		101.38	159.56	0.012	17.47	5036.7			841	9447	15930	0.66
3/23/2011	7.66	17430	11.98	6301.42		106.25	165.16	0.011	15.72	4955.6			952	10522	16069	0.99
12/7/2010	7.66	17100	13.4	6300		99.89	145.95	0.011	28.13	4739.6			802	10146	16242	0.49
9/20/2010	7.14	17200	12.8	6300.6		106.97	160.46	0.013	15.84	4799.6			822	9872	16658	1.4
6/9/2010	7.58	17580	12.71	6300.69		111.3	169.41	0.012	15.3	5110.4			787	9816	16575	0.82
3/17/2010	7.79	17009	12.8	6300.6		114.15	181.38	0.002	16.26	5193.1			775	9706	16537	0.5
12/2/2009	7.97	17960	13.5	6299.9		109.51	181.71	0.01	16.18	4976.8			805	10152	16486	0.64
9/9/2009	6.95	18950	12.57	6300.83		116.19	193.79	0.013	14.51	5062.3			760	9652	16267	3.22
6/18/2009	7.09	17580	11.8	6301.6		117	187.36	0.012	15.73	4832			801	9892	16432	1.15
3/24/2009	7.76	17160	11.43	6301.97		116.43	195.44	0.012	17.25	4893.5			736	9567	16228	2.21
12/4/2008	7.64	18300	10.34	6303.06		116.5	189.37	0.01	15.36	5028.7			725	9891	16497	0.38
9/23/2008	7.49	19410	11.52	6301.88		113.28	181.39	0.013	16.39	4851.9			711	9690	16454	2.12
6/18/2008	8	17590	10.12	6303.28		116.55	188.4	< .002	12.65	4819			745	9816	16263	2.82
3/24/2008	7.53	17890	8.5	6304.9		110	180	0.02	16.59	5141			730	9836	16032	2.28
12/5/2007	5.5	16460	10.9	6302.5		102.45	160.06	0.018	16.54	5278.8			798	10459	16768	4.15
9/19/2007	7.6	19910	10.2	6303.2		111	189	0.013	18.2	4890			745	9988	16739	1.32
6/29/2007	7.76	17180	9.3	6304.1		123	168	0.018	11.7	4840			741	10298	17065	1.99
3/26/2007	7.65	18360	9.92	6303.48		120	4.54	< .002	7.67	5260			757	10807	16844	2.27
12/7/2006	7.83	18610	8.96	6304.44		121.77	175.8	0.02	17.66	5302.2			686	10287	16796	3.48
9/27/2006	7.96	18260	7.56	6305.84		113.2	149.36	0.02	9.83	5036.2			668	9739	17226	26.02
6/22/2006	7.35	18530	5.63	6307.77		118	160	0.044	14.6	4980			723	10507	17216	2.41
3/14/2006	7.28	15640	7.11	6306.29		114	171	0.019	20.7	4980			743	10200	17097	3.94
12/13/2005	7.32	13400	5.92	20693.83		95	119	0.02	12.5	5090			720	10300	17109	1.97
9/23/2005	7.05	16680	7.98	6305.42		106	147	0.011	13.1	4970			710	10630	16977	0.96
6/22/2005	9.4	17100	3.62	6309.78		110	146	0.015	6.12	5050			719	10970	16599	1.68
3/21/2005	8.63	16800	4.4	6309		103	139	0.03	23.3	5100			622	10060	16859	0.65
12/14/2004	8.5	17200	4.98	6308.42		98.3	136	0.009	13.6	4820			722	10830	16565	2.46
9/9/2004	8.37	17300	8.62	6304.78		97.9	133	0.009	15.3	4850	675	< 5.	688	11860	16844	1.31
6/3/2004	8.64	17500	24.02	6289.38		106	145	0.013	16.2	5200	683	< 5.	749	10990	17223	1.26
3/9/2004	8.9	17100	7.05	6306.35		112	150	0.014	29.6	5170	833	< 5.	876	10834	17561	3.57
12/9/2003	7.25	18200	10.06	6303.34		116	164	0.011	26.6	5250	825	< 5.	820	10272	17580	0.604
9/16/2003	8.19	18100	29.40	6284.00		115	159	0.011	24.9	5610	826	< 5.	939	11451	17143	1.23
6/26/2003	8.11	17900	8.54	6304.86		115	151	< .05	13.5	5170	788	< 5.	767	11302	17473	1.29
3/13/2003	7.93	17800	25.98	6287.42		117	157	0.011	14.3	5480	842	< 5.	732	10987	17635	0.28
12/5/2002	7.42	18200	22.90	6290.50		95	145	< .05	13	4500	789	< 5.	692	11317	17866	0.6
9/19/2002	8.25	21300	6.62	6306.78		106	159	< .05	14	5170	806	< 5.	780	10901	17680	0.8
6/25/2002	7.84	19300	26.05	6287.35		110	164	< .05	14	5365	811	< 5.	813	10717	17669	1.6
3/19/2002	7.66	20500	22.47	6290.93		108	158	< .05	13	5370	809	< 5.	753	11583	17936	0.6
12/13/2001	7.31	19300	6.50	6306.9		104	165	< .05	14	5360	792	< 5.	27.3	11668.6	18064	0.7
9/17/2001	7.96	800	6.94	6306.46		121	175	< .05	14	5850	805	< 5.	771.6	11447.3	18112	1.1
6/29/2001	7.16	21200	7.16	6306.24		110	162	< .05	13	5720	802	< 5.	570.6	7559	18400	1
3/13/2001	7.72	21000	5.32	6308.08		111	175	< .1	13	5810	806	< 5.	792	12167	18622	0.4
12/5/2000	7.58	22000	8.31	6305.09		120	166	< .1	14	5700	789	< 5.	762	11077	18772	0.7
3/4/1999	7.35	18800	6.04	6307.36		123	195	< .1	14	5890	788	< 5.	817	13073	19473	0.4
12/7/1998	7.36	20800	6.02	6307.38		128	197	< .1		6255	804	< 5.	1009	11940	19628	0.4
9/15/1998	7.54	21000	6.91	6306.49		126	179	< .1	13	6070	804	< 5.	291	11697	19925	0.3
6/9/1998	7.61	21000	7.00	6306.4		122	185	< .1	13	6340	816	< 5.	824	11811	19776	3
3/17/1998	7.89	22700		6305.9		111	167	< .1	13	6260	810	< 5.	840	12756	19930	0.9
12/15/1997	8.3	1890		6307.34		113	180	< .1	13	6530	817	< 5.	17	12786	19730	0.7
9/16/1997	7.76	1850	6.76	6306.641		127	185	< .1	11	5650	806	< 5.	865	12798	20060	0.7
6/26/1997	7.76	1810	5.71	6307.691		126	206	< .1	14	6850	800	< 5.	840	12595	20400	0.9
3/21/1997	7.77	1760	4.65	6308.751		126	199	< .1	13	6950	834	< 5.	815	12178	20770	1
12/16/1996	8.25	1820	5.51	6307.888		140	210	< .1	14	6660	684	< 5.	810	14898	20818	1.2
9/30/1996	8.07	1850	6.30	6307.101		133	42	< .1	14	6620	830	< 5.	80	13959		0.9
6/13/1996		< 1100.		6307		4	2	< .1	1	517	827	< 5.	846	13249	21506	1.6
4/2/1996	7.97	19400	5.18	6308.216		150	216	< .04	12.3	6310	770	< 2.	620	13123	21406	1.09
12/14/1995	7.97	18300	5.45	6307.954	55						800	< 5.	756	13144	21710	0.5
9/18/1995	7.78	1860	6.89	6306.51	10						750	< 5.	884	11705	21760	0.6
6/30/1995			5.15	6308.249	25						740	15	1200	14000	21920	0.9
3/29/1995	7.99	20800	5.22	6308.183	20						725	< 5.	870	13000	21800	1.2
12/19/1994	7.73	2070	5.61	6307.79	33						705	< 5.	940	12200	21880	[illegible]
9/16/1994	7.6	2100	5.51	6307.888	16						781	< 1.	777	11000	22280	0.9
6/22/1994	7.86	2160	4.82	6308.577	53						719	< 1.	822	13000	22880	1.2
3/23/1994			5.02	6308.38	62						820	2	206	13000	21870	1.1
12/17/1993	8.21	17900	4.53	6308.872	42						626	< 1.	850	13000	21791	1.3

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HISTORIC DATA COLLECTED FROM WELL DCWR1
(Data downloaded from the Utah Division of Oil, Gas and Mingin web site, 28 Jan 2015)

DATE	Field pH pH units	Cond (Field) umhos/cm	Depth feet	WL feet	TSS mg/l	D-Ca mg/l	D-Mg mg/l	D-Mn mg/l	D-K mg/l	D-Na mg/l	Bicarb mg/l	Carb mg/l	Cl mg/l	SO4 mg/l	TDS mg/l	T-Fe mg/l
9/28/1993	7.78	17300	4.53	6308.872	30						807	< 1.	872.1	12000	22324	1
7/1/1993			4.72	6308.676	57						777	0	954.3	13000	22789	0.59
3/23/1993			4.99	6308.413												
3/17/1993			3.81	6309.594	54						767	0	992.5	1500	23169	0.19
12/21/1992			6.17	6307.232	197						673	0	930	18000	22218	2.12
9/3/1992	7.66	20000	5.81	6307.593	16						808	0	865	17000	22790	1.74
6/25/1992	7.52	20100	6.99	6306.412	219						765	0	870	17000	22705	1.17
3/20/1992			4.49	6308.905	20						749	0	885	18000	22860	0.36
12/12/1991	7.83	19900	5.61	6307.79	155						744	0	1000	13000	20210	1.26
9/10/1991	7.58	20600	7.48	6305.92	126						758	< 1.	895	18000	23040	2.13
6/11/1991	7.63	21000	6.43	6306.97	139						733	< 1.	900	600	13000	1.32
3/28/1991			5.41	6307.987	175						773	< 1.	835	15000	23845	2.64
12/14/1990			4.89	6308.512												
12/14/1990	7.17				114						935	< 1.	915	10000	18954	0.62
9/25/1990	7.15		4.00	6309.397	227						772	< 1.	1140	12800	24189	2.52
9/25/1990			4.00	6309.397												
6/14/1990	7.12				125						731	< 1.	1115	11000	21623	0.22
6/13/1990			5.22	6308.183												
3/6/1990			2.99	6310.414	24						884	< 1.	980	10500	11466	0.17
12/6/1989	7.34		3.61	6309.791	54						698	< 1.	645	12000	21671	0.08
12/6/1989			5.09	6308.315												
9/21/1989			5.91	6307.494												
8/25/1989			5.91	6307.494												
5/19/1989			5.41	6307.987												

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SGS

Analysis Report

June 25, 2018

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	DCWR1	Sample ID By:	PacifiCorp
Date Sampled:	Jun 11, 2018	Sample Taken By:	RMC
Date Received:	Jun 11, 2018	Time Sampled:	1305
Product Description:	WATER	Time Received:	1428
		Location:	DCWR1
		Mine:	4
		Site:	62
		Field - pH:	8.13 pH
		Depth:	20.55 ft
		Field - Conductivity:	17960 umhos/cm
		Field - Temperature:	14.1 Deg C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1805428-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	ANALYZED TIME	ANALYST
Hardness, mg equivalent CaCO3/L	1526	mg/L	SM2340-B	1	2018-06-25	10:00:00	KN
Acidity	9	mg/L	D1067	5	2018-06-13	12:10:00	CH
Cations	224.62	meq/L	SM1030E	0	2018-06-25	10:00:00	KN
Anions	232.16	meq/L	SM1030E	0	2018-06-25	10:00:00	KN
Balance	-1.65	%	SM1030E	-10	2018-06-25	10:00:00	KN
Alkalinity, mg CaCO3/L (pH 4.5)	736	mg/L	SM2320-B	5	2018-06-15	09:00:00	HL
Bicarbonate Alkalinity as CaCO3	736	mg/L	SM2320-B	5	2018-06-15	09:00:00	HL
Carbonate Alkalinity as CaCO3	<5	mg/L	SM2320-B	5	2018-06-15	09:00:00	HL
pH	7.91		SM4500-H	0.01	2018-06-12	08:34:00	BP
pH Temperature	19.70	°C	SM4500-H	0.01	2018-06-12	08:34:00	BP
Conductivity	18100	µmhos/cm	SM2510	0.1	2018-06-12	07:52:00	BP
Total Dissolved Solids	15719	mg/L	SM2540-C	30	2018-06-14	11:00:23	CH
Chloride, Cl	1004	mg/L	EPA 300.0	1	2018-06-12	14:45:00	CH
Sulfate, SO4	9083	mg/L	EPA 300.0	1	2018-06-12	14:45:00	CH
METALS BY ICP							
Calcium, Ca - Dissolved	179.90	mg/L	EPA 200.7	0.03	2018-06-20	11:43:52	KN
Iron, Fe - Total	0.33	mg/L	EPA 200.7	0.05	2018-06-20	11:43:52	KN
Iron, Fe - Dissolved	<0.03	mg/L	EPA 200.7	0.03	2018-06-20	11:43:52	KN

Kaitlyn Natelli
Lead Lab Tech

SGS North America Inc. | Minerals Services Division
2035 North Airport Road Huntington UT 84528 t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

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SGS

Analysis Report

June 25, 2018

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	DCWR1	Sample ID By:	PacifiCorp
Date Sampled:	Jun 11, 2018	Sample Taken By:	RMC
Date Received:	Jun 11, 2018	Time Sampled:	1305
Product Description:	WATER	Time Received:	1428
		Location:	DCWR1
		Mine:	4
		Site:	62
		Field - pH:	8.13 pH
		Depth:	20.55 ft
		Field - Conductivity:	17960 umhos/cm
		Field - Temperature:	14.1 Deg C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1805428-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	ANALYZED TIME	ANALYST
METALS BY ICP (continued)							
Magnesium, Mg - Dissolved	261.50	mg/L	EPA 200.7	0.01	2018-06-20	11:43:52	KN
Manganese, Mn - Total	0.010	mg/L	EPA 200.7	0.002	2018-06-20	11:43:52	KN
Manganese, Mn - Dissolved	0.002	mg/L	EPA 200.7	0.002	2018-06-20	11:43:52	KN
Potassium, K - Dissolved	30.84	mg/L	EPA 200.7	0.14	2018-06-20	11:43:52	KN
Sodium, Na - Dissolved	4445.00	mg/L	EPA 200.7	0.09	2018-06-22	10:06:00	KN

Kaitlyn Natelli
Lead Lab Tech

SGS North America Inc. | Minerals Services Division
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APPENDIX 7-3

DATA FROM USGS GAUGING STATION ON HUNTINGTON CREEK

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Data Category: Current Conditions Geographic Area: United States GO

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USGS 09318000 HUNTINGTON CREEK NR HUNTINGTON, UTAH

Available data for this site Time-series: Monthly statistics GO

Emery County, Utah
Hydrologic Unit Code 14060009
Latitude 39°22'17", Longitude 111°03'47" NAD27
Drainage area 187.00 square miles
Gage datum 6,210.00 feet above NGVD29

Output formats
HTML table of all data
Tab-separated data
Reselect output format

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00060, Discharge, cubic feet per second,												
YEAR	Monthly mean in ft3/s (Calculation Period: 1909-06-01 -> 1979-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1909						740.6	190.5	107.2	102.0	35.0		
1910	45.9	52.3	81.1	326.4	654.7	164.5		32.6	56.4	39.9	34.0	32.9
1911			49.5	79.3	299.7	275.0	121.2	62.5	36.8			
1912			23.6	42.7	269.2	487.8	127.3	85.4	47.9	36.0		
1913				157.3	376.4	217.9	126.4	70.9	69.6	46.8	43.2	47.6
1914	52.4	42.3	52.8	134.4	763.9	474.2	144.5	102.1	55.7	56.7	40.7	30.3
1915	34.6	31.8	43.9	125.0	223.7	236.5	124.0	63.4	41.8	41.0	39.2	38.9
1916	38.6	35.8	54.6	128.2	549.4	480.0	141.4	117.7	54.5	56.2	35.9	35.4
1917	25.0	30.0	44.8	92.6	418.0	778.6	226.9	101.5	67.7			
1920				42.3	569.4	452.1				43.6	44.9	
1921				88.8	635.8	766.5	184.4	155.4	94.9	62.8	51.3	40.0
1922	45.0	45.0	50.9	77.5	520.0	553.2	173.0	122.5	51.8	17.5	29.4	45.6
1923	48.4	45.0	50.0	82.3	501.8	329.0	180.6	92.4	52.5	47.1	42.0	
1924				75.1	192.2	98.3	64.0	35.2	40.3	32.4	33.0	25.5
1925	27.6	28.4	35.3	104.0	209.0	121.9	96.5	67.4	35.2	34.6	30.8	

1926			41.7	131.9	327.4	148.7	91.5	50.1	32.0	32.9	29.2	30.1
1927	32.0	34.0	34.6	68.6	379.7	259.9	111.7	88.9	78.6	35.1	34.9	27.0
1928	27.0	27.0	37.0	92.0	549.6	228.3	124.8	53.2	34.6	37.9	32.1	27.0
1929	27.0	30.0	40.0	45.3	364.6	368.3	148.5	90.5	78.9	46.3		35.0
1930	30.0		41.8	138.2	235.2					49.8	35.9	
1931		30.5	34.4	71.2	136.5	86.6	69.9	30.7	25.6	23.3	26.9	
1932			27.6	81.3	327.3	259.6	122.5	66.2	26.9			
1933				41.1	173.5	469.7	126.3	57.7	30.3	27.4		
1934		29.0	31.2	81.6	72.0	51.1	20.7	19.3	19.5	21.8	21.9	
1935		23.1	26.4	48.1	223.8	394.1	128.7	60.6	26.2	23.3	24.3	22.3
1936		27.1	28.8	130.6	579.5	278.9	112.8	80.3	50.0	33.8	26.9	
1937			28.5	66.3	471.7	230.2	113.3	88.8	51.6	42.0	28.2	31.5
1938	29.2	29.3	31.7	115.3	326.2	258.3	128.0	73.1	37.7	33.3	32.0	
1939			38.8	128.4	212.6	140.5	103.0	40.2	31.9	28.9	23.7	20.5
1940	19.0	23.0	27.9	72.3	373.8	158.1	100.5	35.6	36.0	31.1	25.7	26.6
1941	24.0	26.4	30.0	41.4	525.4	370.7	160.3	77.6	69.9	62.3	43.8	35.5
1942	33.0	30.0	34.2	139.6	371.7	378.4	152.4	80.9	39.1	36.7	35.4	33.5
1943	32.0	31.7	33.3	178.4	211.2	211.0	122.2	74.1	33.3	36.0	27.7	28.2
1944	23.0	25.0	32.9	45.0	450.0	479.9	159.4	101.6	40.7	37.2	34.9	30.0
1945	28.0	28.7	35.4	53.0	304.9	239.3	145.6	94.4	47.6	36.5	32.9	28.0
1946	26.0	25.0	34.7	173.3	224.4	167.2	121.7	52.2	28.5	43.2	32.5	28.7
1947	27.7	30.7	35.8	91.5	354.2	200.3	153.9	92.6	39.9	39.4	36.5	37.6
1948	32.0	32.0	31.5	51.9	224.1	132.2	100.0	52.5	28.5	31.0	28.4	25.5
1949	24.0	25.0	31.3	107.2	348.3	319.1	177.3	121.0	56.7	40.8	31.4	24.1
1950	23.3	27.8	31.5	98.8	251.5	194.5	148.7	104.5	47.1	34.4	31.3	29.6
1951	27.0	23.9	29.6	82.7	266.1	260.5	171.6	91.2	64.4	38.2	27.8	25.4
1952	25.6	32.4	35.0	123.8	850.0	776.5	251.0	169.0	131.3	67.9	43.0	40.0
1953	37.0	39.3	46.5	79.4	184.6	318.2	187.2	102.2	73.0	41.9	33.2	29.3
1954	28.2	35.3	37.0	91.7	150.1	122.2	75.9	46.5	33.2	29.3	23.7	21.2
1955	19.1	21.4	24.3	38.3	168.4	156.1	138.2	67.1	28.3	26.6	21.5	24.5
1956	26.2	24.7	29.9	87.7	229.8	159.7	157.9	58.7	27.4	25.8	19.6	19.0
1957	19.0	22.5	23.7	37.6	226.4	587.0	206.3	116.0	92.4	77.5	37.3	32.8
1958	30.0	31.9	34.4	95.2	610.9	412.1	182.8	150.2	47.8	38.7	25.8	26.4
1959	25.3	26.7	28.9	53.0	106.6	93.5	93.4	63.9	26.2	26.0	21.3	20.0
1960	19.1	21.2	25.5	57.6	156.3	130.2	131.7	64.1	24.2	25.3	21.7	19.9
1961	18.0	18.4	21.2	43.1	103.3	81.4	86.9	40.8	33.9	23.5	23.6	17.1
1962	12.3	23.6	27.7	123.2	378.1	308.6	171.4	160.8	51.6	35.5	28.2	19.6
1963	12.7	25.5	26.3	39.3	202.1	126.0	147.4	101.5	36.6	32.6	17.8	14.5
1964	17.0	19.0	19.7	34.0	238.2	178.0	139.1	134.7	26.7	23.0	21.4	21.0
1965	22.8	24.9	26.0	52.1	300.0	525.1	228.9	173.6	125.4	60.8	35.1	36.1
1966	33.3	28.0	37.7	115.3	186.8	141.5	112.7	76.0	56.8	34.5	25.0	20.9

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1967	20.2	18.4	31.0	42.3	244.9	344.5	162.3	121.9	72.6	46.2	24.2	21.1
1968	19.7	23.4	30.9	51.1	267.5	434.9	137.7	70.2	86.8	67.9	31.8	25.8
1969	26.0	27.4	32.6	120.9	551.9	284.7	132.8	88.4	58.6	61.8	32.0	30.3
1970	29.5	34.4	34.1	70.8	363.2	378.1	145.5	97.3	80.1	55.7	36.7	32.5
1971	30.0	32.7	38.5	105.5	240.3	262.6	139.0	114.3	62.9	49.9	31.1	28.0
1972	27.3	31.8	47.3	94.6	189.0	140.5	91.4	69.5	45.1	43.1	28.2	26.0
1973	22.3	29.4	31.7	57.9	562.8	436.2	116.9	110.2	82.1			
1977										16.9	19.8	16.3
1978	19.5	22.1	23.5	39.4	171.9	379.1	134.0	120.4	60.1	24.4	24.9	25.5
1979	30.3	28.9	29.7	58.1	185.7	195.7	117.7	120.8	83.8			
Mean of monthly Discharge	28	29	35	88	333	304	137	86	53	39	31	28

** No Incomplete data have been used for statistical calculation

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USGS 09318000 HUNTINGTON CREEK NR HUNTINGTON, UTAH

Available data for this site Time-series: Annual statistics GO

Emery County, Utah Hydrologic Unit Code 14060009 Latitude 39°22'17", Longitude 111°03'47" NAD27 Drainage area 187.00 square miles Gage datum 6,210.00 feet above NGVD29	**Output formats** HTML table of all data Tab-separated data Reselect output format

Water Year	00060, Discharge, cubic feet per second
1909	318.3
1910	153.3
1911	103.0
1912	154.3
1913	135.1
1914	164.2
1915	87.9
1916	143.5

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Water Year	00060, Discharge, cubic feet per second
1917	159.5
1919	182.8
1920	299.2
1921	239.8
1922	149.9
1923	123.5
1924	74.5
1925	68.3
1926	98.7
1927	98.8
1928	106.4
1929	107.9
1930	92.7
1931	57.3
1932	106.4
1933	139.9
1934	38.9
1935	96.7
1936	123.4
1937	122.1
1938	94.6
1939	82.3
1940	76.9
1941	118.1
1942	117.1
1943	86.2
1944	121.0
1945	90.4
1946	79.4
1947	94.8

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Water Year	00060, Discharge, cubic feet per second
1948	66.8
1949	108.4
1950	85.7
1951	93.1
1952	207.5
1953	101.7
1954	60.5
1955	61.6
1956	73.1
1957	116.3
1958	146.2
1959	50.9
1960	58.3
1961	43.0
1962	110.6
1963	67.2
1964	73.0
1965	129.0
1966	77.0
1967	95.2
1968	101.0
1969	121.5
1970	113.4
1971	96.2
1972	70.6
1973	129.5
1978	85.3
1979	77.4
1980	35.5

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Water Year	00060, Discharge, cubic feet per second
** Incomplete data have been used for statistical calculation	

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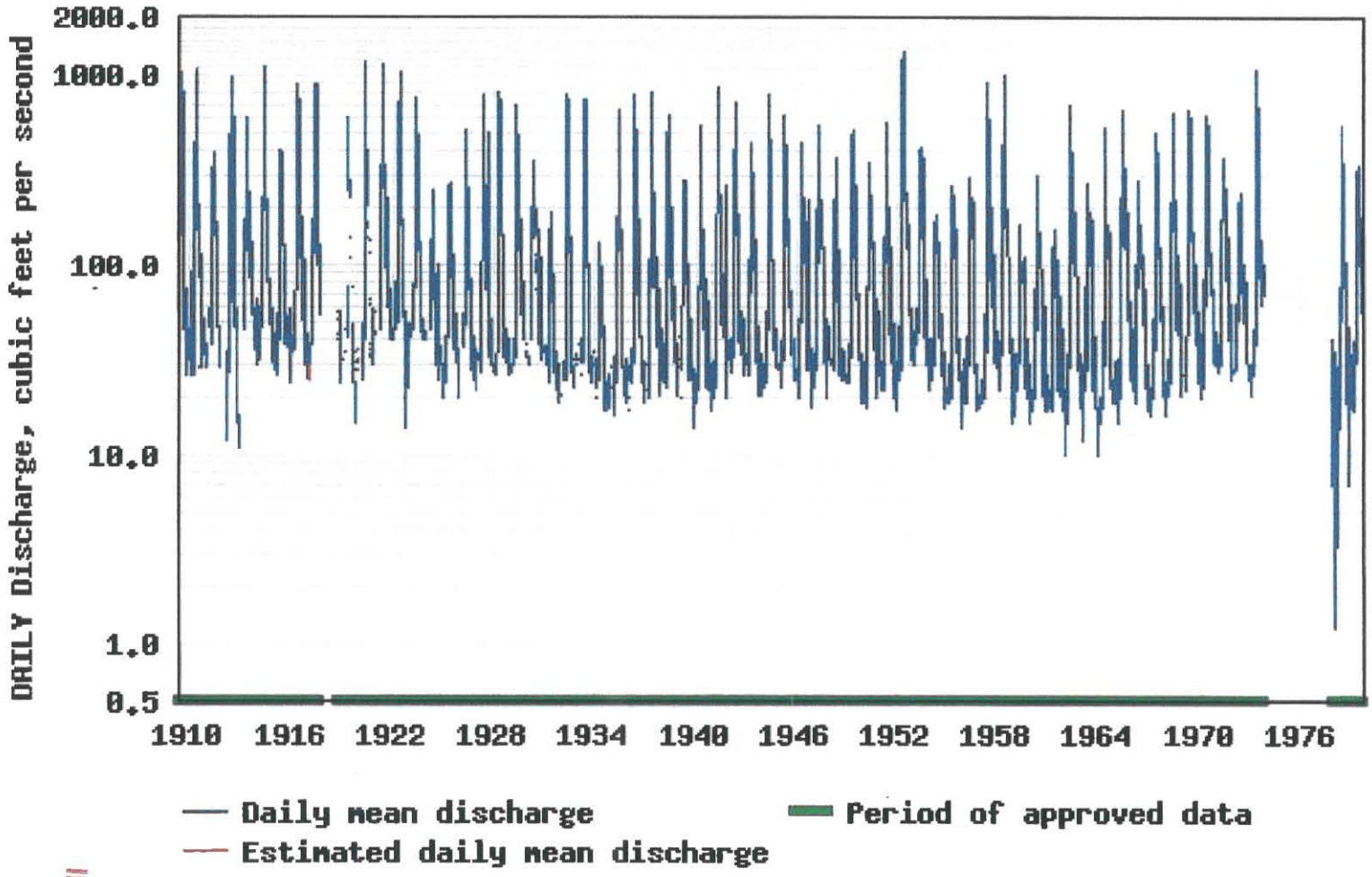

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Peak Streamflow for the Nation

USGS 09318000 HUNTINGTON CREEK NR HUNTINGTON, UTAH

Available data for this site Surface-water: Peak streamflow GO

Emery County, Utah
Hydrologic Unit Code 14060009
Latitude 39°22'17", Longitude 111°03'47" NAD27
Drainage area 187.00 square miles
Gage datum 6,210.00 feet above NGVD29

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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1909	Aug. 18, 1909	6.00[3]	1,390[5]
1910	May 05, 1910	5.90[3]	1,070[5]
1911	May 24, 1911	4.20[3]	409[5]
1912	Jul. 26, 1912	5.80[3]	1,200[5]
1913	May 11, 1913	5.10[3,6]	798[5]
1914	May 23, 1914	6.15[3]	1,290[5]

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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1915	Jun. 01, 1915	4.68[3]	606[5]
1916	May 08, 1916	5.60[3]	1,100[5]
1917	May 17, 1917	5.58[3]	888[5]
1918	Jun. 19, 1918	5.60[6]	1,160[5]
1919	May 02, 1919	4.86	790[5]
1920	May 24, 1920	5.33	1,340[5]
1921	May 16, 1921	5.38	1,380[5]
1922	May 25, 1922	5.29	1,340[5]
1923	May 20, 1923	4.70	907[5]
1924	May 03, 1924	3.34	308[5]
1925	Aug. 25, 1925	4.70	870[5]
1926	Sep. 11, 1926	4.45	755[5]
1927	Sep. 10, 1927	6.90	2,000[5]
1928	May 09, 1928	4.80	980[5]
1929	May 24, 1929	4.62	830[5]
1930	Aug. 02, 1930	7.50	2,500[5]
1931	May 16, 1931	2.65	262[5]
1932	May 21, 1932	3.75	1,060[5]
1933	Jun. 01, 1933	3.75	1,030[5]
1934	Aug. 09, 1934	3.08	542[5]
1935	Jun. 07, 1935	3.57	826[5]
1936	May 14, 1936	3.80	980[5]
1937	Jul. 08, 1937	4.52	1,630[5]
1938	Aug. 08, 1938	4.15	1,260[5]
1939	May 03, 1939	2.94	338[5]
1940	Aug. 06, 1940	3.98	761[5]
1941	May 12, 1941	4.30	1,050[5]
1942	May 27, 1942	4.00	851[5]
1943	Jun. 01, 1943	3.65	694[5]
1944	May 15, 1944	4.06	1,020[5]

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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1945	May 11, 1945	4.24[1]	925[5]
1946	Jul. 24, 1946	6.14[1]	2,300[5]
1947	May 05, 1947	3.71	740[5]
1948	May 18, 1948	3.23	462[5]
1949	Jun. 12, 1949	3.43	562[5]
1950	May 16, 1950	3.09	420[5]
1951	Aug. 23, 1951	3.97	800[5]
1952	Jun. 04, 1952	6.10	1,580[5]
1953	Jul. 10, 1953	6.23	1,650[5]
1954	Jul. 13, 1954	3.53	257[5]
1955	May 11, 1955	3.89	338[5]
1956	Jul. 30, 1956	8.20[1,5]	1,940[5]
1957	Jun. 06, 1957	5.47	1,170[5]
1958	May 23, 1958	5.38	1,180[5]
1959	Aug. 01, 1959	3.41[2]	227[5]
1960	May 12, 1960	4.10	442[5]
1961	Aug. 05, 1961	7.10	2,120[5]
1962	May 08, 1962	4.98	842[5]
1963	Aug. 04, 1963	4.28	510[5]
1964	May 21, 1964	4.77	766[5]
1965	May 21, 1965	4.81	766[5]
1966	Jul. 11, 1966	3.97	387[5]
1967	Sep. 09, 1967	4.83	782[5]
1968	Jul. 30, 1968	6.33	1,640[5]
1969	May 13, 1969	4.71	777[5]
1970	May 19, 1970	4.83	817[5]
1971	May 17, 1971	4.22	489[5]
1972	May 30, 1972	3.56	264[5]
1973	May 21, 1973	5.12	1,080[5]
1974	May 09, 1974	3.17	361[5]

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Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1975	Jul. 09, 1975	5.08	910[5]
1976	Jul. 18, 1976	3.52	253[5]
1977	Jul. 23, 1977		241[5]
1978	Jun. 10, 1978	4.42	591[5]
1979	Aug. 13, 1979	4.84	684[5]

?

Peak Gage-Height Qualification Codes.

- 1 -- Gage height affected by backwater
- 2 -- Gage height not the maximum for the year
- 3 -- Gage height at different site and(or) datum
- 5 -- Gage height is an estimate
- 6 -- Gage datum changed during this year

?

Peak Streamflow Qualification Codes.

- 5 -- Discharge affected to unknown degree by Regulation or Diversion

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APPENDIX 7-4

CLIMATOLOGICAL DATA

CASTLE DALE, UTAH (421214)

Period of Record Monthly Climate Summary

Period of Record : 02/08/1899 to 12/31/2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	35.2	41.9	53.2	62.5	72.2	82.8	88.5	85.8	77.6	65.2	50.1	37.9	62.8
Average Min. Temperature (F)	6.7	14.3	23.5	30.7	38.6	46.5	53.4	51.3	42.1	31.5	20.4	10.7	30.8
Average Total Precipitation (in.)	0.60	0.56	0.52	0.54	0.64	0.46	0.77	1.05	0.87	0.84	0.51	0.53	7.89
Average Total SnowFall (in.)	5.9	3.2	1.3	0.3	0.2	0.0	0.0	0.0	0.0	0.1	1.0	4.0	16.0
Average Snow Depth (in.)	5	5	4	4	4	4	4	4	4	3	4	4	4

Percent of possible observations for period of record.
Max. Temp.: 81.3% Min. Temp.: 81.4% Precipitation: 89.6% Snowfall: 85.8% Snow Depth: 67.1%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

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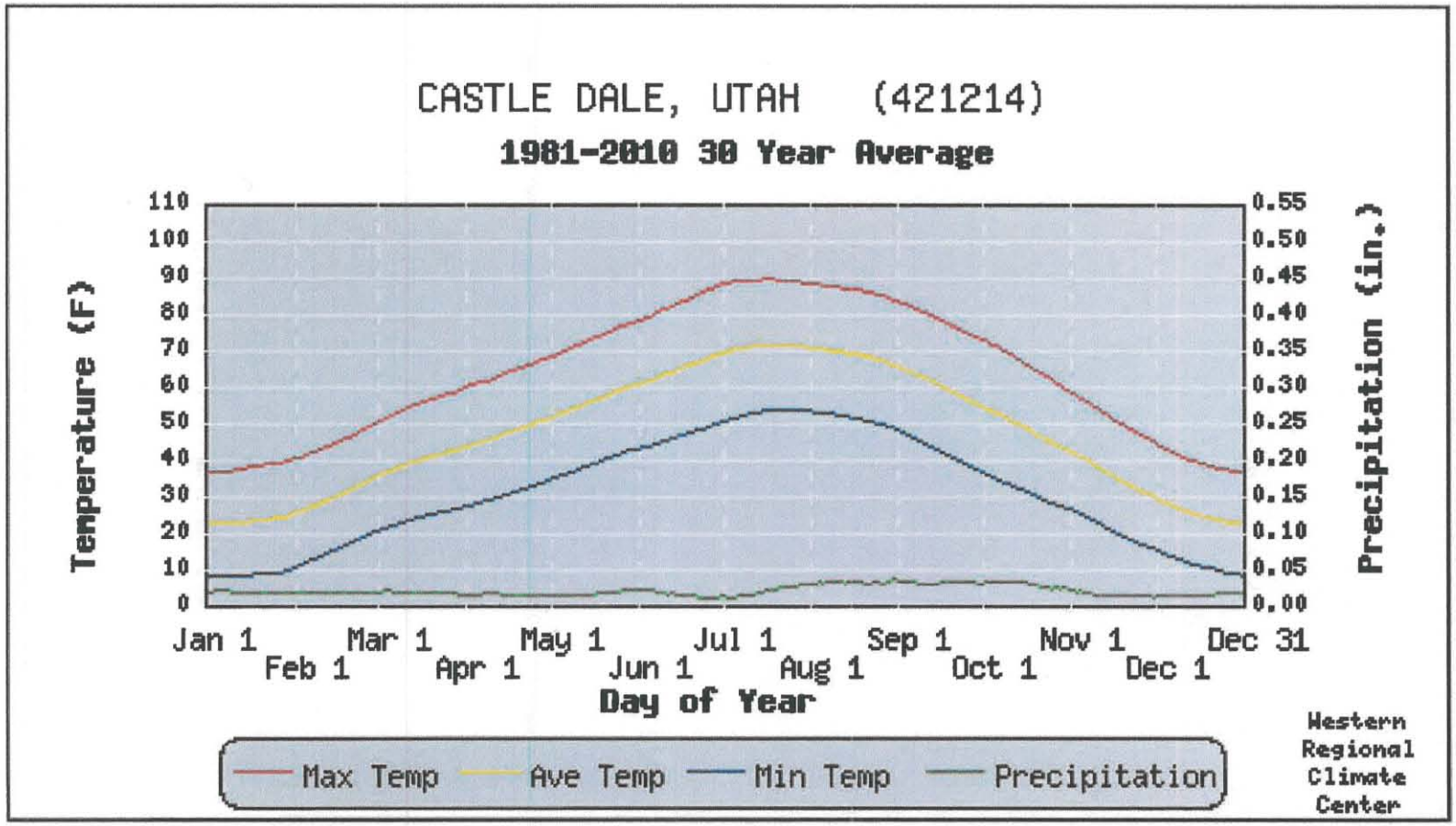

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CASTLE DALE, UTAH

Period of Record General Climate Summary - Temperature

Station:(421214) CASTLE DALE

From Year=1899 To Year=2012

	Monthly Averages				Daily Extremes			Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	35.2	6.7	20.8	67	31/2003	-34	22/1937	34.6	2003	-2.4	1937	0.0	11.9	30.7	9.3
February	41.9	14.3	28.1	70	26/1986	-35	10/1933	39.8	1995	5.3	1933	0.0	4.3	27.7	3.3
March	53.2	23.5	38.4	83	21/2004	-7	03/1922	46.3	2004	29.6	1917	0.0	0.3	27.6	0.1
April	62.5	30.7	46.6	89	26/1910	-6	27/1902	54.7	1943	39.3	1933	0.0	0.0	17.8	0.0
May	72.2	38.6	55.4	97	28/2003	13	11/1922	61.3	1969	48.1	1933	0.3	0.0	5.7	0.0
June	82.8	46.5	64.7	103	25/1994	25	01/1919	71.2	1918	58.1	1904	6.8	0.0	0.5	0.0
July	88.5	53.4	71.0	107	13/2002	29	06/1902	75.4	2003	65.9	1904	15.3	0.0	0.0	0.0
August	85.8	51.3	68.6	106	13/2007	30	21/1904	73.3	1994	62.7	1927	9.4	0.0	0.0	0.0
September	77.6	42.1	59.9	97	14/2000	19	16/1903	66.1	1899	54.7	1986	1.4	0.0	2.9	0.0
October	65.2	31.5	48.4	88	02/1899	3	30/1971	54.7	2003	41.3	1905	0.0	0.0	17.4	0.0
November	50.1	20.4	35.3	85	14/1910	-10	30/2004	41.6	1914	25.9	1938	0.0	0.8	28.2	0.2
December	37.9	10.7	24.6	67	04/1995	-28	27/1909	34.4	1980	10.3	1924	0.0	8.3	30.4	4.7
Annual	62.8	30.8	46.8	107	20020713	-35	19330210	50.5	1981	42.1	1932	33.2	25.6	189.0	17.6

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Winter	38.3	10.5	24.5	70	19860226	-35	19330210	33.9	1981	7.4	1933	0.0	24.5	88.8	17.3
Spring	62.7	31.0	46.8	97	20030528	-7	19220303	51.2	2004	39.5	1917	0.3	0.3	51.1	0.1
Summer	85.7	50.4	68.1	107	20020713	25	19190601	72.7	1994	62.8	1904	31.5	0.0	0.6	0.0
Fall	64.3	31.3	47.9	97	20000914	-10	20041130	51.9	1963	43.5	1930	1.4	0.8	48.5	0.2

Table updated on Oct 31, 2012
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

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CASTLE DALE, UTAH

Period of Record General Climate Summary - Precipitation

Station:(421214) CASTLE DALE

From Year=1899 To Year=2012

	Precipitation											Total Snowfall		
	Mean	High	Year	Low	Year	1 Day Max.		>= 0.01 in.	>= 0.10 in.	>= 0.50 in.	>= 1.00 in.	Mean	High	Year
	in.	in.	-	in.	-	in.	dd/yyyy or yyyymmdd	# Days	# Days	# Days	# Days	in.	in.	-
January	0.60	2.32	1993	0.00	1931	1.00	20/1904	4	2	0	0	5.9	24.5	1980
February	0.56	2.04	1998	0.00	1906	1.10	07/1965	4	2	0	0	3.2	19.9	1978
March	0.52	1.93	1981	0.00	1909	1.10	13/1996	3	2	0	0	1.3	13.5	2006
April	0.54	2.71	1906	0.00	1899	0.92	17/1988	4	2	0	0	0.3	6.0	1973
May	0.64	2.73	1941	0.00	1899	1.65	27/1993	4	2	0	0	0.2	4.0	1905
June	0.46	2.25	1910	0.00	1902	1.40	28/1910	3	2	0	0	0.0	0.0	1902
July	0.77	3.21	1936	0.00	1909	1.43	23/1977	5	2	0	0	0.0	0.0	1908
August	1.05	3.27	1961	0.00	1940	2.15	28/2007	6	3	0	0	0.0	0.0	1908
September	0.87	3.68	1961	0.00	1901	1.70	30/1911	4	2	0	0	0.0	0.0	1901
October	0.84	3.80	2006	0.00	1902	1.51	06/2006	4	2	0	0	0.1	4.0	1984
November	0.51	2.68	1978	0.00	1901	1.75	21/1905	3	1	0	0	1.0	12.1	1983
December	0.53	2.08	1909	0.00	1901	1.20	29/1915	4	2	0	0	4.0	18.4	1983
Annual	7.89	14.28	1965	3.29	1934	2.15	20070828	47	25	3	0	16.0	52.8	1983
Winter	1.69	4.90	1993	0.00	1961	1.20	19151229	11	6	1	0	13.1	42.0	1937
Spring	1.70	4.28	1906	0.01	1955	1.65	19930527	11	6	1	0	1.8	13.5	2006
Summer	2.28	5.91	1965	0.26	1956	2.15	20070828	14	7	1	0	0.0	0.0	1928
Fall	2.22	5.58	1905	0.11	1935	1.75	19051121	11	6	1	0	1.1	12.1	1983

Table updated on Oct 31, 2012
For monthly and annual means, thresholds, and sums:
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered
Seasons are climatological not calendar seasons
Winter = Dec., Jan., and Feb. Spring = Mar., Apr., and May
Summer = Jun., Jul., and Aug. Fall = Sep., Oct., and Nov.

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STATION: PRICE-CARBON COUNTY AIRPORT (KPUC), UT

CLIMATOLOGICAL SUMMARY. Period of Record: Sep 1998 to Dec 2008

Summaries based on unedited daily ASOS data. Errors may be present.

TEMPERATURE (F)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Avg Max Temp	36.3	41.0	52.7	61.7	73.0	83.7	91.8	86.4	76.3	62.8	48.0	35.8	62.5
Avg Min Temp	16.4	20.8	27.8	34.0	43.1	51.6	60.4	57.0	47.4	37.6	25.8	15.6	36.5
Avg Temperature	26.3	30.9	40.2	47.8	58.0	67.7	76.1	71.7	61.9	50.2	36.9	25.7	49.5
Extremes:													
Extreme Max Temp	55	59	77	83	95	98	102	99	92	83	66	54	102
Date of Ext-Day	19	25	21	30	30	30	09	20	01	01	01	27	
-Year	2000	1999	2004	2007	2002	2002	2002	2007	2007	2000	1999	1999	
Extreme Min Temp	-7	1	2	14	25	31	47	44	28	21	0	-3	-7
Date of Ext-Day	15	10	02	10	11	13	04	28	30	17	30	28	
-Year	2007	2004	2002	1999	1999	2001	2000	2004	2007	1999	2004	2007	
Heating Degree Days	1198	963	768	515	245	55	0	4	129	461	844	1218	6401
Cooling Degree Days	0	0	0	0	30	135	345	212	35	1	0	0	758
Avg Number of Days:													
Max Temp >= 90	0.0	0.0	0.0	0.0	1.0	9.0	21.7	9.9	0.6	0.0	0.0	0.0	42.2
Max Temp >= 75	0.0	0.0	0.4	2.0	15.9	25.3	30.9	30.0	18.5	3.3	0.0	0.0	126.3
Max Temp <= 32	10.5	2.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	11.8	27.3
Min Temp <= 32	30.6	27.7	23.8	11.1	2.7	0.1	0.0	0.0	0.6	6.8	24.7	30.9	159.1
Min Temp <= 20	20.7	12.1	4.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	6.5	21.7	66.6
Min Temp <= 0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	2.3
Avg Dew Point Temp	16.1	18.2	20.0	22.7	28.3	32.3	40.4	42.1	33.8	27.9	19.9	14.7	26.4
Avg Wet Bulb Temp	22.7	26.2	32.1	37.1	44.1	50.0	56.3	54.9	47.7	39.8	29.9	21.9	38.6
Avg Sea Level Pres (Inches of Mercury)	30.27	30.17	30.07	29.97	29.93	29.90	29.88	29.92	29.99	30.08	30.21	30.27	30.06

WEATHER See disclaimer below	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Avg Number of Days:													
Thunderstorms	0.0	0.3	1.0	2.2	2.6	5.2	9.2	10.4	4.6	2.5	0.4	0.0	38.4
Heavy Fog	2.5	2.8	0.9	0.3	0.1	0.0	0.1	0.0	0.0	0.4	0.9	1.6	9.5
Fog	6.2	6.7	4.0	3.9	1.4	1.7	0.8	2.1	2.9	4.6	3.6	5.4	43.4
Hail	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PRECIPITATION (In)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Monthly	0.65	0.79	0.52	0.60	0.40	0.59	0.46	0.80	1.11	1.18	0.47	0.61	8.17
Maximum Daily	0.53	0.72	0.69	1.16	0.46	0.69	0.61	0.70	1.05	1.38	0.56	0.63	1.38
Date of Ext-Day	26	22	29	24	22	25	14	16	01	06	11	25	
-Year	2000	2008	2006	2005	2008	2005	1999	2005	1999	2006	2004	2008	
Avg Number of Days:													
>= 0.01	5.2	5.6	4.1	5.5	4.4	4.6	4.8	7.6	5.7	6.9	3.4	4.6	62.5
>= 0.10	2.3	3.0	1.6	2.3	1.1	1.4	1.7	2.8	2.4	3.0	1.8	2.1	25.6

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>= 0.25	0.8	1.0	0.7	0.3	0.5	0.8	0.6	0.6	1.3	1.3	0.7	0.7	9.3
>= 0.50	0.1	0.1	0.1	0.2	0.0	0.2	0.1	0.2	0.7	0.7	0.1	0.3	2.8
>= 1.00	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.5

WIND (MPH)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Avg Wind Speed	5.1	6.0	8.0	8.6	8.5	8.1	7.2	6.7	6.9	6.6	6.0	5.0	6.9
Daily Avg Max 2-Min	14.4	15.8	20.2	22.6	22.9	22.6	22.2	21.0	18.6	16.6	15.1	14.1	18.8
Daily Avg Peak Gust	17.3	19.6	25.8	29.2	30.0	29.4	28.4	26.9	23.8	20.9	18.5	17.0	23.9
Maximum Daily Avg	17.7	18.2	21.1	18.8	18.7	19.8	12.1	14.7	14.9	15.9	20.0	17.7	21.1
Maximum 2-Minute Avg	38	36	49	41	41	40	39	43	39	44	45	37	49
Date of Max 2min-Day	06	08	20	15	30	01	14	15	17	20	17	15	
-Year	2003	2002	2000	2002	1999	2002	2007	2001	2003	2007	1998	2003	
Maximum Peak Gust	44	46	64	61	71	60	53	56	47	58	54	49	71
Date of Max Gust-Day	06	17	20	29	30	06	17	07	17	20	17	15	
-Year	2003	1999	2000	2007	1999	2007	2000	2000	2003	2007	1998	2003	
Avg Number of Days:													
Peak Gust >=30	4.0	4.5	9.9	13.8	15.8	14.3	12.4	10.6	7.3	5.7	4.1	3.6	106.0
Peak Gust >=40	0.5	0.5	1.9	3.1	3.6	2.0	2.4	1.6	0.9	1.1	0.6	0.9	19.2
Peak Gust >=50	0.0	0.0	0.2	0.5	0.4	0.4	0.3	0.2	0.0	0.2	0.2	0.0	2.4
Max 2-Minute >=30	0.5	0.7	2.8	4.0	4.2	2.2	3.2	2.5	1.6	1.1	0.7	0.0	23.6
Max 2-Minute >=40	0.0	0.0	0.1	0.2	0.4	0.1	0.0	0.1	0.0	0.2	0.1	0.0	1.2

Observations of WEATHER may me innacurate due to early ASOS inconsistancies. Average days with Thunderstorms may be low due to early mis-detection.

Heavy Fog = Visibility less than or equal to 1/4 mile.
Fog = Visibility greater than 1/4 mile or less than 7 miles.
Peak Gust = Maximum 5-second average.
Snowfall data not observed at ASOS stations.

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APPENDIX 7-5

SEDIMENT YIELD EVALUATION OF RECLAIMED VS. NATURAL CONDITIONS

Pre- vs. Post-Disturbance
Sediment Yield Calculations
Using the Revised Universal Soil Loss Equation

Site: Deer Creek Waste Rock Site
Client: BRC Wellington

Pre-Disturbance Condition: Mancos shale residuum, highly erodible
Reclamation Summary: Subsoil and topsoil cover, deep gouging, mulched, revegetated

Sediment Yield Calculation

RUSLE Equation:

A = R K LS VM, where A is the annual sediment yield (tons/acre/year)

Factor	Value	Source
R (Rainfall erosivity)	10	Israelsen et al. (1984), Map R7
K (Soil erodibility)	0.10	Web Soil Survey (value for Gerst-Strych-Badland complex)
LS (Topographic factor)	See attached calculation spreadsheet	
VM (vegetative/mechanical)		
Pre-disturbance	1.000	Average of "bare soil conditions" presented by Haan et al. (1991)
Newly reclaimed	0.010	Israelsen et al. (1984), Figure 4, 2 tons/ac mulch
Successfully revegetated	0.220	Israelsen et al. (1984), Figure 7, 0% canopy of tall weeds with 17.5% grass cover (from study presented in Appendix 3-2, data collected on fill slope)

Vegetative Community	R	K	LS	VM	A (t/ac/yr)	Sediment yield as a % of pre-disturbance conditions
Pre-Disturbance						
Natural site conditions	10	0.10	1.37	1.000	1.369	100
Post-Reclamation						
Newly reclaimed	10	0.10	3.09	0.010	0.031	2.3
Successfully revegetated	10	0.10	3.09	0.220	0.679	49.6

Reference:

Haan, C.T., B.J. Barfield, and J.C. Hayes. 1991. *Design Hydrology and Sedimentology for Small Catchments*. Academic Press. San Diego, California.

Israelsen, C. Earl, Joel E. Fletcher, Frank W. Haws, and Eugene K. Israelsen. 1984. *Erosion and Sedimentation in Utah: A Guide for Control*. Hydraulics and Hydrology Series UWRL/H-84/03. Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah.

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LS Calculation Table

Condition	s	l	m	LS
Pre-Disturbance	10.0	100	0.5	1.37
Post-Reclamation	50.0	3	0.5	3.09

Factor	Values		Source
	Pre Distrub	Post Reclaim	
s (slope angle %)	10	50	Based on a typical pre-disturance slope of 10% and the steepest reclaimed slope of 50% (i.e., the 2:1 outslope of the pile)
l (slope length)	100	3	This value is defined as the distance from the origin of overland flowto the point of deposition or channelized flow. For the pre-disturbace site, this is typical of the shortest distance to a rill. The post-reclamation length was assumed based on the typical distance from the top to the bottom of a gouge.
m (slope-based exponent	0.5	0.5	Israelsen et al. (1984), Appendix C

l = slope length (ft). This value is defined as the distance from the origin of overland flow to the point of deposition or channelized flow. Slope lengths rarely exceed 400 feet, and in this case, the presence of rocks, trees, and roads are conservatively estimated to limit the pre-disturbance slope length to 100 feet. Post-reclamation slope lengths are taken as 3 feet, which is the average distance from the top to the bottom of a deep gouge.

m = a factor in the LS equation which is 0.5 for slopes steeper than

$$LS = ((65.41s^2/(s^2+10{,}000)) + 4.56s/(s^2+10{,}000)^{0.5} + 0.065) / (l/72.6)^m$$

(Israelsen et al., 1984)

References:

Israelsen, C. Earl, Joel E. Fletcher, Frank W. Haws, and Eugene K. Israelsen, 1984. *Erosion and Sedimentation in Utah: A Guide for Control*. Hydraulics and Hydrology Series UWRL/H-84/03. Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah.

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APPENDIX 7-6
WATER RIGHTS INFORMATION

APPROPRIATED POINTS OF DIVERSION
SEC. 5, T. 17 S., R. 8 E.

(Data downloaded from the Utah Division of Water Rights Web site, 29 Jan 2015)

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Utah Division of Water Rights

Search of TOWNSHIP = '17S' and RANGE = '8E' and SECTION_NO = '05' and BEM = 'SL'

WR Number	Diversion Type	Well Log	Location	Status	Priority	Uses	CFS	ACFT	Address	Owner Name	Latitude	Longitude
93-2229	Surface		N760 0 SW 05 17S 8E SL	P	1879	IS	45.000	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-2230	Surface		N760 0 SW 05 17S 8E SL	P	1884	IS	77.250	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-2231	Surface		N760 0 SW 05 17S 8E SL	P	1888	IS	80.000	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-2232	Surface		N100 E1270 SW 05 17S 8E SL	P	1879	IS	45.000	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-2233	Surface		N100 E1270 SW 05 17S 8E SL	P	1884	IS	77.250	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-2234	Surface		N100 E1270 SW 05 17S 8E SL	P	1888	IS	80.000	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-224	Surface		N760 0 SW 05 17S 8E SL	P	1875	IS	150.000	0.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-226	Surface		N100	P	1875	IS	150.000	0.000	P.O. BOX 327	HUNTINGTON	39.3668169133	-

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		E1270 SW 05 17S 8E SL							CLEVELAND IRRIGATION COMPANY			111.054112301
93-3195	Rediversion	N760 0 SW 05 17S 8E SL	P	19800228	DIMOSP	0.000	2000.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-	111.058607461
93-3195	Rediversion	N100 E1270 SW 05 17S 8E SL	P	19800228	DIMOSP	0.000	2000.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-	111.054112301
93-928	Rediversion	N760 0 SW 05 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-	111.058607461
93-928	Rediversion	N100 E1270 SW 05 17S 8E SL	P	19160725	DIMOSP	0.000	600.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-	111.054112301
93-950	Rediversion	N760 0 SW 05 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-	111.058607461
93-950	Rediversion	N100 E1270 SW 05 17S 8E SL	P	19210112	DIMOSP	0.000	465.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-	111.054112301
93-951	Rediversion	N760 0 SW 05 17S 8E SL	P	19220803	DIMOSP	0.000	9892.620	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-	111.058607461
93-951	Rediversion	N100 E1270 SW 05 17S 8E SL	P	19220803	DIMOSP	0.000	9892.620	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-	111.054112301
a15762	Rediversion	N760 0 SW 05 17S 8E SL	A	19900730	IMP	0.000	31264.000	ATTN: CARLY BURTON	PACIFICORP DBA UTAH POWER & LIGHT COMPANY	39.368627432	-	111.058607461

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a15762	Rediversion	N100 E1270 SW 05 17S 8E SL	A	19900730	IMP	0.000	31264.000	ATTN: CARLY BURTON	PACIFICORP DBA UTAH POWER & LIGHT COMPANY	39.3668169133	-111.054112301
93-216	Point to Point	N660 E660 SW 05 17S 8E SL	P	1902	S	0.000	0.000	HUNTINGTON UT 84528	EDWARD HARRISON	39.3683539463	-111.056271892
93-225	Point to Point	S660 W660 N4 05 17S 8E SL	P	1902	S	0.000	0.000	C/O MILAS JOHNSON, BOX 336 PLEASANT DRIVE	RUTH LARUE JOHNSON	39.3794302642	-111.051561828
93-216	Point to Point	N660 E660 SW 05 17S 8E SL	P	1902	S	0.000	0.000	HUNTINGTON UT 84528	EDWARD HARRISON	39.3683539463	-111.056271892
93-225	Point to Point	S660 W660 N4 05 17S 8E SL	P	1902	S	0.000	0.000	C/O MILAS JOHNSON, BOX 336 PLEASANT DRIVE	RUTH LARUE JOHNSON	39.3794302642	-111.051561828
93-1136	Rediversion	N760 0 SW 05 17S 8E SL	P	1892	DIMOSP	0.000	2025.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-1136	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1892	DIMOSP	0.000	2025.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-1137	Rediversion	N760 0 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	3274.710	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-1137	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	3274.710	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-1138	Rediversion	N760 0 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	50.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461

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93-1138	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	50.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
93-1139	Rediversion	N760 0 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	58.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.368627432	-111.058607461
93-1139	Rediversion	N100 E1270 SW 05 17S 8E SL	P	1890	DIMOSP	0.000	58.000	P.O. BOX 327	HUNTINGTON CLEVELAND IRRIGATION COMPANY	39.3668169133	-111.054112301
a14107	Rediversion	N760 0 SW 05 17S 8E SL	A	19800228	DIMSPX	0.000	3000.000	1594 WEST NORTH TEMPLE STE 310	STATE OF UTAH BOARD OF WATER RESOURCES	39.368627432	-111.058607461
a14107	Rediversion	N100 E1270 SW 05 17S 8E SL	A	19800228	DIMSPX	0.000	3000.000	1594 WEST NORTH TEMPLE STE 310	STATE OF UTAH BOARD OF WATER RESOURCES	39.3668169133	-111.054112301
93-152	Point to Point	S660 E660 N4 05 17S 8E SL	P	1902	S	0.000	0.000	675 EAST 500 SOUTH, SUITE 500	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.	39.3794322651	-111.046890515

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APPROPRIATED POINTS OF DIVERSION
SEC. 6, T. 17 S., R. 8 E.

(Data downloaded from the Utah Division of Water Rights Web site, 29 Jan 2015)

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Utah Division of Water Rights

Search of TOWNSHIP = '17S' and RANGE = '8E' and SECTION_NO = '06' and BEM = 'SL'

WR Number	Diversion Type	Well Log	Location	Status	Priority	Uses	CFS	ACFT	Address	Owner Name	Latitude	Longitude
93-954	Surface		N1565 W1430 SE 06 17S 8E SL	A	19220808	IS	75.000	0.000	UPPER COLORADO REGION	USA BUREAU OF RECLAMATION -- PROVO AREA OFFICE	39.3708356568	-111.063669273
a3812	Rediversion		S650 W50 NW 06 17S 8E SL	A	19601102	I	0.000	10000.000	P.O. BOX 327	HUNTINGTON-CLEVELAND IRRIGATION COMPANY	39.3794971344	-111.077732083
a3812	Rediversion		S1350 E1300 NW 06 17S 8E SL	A	19601102	I	0.000	10000.000	P.O. BOX 327	HUNTINGTON-CLEVELAND IRRIGATION COMPANY	39.3775776916	-111.072952553
93-214	Point to Point		N660 W660 SE 06 17S 8E SL	P	1902	S	0.000	0.000	ATTN: MS. JODY L. WILLIAMS	PACIFICORP DBA UTAH POWER & LIGHT COMPANY	39.3683515668	-111.060942579
93-1140	Surface		N1572 W1466 SE 06 17S 8E SL	A	19220808	I	0.000	4000.000	P O BOX 129	NORTH EMERY WATER USERS SPECIAL SERVICE DISTRICT	39.3708548696	-111.063796759
a15762	Rediversion		S370 E350 NW 06 17S 8E SL	A	19900730	IMP	0.000	31264.000	ATTN: CARLY BURTON	PACIFICORP DBA UTAH POWER & LIGHT COMPANY	39.3802670674	-111.076317339
E1708	Surface		S700 W1220 E4 06 17S 8E SL	A	19800915	IS	0.000	10.800	ATTN: CLAUDIA CONDER	PACIFICORP DBA UTAH POWER & LIGHT COMPANY	39.3719739677	-111.063078676

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APPROPRIATED POINTS OF DIVERSION
SEC. 31, T. 16 S., R. 8 E.

(Data downloaded from the Utah Division of Water Rights Web site, 29 Jan 2015)

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APPROPRIATED POINTS OF DIVERSION
SEC. 32, T. 16 S., R. 8 E.

(Data downloaded from the Utah Division of Water Rights Web site, 29 Jan 2015)

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Utah Division of Water Rights

Search of TOWNSHIP = '16S' and RANGE = '8E' and SECTION_NO = '32' and BEM = 'SL'

WR Number	Diversion Type	Well Log	Location	Status	Priority	Uses	CFS	ACFT	Address	Owner Name	Latitude	Longitude
93-564	Point to Point		S660 E660 NW 32 16S 8E SL	P	1902	S	0.000	0.000	675 EAST 500 SOUTH, 5TH FLOOR	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.	39.393872658	-111.055900439
93-564	Point to Point		N660 W660 S4 32 16S 8E SL	P	1902	S	0.000	0.000	675 EAST 500 SOUTH, 5TH FLOOR	UTAH SCHOOL AND INSTITUTIONAL TRUST LANDS ADMIN.	39.3830558845	-111.051146787

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APPENDIX 7-7

OPERATIONAL HYDROLOGY DESIGN METHODS AND CALCULATIONS

Section III HYDROLOGICAL ANALYSIS

PURPOSE:

To evaluate the hydrological characteristics of the Deer Creek Mine waste rock storage facility and determine the design of ditches and culverts to properly handle the storm runoff, for both disturbed and undisturbed areas.

DESCRIPTION OF PROJECT:

The waste rock storage facility consists of 29.5 acres of distrubed land which are bordered by an earth berm and collection ditch. The berm retains the mine waste rock which is hauled in by truck and the ditch collects the undisturbed storm runoff which would normally flow through the storage site. The ditch conveys the water around the border of the site and discharges it into an existing man made channel in one case and into the natural drainage channel in another. (See drawing CM-10779 DR, Map Packet # 4-6) The access road is crossed in several cases by culverts which discharge into the natural drainage.

DESIGN PROCEDURE:

The waste rock storage facility was marked on a topographical map and separated into four drainage areas which would contribute runoff into the collection ditch at the perimeter of the site and a fifth area being the site itself. (See Exhibit A.) Peak runoff values were calculated by use of the "Storm Hydrograph Program" by Richard H. Hawkins and Kim A. Marshall, September 1979, Utah State University Foundation. (See Table 1 and Exhibits B thru F.)

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TABLE 1

STORM RUNOFF VALUES FOR 100 YEAR, 24 HOUR EVENT
RAINFALL DEPTH: 3.4 INCHES
DISTRIBUTION: SOIL CONSERVATION SERVICE TYPE II

DRAINAGE #	AREA SQ.M.	DRAINAGE LENGTH FT	SLOPE	VELOCITY FPS	T.O.C. HRS	PEAK FLOW/CFS	TIME TO PEAK/HR
1	.0214	1482	.22	4.7	.0876	8.58	11.99
2	.0867	3360	.49	7.1	.1315	34.59	11.99
3	.0361	2223	.58	7.8	0.792	13.06	12.06
4	.0619	2866	.48	7.0	.1137	24.72	11.99
5	.0459	1400	.005	0.7	.5556	12.50	12.05

CURVE NUMBER FOR #1 THRU #4 = 85 (See Exhibit I)

CURVE NUMBER OF #5 = 77

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UNDISTURBED DRAINAGE DITCH

The design of the collection ditch is based on Manning's equation for open channels. The design channel is a trapezoid shape with 1:3 side slopes and a varying bottom width. The value for Manning's N was calculated based on the size of the rocks in the channel lining. The riprap ditch lining design was based on the procedure in Applied Hydrology and Sedimentology for Disturbed Areas, by B.J. Barfield, R.C. Warner and C.T. Haan, Oklahoma Technical Press, 1981 (see Riprap Sizing Program, exhibit G). The ditch lining design requires a median rock diameter (D_{50}) of 3.5 inches in one case and up to 14 inches in another. As far as practical, the actual rock size will be graded to give a smooth distribution curve with the largest rock size (D_{100}) roughly equal to twice the D_{50} and the D_{20} equal to one half the D_{50}.

TABLE 2

UNDISTURBED DITCH AND CHANNEL LINING DESIGN VALUES

DITCH #	DRAINAGE AREAS CONTRIBUTING	PEAK FLOW CFS	CHANNEL SLOPE	BOTTOM WIDTH FT.	VELOCITY FPS	FLOW DEPTH FT.	D50 FT.	S.F. DITCH BOTTOM	S.F. BANKS
1	1	8.58	2%	2	3.56	0.618	.296	1.80	1.50
2	2	34.59	2%	3	4.72	1.14	.547	1.80	1.50
3	2 AND 3	47.65	2%	4	5.03	1.23	.590	1.80	1.50
4	2, 3, AND 4	72.37	4%	5	6.59	1.25	1.17	1.69	1.50

The area of the discharge from ditch 4 into the existing channel will be protected from erosion by a rock apron consisting of the same size and distribution of rocks as the channel lining used on the ditch itself. The apron will be fan shaped with the wide end 12 feet wide and will extend 15 feet from the end of the ditch.

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A filter layer will be placed beneath the rip-rap channel lining materials. The filter will consist of 2 inch minus road base material and will be placed in a layer equal in thickness to the D_{50} size of the ditch.

DISTURBED RUNOFF COLLECTION

The runoff which collects within the storage site will be confined within the perimeter berm and collected into one of two detention basins. This water will be retained and allowed to dissipate through evaporation. The total volume of the runoff to be collected was taken from the hydrograph analysis for Area 5, Exhibit F. The total runoff depth for the 100 year, 24 hour storm event was determined to be 1.357 inches over the 29.5 acre facility. Storage capacity of each basin is planned to allow for two 100 year storms plus sediment equal to 0.1 acre foot for each acre drained.

The operating plan for the storage site involves dividing the site into two sections and using only one section at a time. This limits the amount of area disturbed at any one time. Phase I will encompass the western end of the site to station 9+50. During Phase I, all runoff will be drained to the basin on the west end of the site. When the area of Phase I is filled, the soil in the berm will be used to cover the waste rock material and the area will be reclaimed. Runoff from the top of the reclaimed Phase I area will still run westward to the basin and runoff from the slopes will be conveyed in ditches to the basin until final approval to remove the basin. Thereafter drainage from Phase I areas will be directed into the existing drainage channels south of the site.

During Phase II of the operating plan, runoff will be collected in a detention basin located along the south berm at station 7+80. Runoff during Phase II will be handled as previously described for Phase I. Basin design values and volumes are listed in Table 3.

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TABLE 3

	AREA	100 YR STORM RUNOFF VOLUME	SEDIMENT VOLUME	TOTAL REQUIRED VOLUME
PHASE I	9.8 ACRES	1.1 AC FT	.98 AC FT	3.18 AC FT
PHASE II	19.4 ACRES	2.2 AC-FT	1.94 AC FT	6.34 AC FT

RUNOFF VOLUME = 1.357" X AREA

TOTAL REQUIRED VOLUME = 2 X 100 YEAR STORM RUNOFF + SEDIMENT VOLUME

Each of the detention basins will have an emergency spillway capable of discharging the runoff anticipated from a 100 year, 24 storm event. Because of the extra storage capacity built into the basins to ensure total containment, no principal spillway is provided. The emergency spillway will consist of an open channel with grouted bottom and sides to prevent erosion. The spillway crest will be at the top of the water elevation shown on the accompanying drawings. The spillway flow rate was determined using the Soil Conservation Service National Engineering Handbook Section 4, Hydrology, Chapter 21. (Exhibit H) The spillways are designed as broad crested weirs, with flow depths slightly above one foot. The channel design parameters are listed below:

	Peak Flow	Channel Width	Flow Depth
Basin 1	10.77cfs	3 ft	1.18 ft
Basin 2	19.76cfs	6 ft	1.11 ft

Each of the spillway channels will have a minimum 1.5 foot depth to ensure the channel capacity will not be exceeded. An energy dissipation section will be constructed on the end of each channel to prevent erosion of the receiving channel streambanks. Details of each spillway are shown on drawings of each respective basin.

Ditches used to collect the disturbed runoff are designed as vee shaped, one foot deep, with 1:3 side slopes. These ditches will generally convey the runoff from the side slopes of the waste pile to the detention basin. The ditch between Phase I and II areas will carry the most runoff and only the design of this ditch is given, the others obviously meeting the capacity requirements.

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The flow rate for the separation ditch is taken as a percentage of the peak flow for the entire site. The maximum area which could be drained by the separation ditch (the entire area of Phase II) is 19.4 acres. The peak flow is:

19.4 X 12.50 cfs / 29.4 acres = 8.25 cfs.

Revised 6-7-88
Revised 8-4-88

The depth of flow for a 2% channel slope is 0.61 feet, which leaves more than adequate freeboard. (See Exhibit J and Ditch Design Program, Exhibit G.)

ACCESS ROAD DRAINAGE

Culverts will be used to convey the anticipated storm runoff across the access road. The ditch on the east end of the storage site discharges into the natural channel which crosses the access road. An 18 inch diameter culvert will be installed with a rock head wall on the inlet end and discharge into the natural channel. Three additional culverts will be located along the access road between the storage site and the highway. The culverts will also be 18 inch diameter and will have a rock head wall and discharge into a natural channel or a rock apron if no natural channel exists. The culverts will be spaced not more than 600 feet apart along the road which has a 3.8% grade. The 18 inch culverts will handle a flow of 5.5 cfs without exceeding a headwater depth equal to the diameter of the pipe. The sizing of the culverts is based on Area 1 at the beginning of this section. The 100 year storm event, with total precipitation of 3.4 inches, yielded a design flow of 8.58 cfs. The 10 year storm event is the basis of the design of the culverts and has a total precipitation of 2.2 inches (NOAA ATLAS 2, Volume VI Utah, Figure 27). From the SCS NEH 4, Hydrology, Fig 10.1 the direct runoff from the 100 year event, P=3.4 inches and CN = 85, is 1.9 inches, and the runoff from the 10 year event, P=2.2 inches and CN=85, is 0.95 inches. Therefore the flow rate for the culvert can be estimated as 8.58 cfs x (0.95/1.9) = 4.29 cfs. This is well below the capacity at the 18 inch culvert.

Rock aprons used on the discharge end of the 18 inch diameter culverts are designed according to Applied Hydrology, page 538. Using the design flow of 4.29 cfs and a tailwater depth less than one half the diameter, the length of the apron is 8 feet and the D_{50} is three inches. The width of the apron is 9.5 feet.

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INTERIM DRAINAGE

Two rip-rap, final reclamation channels, Channel 1A and 1B (See Map Packet 4-5), will be constructed as the refuse elevation increases during Phase I. Calculations for the channels are found in Tables 4,5 and Map 4-4). Because of the commitment to fill the north part of Phase I before the south part, one channel will be constructed prior to the other. Berms will direct the surface flow into Channel 1A and 1B, as indicated on Map Packet 4-5. Runoff from the temporary refuse access will flow onto the south pad and then to the designed channel.

A small area of Phase I (East Outslope) is not treated by the Phase I Sediment Basin. This same area can be treated upon construction of the Phase II Sediment Basin. The refuse outslope of this area is treated by siltfence at the outslope toe. This is considered a BTCA until the Phase II Sediment Basin construction (See Map 4-5) is complete.

Flow from the east refuse outslope reports to a roadside ditch near station 24+00 and eventually to an 18" diameter road drainage culvert at station 23+20 (See Map 4-5). The drainage areas for the culvert and ditch are shown on Figures 1 and 2, respectively. The east refuse outslope is included within the ditch drainage area depicted in Figure 2. Calculations for a 10 year/6 hour storm event indicate a flow to the culvert of 8.16 cfs, which is only 58% of its capacity (See Exhibit VI). Drainage calculations for the area which reports to the roadside ditch (See Exhibit VII) result in a flow of 1.15 cfs. Only 0.03 cfs of the 1.15 cfs results from the east refuse outslope (See Exhibit VIII). The maximum capacity of the ditch is 25.26 cfs; therefore, 1.15 cfs results in a flow depth of only 0.31 feet, with approximately 0.7 feet of freeboard (See Exhibit IX). These calculations indicate that the design flows are easily contained by the culvert and ditch.

Phase II interim drainage will be directed to the Phase II Sediment Basin in a similar manner as Phase I. During the filling of the north part of Phase II, the refuse pad drainage will be directed to the south part of Phase 2 via a temporary channel 2A. The discharge from temporary channel 2A will then flow to the sediment basin. Final reclamation channels 2A and 2B will be constructed as the south part of Phase II is filled (See Tables 4,5 and Map 4-4). The temporary channel 2A will be filled in as refuse elevation increases. (See Map 4-6)

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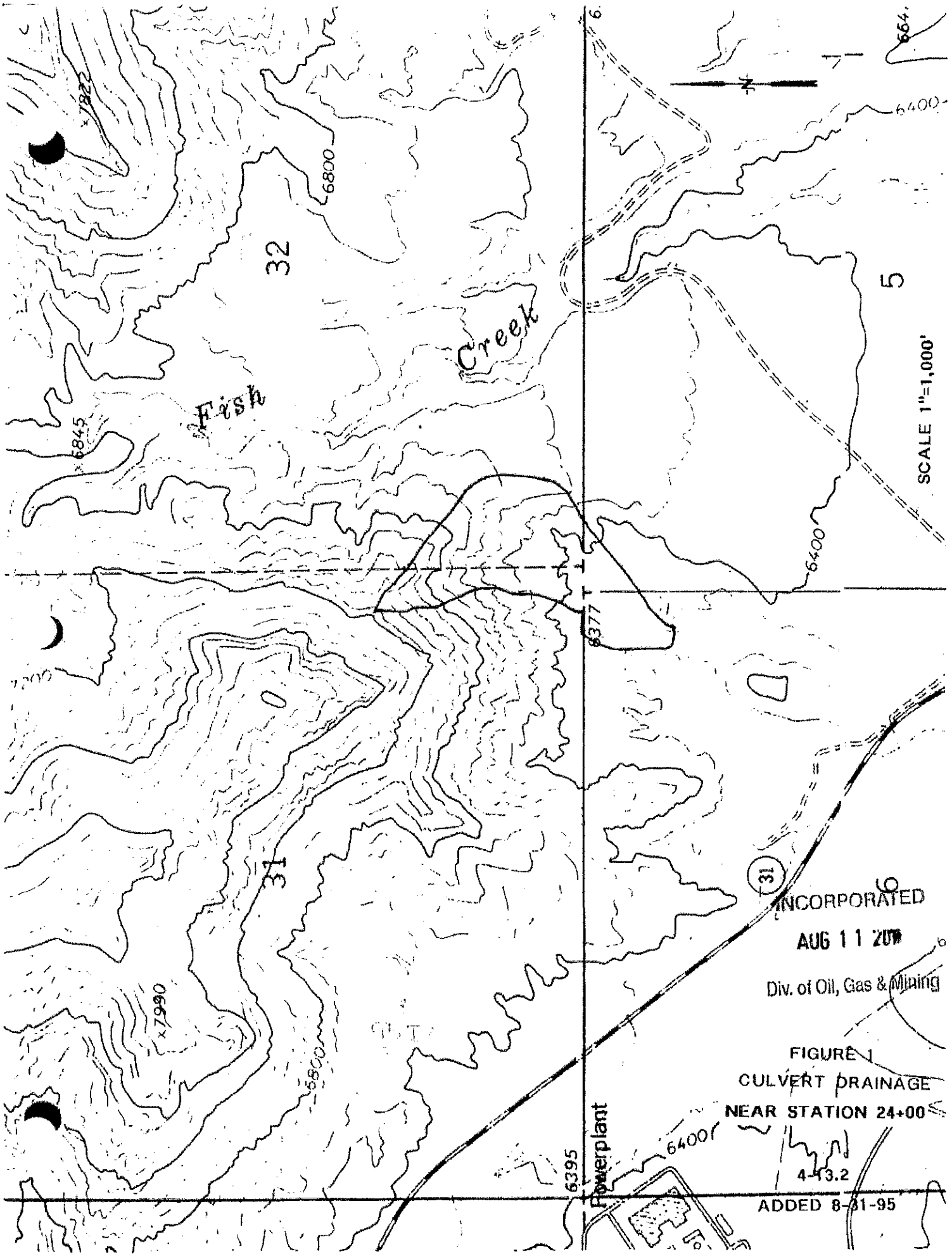

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FIGURE 1
CULVERT DRAINAGE
NEAR STATION 24+00

4-13.2
ADDED 8-31-95

Project Title = **CULVERT DRAINAGE NEAR STATION 24+00**
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 85.0
Area = 43.5 acres
Hydraulic length = 2800.00 Feet
Elevation change = 810.0 feet.
Concentration time = 0.14 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 43.5 acres

-- Storm data
Total precipitation = 1.2 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 8.16 cfs
Discharge volume = 1.00 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.008	0.000
0.20	0.008	0.000	*	0.30	0.008	0.000
0.40	0.008	0.000	*	0.50	0.008	0.000
0.60	0.012	0.000	*	0.70	0.012	0.000
0.80	0.012	0.000	*	0.90	0.012	0.000
1.00	0.012	0.000	*	1.10	0.013	0.000
1.20	0.013	0.000	*	1.30	0.013	0.000
1.40	0.013	0.000	*	1.50	0.013	0.000
1.60	0.023	0.000	*	1.70	0.023	0.000
1.80	0.023	0.000	*	1.90	0.023	0.000
2.00	0.023	0.000	*	2.10	0.089	0.010
2.20	0.089	0.928	*	2.30	0.089	3.065
2.40	0.089	5.634	*	2.50	0.089	8.162
2.60	0.024	6.526	*	2.70	0.024	4.467
2.80	0.024	4.064	*	2.90	0.024	3.760
3.00	0.024	3.646	*	3.10	0.019	3.445
3.20	0.019	3.267	*	3.30	0.019	3.274
3.40	0.019	3.303	*	3.50	0.019	3.355
3.60	0.013	2.963	*	3.70	0.013	2.618
3.80	0.013	2.543	*	3.90	0.013	2.504
4.00	0.013	2.501	*	4.10	0.012	2.414
4.20	0.012	2.340	*	4.30	0.012	2.337
4.40	0.012	2.343	*	4.50	0.012	2.358
4.60	0.010	2.194	*	4.70	0.010	2.052
4.80	0.010	2.022	*	4.90	0.010	2.007
5.00	0.010	2.008	*	5.10	0.009	1.936
5.20	0.009	1.875	*	5.30	0.009	1.866
5.40	0.009	1.863	*	5.50	0.009	1.868
5.60	0.010	1.969	*	5.70	0.010	2.059
5.80	0.010	2.095	*	5.90	0.010	2.123
6.00	0.010	2.144	*	6.10	0.000	1.237

EXHIBIT V

4-13.3

ADDED 8-31-95

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time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	1.237				
6.20	0.000	0.451	*	6.30	0.000	0.223
6.40	0.000	0.073	*			

EXHIBIT V

4-13.4

ADDED 8-31-95

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: **CULVERT FLOW**

Comment: **NEAR STATION 24+00**

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0500 ft/ft
Manning's n.....	0.024
Discharge.....	8.16 cfs

Computed Results:

Depth.....	0.87 ft
Velocity.....	7.64 fps
Flow Area.....	1.07 sf
Critical Depth....	1.11 ft
Critical Slope....	0.0257 ft/ft
Percent Full.....	58.23 %
Full Capacity.....	12.72 cfs
QMAX @.94D.....	13.69 cfs
Froude Number.....	1.59 (flow is Supercritical)

Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

EXHIBIT VI

4-13.5

ADDED 8-31-95

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95 I

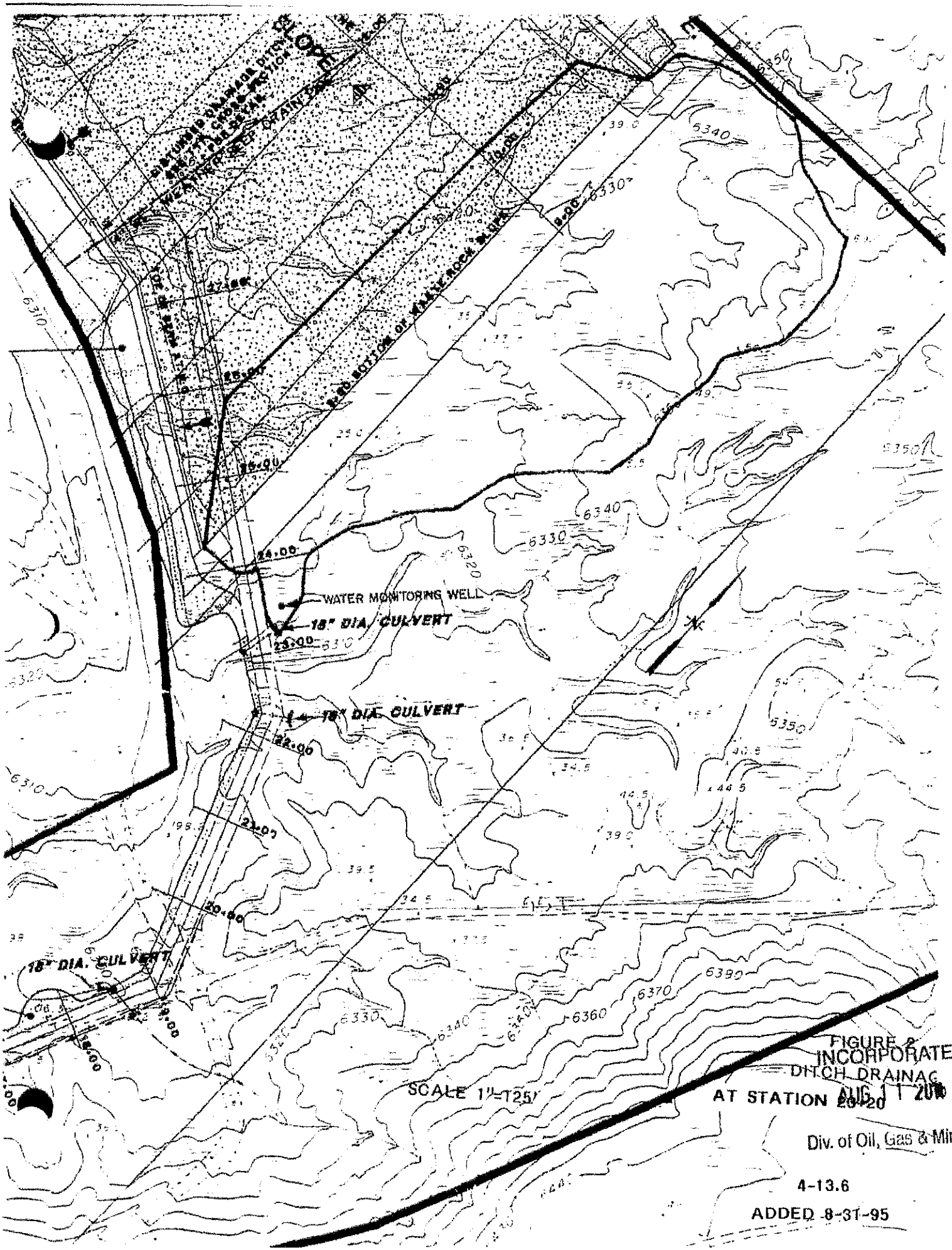

FIGURE 2
INCORPORATED
DITCH DRAINAGE
AT STATION 26+20

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4-13.6

ADDED 8-31-95

Project Title = **DITCH DRAINAGE AT STA 23+20**
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 85.0
Area = 5.0 acres
Hydraulic length = 800.00 Feet
Elevation change = 50.0 feet.
Concentration time = 0.09 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

-- Total Area = 5.0 acres

-- Storm data
Total precipitation = 1.2 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 1.15 cfs
Discharge volume = 0.11 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.008	0.000
0.20	0.008	0.000	*	0.30	0.008	0.000
0.40	0.008	0.000	*	0.50	0.008	0.000
0.60	0.012	0.000	*	0.70	0.012	0.000
0.80	0.012	0.000	*	0.90	0.012	0.000
1.00	0.012	0.000	*	1.10	0.013	0.000
1.20	0.013	0.000	*	1.30	0.013	0.000
1.40	0.013	0.000	*	1.50	0.013	0.000
1.60	0.023	0.000	*	1.70	0.023	0.000
1.80	0.023	0.000	*	1.90	0.023	0.000
2.00	0.023	0.000	*	2.10	0.089	0.002
2.20	0.089	0.186	*	2.30	0.089	0.506
2.40	0.089	0.836	*	2.50	0.089	1.146
2.60	0.024	0.615	*	2.70	0.024	0.500
2.80	0.024	0.445	*	2.90	0.024	0.436
3.00	0.024	0.453	*	3.10	0.019	0.401
3.20	0.019	0.395	*	3.30	0.019	0.397
3.40	0.019	0.404	*	3.50	0.019	0.414
3.60	0.013	0.329	*	3.70	0.013	0.310
3.80	0.013	0.303	*	3.90	0.013	0.303
4.00	0.013	0.307	*	4.10	0.012	0.287
4.20	0.012	0.284	*	4.30	0.012	0.284
4.40	0.012	0.286	*	4.50	0.012	0.289
4.60	0.010	0.254	*	4.70	0.010	0.246
4.80	0.010	0.244	*	4.90	0.010	0.244
5.00	0.010	0.246	*	5.10	0.009	0.230
5.20	0.009	0.227	*	5.30	0.009	0.226
5.40	0.009	0.227	*	5.50	0.009	0.229
5.60	0.010	0.248	*	5.70	0.010	0.254
5.80	0.010	0.258	*	5.90	0.010	0.261
6.00	0.010	0.262	*	6.10	0.000	0.079

EXHIBIT VII

4-13.7
ADDED 8-31-95

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time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.079				
6.20	0.000	0.031	*	6.30	0.000	0.008
6.40	0.000	0.000	*			

EXHIBIT VII

4-13.8
ADDED 8-31-95

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Project Title = PHASE 1 REFUSE OUTSLOPE DRAINAGE
WATERSHED HYDROGRAPH
Inflow into structure # 1
Structure type: Null

-- Watershed data for watershed # 1
Curve number = 75.0
Area = 1.1 acres
Hydraulic length = 675.00 Feet
Elevation change = 50.0 feet.
Concentration time = 0.07 hours
Concentration time type = SCS Upland Curves
Unit hydrograph type = Disturbed

Total Area = 1.1 acres

-- Storm data
Total precipitation = 1.2 inches
Storm type = SCS 6 hour design storm
Peak Discharge = 0.03 cfs
Discharge volume = 0.01 acre ft

time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
0.00	0.000	0.000	*	0.10	0.008	0.000
0.20	0.008	0.000	*	0.30	0.008	0.000
0.40	0.008	0.000	*	0.50	0.008	0.000
0.60	0.012	0.000	*	0.70	0.012	0.000
0.80	0.012	0.000	*	0.90	0.012	0.000
1.00	0.012	0.000	*	1.10	0.013	0.000
1.20	0.013	0.000	*	1.30	0.013	0.000
1.40	0.013	0.000	*	1.50	0.013	0.000
1.60	0.023	0.000	*	1.70	0.023	0.000
1.80	0.023	0.000	*	1.90	0.023	0.000
2.00	0.023	0.000	*	2.10	0.089	0.000
2.20	0.089	0.000	*	2.30	0.089	0.000
2.40	0.089	0.000	*	2.50	0.089	0.007
2.60	0.024	0.009	*	2.70	0.024	0.013
2.80	0.024	0.016	*	2.90	0.024	0.019
3.00	0.024	0.023	*	3.10	0.019	0.022
3.20	0.019	0.023	*	3.30	0.019	0.025
3.40	0.019	0.027	*	3.50	0.019	0.029
3.60	0.013	0.023	*	3.70	0.013	0.022
3.80	0.013	0.023	*	3.90	0.013	0.024
4.00	0.013	0.024	*	4.10	0.012	0.023
4.20	0.012	0.023	*	4.30	0.012	0.024
4.40	0.012	0.025	*	4.50	0.012	0.025
4.60	0.010	0.022	*	4.70	0.010	0.022
4.80	0.010	0.022	*	4.90	0.010	0.022
5.00	0.010	0.023	*	5.10	0.009	0.021
5.20	0.009	0.021	*	5.30	0.009	0.022
5.40	0.009	0.022	*	5.50	0.009	0.022
5.60	0.010	0.024	*	5.70	0.010	0.025
5.80	0.010	0.026	*	5.90	0.010	0.026
6.00	0.010	0.027	*	6.10	0.000	0.006

EXHIBIT VIII

4-13.9
ADDED 8-31-95

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time (hr.)	rainfall (in.)	hydrograph (cfs)		time (hr.)	rainfall (in.)	hydrograph (cfs)
6.10	0.000	0.006				
6.20	0.000	0.002	*			

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EXHIBIT VIII

4-13.10
ADDED 8-31-95

95 I.

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: **DITCH FLOW**

Comment: **AT STA 23+20**

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.024
Channel Slope....	0.0500 ft/ft
Discharge.....	1.15 cfs

Computed Results:

Depth.....	0.31 ft
Velocity.....	3.89 fps
Flow Area.....	0.30 sf
Flow Top Width...	1.88 ft
Wetted Perimeter.	1.99 ft
Critical Depth...	0.39 ft
Critical Slope...	0.0155 ft/ft
Froude Number....	1.73 (flow is Supercritical)

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Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

EXHIBIT IX

4-13.11
ADDED 8-31-95

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: **DITCH FLOW**

Comment: **AT STA 23+20**

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.024
Channel Slope....	0.0500 ft/ft
Depth.....	1.00 ft

Computed Results:

Discharge.....	25.26 cfs
Velocity.....	8.42 fps
Flow Area.....	3.00 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	6.32 ft
Critical Depth...	1.35 ft
Critical Slope...	0.0103 ft/ft
Froude Number....	2.10 (flow is Supercritical)

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Open Channel Flow Module, Version 3.21 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

TABLE 1

STORM RUNOFF DETERMINATION
FOR
DEER CREEK WASTE ROCK SITE #1

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS

RUNOFF AREA = .0214 SQ. MILES (3.7 acre)
RUNOFF CURVE NO. = 85
TIME OF CONCENTRATION = .0876 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.01	0.00	0.0000	0.0000	0.0000	0.00
0.02	0.00	0.0000	0.0000	0.0000	0.00
0.04	0.00	0.0000	0.0000	0.0000	0.00
0.05	0.00	0.0000	0.0000	0.0000	0.00
0.06	0.00	0.0000	0.0000	0.0000	0.00
0.07	0.00	0.0000	0.0000	0.0000	0.00
0.08	0.00	0.0000	0.0000	0.0000	0.00
0.09	0.00	0.0000	0.0000	0.0000	0.00
0.11	0.00	0.0000	0.0000	0.0000	0.00
0.12	0.00	0.0000	0.0000	0.0000	0.00
0.13	0.00	0.0000	0.0000	0.0000	0.00
0.14	0.00	0.0000	0.0000	0.0000	0.00
0.15	0.01	0.0000	0.0000	0.0000	0.00
0.16	0.01	0.0000	0.0000	0.0000	0.00
0.18	0.01	0.0000	0.0000	0.0000	0.00
0.19	0.01	0.0000	0.0000	0.0000	0.00
0.20	0.01	0.0000	0.0000	0.0000	0.00
0.21	0.01	0.0000	0.0000	0.0000	0.00
0.22	0.01	0.0000	0.0000	0.0000	0.00
0.23	0.01	0.0000	0.0000	0.0000	0.00
0.25	0.01	0.0000	0.0000	0.0000	0.00
0.26	0.01	0.0000	0.0000	0.0000	0.00
0.27	0.01	0.0000	0.0000	0.0000	0.00
0.28	0.01	0.0000	0.0000	0.0000	0.00
0.29	0.01	0.0000	0.0000	0.0000	0.00
0.30	0.01	0.0000	0.0000	0.0000	0.00
0.32	0.01	0.0000	0.0000	0.0000	0.00
0.33	0.01	0.0000	0.0000	0.0000	0.00
0.34	0.01	0.0000	0.0000	0.0000	0.00
0.35	0.01	0.0000	0.0000	0.0000	0.00
0.36	0.01	0.0000	0.0000	0.0000	0.00
0.37	0.01	0.0000	0.0000	0.0000	0.00
0.39	0.01	0.0000	0.0000	0.0000	0.00

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11.54	1.87	0.7002	0.0068	0.5730	7.91
11.55	1.88	0.7070	0.0068	0.5744	7.93
11.56	1.89	0.7137	0.0068	0.5759	7.95
11.57	1.90	0.7206	0.0068	0.5773	7.97
11.59	1.91	0.7274	0.0068	0.5787	7.99
11.60	1.92	0.7342	0.0069	0.5801	8.01
11.61	1.93	0.7411	0.0069	0.5815	8.03
11.62	1.94	0.7480	0.0069	0.5828	8.05
11.63	1.94	0.7549	0.0069	0.5842	8.07
11.64	1.95	0.7618	0.0069	0.5855	8.09
11.66	1.96	0.7687	0.0069	0.5868	8.10
11.67	1.97	0.7756	0.0069	0.5882	8.12
11.68	1.98	0.7826	0.0070	0.5895	8.14
11.69	1.99	0.7895	0.0070	0.5908	8.16
11.70	2.00	0.7965	0.0070	0.5921	8.18
11.71	2.01	0.8035	0.0070	0.5933	8.19
11.73	2.02	0.8105	0.0070	0.5946	8.21
11.74	2.03	0.8175	0.0070	0.5958	8.23
11.75	2.04	0.8245	0.0070	0.5971	8.25
11.76	2.05	0.8316	0.0071	0.5983	8.26
11.77	2.06	0.8387	0.0071	0.5995	8.28
11.79	2.07	0.8457	0.0071	0.6008	8.30
11.80	2.08	0.8528	0.0071	0.6020	8.31
11.81	2.09	0.8599	0.0071	0.6032	8.33
11.82	2.10	0.8670	0.0071	0.6043	8.35
11.83	2.11	0.8742	0.0071	0.6055	8.36
11.84	2.12	0.8813	0.0072	0.6067	8.38
11.86	2.13	0.8884	0.0072	0.6078	8.39
11.87	2.14	0.8956	0.0072	0.6090	8.41
11.88	2.14	0.9028	0.0072	0.6101	8.43
11.89	2.15	0.9100	0.0072	0.6112	8.44
11.90	2.16	0.9172	0.0072	0.6123	8.46
11.91	2.17	0.9244	0.0072	0.6134	8.47
11.93	2.18	0.9316	0.0072	0.6145	8.49
11.94	2.19	0.9389	0.0073	0.6156	8.50
11.95	2.20	0.9461	0.0073	0.6167	8.52
11.96	2.21	0.9534	0.0073	0.6178	8.53
11.97	2.22	0.9607	0.0073	0.6188	8.55
11.98	2.23	0.9679	0.0073	0.6199	8.56
12.00	2.24	0.9752	0.0044	0.6209	8.58
12.01	2.25	0.9797	0.0024	0.6145	8.49
12.02	2.25	0.9821	0.0024	0.5956	8.22
12.03	2.25	0.9845	0.0024	0.5640	7.79
12.04	2.26	0.9870	0.0024	0.5199	7.18
12.05	2.26	0.9894	0.0024	0.4631	6.40
12.07	2.26	0.9919	0.0024	0.4056	5.60
12.08	2.26	0.9943	0.0024	0.3554	4.91
12.09	2.27	0.9968	0.0024	0.3127	4.32
12.10	2.27	0.9992	0.0024	0.2774	3.83
12.11	2.27	1.0016	0.0024	0.2496	3.45
12.12	2.28	1.0041	0.0025	0.2292	3.16
12.14	2.28	1.0065	0.0025	0.2162	2.98
12.15	2.28	1.0090	0.0025	0.2108	2.91

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23.92	3.40	1.9272	0.0003	0.0295	0.41
23.93	3.40	1.9276	0.0005	0.0295	0.41
23.94	3.40	1.9279	0.0003	0.0295	0.41
23.96	3.40	1.9283	0.0002	0.0295	0.41
23.97	3.40	1.9286	0.0002	0.0295	0.41
23.98	3.40	1.9289	0.0003	0.0295	0.41
23.99	3.40	1.9293	0.0003	0.0295	0.41
24.00	3.40	1.9296	0.0000	0.0293	0.40
24.01	3.40	1.9296	0.0000	0.0282	0.39
24.03	3.40	1.9296	0.0000	0.0262	0.36
24.04	3.40	1.9296	0.0000	0.0234	0.32
24.05	3.40	1.9296	0.0000	0.0197	0.27
24.06	3.40	1.9296	0.0000	0.0154	0.21
24.07	3.40	1.9296	0.0000	0.0116	0.16
24.08	3.40	1.9296	0.0000	0.0084	0.12
24.10	3.40	1.9296	0.0000	0.0057	0.08
24.11	3.40	1.9296	0.0000	0.0035	0.05
24.12	3.40	1.9296	0.0000	0.0018	0.03
24.13	3.40	1.9296	0.0000	0.0007	0.01
24.14	3.40	1.9296	0.0000	0.0001	0.00
24.15	3.40	1.9296	0.0000	0.0000	0.00
24.17	3.40	1.9296	0.0000	0.0000	0.00
24.18	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.93 IN. TIME TO PEAK = 11.991 HOURS
INITIAL ABSTRACTION = .353 IN. RUNOFF VOLUME CHECK = 1.933 IN.
PEAK FLOW = 8.583999 CFS

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TABLE 2

STORM RUNOFF DETERMINATION
FOR
DEER CREEK WASTE ROCK SITE #2

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS
RUNOFF AREA = .0867 SQ. MILES
RUNOFF CURVE NO. = 85
TIME OF CONCENTRATION = .1315 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.02	0.00	0.0000	0.0000	0.0000	0.00
0.04	0.00	0.0000	0.0000	0.0000	0.00
0.05	0.00	0.0000	0.0000	0.0000	0.00
0.07	0.00	0.0000	0.0000	0.0000	0.00
0.09	0.00	0.0000	0.0000	0.0000	0.00
0.11	0.00	0.0000	0.0000	0.0000	0.00
0.12	0.00	0.0000	0.0000	0.0000	0.00
0.14	0.00	0.0000	0.0000	0.0000	0.00
0.16	0.01	0.0000	0.0000	0.0000	0.00
0.18	0.01	0.0000	0.0000	0.0000	0.00
0.19	0.01	0.0000	0.0000	0.0000	0.00
0.21	0.01	0.0000	0.0000	0.0000	0.00
0.23	0.01	0.0000	0.0000	0.0000	0.00
0.25	0.01	0.0000	0.0000	0.0000	0.00
0.26	0.01	0.0000	0.0000	0.0000	0.00
0.28	0.01	0.0000	0.0000	0.0000	0.00
0.30	0.01	0.0000	0.0000	0.0000	0.00
0.32	0.01	0.0000	0.0000	0.0000	0.00
0.33	0.01	0.0000	0.0000	0.0000	0.00
0.35	0.01	0.0000	0.0000	0.0000	0.00
0.37	0.01	0.0000	0.0000	0.0000	0.00
0.39	0.01	0.0000	0.0000	0.0000	0.00
0.40	0.01	0.0000	0.0000	0.0000	0.00
0.42	0.01	0.0000	0.0000	0.0000	0.00
0.44	0.01	0.0000	0.0000	0.0000	0.00
0.46	0.02	0.0000	0.0000	0.0000	0.00
0.47	0.02	0.0000	0.0000	0.0000	0.00
0.49	0.02	0.0000	0.0000	0.0000	0.00
0.51	0.02	0.0000	0.0000	0.0000	0.00
0.53	0.02	0.0000	0.0000	0.0000	0.00
0.54	0.02	0.0000	0.0000	0.0000	0.00
0.56	0.02	0.0000	0.0000	0.0000	0.00
0.58	0.02	0.0000	0.0000	0.0000	0.00

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11.75	2.04	0.8229	0.0106	0.5932	33.19
11.76	2.05	0.8335	0.0106	0.5951	33.30
11.78	2.07	0.8441	0.0106	0.5970	33.40
11.80	2.08	0.8548	0.0107	0.5989	33.51
11.82	2.10	0.8654	0.0107	0.6007	33.61
11.83	2.11	0.8761	0.0107	0.6025	33.71
11.85	2.12	0.8869	0.0108	0.6043	33.81
11.87	2.14	0.8976	0.0108	0.6060	33.91
11.89	2.15	0.9084	0.0108	0.6077	34.00
11.91	2.17	0.9192	0.0108	0.6095	34.10
11.92	2.18	0.9301	0.0109	0.6112	34.19
11.94	2.20	0.9409	0.0109	0.6128	34.29
11.96	2.21	0.9518	0.0109	0.6145	34.38
11.98	2.22	0.9627	0.0109	0.6161	34.47
11.99	2.24	0.9727	0.0067	0.6177	34.56
12.01	2.25	0.9804	0.0037	0.6119	34.24
12.03	2.25	0.9840	0.0037	0.5926	33.21
12.05	2.26	0.9877	0.0037	0.5626	31.48
12.06	2.26	0.9914	0.0037	0.5190	29.04
12.08	2.27	0.9950	0.0037	0.4627	25.89
12.10	2.27	0.9987	0.0037	0.4054	22.68
12.12	2.28	1.0024	0.0037	0.3555	19.89
12.13	2.28	1.0060	0.0037	0.3129	17.51
12.15	2.29	1.0097	0.0037	0.2777	15.54
12.17	2.29	1.0134	0.0037	0.2495	13.96
12.19	2.29	1.0171	0.0037	0.2295	12.84
12.20	2.30	1.0208	0.0037	0.2166	12.12
12.22	2.30	1.0245	0.0037	0.2112	11.82
12.24	2.31	1.0282	0.0037	0.2103	11.77
12.26	2.31	1.0319	0.0037	0.2105	11.78
12.27	2.32	1.0356	0.0037	0.2107	11.79
12.29	2.32	1.0393	0.0037	0.2108	11.80
12.31	2.33	1.0430	0.0037	0.2110	11.80
12.33	2.33	1.0467	0.0037	0.2111	11.81
12.34	2.34	1.0504	0.0037	0.2113	11.82
12.36	2.34	1.0541	0.0037	0.2115	11.83
12.38	2.35	1.0578	0.0037	0.2116	11.84
12.40	2.35	1.0616	0.0037	0.2118	11.85
12.41	2.36	1.0653	0.0037	0.2119	11.86
12.43	2.36	1.0690	0.0037	0.2121	11.87
12.45	2.37	1.0727	0.0037	0.2122	11.87
12.47	2.37	1.0765	0.0037	0.2124	11.88
12.48	2.38	1.0802	0.0037	0.2125	11.89
12.50	2.38	1.0839	0.0037	0.2127	11.90
12.52	2.39	1.0877	0.0037	0.2128	11.91
12.54	2.39	1.0914	0.0037	0.2130	11.92
12.55	2.39	1.0951	0.0037	0.2131	11.92
12.57	2.40	1.0989	0.0037	0.2133	11.93
12.59	2.40	1.1026	0.0038	0.2134	11.94
12.61	2.41	1.1064	0.0038	0.2136	11.95
12.62	2.41	1.1101	0.0038	0.2137	11.96
12.64	2.42	1.1139	0.0038	0.2139	11.97
12.66	2.42	1.1177	0.0038	0.2140	11.98

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23.83	3.39	1.9245	0.0005	0.0295	1.65
23.85	3.39	1.9250	0.0005	0.0295	1.65
23.86	3.40	1.9255	0.0005	0.0295	1.65
23.88	3.40	1.9260	0.0005	0.0295	1.65
23.90	3.40	1.9266	0.0005	0.0295	1.65
23.92	3.40	1.9271	0.0005	0.0295	1.65
23.93	3.40	1.9276	0.0005	0.0295	1.65
23.95	3.40	1.9281	0.0005	0.0295	1.65
23.97	3.40	1.9286	0.0005	0.0295	1.65
23.99	3.40	1.9291	0.0004	0.0295	1.65
24.00	3.40	1.9296	0.0000	0.0293	1.64
24.02	3.40	1.9296	0.0000	0.0282	1.59
24.04	3.40	1.9296	0.0000	0.0263	1.47
24.06	3.40	1.9296	0.0000	0.0235	1.3[illegible]
24.07	3.40	1.9296	0.0000	0.0198	1.11
24.09	3.40	1.9296	0.0000	0.0155	0.87
24.11	3.40	1.9296	0.0000	0.0117	0.65
24.13	3.40	1.9296	0.0000	0.0084	0.47
24.14	3.40	1.9296	0.0000	0.0057	0.32
24.16	3.40	1.9296	0.0000	0.0035	0.20
24.18	3.40	1.9296	0.0000	0.0019	0.10
24.20	3.40	1.9296	0.0000	0.0007	0.04
24.21	3.40	1.9296	0.0000	0.0001	0.01
24.23	3.40	1.9296	0.0000	0.0000	0.00
24.25	3.40	1.9296	0.0000	0.0000	0.00
24.27	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.93 IN. TIME TO PEAK = 11.900 HOURS
INITIAL ABSTRACTION = .353 IN. RUNOFF VOLUME CHECK = 1.933 IN.
PEAK FLOW = 34.593 CFS

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TABLE 3

STORM RUNOFF DETERMINATION
FOR
DEER CREEK WASTE ROCK SITE #3

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS
RUNOFF AREA = .0361 SQ. MILES
RUNOFF CURVE NO. = 85
TIME OF CONCENTRATION = .792 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.11	0.00	0.0000	0.0000	0.0000	0.00
0.21	0.01	0.0000	0.0000	0.0000	0.00
0.32	0.01	0.0000	0.0000	0.0000	0.00
0.42	0.01	0.0000	0.0000	0.0000	0.00
0.53	0.02	0.0000	0.0000	0.0000	0.00
0.63	0.02	0.0000	0.0000	0.0000	0.00
0.74	0.03	0.0000	0.0000	0.0000	0.00
0.84	0.03	0.0000	0.0000	0.0000	0.00
0.95	0.03	0.0000	0.0000	0.0000	0.00
1.06	0.04	0.0000	0.0000	0.0000	0.00
1.16	0.04	0.0000	0.0000	0.0000	0.00
1.27	0.04	0.0000	0.0000	0.0000	0.00
1.37	0.05	0.0000	0.0000	0.0000	0.00
1.48	0.05	0.0000	0.0000	0.0000	0.00
1.58	0.05	0.0000	0.0000	0.0000	0.00
1.69	0.06	0.0000	0.0000	0.0000	0.00
1.80	0.06	0.0000	0.0000	0.0000	0.00
1.90	0.06	0.0000	0.0000	0.0000	0.00
2.01	0.07	0.0000	0.0000	0.0000	0.00
2.11	0.07	0.0000	0.0000	0.0000	0.00
2.22	0.08	0.0000	0.0000	0.0000	0.00
2.32	0.08	0.0000	0.0000	0.0000	0.00
2.43	0.09	0.0000	0.0000	0.0000	0.00
2.53	0.10	0.0000	0.0000	0.0000	0.00
2.64	0.10	0.0000	0.0000	0.0000	0.00
2.75	0.11	0.0000	0.0000	0.0000	0.00
2.85	0.11	0.0000	0.0000	0.0000	0.00
2.96	0.12	0.0000	0.0000	0.0000	0.00
3.06	0.12	0.0000	0.0000	0.0000	0.00
3.17	0.13	0.0000	0.0000	0.0000	0.00
3.27	0.13	0.0000	0.0000	0.0000	0.00
3.38	0.14	0.0000	0.0000	0.0000	0.00
3.48	0.14	0.0000	0.0000	0.0000	0.00

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9.19	0.53	0.0160	0.0019	0.0121	0.28
9.29	0.54	0.0179	0.0020	0.0131	0.31
9.40	0.55	0.0199	0.0021	0.0141	0.33
9.50	0.56	0.0220	0.0022	0.0151	0.35
9.61	0.57	0.0242	0.0023	0.0161	0.38
9.72	0.58	0.0265	0.0024	0.0171	0.40
9.82	0.59	0.0289	0.0025	0.0180	0.42
9.93	0.60	0.0314	0.0083	0.0189	0.44
10.03	0.64	0.0397	0.0249	0.0215	0.50
10.14	0.72	0.0645	0.0296	0.0303	0.71
10.24	0.81	0.0942	0.0339	0.0468	1.09
10.35	0.90	0.1280	0.0376	0.0720	1.68
10.45	0.98	0.1656	0.0410	0.1071	2.50
10.56	1.07	0.2066	0.0440	0.1504	3.50
10.67	1.16	0.2507	0.0468	0.1953	4.55
10.77	1.24	0.2974	0.0492	0.2402	5.60
10.88	1.33	0.3467	0.0515	0.2842	6.62
10.98	1.41	0.3982	0.0536	0.3260	7.59
11.09	1.50	0.4517	0.0554	0.3648	8.50
11.19	1.59	0.5072	0.0571	0.3997	9.31
11.30	1.67	0.5643	0.0587	0.4300	10.02
11.40	1.76	0.6230	0.0602	0.4557	10.62
11.51	1.84	0.6832	0.0615	0.4784	11.15
11.62	1.93	0.7447	0.0628	0.4990	11.63
11.72	2.02	0.8075	0.0639	0.5173	12.06
11.83	2.10	0.8714	0.0650	0.5349	12.46
11.93	2.19	0.9363	0.0499	0.5506	12.82
12.04	2.25	0.9862	0.0221	0.5605	13.06
12.14	2.28	1.0084	0.0222	0.5565	12.96
12.25	2.31	1.0306	0.0223	0.5385	12.55
12.36	2.34	1.0529	0.0224	0.5065	11.80
12.46	2.37	1.0753	0.0225	0.4604	10.72
12.57	2.40	1.0978	0.0226	0.4072	9.49
12.67	2.43	1.1204	0.0227	0.3602	8.39
12.78	2.46	1.1431	0.0228	0.3193	7.44
12.88	2.48	1.1659	0.0229	0.2850	6.64
12.99	2.51	1.1888	0.0230	0.2574	6.00
13.09	2.54	1.2118	0.0230	0.2367	5.51
13.20	2.57	1.2348	0.0231	0.2231	5.20
13.31	2.60	1.2579	0.0232	0.2168	5.05
13.41	2.63	1.2811	0.0233	0.2160	5.03
13.52	2.66	1.3044	0.0234	0.2169	5.05
13.62	2.69	1.3278	0.0234	0.2177	5.07
13.73	2.71	1.3512	0.0235	0.2185	5.09
13.83	2.74	1.3747	0.0236	0.2193	5.11
13.94	2.77	1.3983	0.0174	0.2200	5.13
14.04	2.79	1.4156	0.0089	0.2190	5.10
14.15	2.80	1.4245	0.0089	0.2137	4.98
14.26	2.81	1.4334	0.0089	0.2042	4.76
14.36	2.82	1.4423	0.0089	0.1904	4.44
14.47	2.84	1.4512	0.0089	0.1723	4.01
14.57	2.85	1.4601	0.0089	0.1528	3.56
14.68	2.86	1.4690	0.0089	0.1358	3.16

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23.34	3.38	1.9101	0.0031	0.0294	0.69
23.45	3.38	1.9132	0.0031	0.0294	0.69
23.55	3.39	1.9163	0.0031	0.0294	0.69
23.65	3.39	1.9194	0.0031	0.0294	0.69
23.76	3.39	1.9225	0.0031	0.0294	0.69
23.87	3.40	1.9256	0.0031	0.0294	0.69
23.97	3.40	1.9287	0.0008	0.0294	0.69
24.08	3.40	1.9296	0.0000	0.0288	0.67
24.18	3.40	1.9296	0.0000	0.0273	0.64
24.29	3.40	1.9296	0.0000	0.0249	0.58
24.39	3.40	1.9296	0.0000	0.0216	0.50
24.50	3.40	1.9296	0.0000	0.0174	0.41
24.60	3.40	1.9296	0.0000	0.0134	0.31
24.71	3.40	1.9296	0.0000	0.0099	0.23
24.82	3.40	1.9296	0.0000	0.0069	0.16
24.92	3.40	1.9296	0.0000	0.0045	0.11
25.03	3.40	1.9296	0.0000	0.0026	0.06
25.13	3.40	1.9296	0.0000	0.0012	0.03
25.24	3.40	1.9296	0.0000	0.0004	0.01
25.34	3.40	1.9296	0.0000	0.0000	0.00
25.45	3.40	1.9296	0.0000	0.0000	0.00
25.56	3.40	1.9296	0.0000	0.0000	0.00
25.66	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.93 IN. TIME TO PEAK = 12.061 HOURS
INITIAL ABSTRACTION = .353 IN. RUNOFF VOLUME CHECK = 1.933 IN.
PEAK FLOW = 13.065 CFS

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TABLE 4

STORM RUNOFF DETERMINATION
FOR
DEER CREEK WASTE ROCK SITE #4

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS
RUNOFF AREA = .0619 SQ. MILES
RUNOFF CURVE NO. = 85
TIME OF CONCENTRATION = .1137 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.02	0.00	0.0000	0.0000	0.0000	0.00
0.03	0.00	0.0000	0.0000	0.0000	0.00
0.05	0.00	0.0000	0.0000	0.0000	0.00
0.06	0.00	0.0000	0.0000	0.0000	0.00
0.08	0.00	0.0000	0.0000	0.0000	0.00
0.09	0.00	0.0000	0.0000	0.0000	0.00
0.11	0.00	0.0000	0.0000	0.0000	0.00
0.12	0.00	0.0000	0.0000	0.0000	0.00
0.14	0.00	0.0000	0.0000	0.0000	0.00
0.15	0.01	0.0000	0.0000	0.0000	0.00
0.17	0.01	0.0000	0.0000	0.0000	0.00
0.18	0.01	0.0000	0.0000	0.0000	0.00
0.20	0.01	0.0000	0.0000	0.0000	0.00
0.21	0.01	0.0000	0.0000	0.0000	0.00
0.23	0.01	0.0000	0.0000	0.0000	0.00
0.24	0.01	0.0000	0.0000	0.0000	0.00
0.26	0.01	0.0000	0.0000	0.0000	0.00
0.27	0.01	0.0000	0.0000	0.0000	0.00
0.29	0.01	0.0000	0.0000	0.0000	0.00
0.30	0.01	0.0000	0.0000	0.0000	0.00
0.32	0.01	0.0000	0.0000	0.0000	0.00
0.33	0.01	0.0000	0.0000	0.0000	0.00
0.35	0.01	0.0000	0.0000	0.0000	0.00
0.36	0.01	0.0000	0.0000	0.0000	0.00
0.38	0.01	0.0000	0.0000	0.0000	0.00
0.39	0.01	0.0000	0.0000	0.0000	0.00
0.41	0.01	0.0000	0.0000	0.0000	0.00
0.42	0.01	0.0000	0.0000	0.0000	0.00
0.44	0.01	0.0000	0.0000	0.0000	0.00
0.45	0.02	0.0000	0.0000	0.0000	0.00
0.47	0.02	0.0000	0.0000	0.0000	0.00
0.49	0.02	0.0000	0.0000	0.0000	0.00
0.50	0.02	0.0000	0.0000	0.0000	0.00

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11.76	2.05	0.8331	0.0092	0.5965	23.83
11.78	2.06	0.8422	0.0092	0.5981	23.89
11.79	2.08	0.8514	0.0092	0.5997	23.95
11.81	2.09	0.8606	0.0092	0.6012	24.02
11.82	2.10	0.8699	0.0093	0.6028	24.08
11.84	2.11	0.8791	0.0093	0.6043	24.14
11.86	2.13	0.8884	0.0093	0.6059	24.20
11.87	2.14	0.8977	0.0093	0.6074	24.26
11.89	2.15	0.9070	0.0093	0.6089	24.32
11.90	2.16	0.9164	0.0094	0.6103	24.38
11.92	2.18	0.9257	0.0094	0.6118	24.44
11.93	2.19	0.9351	0.0094	0.6132	24.50
11.95	2.20	0.9445	0.0094	0.6146	24.55
11.96	2.21	0.9540	0.0094	0.6160	24.61
11.98	2.22	0.9634	0.0095	0.6174	24.66
11.99	2.24	0.9729	0.0067	0.6188	24.72
12.01	2.25	0.9796	0.0032	0.6147	24.55
12.02	2.25	0.9828	0.0032	0.5980	23.89
12.04	2.25	0.9859	0.0032	0.5687	22.72
12.05	2.26	0.9891	0.0032	0.5263	21.04
12.07	2.26	0.9923	0.0032	0.4722	18.86
12.08	2.27	0.9954	0.0032	0.4138	16.53
12.10	2.27	0.9986	0.0032	0.3626	14.49
12.11	2.27	1.0018	0.0032	0.3189	12.74
12.13	2.28	1.0050	0.0032	0.2825	11.28
12.14	2.28	1.0082	0.0032	0.2535	10.13
12.16	2.29	1.0113	0.0032	0.2320	9.27
12.17	2.29	1.0145	0.0032	0.2180	8.71
12.19	2.30	1.0177	0.0032	0.2114	8.44
12.20	2.30	1.0209	0.0032	0.2101	8.39
12.22	2.30	1.0241	0.0032	0.2103	8.40
12.23	2.31	1.0273	0.0032	0.2104	8.41
12.25	2.31	1.0305	0.0032	0.2106	8.41
12.26	2.32	1.0337	0.0032	0.2107	8.42
12.28	2.32	1.0369	0.0032	0.2108	8.42
12.29	2.32	1.0401	0.0032	0.2110	8.43
12.31	2.33	1.0433	0.0032	0.2111	8.43
12.32	2.33	1.0465	0.0032	0.2112	8.44
12.34	2.34	1.0497	0.0032	0.2114	8.44
12.36	2.34	1.0529	0.0032	0.2115	8.45
12.37	2.34	1.0561	0.0032	0.2116	8.45
12.39	2.35	1.0593	0.0032	0.2118	8.46
12.40	2.35	1.0626	0.0032	0.2119	8.47
12.42	2.36	1.0658	0.0032	0.2121	8.47
12.43	2.36	1.0690	0.0032	0.2122	8.48
12.45	2.37	1.0722	0.0032	0.2123	8.48
12.46	2.37	1.0754	0.0032	0.2124	8.49
12.48	2.37	1.0787	0.0032	0.2126	8.49
12.49	2.38	1.0819	0.0032	0.2127	[illegible]
12.51	2.38	1.0851	0.0032	0.2128	8.50
12.52	2.39	1.0884	0.0032	0.2130	8.51
12.54	2.39	1.0916	0.0032	0.2131	8.51
12.55	2.39	1.0948	0.0032	0.2132	8.52

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23.82	3.39	1.9241	0.0004	0.0295	1.18
23.83	3.39	1.9246	0.0004	0.0295	1.18
23.85	3.39	1.9250	0.0004	0.0295	1.18
23.86	3.40	1.9255	0.0004	0.0295	1.18
23.88	3.40	1.9259	0.0004	0.0295	1.18
23.89	3.40	1.9264	0.0004	0.0295	1.18
23.91	3.40	1.9268	0.0004	0.0295	1.18
23.92	3.40	1.9273	0.0004	0.0295	1.18
23.94	3.40	1.9277	0.0004	0.0295	1.18
23.95	3.40	1.9282	0.0004	0.0295	1.18
23.97	3.40	1.9286	0.0004	0.0295	1.18
23.98	3.40	1.9290	0.0004	0.0295	1.18
24.00	3.40	1.9295	0.0001	0.0295	1.18
24.01	3.40	1.9296	0.0000	0.0287	1.15
24.03	3.40	1.9296	0.0000	0.0271	1.08
24.04	3.40	1.9296	0.0000	0.0246	0.98
24.06	3.40	1.9296	0.0000	0.0211	0.84
24.07	3.40	1.9296	0.0000	0.0169	0.67
24.09	3.40	1.9296	0.0000	0.0129	0.52
24.10	3.40	1.9296	0.0000	0.0095	0.38
24.12	3.40	1.9296	0.0000	0.0064	0.26
24.13	3.40	1.9296	0.0000	0.0042	0.17
24.15	3.40	1.9296	0.0000	0.0024	0.09
24.16	3.40	1.9296	0.0000	0.0011	0.04
24.18	3.40	1.9296	0.0000	0.0003	0.01
24.19	3.40	1.9296	0.0000	0.0000	0.00
24.21	3.40	1.9296	0.0000	0.0000	0.00
24.23	3.40	1.9296	0.0000	0.0000	0.00
24.24	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

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TOTAL RUNOFF DEPTH = 1.93 IN. TIME TO PEAK = 11.988 HOURS
INITIAL ABSTRACTION = .353 IN. RUNOFF VOLUME CHECK = 1.933 IN.
PEAK FLOW = 24.722 CFS

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TABLE 5

STORM RUNOFF DETERMINATION
FOR
DEER CREEK WASTE ROCK SITE #5

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS
RUNOFF AREA = .0459 SQ. MILES
RUNOFF CURVE NO. = 77
TIME OF CONCENTRATION = .5556 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.07	0.00	0.0000	0.0000	0.0000	0.00
0.15	0.01	0.0000	0.0000	0.0000	0.00
0.22	0.01	0.0000	0.0000	0.0000	0.00
0.30	0.01	0.0000	0.0000	0.0000	0.00
0.37	0.01	0.0000	0.0000	0.0000	0.00
0.44	0.02	0.0000	0.0000	0.0000	0.00
0.52	0.02	0.0000	0.0000	0.0000	0.00
0.59	0.02	0.0000	0.0000	0.0000	0.00
0.67	0.02	0.0000	0.0000	0.0000	0.00
0.74	0.03	0.0000	0.0000	0.0000	0.00
0.81	0.03	0.0000	0.0000	0.0000	0.00
0.89	0.03	0.0000	0.0000	0.0000	0.00
0.96	0.03	0.0000	0.0000	0.0000	0.00
1.04	0.04	0.0000	0.0000	0.0000	0.00
1.11	0.04	0.0000	0.0000	0.0000	0.00
1.19	0.04	0.0000	0.0000	0.0000	0.00
1.26	0.04	0.0000	0.0000	0.0000	0.00
1.33	0.05	0.0000	0.0000	0.0000	0.00
1.41	0.05	0.0000	0.0000	0.0000	0.00
1.48	0.05	0.0000	0.0000	0.0000	0.00
1.56	0.05	0.0000	0.0000	0.0000	0.00
1.63	0.06	0.0000	0.0000	0.0000	0.00
1.70	0.06	0.0000	0.0000	0.0000	0.00
1.78	0.06	0.0000	0.0000	0.0000	0.00
1.85	0.06	0.0000	0.0000	0.0000	0.00
1.93	0.07	0.0000	0.0000	0.0000	0.00
2.00	0.07	0.0000	0.0000	0.0000	0.00
2.07	0.07	0.0000	0.0000	0.0000	0.00
2.15	0.08	0.0000	0.0000	0.0000	0.00
2.22	0.08	0.0000	0.0000	0.0000	0.00
2.30	0.08	0.0000	0.0000	0.0000	0.00
2.37	0.09	0.0000	0.0000	0.0000	0.00
2.44	0.09	0.0000	0.0000	0.0000	0.00

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10.37	0.91	0.0305	0.0119	0.0286	0.85
10.45	0.93	0.0424	0.0137	0.0446	1.33
10.52	1.04	0.0561	0.0153	0.0635	1.88
10.59	1.10	0.0714	0.0168	0.0845	2.50
10.67	1.16	0.0882	0.0183	0.1071	3.17
10.74	1.22	0.1065	0.0197	0.1304	2.86
10.82	1.28	0.1262	0.0210	0.1540	4.56
10.89	1.34	0.1471	0.0223	0.1773	5.25
10.96	1.40	0.1694	0.0235	0.1996	5.91
11.04	1.46	0.1929	0.0246	0.2209	6.54
11.11	1.52	0.2175	0.0257	0.2411	7.14
11.19	1.58	0.2431	0.0267	0.2602	7.71
11.26	1.64	0.2699	0.0277	0.2785	8.25
11.33	1.70	0.2976	0.0287	0.2958	8.76
11.41	1.76	0.3263	0.0296	0.3123	9.25
11.48	1.82	0.3559	0.0305	0.3281	9.72
11.56	1.88	0.3864	0.0313	0.3431	10.16
11.63	1.94	0.4177	0.0321	0.3575	10.59
11.70	2.00	0.4498	0.0329	0.3712	10.99
11.78	2.06	0.4827	0.0336	0.3842	11.38
11.85	2.12	0.5163	0.0343	0.3968	11.75
11.93	2.18	0.5506	0.0347	0.4088	12.11
12.00	2.24	0.5853	0.0115	0.4201	12.44
12.08	2.26	0.5971	0.0119	0.4218	12.48
12.15	2.28	0.6090	0.0120	0.4122	12.21
12.22	2.30	0.6209	0.0120	0.3926	11.63
12.30	2.32	0.6330	0.0121	0.3622	10.73
12.37	2.35	0.6451	0.0122	0.3212	9.51
12.45	2.37	0.6572	0.0122	0.2845	8.43
12.52	2.39	0.6695	0.0123	0.2525	7.48
12.59	2.41	0.6818	0.0124	0.2252	6.67
12.67	2.43	0.6941	0.0124	0.2028	6.01
12.74	2.45	0.7066	0.0125	0.1856	5.50
12.82	2.47	0.7191	0.0126	0.1736	5.14
12.89	2.49	0.7316	0.0126	0.1671	4.95
12.96	2.51	0.7442	0.0127	0.1662	4.92
13.04	2.53	0.7569	0.0127	0.1671	4.95
13.11	2.55	0.7696	0.0128	0.1680	4.98
13.19	2.57	0.7825	0.0129	0.1688	5.00
13.26	2.59	0.7953	0.0129	0.1697	5.03
13.33	2.61	0.8082	0.0130	0.1705	5.05
13.41	2.63	0.8212	0.0130	0.1714	5.08
13.48	2.65	0.8342	0.0131	0.1722	5.10
13.56	2.67	0.8473	0.0131	0.1730	5.12
13.63	2.69	0.8605	0.0132	0.1738	5.15
13.70	2.71	0.8737	0.0133	0.1746	5.17
13.78	2.73	0.8869	0.0133	0.1754	5.20
13.85	2.75	0.9003	0.0134	0.1762	5.22
13.93	2.77	0.9136	0.0135	0.1770	5.24
14.00	2.79	0.9269	0.0050	0.1777	5.26
14.08	2.80	0.9319	0.0051	0.1749	5.18
14.15	2.80	0.9370	0.0051	0.1688	5.00
14.22	2.81	0.9421	0.0051	0.1592	4.71

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22.15	3.34	1.3107	0.0018	0.0248	0.73
22.22	3.34	1.3125	0.0018	0.0248	0.73
22.30	3.34	1.3144	0.0018	0.0248	0.73
22.37	3.34	1.3162	0.0018	0.0248	0.73
22.45	3.35	1.3180	0.0018	0.0248	0.73
22.52	3.35	1.3199	0.0018	0.0248	0.73
22.59	3.35	1.3217	0.0018	0.0248	0.73
22.67	3.35	1.3235	0.0018	0.0248	0.73
22.74	3.36	1.3254	0.0018	0.0248	0.74
22.82	3.36	1.3272	0.0018	0.0248	0.74
22.89	3.36	1.3291	0.0018	0.0248	0.74
22.96	3.36	1.3309	0.0018	0.0248	0.74
23.04	3.37	1.3327	0.0018	0.0249	0.74
23.11	3.37	1.3346	0.0018	0.0249	0.74
23.19	3.37	1.3364	0.0018	0.0249	0.74
23.26	3.37	1.3383	0.0018	0.0249	0.74
23.34	3.38	1.3401	0.0018	0.0249	0.74
23.41	3.38	1.3419	0.0018	0.0249	0.74
23.48	3.38	1.3438	0.0018	0.0249	0.74
23.56	3.38	1.3456	0.0018	0.0249	0.74
23.63	3.39	1.3475	0.0018	0.0249	0.74
23.71	3.39	1.3493	0.0018	0.0249	0.74
23.78	3.39	1.3512	0.0018	0.0249	0.74
23.85	3.40	1.3530	0.0018	0.0249	0.74
23.93	3.40	1.3549	0.0018	0.0249	0.74
24.00	3.40	1.3567	0.0000	0.0249	0.74
24.08	3.40	1.3567	0.0000	0.0242	0.72
24.15	3.40	1.3567	0.0000	0.0227	0.67
24.22	3.40	1.3567	0.0000	0.0204	0.60
24.30	3.40	1.3567	0.0000	0.0174	0.52
24.37	3.40	1.3567	0.0000	0.0137	0.41
24.45	3.40	1.3567	0.0000	0.0104	0.31
24.52	3.40	1.3567	0.0000	0.0076	0.22
24.59	3.40	1.3567	0.0000	0.0052	0.15
24.67	3.40	1.3567	0.0000	0.0033	0.10
24.74	3.40	1.3567	0.0000	0.0018	0.05
24.82	3.40	1.3567	0.0000	0.0007	0.02
24.89	3.40	1.3567	0.0000	0.0001	0.00
24.96	3.40	1.3567	0.0000	0.0000	0.00
25.04	3.40	1.3567	0.0000	0.0000	0.00
25.11	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 1.357 IN. TIME TO PEAK = 12.047 HOURS
INITIAL ABSTRACTION = .597 IN. RUNOFF VOLUME CHECK = 1.359 IN.
PEAK FLOW = 12.503 CFS

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```
1 CLS : REM                    RIPRAP SIZING PROGRAM TAKEN FROM
2 KEY OFF: REM     "APPLIED HYDROLOGY AND SEDIMENTOLOGY FOR DISTURBED AREAS"
3 REM:                      BY BARFEILD, WARNER AND HAAN,  PAGE 185
50 DEF FNSIND(I)=SIN(I*3.14159/180)
60 DEF FNCOSD(I)=COS(I*3.14159/180)
70 DEF FNTAND(I)=TAN(I*3.14159/180)
80 DEF FNATND(I)=(180/3.14159)*ATN(I)
100 PRINT TAB(13)"R I P R A P  S I Z I N G  F O R"
110 PRINT TAB(11)"T R A P A Z O I D A L  D I T C H E S"
120 PRINT
130 PRINT TAB(13)"ENTER LISTED PARAMETERS"
140 PRINT TAB(13)"1. FLOW RATE (CFS)"
150 PRINT TAB(13)"2. CHANNEL SLOPE"
160 PRINT TAB(13)"3. BOTTOM WIDTH (FT)"
170 PRINT TAB(13)"4. SIDE SLOPE"
180 PRINT TAB(13)"5. PHI ANGLE"
190 PRINT TAB(13)"6. SPECIFIC GRAVITY OF RIPRAP"
195 PRINT
300 LOCATE 5,32:INPUT;"",Q
310 LOCATE 6,30:INPUT;"",S
320 LOCATE 7,34:INPUT;"",B
330 LOCATE 8,27:INPUT;"",SS
340 LOCATE 9,26:INPUT;"",PHI
350 LOCATE 10,43:INPUT;"",SG
360 LOCATE 12,13:INPUT;"DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM  ",DSF
370 LOCATE 13,13:INPUT;"DESIRED SAFETY FACTOR FOR CHANNEL BANKS  ",DSFB
400 SA=FNATND(S) :SSA=FNATND(SS)
480 D50=1: D=1
490 Q=INT(Q*1000+.5)/1000
500 N=((D50)^(1/6))*(.0395)
502 D50=INT(D50*10000+.5)/10000
505 Q1=1.49*(S^.5)/N
508 A=B*D+D*D/SS
510 Q2=Q1*A^(5/3)/(B+2*D*(1+1/(SS^2))^(.5))^(2/3)
512 Q3=INT(Q2*1000+.5)/1000
514 IF Q3=Q GOTO 520
516 D=(Q/Q2*D+D)/2
518 GOTO 505
520 T=62.4*D*S
525 VEL=Q/A
526 VEL=INT(VEL*1000+.5)/1000 :D=INT(D*1000+.5)/1000
530 NU=21*T/(62.4*(SG-1)*D50)
540 SF=FNCOSD(SA)*FNTAND(PHI)/(FNSIND(SA)+NU*FNTAND(PHI))
600 REM LAMBDA = CHANNEL SLOPE ANGLE SA
605 NU=.76*NU : REM ASSUME Tmax = .76*t AND NU(BANK)=.76*NU
610 BETA=FNATND(FNCOSD(SA)/(2*FNSIND(SSA)/(NU*FNTAND(PHI))+FNSIND(SA)))
620 NUP=NU*(1+FNSIND(SA+BETA))/2
630 SFB=FNCOSD(SSA)*FNTAND(PHI)/(NUP*FNTAND(PHI)+FNSIND(SSA)*FNCOSD(BETA))
700 SF=INT(SF*1000+.5)/1000
710 SFB=INT(SFB*1000+.5)/1000
720 LOCATE 16,10:PRINT"VELOCITY      DEPTH       D50      S.F. BTM      S.F. BANK"
730 LOCATE 17,11:PRINT VEL;"      ";D;"    ";D50;"     ";SF;"      ";SFB;"    "
740 IF SFB=0 GOTO 815
750 IF SFB=DSFB GOTO 800
760 D50=(DSFB/SFB*D50+D50)/2
765 K=K+1:IF K=100 THEN GOTO 860
770 GOTO 500
790 IF SF>=DSF GOTO 820
810 LOCATE 20,13:PRINT"ERRROR: SF BANK > SF BTM":END
815 LOCATE 20,13:PRINT"ERROR: SFB=0": END
820 LOCATE 20,13:PRINT"RUN COMPLETE"
850 END
860 PRINT"Exceeds allowable number of iterations (see line 765)":END
```

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R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS -
1. FLOW RATE (CFS) 8.5
2. CHANNEL SLOPE .02
3 BOTTOM WIDTH (FT) 6
4. SIDE SLOPE .333
5. PHI ANGLE 40
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
3.565	.618	.2965	1.803	1.5

RUN COMPLETE

Ok

R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 34.59
2. CHANNEL SLOPE .02
3. BOTTOM WIDTH (FT) 3
4. SIDE SLOPE .333
5. PHI ANGLE 40
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
4.725	1.14	.5467	1.803	1.5

RUN COMPLETE

Ok

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R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 47.65
2. CHANNEL SLOPE .02
3. BOTTOM WIDTH (FT) 4
4. SIDE SLOPE .333
5. PHI ANGLE 40
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
5.033	1.23	.5901	1.803	1.5

RUN COMPLETE

Ok

R I P R A P S I Z I N G F O R
T R A P A Z O I D A L D I T C H E S

ENTER LISTED PARAMETERS
1. FLOW RATE (CFS) 72.37
2. CHANNEL SLOPE .04
3. BOTTOM WIDTH (FT) 5
4. SIDE SLOPE .333
5. PHI ANGLE 41
6. SPECIFIC GRAVITY OF RIPRAP 2.65

DESIRED SAFETY FACTOR FOR CHANNEL BOTTOM 1.5
DESIRED SAFETY FACTOR FOR CHANNEL BANKS 1.5

VELOCITY	DEPTH	D50	S.F. BTM	S.F. BANK
6.59	1.253	1.1701	1.69	1.5

RUN COMPLETE

Ok

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EMERGENCY SPILLWAY DESIGN - SEDIMENT PONDS 1 & 2

METHOD - See National Engineering Handbook, Section 4, Hydrology, Chapter 21, Design Hydrographs page 21.49

1. Design Storm Rainfall Amount

   P=3.4 inches for 100 year, 24 hour storm event. No adjustment of this amount is required for the area or the time of concentration.

2. Determine the Runoff Amount

   for CN = 77, P = 3.4 figure 10.1
   Q_2 = 1.4"

3. Determine Hydrograph Family

   From figure 21.3, Hydrograph Family = #5

4. Determine Duration of Excess Rainfall, T_o

   From figure 21.4, T_o = 2.0 hrs.

5. Compute Initial Tp Valve

   Pond #1, Length = 700', Velocity = 0.7 fps, Tc_1 = .278 hrs
   Pond #2, Length = 700', Velocity = 0.7 fps, T = .278 hrs
   700', Velocity = 1.4 fps, T = .139 hrs
   Tc_2 = .417 hrs

   Tp_1 = .7 (Tc_1) = 0.195 hrs
   Tp_2 = .7 (Tc_2) = 0.292 hrs

6. Compute T_o/Tp

   T_o/Tp_1 = 10.26 hrs
   T_o/Tp_2 = 6.85 hrs

7. Select T_o/Tp Ratio

   T_o/Tp_1 = 10 for Pond #1
   T_o/Tp_2 = 6 for Pond #2

8. Revise Tp

   Rev Tp_1 = 2.0/10.0 = .200
   Rev Tp_2 = 2.0/ 6.0 = .333

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9. Compute qp A_1 = 9.8 Acres = .015 sq. mi.
A_2 = 19.4 Acres = .030 sq. mi.

$$qp_1 = \frac{484*A}{Rev\ Tp_1} = 36.30 \text{ cfs}$$

$$qp_2 = \frac{484*A}{Rev\ Tp_2} = 43.60 \text{ cfs}$$

10. Compute Q qp

Qqp_1 = (1.4) (36.3) = 50.8 cfs
Qqp_2 = (1.4) (43.6) = 61.0 cfs

11. Construct Hydrograph & Determine Maximum Flow Rate

Pond #1 Max q = 10.77 cfs see table 1
Pond #2 Max q = 19.76 cfs see table 2

12. Design Spillway

Assume a broad crested weir

$$Q = CLh^{3/2}$$

Q = Flow in cfs
C = Coefficient, use C = 2.80
L = Length of Wier
h = Head in Feet

Pond #1 L = 3' Q = 10.77 cfs

$$h = \frac{Q}{CL}^{2/3} = \frac{10.77}{(2.8)(3)}^{2/3} = 1.18'$$

Pond #2 L = 6' Q = 19.76 cfs

$$h = \frac{19.76}{(2.8)(6)}^{2/3} = 1.11'$$

To provide the required freeboard, make the spillways 1.5 feet deep.

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POND 1, EMERGENCY SPILLWAY HYDROGRAPH

HYDROGRAPH FAMILY 5, $T_o/Tp = 10$

	t/Tp	time,hrs	qc/qp	Flow,cfs	Qt/Q	Volume Inches
1	0.0	0.0	0.0	0.0	0.0	0.0
2	.67	.134	.013	.660	.003	.004
3	1.34	.268	.061	3.094	.022	.031
4	2.01	.402	.091	4.623	.059	.083
5	2.68	.536	.102	5.182	.107	.150
6	3.35	.670	.107	5.436	.159	.223
7	4.02	.804	.110	5.588	.213	.298
8	4.69	.938	.111	5.639	.268	.375
9	5.36	1.072	.111	5.639	.323	.452
10	6.03	1.206	.112	5.690	.378	.529
11	6.70	1.340	.112	5.690	.434	.608
12	7.37	1.474	.112	5.690	.490	.686
13	8.04	1.608	.116	5.893	.546	.764
14	8.71	1.742	.160	8.128	.615	.861
15	9.38	1.876	.198	10.058	.704	.986
16	10.05	2.010	.212	10.770	.805	1.127
17	10.72	2.144	.168	8.534	.900	1.260
18	11.39	2.278	.074	3.759	.960	1.344
19	12.06	2.412	.027	1.372	.985	1.379
20	12.73	2.546	.010	.508	.994	1.392

time = (t/Tp)* Rev Tp = (t/Tp)* (.200)
flow = (qc/qp)* Qqp = (qc/qp)* (50.8)
volume = (Q_T/Q)* Q = (Q_T/Q)* (1.4)

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POND 2, EMERGENCY SPILLWAY HYDROGRAPH

HYDROGRAPH FAMILY 5, $T_o/Tp = 6.0$

	t/Tp	time,hrs	qc/qp	flow,cfs	Qt/Q	Volume Inches
1	0.0	0.0	0.0	0.0	0.0	0.0
2	.52	.173	.015	.915	.003	.004
3	1.04	.346	.070	4.270	.019	.027
4	1.56	.519	.130	7.930	.057	.080
5	2.08	.693	.159	9.699	.112	.157
6	2.60	.866	.172	10.492	.176	.246
7	3.12	1.039	.178	10.858	.242	.339
8	3.64	1.212	.182	11.102	.311	.435
9	4.16	1.385	.183	11.163	.381	.533
10	4.68	1.558	.184	11.224	.451	.631
11	5.20	1.732	.218	13.298	.527	.738
12	5.72	1.905	.285	17.385	.623	.877
13	6.24	2.078	.324	19.764	.740	1.036
14	6.76	2.251	.267	16.287	.852	1.193
15	7.28	2.424	.133	8.113	.929	1.301
16	7.80	2.597	.064	3.904	.966	1.352
17	8.32	2.771	.029	1.769	.984	1.378
18	8.84	7.994	.016	.976	.993	1.390
19	9.36	3.117	.007	.427	.997	1.396
20	9.33	3.290	.003	.183	.999	1.399

time = (t/Tp) * Rev Tp = (t/Tp) * (.333)
flow = (qc/qp) * Qqp = (qc/qp) * (61.0)
volume = (Qt/Q) * Q = (Q_T/Q) * (1.4)

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CURVE NUMBER DETERMINATION - AREAS 1 THRU 4

LAND USE - WESTERN RANGELAND
15 TO 20% GROUND COVER
JUNIPER - GRASS COMPLEX

SOIL GROUP C - SLOW INFILTRATION RATE
SOIL LAYER IMPEDES DOWNWARD
MOVEMENT OF WATER, SLOW
RATE OF WATER TRANSMISSION

FIGURE 9.6 AT GROUND COVER = 17%, CN ≈ 85

AREA 5 - SAME AS ABOVE WITH GROUND COVER = 40%
≈ CN 77

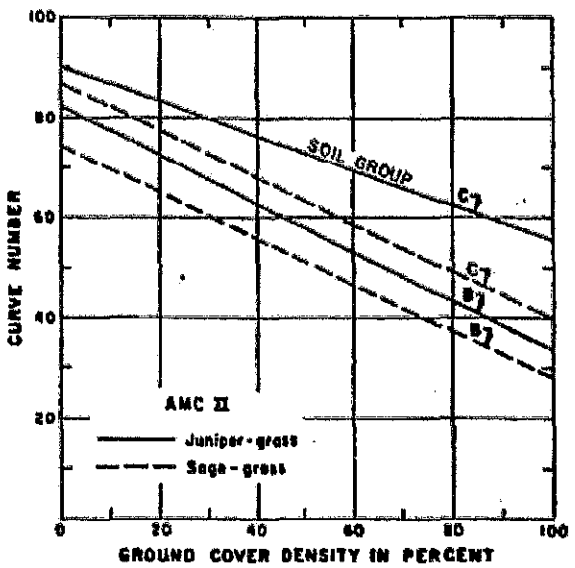

Figure 9.6.--Graph for estimating runoff curve numbers of forest-range complexes in western United States: juniper-grass and sage-grass complexes.

SCS NATIONAL ENGINEERING HANDBOOK
SECTION 4, HYDROLOGY

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DEER CREEK MINE
WASTE ROCK SITE
ROAD ALIGNMENT
CHANNEL CHANGE

WATERSHED PARAMETERS (EXHIBIT A)

Distribution	SCS Type II
Design Storm Event	100-year, 24-hour
Rainfall Depth	3.4 inches
Area	0.2813 sq. miles
Curve Number	86
Watershed Length	4,448 feet
Watershed Slope	38.7%
Time of Concentration	0.2298 hrs.
Peak Flow (Table 1)	339 cfs

CHANNEL PARAMETERS (DRWG. DS1098A, SHEET 1 & 2)

Channel Slope	3.8%
Bottom Width	5 ft.
Side Slope	0.5 (2:1)
Manning's N	.025
Discharge	339 cfs
Flow Depth	2.34 ft.
Velocity	14.98 fps

Although the calculations indicate an erosive velocity, a field inspection by Division Hydrologist Tom Munson (3/6/89) verified the conclusion that the realigned channel is no more susceptible to erosional damage than is the natural channel. Therefore, it is proposed that no additional channel protection be installed.

The area will be inspected by UP&L personnel and Division Inspectors to insure the proposed measures are adequate.

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AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining
by T. Munson date 3/30/89

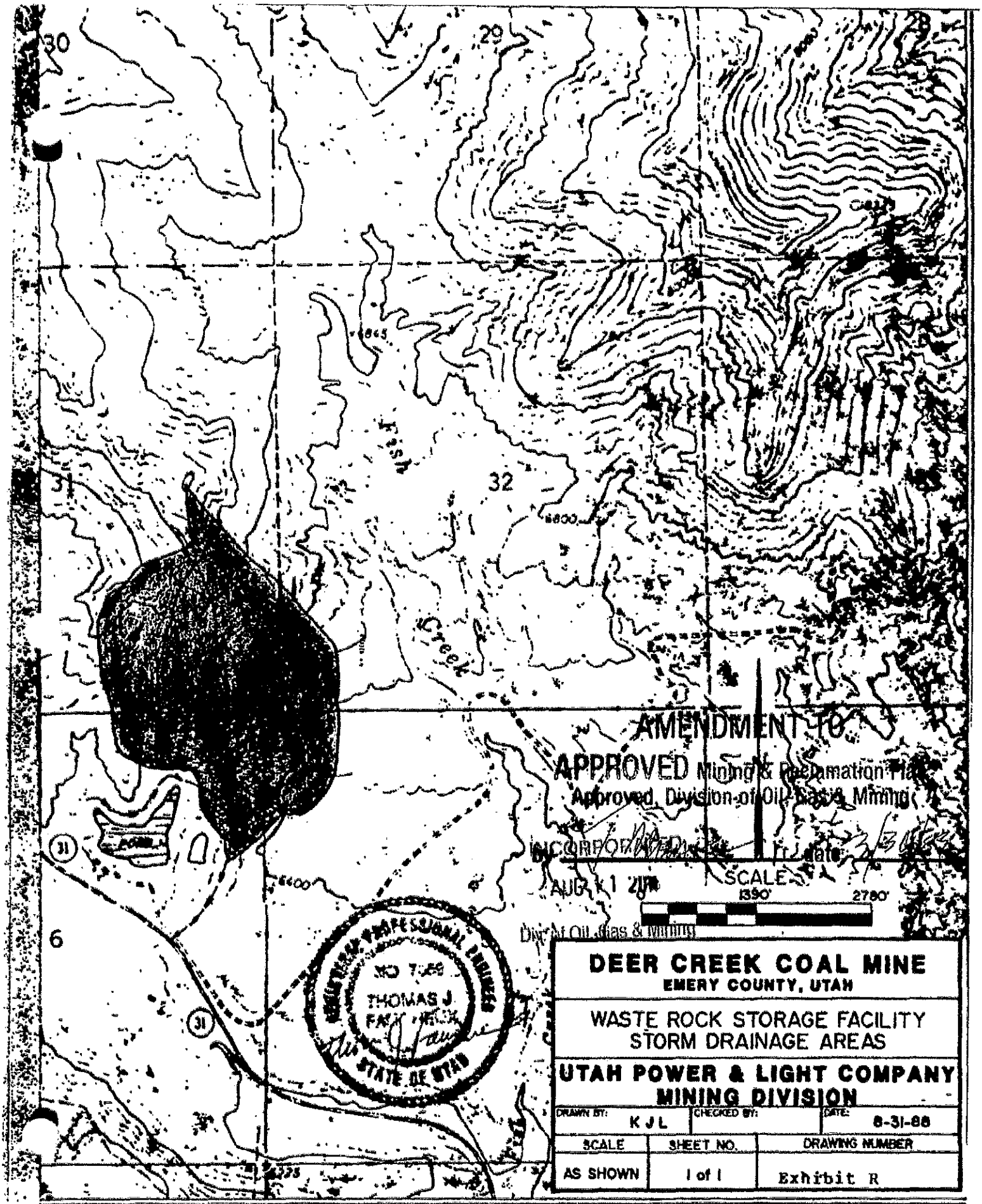
30
29
28
31
32
6
Creek
6600
6800
6775
AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining
INCORPORATED
By: date:
AUG 1 2
Div. of Oil, Gas & Mining
SCALE
1390'
2780'
THOMAS J
STATE OF UTAH
DEER CREEK COAL MINE
EMERY COUNTY, UTAH
WASTE ROCK STORAGE FACILITY
STORM DRAINAGE AREAS
UTAH POWER & LIGHT COMPANY
MINING DIVISION
DRAWN BY: KJL
CHECKED BY:
DATE: 8-31-88
SCALE: AS SHOWN
SHEET NO.: 1 of 1
DRAWING NUMBER: Exhibit R

TABLE 1

STORM RUNOFF DETERMINATION
FOR
DEER CREEK

INPUT SUMMARY:

DISTRIBUTION = SCS TYPE II
RAINFALL DEPTH = 3.4 INCHES
STORM DURATION = 24 HOURS
RUNOFF AREA = .2813 SQ. MILES
RUNOFF CURVE NO. = 86
TIME OF CONCENTRATION = .2298 HRS.

HYDROGRAPH ORDINATES:

TIME (HR)	PPT (IN)	CUM. FLOW (IN)	DEL. FLOW (IN)	FLOW RATE (IN/HR)	FLOW_RATE (CFS)
0.00	0.00	0.0000	0.0000	0.0000	0.00
0.03	0.00	0.0000	0.0000	0.0000	0.00
11.70	1.49	0.4851	0.0531	1.0103	183.40
11.74	1.57	0.5382	0.0545	1.1731	212.95
11.77	1.65	0.5927	0.0558	1.3197	239.58
11.80	1.73	0.6484	0.0570	1.4485	262.95
11.83	1.81	0.7054	0.0581	1.5576	282.76
11.86	1.89	0.7635	0.0591	1.6457	298.74
11.89	1.97	0.8226	0.0601	1.7113	310.65
11.92	2.04	0.8827	0.0610	1.7619	319.83
11.95	2.12	0.9437	0.0618	1.8063	327.90
11.98	2.20	1.0055	0.0445	1.8472	335.33
12.01	2.26	1.0500	0.0119	1.8674	338.98
12.04	2.27	1.0619	0.0119	1.8344	333.00
12.07	2.29	1.0739	0.0120	1.7479	317.29
12.10	2.30	1.0858	0.0120	1.6075	291.82
12.13	2.32	1.0978	0.0120	1.4130	256.50
12.16	2.33	1.1098	0.0120	1.1921	216.40
12.19	2.35	1.1218	0.0121	0.9969	180.96
24.33	3.40	2.0101	0.0000	0.0013	0.23
24.36	3.40	2.0101	0.0000	0.0004	0.07
24.39	3.40	2.0101	0.0000	0.0001	0.01
24.42	3.40	2.0101	0.0000	0.0000	0.00
24.45	3.40	2.0101	0.0000	0.0000	0.00
24.48	0.00	0.0000	0.0000	0.0000	0.00

OUTPUT SUMMARY:

TOTAL RUNOFF DEPTH = 2.01 IN.
INITIAL ABSTRACTION = .326 IN.
PEAK FLOW = 339.042 CFS
TIME TO PEAK = 12.007 HOURS
RUNOFF VOLUME CHECK = 2.014 IN.

AMENDMENT TO
APPROVED ... ng & Reclamation Plan
Approved, D... of Oil, Gas & Mining
by ... date 3/30/99

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Exhibit R
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APPENDIX 7-8

ASCA-1 SEDIMENT YIELD CALCULATIONS

APPENDIX 7-8

EFFECTIVENESS OF SEDIMENT CONTROLS AT ASCA-1

Sediment yield from ASCA-1 at the Deer Creek Waste Rock Site was estimated utilizing the Revised Universal Soil Loss Equation ("RUSLE" - see Galetovic, 1998). The RUSLE is mathematically expressed as follows:

A=RKLSCP

Where:

A	=	Average annual soil loss in tons per acre per year
R	=	Rainfall/runoff erosivity
K	=	Soil erodibility
LS	=	Hillslope length and steepness
C	=	Cover management
P	=	Support practice

The **R factor** is an expression of the erosivity of rainfall and runoff at a particular location. The value of R increases as the amount and intensity of rainfall increases. The Deer Creek Waste Rock Site is not one of the monitoring locations found in the program's database. The town of Hiawatha, located approximately 10 miles north, is an area where climatic data has been recorded and is similar in elevation, temperature, orientation, etc., to the Deer Creek Waste Rock Site. Collected data has been input into the RUSLE database for estimation of the R-factor. The R-value for this area is estimated at 10.

The **K factor** is an expression of the inherent erodibility of the soil or surface material at the Deer Creek Waste Rock Site. The soil texture at this site is silty clay loam texture. The K-factor estimated for the areas of the Deer Creek Waste Rock Site is 0.24.

Topography was taken into account when calculating the **LS factor**. This factor takes the hillslope length (L) and gradient (S) as contributing to erosion. If either one of these factors increase, total soil loss per unit area will also increase. The slopes along the berm outslope have been constructed on a 2:1 gradient and are approximately 35 feet measured horizontally across a plane. The calculated LS factor is 2.55.

The **cover factor (C)** was determined for the soil by estimating average percent cover, effective root mass, etc. These estimations were made by visual examination of the site. Values were given to the various components used for estimating the cover factor. A factor of 0.0351 was calculated for this soil loss parameter.

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The **P factor** is an expression of the effects of supporting conservation practices, such as contouring, buffer strips of close-growing vegetation, and terracing, on soil loss at a particular site. The value of P decreases with the installation of these practices because they reduce runoff volume and velocity and encourage the deposition of sediment on the hillslope surface. Wattles

are used as the support practice at the Deer Creek Waste Rock Site and can effectively reduce the length slope, slow and spread surface flow of runoff allowing infiltration, resulting in a P factor equivalent to 0.18 with the use of wattles.

Table 1 below shows the results of the sediment control practices utilized at the Deer Creek Waste Rock Site. As indicated, the use of wattles provides over five times the protection as compared to using no sediment control practices.

TABLE 1

Results of RUSLE Calculation for ASCA-1

AREA	R	K	LS	C	P	A
ASCA-1 without wattles	10	0.24	2.55	0.0351	1	0.22
ASCA-1 with wattles	10	0.24	2.55	0.0351	0.18	0.04

Reference Cited

Galetovic, J.R. 1998. Guidelines for the Use of the Revised Universal Soil Loss Equation (RUSLE), Version 1.06, on Mined Lands, Construction Sites and Reclaimed Lands. Office of Technical Transfer, Western Regional Coordination Center, U.S. Office of Surface Mining. Denver, Colorado.

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APPENDIX 7-9

RECLAMATION HYDROLOGY DESIGN METHODS AND CALCULATIONS

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RECLAMATION HYDROLOGY DESIGN

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#3	0.000	0.494	RC-1
Channel	#2	==>	#3	0.000	0.494	RC-2
Channel	#3	==>	#4	0.000	0.482	RC-3
Null	#4	==>	End	0.000	0.000	

		#2 Chan'l
		#1 Chan'l
	#3 Chan'l	
#4 Null		

Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	20000.00	450.00	2.25	141.42	0.000
#1	**Muskingum K:**					**0.000**
#2	5. Nearly bare and untilled, and alluvial valley fans	20000.00	450.00	2.25	141.42	0.000
#2	**Muskingum K:**					**0.000**
#3	5. Nearly bare and untilled, and alluvial valley fans	2000.00	105.00	5.25	44.72	0.000
#3	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#2	2.560	2.560	3.53	0.28
#1	1.780	1.780	2.46	0.19
#3	0.000	4.340	5.99	0.47
#4	0.000	4.340	5.99	0.47

Structure Detail:

Structure #2 (Riprap Channel)

RC-2

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.2	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.53 cfs	
Depth:	0.74 ft	1.74 ft
Top Width:	4.97 ft	8.97 ft
Velocity:	1.36 fps	
X-Section Area:	2.59 sq ft	
Hydraulic Radius:	0.486 ft	
Froude Number:	0.33	
Manning's n:	0.0270	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #1 (Riprap Channel)

RC-1

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.2	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.46 cfs	
Depth:	0.62 ft	1.62 ft
Top Width:	4.46 ft	8.46 ft
Velocity:	1.23 fps	
X-Section Area:	1.99 sq ft	
Hydraulic Radius:	0.418 ft	
Froude Number:	0.33	
Manning's n:	0.0270	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #3 (Riprap Channel)

RC-3

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	0.1	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	5.99 cfs	
Depth:	1.11 ft	2.11 ft
Top Width:	7.43 ft	11.43 ft
Velocity:	1.04 fps	
X-Section Area:	5.78 sq ft	
Hydraulic Radius:	0.727 ft	
Froude Number:	0.21	
Manning's n:	0.0260	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #4 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#2	1	2.560	0.000	0.000	0.494	85.000	M	3.53	0.277
	$\sum$	**2.560**						**3.53**	**0.277**
#1	1	1.780	0.000	0.000	0.494	85.000	M	2.46	0.192
	$\sum$	**1.780**						**2.46**	**0.192**
#3	$\sum$	**4.340**						**5.99**	**0.469**
#4	$\sum$	**4.340**						**5.99**	**0.469**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	20000.00	450.00	2.25	141.420	0.000
#1	**1**	**Time of Concentration:**					**0.000**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	19957.08	465.00	2.33	141.260	0.000
#2	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	20000.00	450.00	2.25	141.420	0.000
#1	**1**	**Muskingum K:**					**0.000**
#2	1	5. Nearly bare and untilled, and alluvial valley fans	19957.08	465.00	2.33	141.260	0.000
#2	**1**	**Muskingum K:**					**0.000**

RC-4

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

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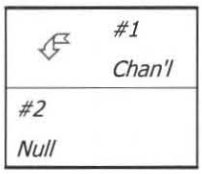
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.494	RC-4
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.96	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	33.800	33.800	46.63	3.66
#2	0.000	33.800	46.63	3.66

Structure Detail:

Structure #1 (Riprap Channel)

RC-4

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.0	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	46.63 cfs	
Depth:	3.26 ft	4.26 ft
Top Width:	15.03 ft	19.03 ft
Velocity:	1.68 fps	
X-Section Area:	27.74 sq ft	
Hydraulic Radius:	1.674 ft	
Froude Number:	0.22	
Manning's n:	0.0250	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	33.800	0.000	0.000	0.494	85.000	M	46.63	3.655
	$\sum$	**33.800**						**46.63**	**3.655**
#2	$\sum$	**33.800**						**46.63**	**3.655**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.960	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.960	0.000
#1	**1**	**Muskingum K:**					**0.000**

RC-5

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

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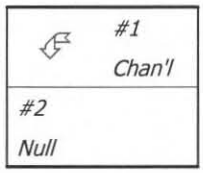
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.494	RC-5
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.96	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	32.800	32.800	45.25	3.55
#2	0.000	32.800	45.25	3.55

Structure Detail:

Structure #1 (Riprap Channel)

RC-5

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	0.0	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	45.25 cfs	
Depth:	3.01 ft	4.01 ft
Top Width:	15.05 ft	19.05 ft
Velocity:	1.66 fps	
X-Section Area:	27.18 sq ft	
Hydraulic Radius:	1.650 ft	
Froude Number:	0.22	
Manning's n:	0.0250	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	32.800	0.000	0.000	0.494	85.000	M	45.25	3.547
	$\sum$	**32.800**						**45.25**	**3.547**
#2	$\sum$	**32.800**						**45.25**	**3.547**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.960	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	4,000.00	23.68	129.960	0.000
#1	**1**	**Muskingum K:**					**0.000**

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RC-6

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

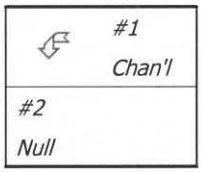
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.494	RC-6
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	16891.89	400.00	2.36	129.96	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	9.400	9.400	12.97	1.02
#2	0.000	9.400	12.97	1.02

Structure Detail:

Structure #1 (Riprap Channel)

RC-6

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.3	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	12.97 cfs	
Depth:	1.23 ft	2.23 ft
Top Width:	6.91 ft	10.91 ft
Velocity:	2.37 fps	
X-Section Area:	5.47 sq ft	
Hydraulic Radius:	0.730 ft	
Froude Number:	0.47	
Manning's n:	0.0260	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	9.400	0.000	0.000	0.467	85.000	M	12.97	1.016
	$\sum$	**9.400**						**12.97**	**1.016**
#2	$\sum$	**9.400**						**12.97**	**1.016**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	568.18	400.00	70.40	23.830	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	568.18	400.00	70.40	23.830	0.000
#1	**1**	**Muskingum K:**					**0.000**

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RC-7

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

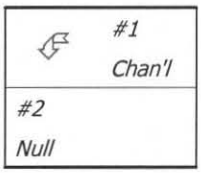
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.471	RC-7
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	775.19	200.00	25.80	27.84	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	2.300	2.300	3.17	0.25
#2	0.000	2.300	3.17	0.25

Structure Detail:

Structure #1 (Riprap Channel)

RC-7

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
3.00	2.0:1	2.0:1	0.1	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	3.17 cfs	
Depth:	0.63 ft	1.63 ft
Top Width:	5.51 ft	9.51 ft
Velocity:	1.19 fps	
X-Section Area:	2.67 sq ft	
Hydraulic Radius:	0.460 ft	
Froude Number:	0.30	
Manning's n:	0.0270	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	2.300	0.000	0.000	0.471	85.000	M	3.17	0.249
	$\sum$	**2.300**						**3.17**	**0.249**
#2	$\sum$	**2.300**						**3.17**	**0.249**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	775.19	200.00	25.80	27.840	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	775.19	200.00	25.80	27.840	0.000
#1	**1**	**Muskingum K:**					**0.000**

RC-8

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

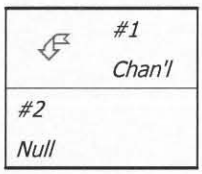
General Information

Storm Information:

Storm Type:	NRCS Type I
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.474	RC-8
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.57	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.850	1.850	1.23	0.20
#2	0.000	1.850	1.23	0.20

Structure Detail:

Structure #1 (Riprap Channel)

RC-8

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.2	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	1.23 cfs	
Depth:	0.41 ft	1.41 ft
Top Width:	3.66 ft	7.66 ft
Velocity:	1.05 fps	
X-Section Area:	1.17 sq ft	
Hydraulic Radius:	0.304 ft	
Froude Number:	0.33	
Manning's n:	0.0280	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	1.850	0.000	0.000	0.474	85.000	M	1.23	0.200
	$\sum$	**1.850**						**1.23**	**0.200**
#2	$\sum$	**1.850**						**1.23**	**0.200**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.570	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.570	0.000
#1	**1**	**Muskingum K:**					**0.000**

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RC-9

Gary E Taylor

EIS Environmental & Engineering Consultant
31 North Main
Helper, UT 84526

Phone: 435-472-3814
Email: tompaluso@preciscom.net

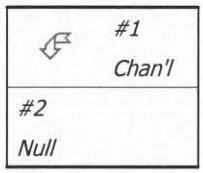
General Information

Storm Information:

Storm Type:	NRCS Type II
Design Storm:	100 yr - 24 hr
Rainfall Depth:	2.650 inches

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	#2	0.000	0.474	RC-9
Null	#2	==>	End	0.000	0.000	



Structure Routing Details:

Stru #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.57	0.000
#1	**Muskingum K:**					**0.000**

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	1.850	1.850	2.55	0.20
#2	0.000	1.850	2.55	0.20

Structure Detail:

Structure #1 (Riprap Channel)

RC-9

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
2.00	2.0:1	2.0:1	0.1	1.00		

Riprap Channel Results:

PADER Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	2.55 cfs	
Depth:	0.71 ft	1.71 ft
Top Width:	4.84 ft	8.84 ft
Velocity:	1.05 fps	
X-Section Area:	2.42 sq ft	
Hydraulic Radius:	0.469 ft	
Froude Number:	0.26	
Manning's n:	0.0270	
Dmin:	0.50 in	
D50:	0.75 in	
Dmax:	1.50 in	

Structure #2 (Null)

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	1.850	0.000	0.000	0.474	85.000	M	2.55	0.200
	$\sum$	**1.850**						**2.55**	**0.200**
#2	$\sum$	**1.850**						**2.55**	**0.200**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.570	0.000
#1	**1**	**Time of Concentration:**					**0.000**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	934.58	100.00	10.70	30.570	0.000
#1	**1**	**Muskingum K:**					**0.000**

NOAA Atlas 14, Volume 1, Version 5
Location name: Huntington, Utah, US*
Latitude: 39.3802°, Longitude: -111.0618°
Elevation: 6329 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.125 (0.108-0.148)	0.161 (0.140-0.190)	0.222 (0.191-0.261)	0.275 (0.235-0.326)	0.359 (0.298-0.425)	0.433 (0.352-0.514)	0.519 (0.413-0.618)	0.618 (0.478-0.743)	0.775 (0.572-0.949)	0.917 (0.653-1.14)
10-min	0.190 (0.165-0.225)	0.245 (0.213-0.290)	0.338 (0.291-0.398)	0.419 (0.358-0.495)	0.546 (0.455-0.647)	0.659 (0.537-0.782)	0.790 (0.629-0.941)	0.940 (0.727-1.13)	1.18 (0.871-1.45)	1.40 (0.993-1.74)
15-min	0.236 (0.205-0.279)	0.303 (0.264-0.359)	0.419 (0.360-0.493)	0.519 (0.444-0.614)	0.677 (0.563-0.802)	0.817 (0.665-0.970)	0.979 (0.780-1.17)	1.17 (0.901-1.40)	1.46 (1.08-1.79)	1.73 (1.23-2.16)
30-min	0.318 (0.276-0.376)	0.408 (0.355-0.484)	0.564 (0.485-0.664)	0.700 (0.598-0.827)	0.912 (0.759-1.08)	1.10 (0.896-1.31)	1.32 (1.05-1.57)	1.57 (1.21-1.89)	1.97 (1.45-2.41)	2.33 (1.66-2.90)
60-min	0.393 (0.341-0.465)	0.505 (0.440-0.599)	0.698 (0.601-0.822)	0.866 (0.740-1.02)	1.13 (0.939-1.34)	1.36 (1.11-1.62)	1.63 (1.30-1.95)	1.94 (1.50-2.34)	2.44 (1.80-2.99)	2.88 (2.05-3.59)
2-hr	0.475 (0.416-0.554)	0.601 (0.525-0.701)	0.803 (0.698-0.935)	0.985 (0.848-1.15)	1.27 (1.07-1.48)	1.53 (1.26-1.79)	1.82 (1.47-2.16)	2.17 (1.69-2.58)	2.72 (2.03-3.31)	3.22 (2.32-3.99)
3-hr	0.532 (0.471-0.611)	0.668 (0.590-0.769)	0.864 (0.762-0.995)	1.04 (0.911-1.20)	1.32 (1.14-1.52)	1.56 (1.31-1.81)	1.85 (1.53-2.16)	2.19 (1.77-2.59)	2.75 (2.13-3.31)	3.25 (2.44-4.03)
6-hr	0.677 (0.606-0.763)	0.840 (0.756-0.950)	1.05 (0.939-1.18)	1.23 (1.09-1.39)	1.48 (1.30-1.68)	1.71 (1.48-1.94)	1.98 (1.69-2.27)	2.29 (1.92-2.66)	2.84 (2.32-3.36)	3.34 (2.66-4.07)
12-hr	0.835 (0.758-0.926)	1.03 (0.939-1.15)	1.27 (1.14-1.41)	1.46 (1.31-1.63)	1.73 (1.54-1.93)	1.94 (1.71-2.18)	2.17 (1.89-2.45)	2.45 (2.11-2.80)	2.97 (2.51-3.43)	3.46 (2.88-4.10)
24-hr	1.07 (0.970-1.19)	1.33 (1.20-1.48)	1.62 (1.47-1.80)	1.85 (1.67-2.06)	2.17 (1.94-2.41)	2.41 (2.15-2.68)	2.65 (2.35-2.96)	2.90 (2.54-3.25)	3.22 (2.79-3.64)	3.47 (2.97-4.14)
2-day	1.24 (1.13-1.38)	1.54 (1.40-1.71)	1.88 (1.71-2.08)	2.16 (1.95-2.39)	2.53 (2.26-2.80)	2.81 (2.50-3.12)	3.10 (2.74-3.46)	3.40 (2.97-3.80)	3.79 (3.26-4.27)	4.09 (3.48-4.65)
3-day	1.36 (1.24-1.52)	1.69 (1.53-1.88)	2.07 (1.87-2.30)	2.37 (2.14-2.63)	2.78 (2.49-3.09)	3.10 (2.75-3.45)	3.42 (3.02-3.82)	3.75 (3.27-4.20)	4.19 (3.59-4.73)	4.53 (3.84-5.15)
4-day	1.48 (1.34-1.66)	1.84 (1.67-2.05)	2.25 (2.04-2.51)	2.58 (2.33-2.88)	3.04 (2.71-3.38)	3.38 (3.00-3.77)	3.74 (3.29-4.18)	4.10 (3.57-4.60)	4.59 (3.93-5.10)	4.96 (4.10-5.65)
7-day	1.72 (1.56-1.92)	2.14 (1.94-2.39)	2.63 (2.37-2.92)	3.02 (2.71-3.35)	3.55 (3.17-3.94)	3.96 (3.51-4.41)	4.38 (3.85-4.90)	4.80 (4.18-5.40)	5.37 (4.60-6.10)	5.81 (4.92-6.66)
10-day	1.96 (1.78-2.17)	2.44 (2.21-2.71)	2.99 (2.71-3.31)	3.43 (3.10-3.79)	4.01 (3.60-4.44)	4.46 (3.97-4.94)	4.90 (4.34-5.46)	5.35 (4.69-5.98)	5.95 (5.14-6.70)	6.40 (5.47-7.28)
20-day	2.50 (2.27-2.79)	3.13 (2.83-3.49)	3.87 (3.49-4.31)	4.45 (4.00-4.95)	5.22 (4.66-5.81)	5.80 (5.14-6.48)	6.40 (5.63-7.16)	7.00 (6.09-7.86)	7.79 (6.69-8.82)	8.39 (7.12-9.56)
30-day	3.02 (2.73-3.35)	3.76 (3.41-4.17)	4.60 (4.16-5.10)	5.25 (4.74-5.82)	6.10 (5.47-6.77)	6.74 (6.01-7.48)	7.37 (6.54-8.21)	7.99 (7.02-8.94)	8.80 (7.64-9.91)	9.40 (8.07-10.7)
45-day	3.68 (3.35-4.08)	4.59 (4.17-5.08)	5.62 (5.10-6.22)	6.42 (5.80-7.09)	7.46 (6.70-8.25)	8.24 (7.35-9.12)	9.01 (7.99-10.0)	9.78 (8.61-10.9)	10.8 (9.37-12.1)	11.5 (9.92-13.0)
60-day	4.30 (3.90-4.77)	5.38 (4.88-5.95)	6.60 (5.97-7.29)	7.53 (6.80-8.32)	8.74 (7.85-9.68)	9.65 (8.61-10.7)	10.5 (9.34-11.7)	11.4 (10.0-12.8)	12.6 (10.9-14.2)	13.4 (11.5-15.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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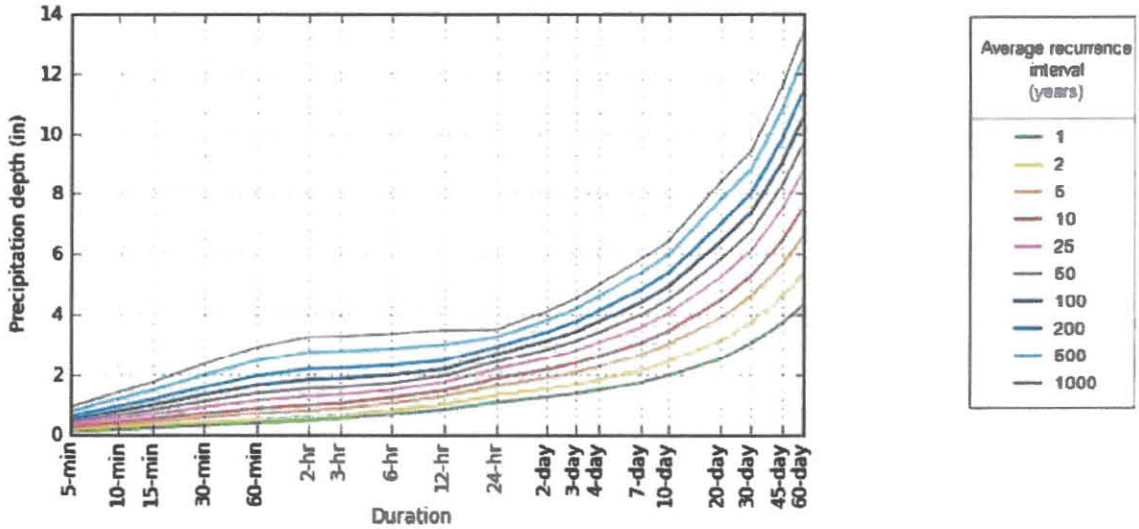
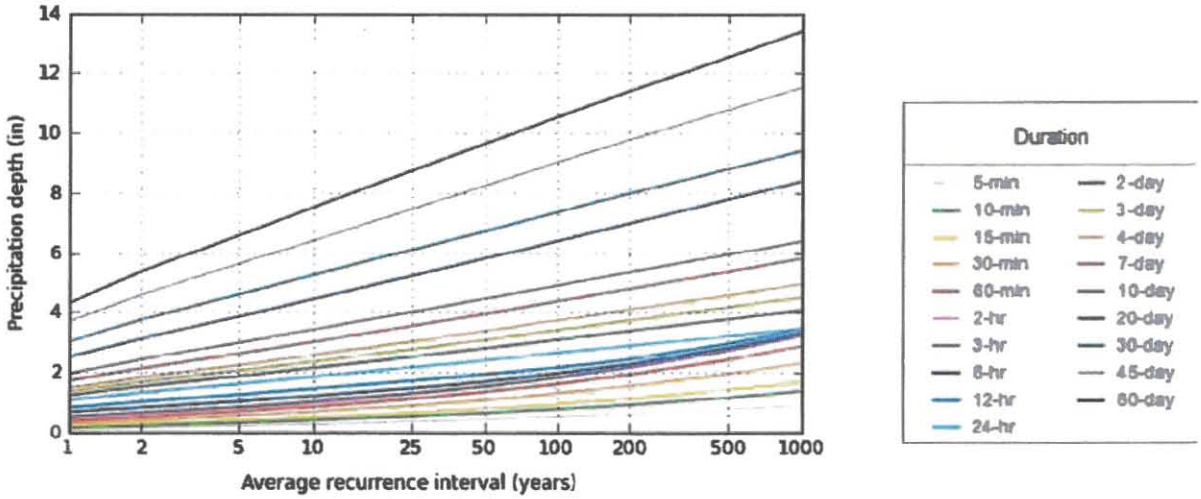
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.3802°, Longitude: -111.0618°





NOAA Atlas 14, Volume 1, Version 5 Created (GMT): Tue Feb 2 17:39:13 2016

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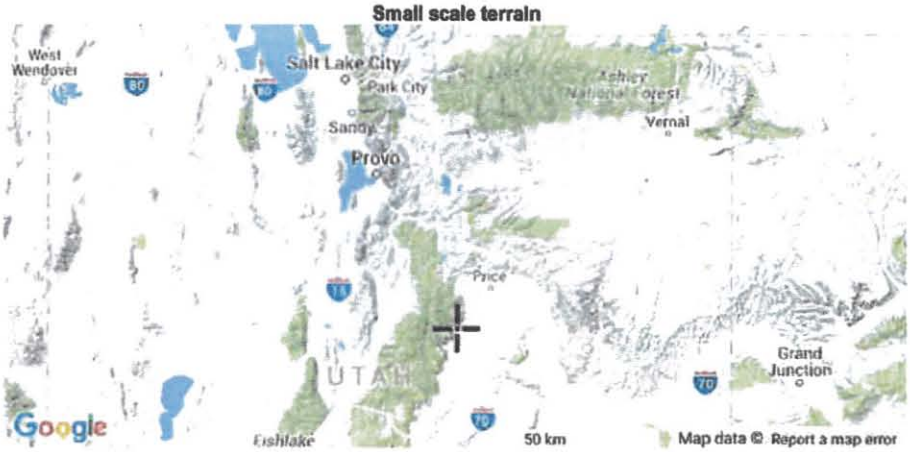
Maps & aerials

Small scale terrain



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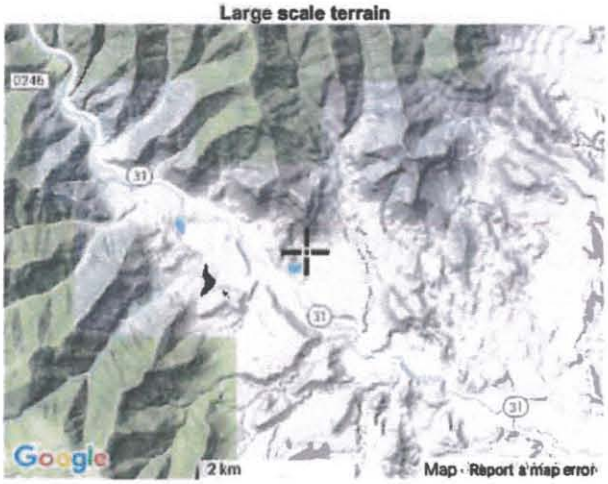
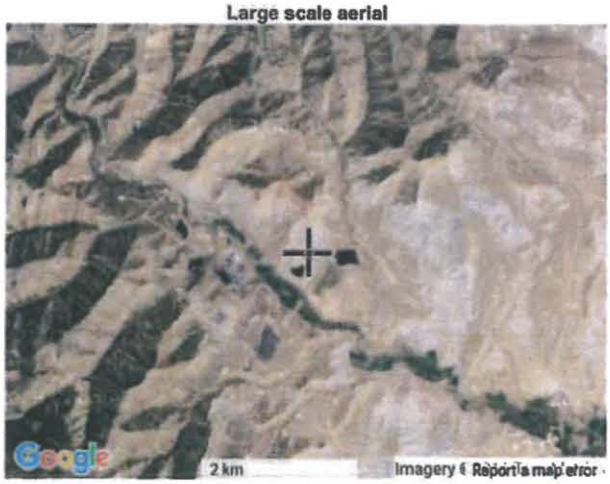
Large scale terrain



Large scale map

Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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R645-301-800

BONDING

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Appendix 8-1 Bonding Cost

Appendix 8-2 Insurance

R645-301-800 BONDING

R645-301-801 Definitions and Division Responsibilities

This chapter provides information regarding the bonding for coal recovery and reclamation operations at the CVM waste rock site (the "CVM site" or the "site"). The applicant has on file with the Utah Division of Oil, Gas and Mining a bond made payable to the Utah Division of Oil, Gas and Mining for performance of all the requirements of the State Program.

R645-301-820 Requirement to File a Bond

The area covered by the bond is outlined on Plate 5-1, which includes all disturbed areas. The disturbed areas and specific acres to be reclaimed are indicated on Plate 5-2. The performance bond period is for the duration of the existing waste rock placement and reclamation operations and the bond will be revised if Phase II is develop. The bond is in the form of a surety bond and is described in Section 860.

R645-301-830 Determination of Bond Amount

The bond amount was determined by using unit costs obtained from *RS Means Heavy Construction Cost Data 32th Edition* adjusted for the Price, Utah area, *45th Edition of Caterpillar Performance Handbook*, and Division of Oil, Gas & Mining Technical Directive 007. The total estimated bond amount is indicated in Appendix 8-1.The bond is sufficient to assure the completion of the reclamation. The reader is encouraged to look at Plate 5-2 when reviewing the bond estimate provided in Appendix 8-1. This Plate generally notes the location of the future waste rock pile (i.e., within the boundary of the current waste rock pile) as well as the corridor in which the site access road currently exists. Additional information regarding the current location of the waste rock pile and the site access road is provided on Plate 5-1.

R645-301-840 General Terms and Conditions of the Bond

The performance bond is in the amount determined by the Utah Division of Oil, Gas and Mining as described in Section 830 and payable to the Division. In the event the surety company becomes insolvent, the Division will be notified by the permittee. The surety company and permittee will notify the Division of any changes in the bonding terms for CVM. The duration of the bond is described in Section 820.

R645-301-850 Bonding Requirements

If required, the applicant will comply with the stipulation that bond coverage be extended 30 days prior to the expiration of the bond term. Under these conditions, a performance bond for a new term will be submitted to the Division at least 30 days prior to expiration of coverage.

R645-301-860 Forms of Bonds

Upon acceptance of this permit application by the Utah Division of Oil, Gas and Mining, a surety bond for the applicant will be executed by a corporate surety licensed to do business in Utah. The surety bond will be non-cancellable during its term except with the prior consent of the Utah Division of Oil, Gas and Mining.

R645-301-870 Replacement of Bonds

CVM does not currently plan to replace the bond for the permit area. However, should a replacement bond be required, the replacement bond will be submitted to and approved by the Division prior to the cancellation of the original bond.

R645-301-880 Requirements to Release Performance Bonds

The applicant will comply with the requirements described in Section R-645-301-880 the Utah regulations when applying for the release of performance bonds.

R645-301-890 Terms and Conditions for Liability Insurance

A Certificate of Insurance applicable to the Division of Oil, Gas & Mining for the waste rock site is provided in Appendix 1-2 of this application. The policy provides for personal injury and property damage protection consistent with the amounts designated in R645-301-890.100.

The insurance policy will be maintained in full force during the life of the permit, including the liability period necessary to complete all reclamation operations. The policy will include a rider stating that the Utah Division of Oil, Gas and Mining be notified of any changes in the policy, including termination or failure to renew.

APPENDIX 8-1

BONDING COST

Castle Valley Mining, LLC
Waste Rock Site

	Direct Cost	
Demolition & Earthwork	$382,121	
Revegetation	$210,859	
Sub Total Direct Costs 2018 Dollars	$592,980	

	Indirect Costs	
Mob/Demob	$59,298	10.0%
Contingency	$29,649	5.0%
Engineering Redsign	$14,825	2.5%
Main Office Expense	$40,323	6.8%
Project Management Fee	$14,825	2.5%
Sub Total Indirect Costs 20018 Dollars	$158,919	26.8%
Total Reclamation Costs 2018 Dollars	$751,899	
Escalation Factor for 2018	0.0178	
Years	5	
Escalation	$69,344	
Total Escalated Reclamation Costs 2023 Dollars	$821,243	
Bond Amount (Rounded to nearest $1,000)	$821,000	

Castle Valley Minin, LLC
Waste Rock Site

Means Number	Materials	Cost	Units	Crew
31 23 16.13 0610	Common Earth 6'-10', 1-1/2 CY Excavator	$3.58	BCY	B-12B
31 23 23.20 1096	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	$5.65	LCY	B-34B
31 23 23.15 5060	Front End Loader w/1-1/2 C.Y. Bucket	$20.00	BCY	B-12O
31 37 13.10 0100	Machine Placed Riprap Slope Protection	$67.50	LCY	B-12G
31 23 23.14 4020	Backfill 200 HP 50' Haul, Common Earth	$1.04	LCY	B-10B
31 23 16.46 4220	Excavtor 200 HP 150' Haul, Common Earth	$4.44	BCY	B-10B
31 23 23.23 6050	12" lifts, 2 passes Towed Sheepfoot	$0.46	ECY	B-10D
31 23 16.13 0130	4'-6' Deep 1-1/2 CY Excavator	$3.97	BCY	B-12B
31 25 14.16 1000	Silt Fence, Install and Maintain, remove	$1.88	LF	B-62
31 25 14.16 1100	Maintenace, 6 Molths	$0.38	LF	B-62
31 23 23.20 2500	Dust Control, Ligth	$1,025.00	Day	B-59
32 01 13.17 5320	Aphalt removal, rip,and sweep 1"-3", no haul	$0.73	SY	B-70
31 23 23.20 1014	12 CY Truck, 15 MPH, 15 min. wait cycke 0.5 mi.	$3.43	LCY	B-34A
Crew B-10D	Equp. Oper., Laborer, Dozer, Vib. Roller	$2,759.88	Day	
31 14 13.23 1420	Topsoil removal and stockpile	$2.65	CY	B-10B
31 23 23.14 4440	Backfill from stockpile 200 HP, 300' Haul, clay	$3.47	LCY	B-10B
32 92 19.14 5400	Utility Mx, hydro seeding with mulch and fer.	$68.00	MSF	B-81
Crew B-12A	Equp. Oper., Laborer, Hyd. Excavator	$1,978.82	Day	
Maple Leaf	Seed Mix	$239.28	AC	

Castle Valley Mining, LLC
Waste Rock Site

Earthwork Costs

Ref:	Item	Costs
01	Temporary Sediment Control	$19,510
02	Grade Refuse Pile	$61,474
03	Reclaim Channel 1 (RC-1)	$93,550
04	Reclaim Channel 2 (RC-2)	$25,323
05	Reclaim Channel 3 (RC-3)	$9,307
06	Reclaim Channel 4 (RC-4)	$56,722
07	Reclaim Channel 5 (RC-5)	$62,435
08	Reclaim Channel 6(RC-6)	$3,994
09	Reclaim Access Road	$24,451
10	Reclaim Channel 7(RC-7)	$10,911
11	Reclaim Channel 8(RC-8)	$7,222
12	Reclaim Channel 9(RC-9)	$7,222
		$382,121

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
01	Temporary Sediment Control																		
	Install and remove silt fencing	Silt Fence, Install and Maintain, remove	31 25 14.16 1000	$1.88	LF	3500											3500		$6,580
	Maintain silt fencing for 2 Months	Maintenace, 6 Molths	31 25 14.16 1100	$0.38	LF	3500											3500		$1,330
	Install stable site enterence at north edge	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						20						20		$1,350
	Dust Control	Dust Control, Ligth	31 23 23.20 2500	$1,025.00	Day								10				10		$10,250
	Subtotal																		$19,510
	Total																		$19,510

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
02	Grade Refuse Pile																		
	Remove asphalt from access road	Aphalt removal, rip,and sweep 1"-3", no haul	32 01 13.17 5320	$0.73	SY					7200					SY		7200	SY	$5,256
	Haul Waste asphalt to waste pile	12 CY Truck, 15 MPH, 15 min. wait cycke 0.5 mi.	31 23 23.20 1014	$3.43	LCY						600				CY		600	CY	$2,058
	Doz. Material in sed. Pond	Excavtor 200 HP 150' Haul, Common Earth	31 23 16.46 4220	$4.44	BCY						8800				CY		8800	CY	$39,072
	Compact material	12" lifts, 2 passes Towed Sheepfoot	31 23 23.23 6050	$0.46	ECY						8800				CY		8800	CY	$4,048
	General grading and compacting	Equp. Oper., Laborer, Dozer, Vib. Roller	Crew B-10D	$2,759.88	Day									4			4	Day	$11,040
																			$61,474
	Subtotal																		
	Total																		$61,474

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
08	Reclaim Channel 1 (RC-1)																		
											4440				CY		4440	CY	$15,895
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13 0610	$3.58	BCY						425				CY		425	CY	$2,401
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						425				CY		425	CY	$8,500
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						850				CY		850	CY	$4,803
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						850				CY		850	CY	$57,375
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						4400				CY		4400	CY	$4,576
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$93,550
	Subtotal																		
	Total																		$93,550

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
04	Reclaim Channel 2 (RC-2)																		
											3620				CY		3620	CY	$12,960
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13	$3.58	BCY						50				CY		50	CY	$283
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20	$5.65	LCY						50				CY		50	CY	$1,000
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15	$20.00	BCY						100				CY		100	CY	$565
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20	$5.65	LCY						100				CY		100	CY	$6,750
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10	$67.50	LCY						3620				CY		3620	CY	$3,765
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14	$1.04	LCY														$25,323
	Subtotal																		
	Total																		$25,323

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
05	Reclaim Channel 3 (RC-3)																		
											1270				CY		1270	CY	$4,547
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13 0610	$3.58	BCY						20				CY		20	CY	$113
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						20				CY		20	CY	$400
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						40				CY		40	CY	$226
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						40				CY		40	CY	$2,700
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						1270				CY		1270	CY	$1,321
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$9,307
	Subtotal																		
	Total																		$9,307

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
06	Reclaim Channel 4 (RC-4)																		
											5870				CY		5870	CY	$21,015
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13 0610	$3.58	BCY						425				CY		425	CY	$2,401
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						160				CY		160	CY	$3,200
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						425				CY		425	CY	$2,401
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						320				CY		320	CY	$21,600
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						5870				CY		5870	CY	$6,105
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$56,722
	Subtotal																		
	Total																		$56,722

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
07	Reclaim Channel 5 (RC-5)																		
											3720				CY		3720	CY	$13,318
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13 0610	$3.58	BCY						245				CY		245	CY	$1,384
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						245				CY		245	CY	$4,900
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						490				CY		490	CY	$2,769
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						490				CY		490	CY	$33,075
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						6720				CY		6720	CY	$6,989
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$62,435
	Subtotal																		
	Total																		$62,435

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
08	Reclaim Channel 6(RC-6)																		
											120				CY		120	CY	$430
	Excavation	Common Earth 6'-10', 1-1/2 CY Excavator	31 23 16.13 0610	$3.58	BCY						20				CY		20	CY	$113
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						20				CY		20	CY	$400
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						40				CY		40	CY	$226
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						40				CY		40	CY	$2,700
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						120				CY		120	CY	$125
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$3,994
	Subtotal																		
	Total																		$3,994

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
09	Reclaim Access Road																		
	Grade fill material into cuts	Excavtor 200 HP 150' Haul, Common Earth	31 23 16.46 4220	$4.44	BCY						4990				CY		4990	CY	$22,156
	Compact new fill material	12" lifts, 2 passes Towed Sheepfoot	31 23 23.23 6050	$0.46	ECY						4990				CY		4990	CY	$2,295
																			$24,451
	Subtotal																		
	Total																		$24,451

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
10	Reclaim Channel 7(RC-7)																		
											290				CY		290	CY	$1,151
	Excavation	4'-6' Deep 1-1/2 CY Excavator	31 23 16.13 0130	$3.97	BCY						55				CY		55	CY	$311
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						55				CY		55	CY	$1,100
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						110				CY		110	CY	$622
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						110				CY		110	CY	$7,425
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						290				CY		290	CY	$302
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$10,911
	Subtotal																		
	Total																		$10,911

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
11	Reclaim Channel 8(RC-8)																		
											240				CY		240	CY	$953
	Excavation	4'-6' Deep 1-1/2 CY Excavator	31 23 16.13 0130	$3.97	BCY						35				CY		35	CY	$198
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						35				CY		35	CY	$700
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						70				CY		70	CY	$396
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						70				CY		70	CY	$4,725
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						240				CY		240	CY	$250
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$7,222
	Subtotal																		
	Total																		$7,222

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
12	Reclaim Channel 9(RC-9)																		
											240				CY		240	CY	$953
	Excavation	4'-6' Deep 1-1/2 CY Excavator	31 23 16.13 0130	$3.97	BCY						35				CY		35	CY	$198
	Haul Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						35				CY		35	CY	$700
	Place Haul Material	Front End Loader w/1-1/2 C.Y. Bucket	31 23 23.15 5060	$20.00	BCY						70				CY		70	CY	$396
	Haul Slope Protection Material	Haul w/ 12C.Y. 45 MPH Cycle 10 Miles	31 23 23.20 1096	$5.65	LCY						70				CY		70	CY	$4,725
	Place Slope Protection	Machine Placed Riprap Slope Protection	31 37 13.10 0100	$67.50	LCY						240				CY		240	CY	$250
	Spread Excess Material	Backfill 200 HP 50' Haul, Common Earth	31 23 23.14 4020	$1.04	LCY														$7,222
	Subtotal																		
	Total																		$7,222

Castle Valley Mining, LLC
Waste Rock Site

Revegetation Cost

Ref.	Item	Costs
15	Cover and Seed Refuse Pile	$188,688
16=	Reclaim Access Road	$22,171
		$210,859

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
15	Cover and Seed Refuse Pile																		
	Separate topsoil	Topsoil removal and stockpile	31 14 13.23 1420	$2.65	CY						2303				CY		2303	CY	$6,103
	Spread subsoil	Backfill from stockpile 200 HP, 300' Haul, clay	31 23 23.14 4440	$3.47	LCY						33896				CY		33896	CY	$117,619
	Compact subsoil	12" lifts, 2 passes Towed Sheepfoot	31 23 23.23 6050	$0.46	ECY						22600				CY		22600	CY	$10,396
	Spread topsoil	Backfill from stockpile 200 HP, 300' Haul, clay	31 23 23.14 4440	$3.47	LCY						2303				CY		2303	CY	$7,991
	Gouge Soil	Equp. Oper., Laborer, Hyd. Excavator	Crew B-12A	$1,978.82	Day								5		Day		5	Day	$9,894
	Hydroseed area w/mulch	Utility Mix, hydro seeding with mulch and fer.	32 92 19.14 5400	$68.00	MSF						490				MSF		490	MSF	$33,320
	Seed Mix		Maple Leaf	$239.28	AC					11.25					AC		11.25	AC	$2,692
	Subtotal																		$188,015
	25% Reseed																		$673
	Subtotal																		
	Total																		$188,688

Castle Valley Mining, LLC
Waste Rock Site

REF	Description	Materials	Means Reference Number?	Unit Costs	Unit	Length	Width	Heigth	Diameter	Area	Volume	Density	Time	Number	Unit	Swell Factor	Quanitity	Unit	Cost
16=	Reclaim Access Road																		
	Gouge Soil	Equp. Oper., Laborer, Hyd. Excavator	Crew B-12A	$1,978.82	Day								5		Day		5	Day	$9,894
	Hydroseed area w/mulch	Utility Mix, hydro seeding with mulch and fer.	32 92 19.14 5400	$68.00	MSF						164				MSF		164	MSF	$11,152
	Seed Mix		Maple Leaf	$239.28	AC					3.76					AC		3.76	AC	$900
	Subtotal																		$21,946
	2.5% Reseed																		$225
	Subtotal																		
	Total																		$22,171

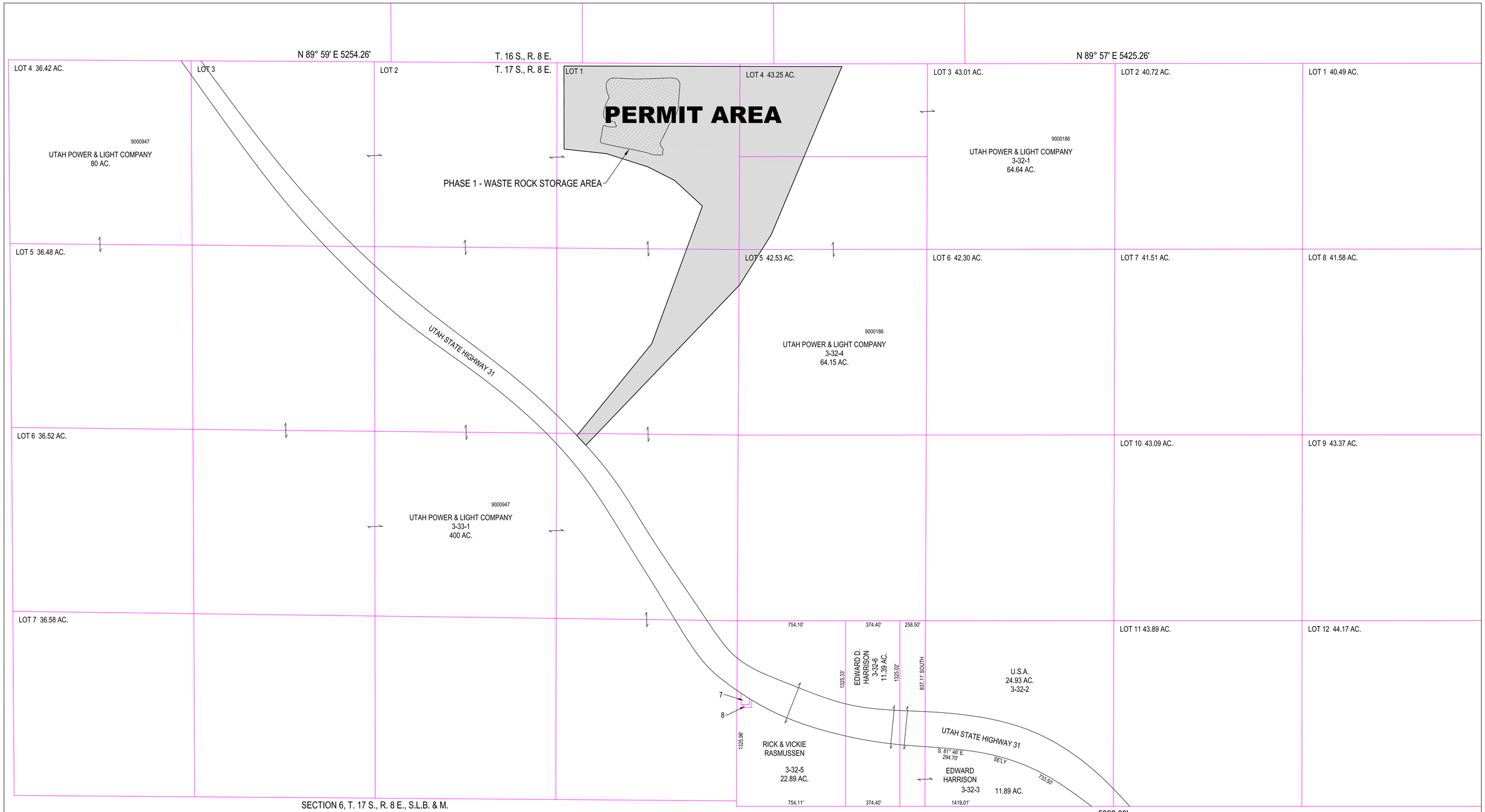
APPENDIX 8-2

INSURANCE

CHAPTER 9

ALLUVIAL VALLEY FLOORS

The Castle Valley Mining, LLC site is located in an upland area overlain by a thin veneer of colluvial, slope wash deposits. It is not located within or adjacent to an alluvial valley floor.



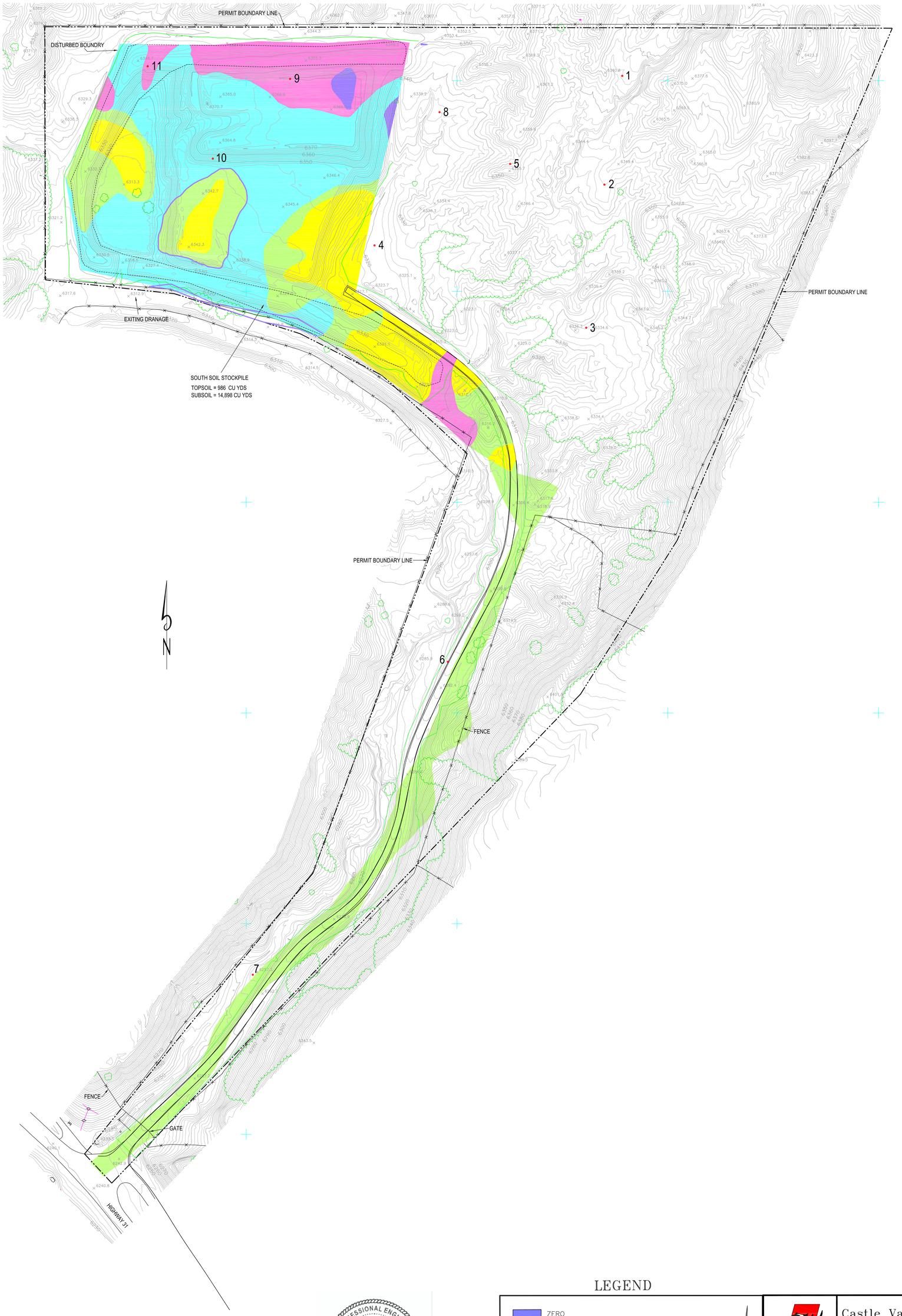
PROFESSIONAL ENGINEER
No. 22-150267-2203
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

RHINO

Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *SURFACE AND SUBSURFACE OWNERSHIP*	
SCALE: 1"=300'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 1-1



LEGEND

- ZERO
- 6 INCHES
- 12 INCHES
- 18 INCHES
- 24 INCHES
- SOIL SAMPLE LOCATION (SAMPLED APRIL 1987)

PROFESSIONAL ENGINEER
No. 22-150067-2202
J. THOMAS PALUSO
STATE OF UTAH
7/3/18

RHINO

Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *SOIL DEPTHS & STOCKPILE LOCTATIONS*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 2-1

PROFESSIONAL ENGINEER
No.
22-150267-2203
J. THOMAS
PALUSO
7/3/18
STATE OF UTAH

LEGEND

PINYON–JUNIPER COMMUNITY (PRE–CONSTRUCTION

N

RHINO

Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *VEGETATION MAP*	
SCALE: 1"=75'	DATE: 6–26–2018
DRAWN BY: J. JORGENSEN	PLATE: 3–1

LEGEND

- DEER/ELK CRITICAL WINTER RANGE
- ELK DEDDING GROUNDS
- DEER/ELK TRAIL

NOTE:
WILDLIFE HABITAT DESIGNATIONS WERE DETERMINED THROUGH PERSONAL COMMUNICATION WITH LARRY DALTON (RESOURCE ANALYST, UDWR) AND FEILD INVESTIGATIONS BY VAL PAYNE (WILDLIFE BIOLOGIST, UP&L).

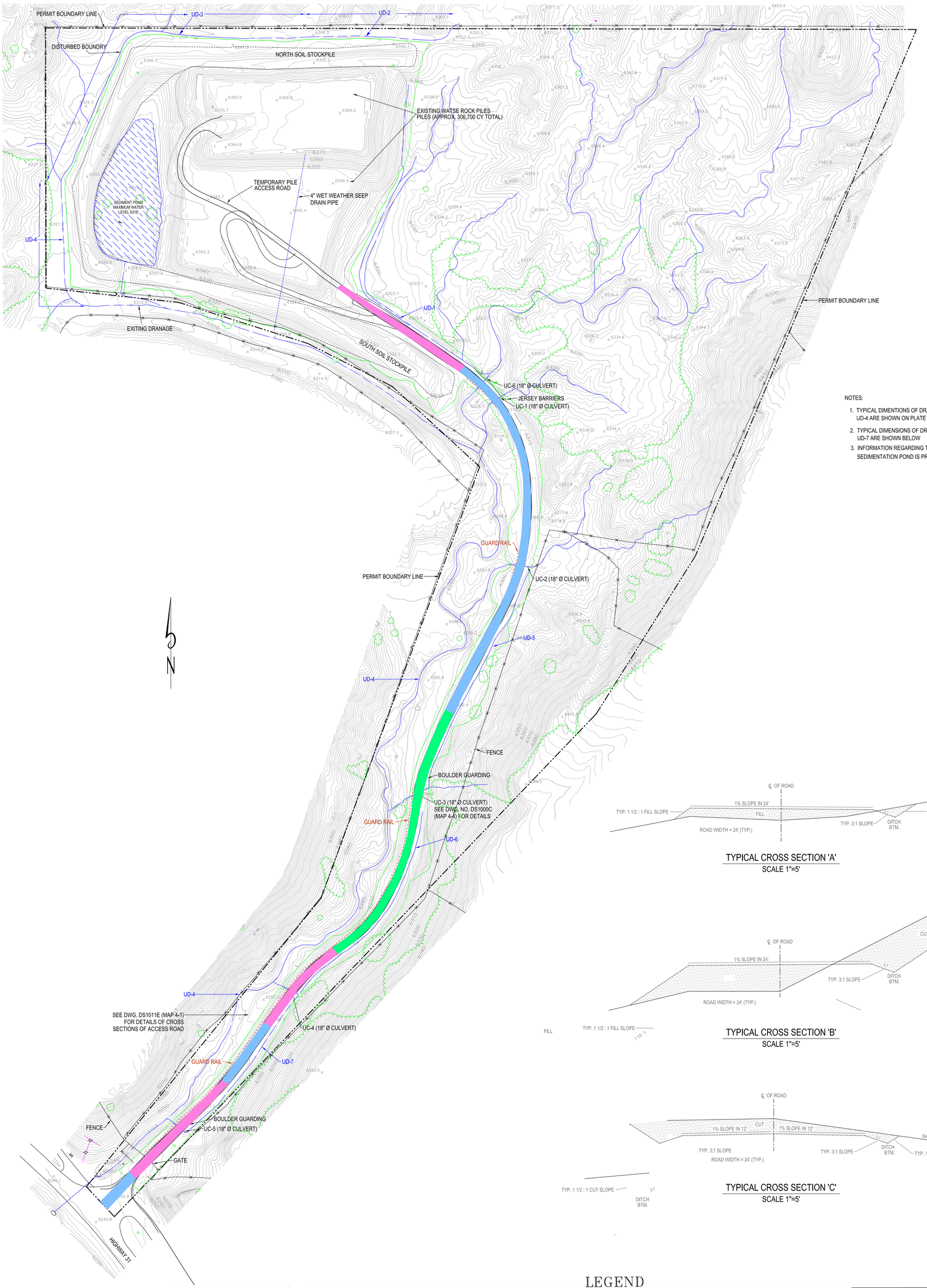
PROFESSIONAL ENGINEER
No. 22-150267-2202
J. THOMAS PALUSO
STATE OF UTAH
7/3/18

RHINO

Castle Valley Mining LLC

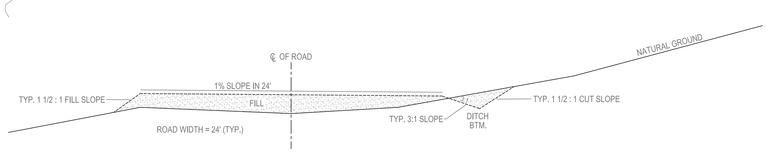
WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *WILDLIFE HABITAT MAP*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 3-2

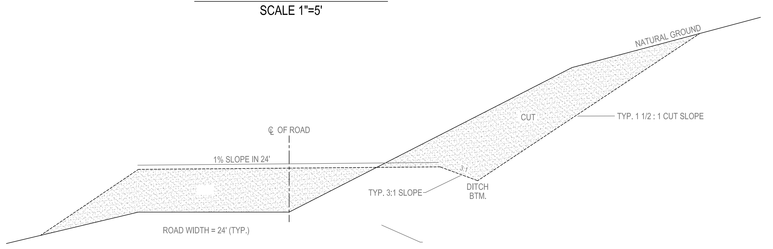


NOTES:

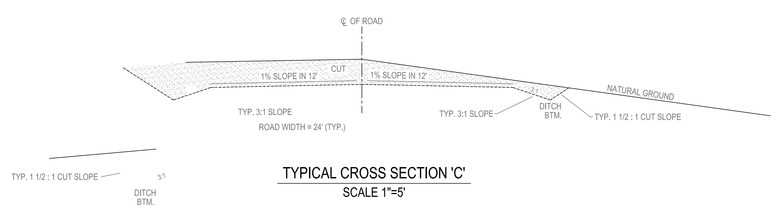
1. TYPICAL DIMENTIONS OF DRAINAGE DITCHES UD-1 THROUGH UD-4 ARE SHOWN ON PLATE 7-2
2. TYPICAL DIMENSIONS OF DRAINAGE DITCHES UD-5 THROUGH UD-7 ARE SHOWN BELOW
3. INFORMATION REGARDING THE DIMENTIONS OF THE SEDIMENTATION POND IS PROVIDED ON PLATE 7-1



TYPICAL CROSS SECTION 'A'
SCALE 1"=5'



TYPICAL CROSS SECTION 'B'
SCALE 1"=5'



TYPICAL CROSS SECTION 'C'
SCALE 1"=5'

PROFESSIONAL ENGINEER
No. 22-150267-2208
J. THOMAS PALUSO
STATE OF UTAH
7/3/18

LEGEND

- PRIMARILY FILL (SEE TYPICAL CROSS SECTION A)
- PRIMARILY CUT & FILL (SEE TYPICAL CROSS SECTION B)
- PRIMARILY CUT (SEE TYPICAL CROSS SECTION C)
- PRIMARILY CUT (SEE TYPICAL CROSS SECTION C)
- DITCH
- DISTURBED AREA BOUNDRY

DD-1 = DISTURBED DITCH #1
UD-1 = UNDISTURBED DITCH #1
DC-1 = DISTURBED CULVERT #1
UC-1 = UNDISTURBED CULVERT #1

N

RHINO

Castle Valley Mining LLC
WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *PERMIT FACILITIES & TYPICAL RD. X-SECTIONS*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 5-1

RECLAMATION CHANNEL CROSS SECTION
(SEE TABLE 7-3 FOR INDIVIDUAL CHANNEL WIDTHS)
NTS

PROFESSIONAL ENGINEER
No. 22-150257-2202
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

LEGEND

- M — M' PRIMARILY FILL (SEE TYPICAL CROSS SECTION A)
- 6320 RECLAMATION CONTOURS (10 FOOT)
- RECLAMATION CONTOURS (2 FOOT)
- RC-7 RECLAMATION CHANNEL (RC 1 THROUGH RC-9)
- WATERWAY
- DISTURBED AREA BOUNDRY

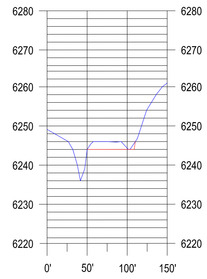
N

RHINO

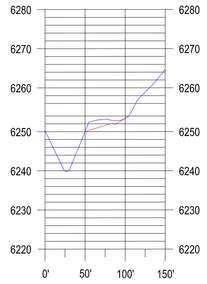
Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *RECLAMATION PLAN MAP*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 5-2



SECTION A



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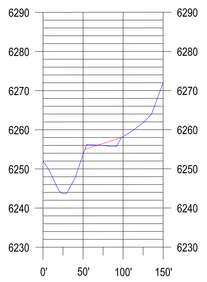

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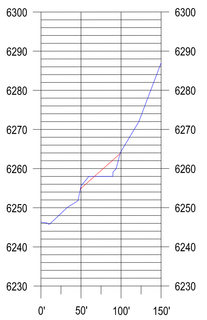

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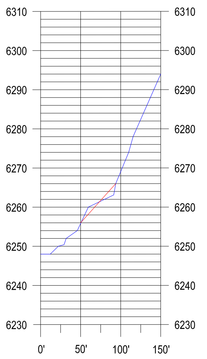

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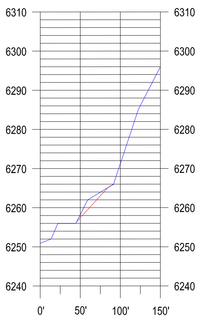

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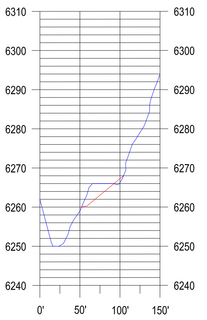

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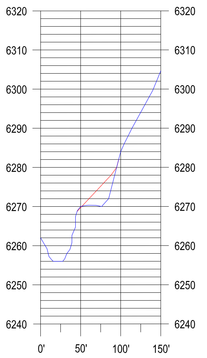

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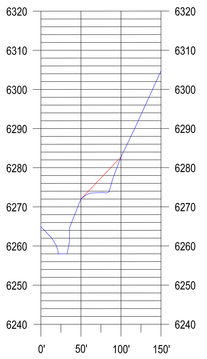
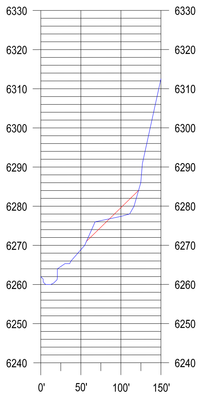


SECTION I



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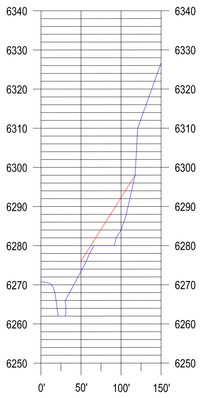

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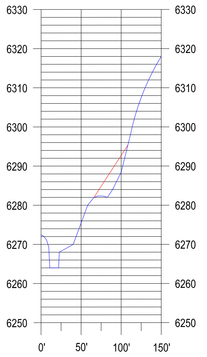

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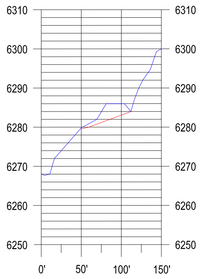

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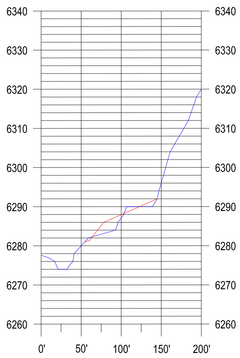

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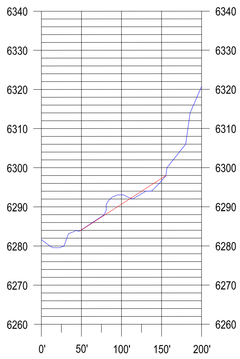
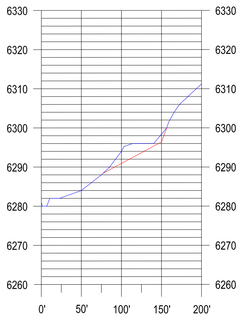


SECTION O



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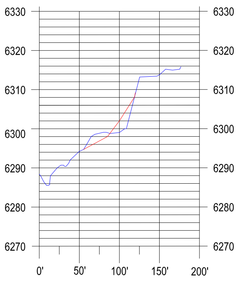

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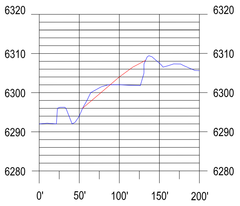

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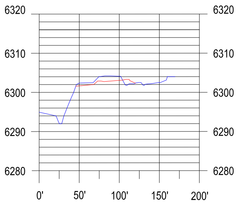

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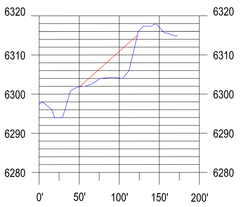

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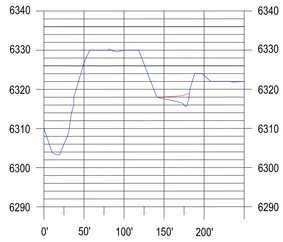

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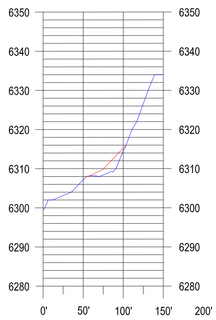

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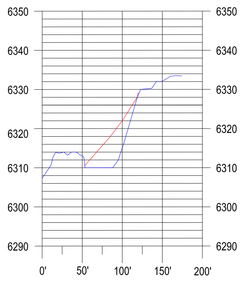

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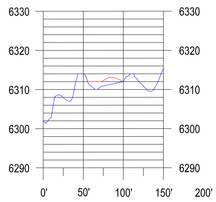

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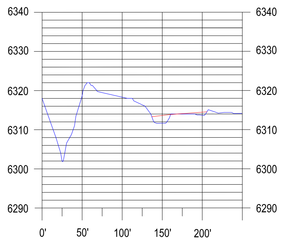

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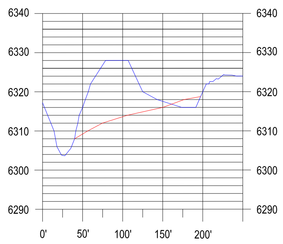


SECTION Z

PROFESSIONAL ENGINEER
No. 22-150267-2203
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

LEGEND

RECLAMATION GROUND SURFACE

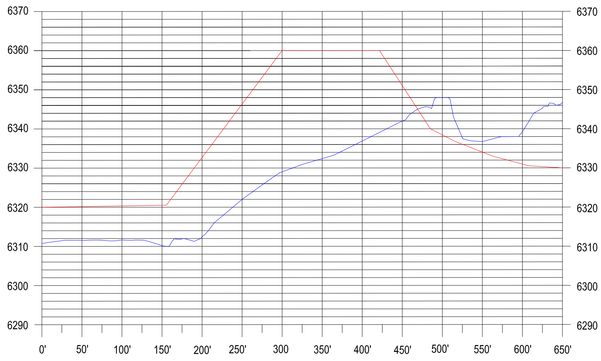
EXISTING GROUND SURFACE

RHINO

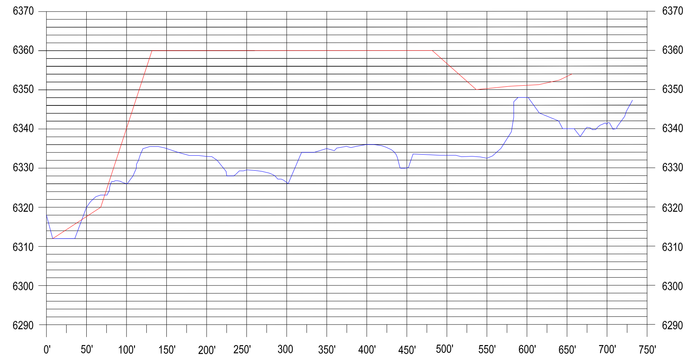
Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *ROAD RECLAMATION CROSS SECTIONS*	
SCALE: N/A	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 5-3



SECTION AA



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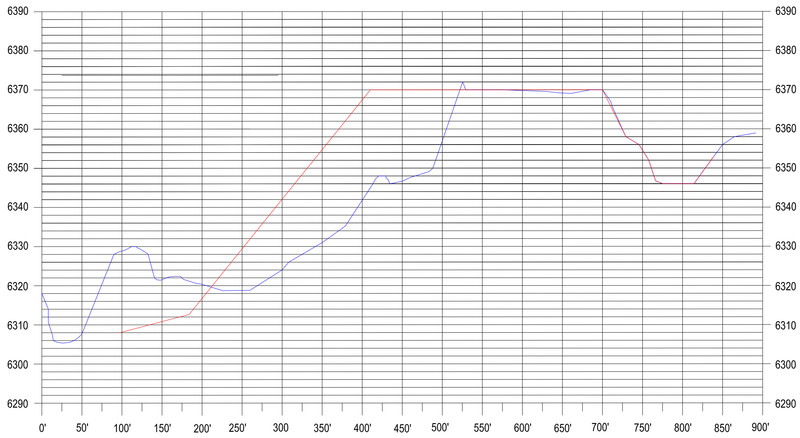
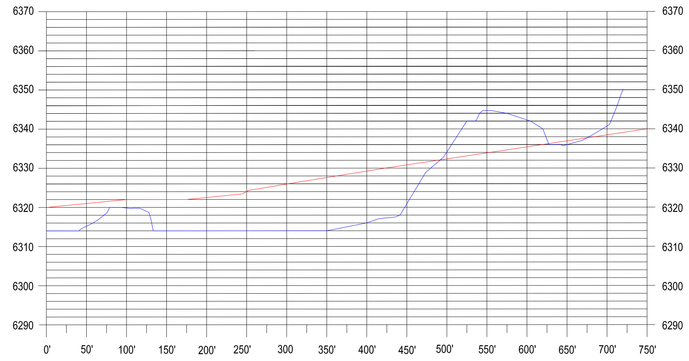


SECTION BB



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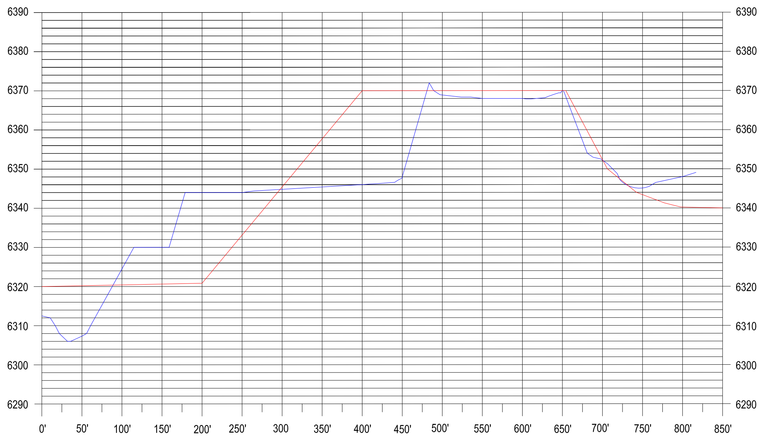
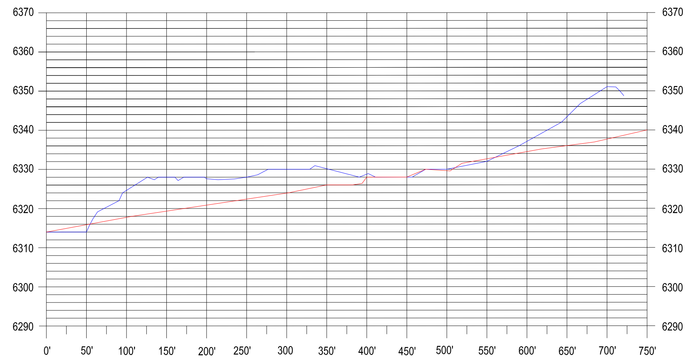


SECTION CC



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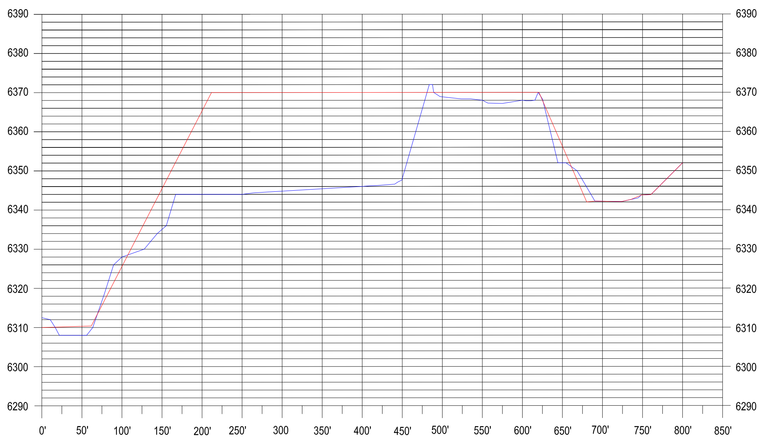

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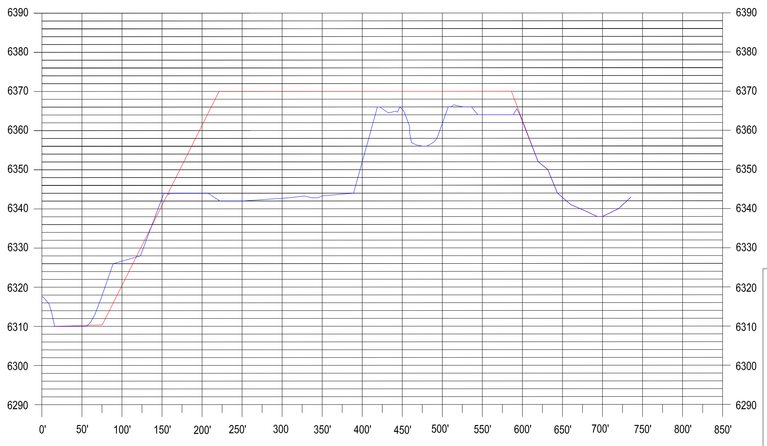


SECTION EE

PROFESSIONAL ENGINEER
No. 22-1502672203
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

LEGEND

RECLAMATION GROUND SURFACE

EXISTING GROUND SURFACE

RHINO

Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *PILE RECLAMATION CROSS SECTIONS*	
SCALE: N/A	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 5-4

PERMIT BOUNDARY LINE

NORTH SOIL STOCKPILE

EXISTING WATSE ROCK PILES
PILES (APPROX. 306,700 CY TOTAL)

TEMPORARY PILE
ACCESS ROAD

4" WET WEATHER SEEP
DRAIN PIPE

SEDIMENT POND
MAXIMUM WATER
LEVEL 6318'
DH-4

DH-3

TH-67

TH-66

TP-104

TP-105

SOUTH SOIL STOCKPILE

WATER MONITORING WELL

DH-1

TP-120

TP-121

TP-122

TP-119

TP-113

TP-112

TERTIARY GRAVEL

A

A'

TH-54

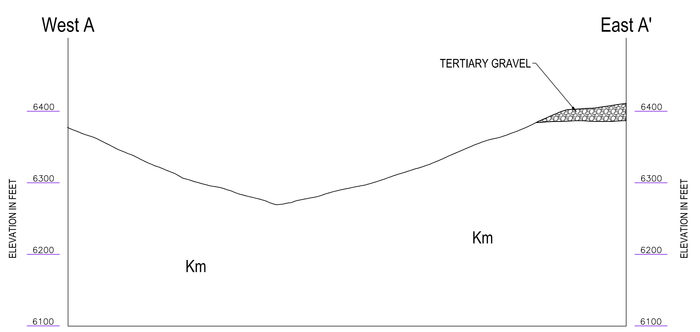
TH-55

TH-56

HIGHWAY 31

Km

N



PROFESSIONAL ENGINEER
No. 22-150267-2202
J. THOMAS PALUSO
STATE OF UTAH
7/3/18

LEGEND

———	PERMIT BOUNDARY LINE	TH-54 ●	TEST HOLE (Huntington Power Plant)
Km	MASUK SHALE	TP-121 ■	TEST PIT (Huntington Power Plant)
DH-1 •	DRILLHOLE		
	TERTIARY GRAVEL		

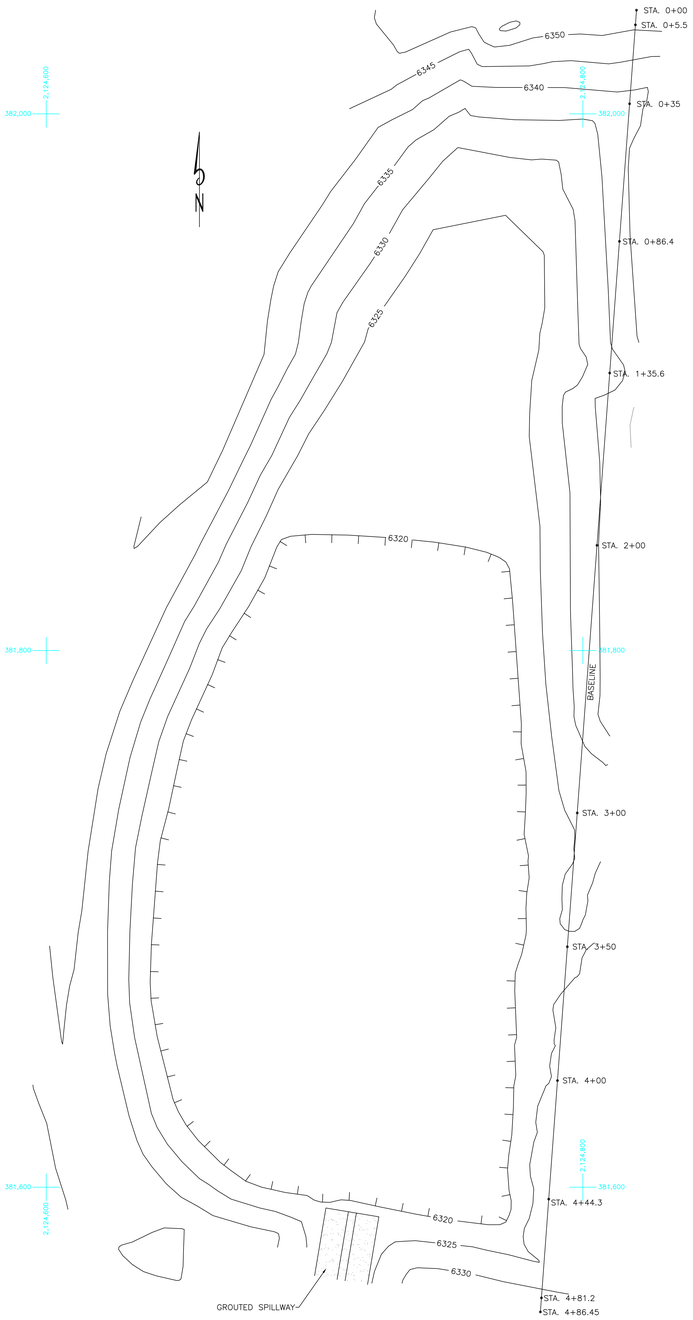
N

RHINO

Castle Valley Mining LLC

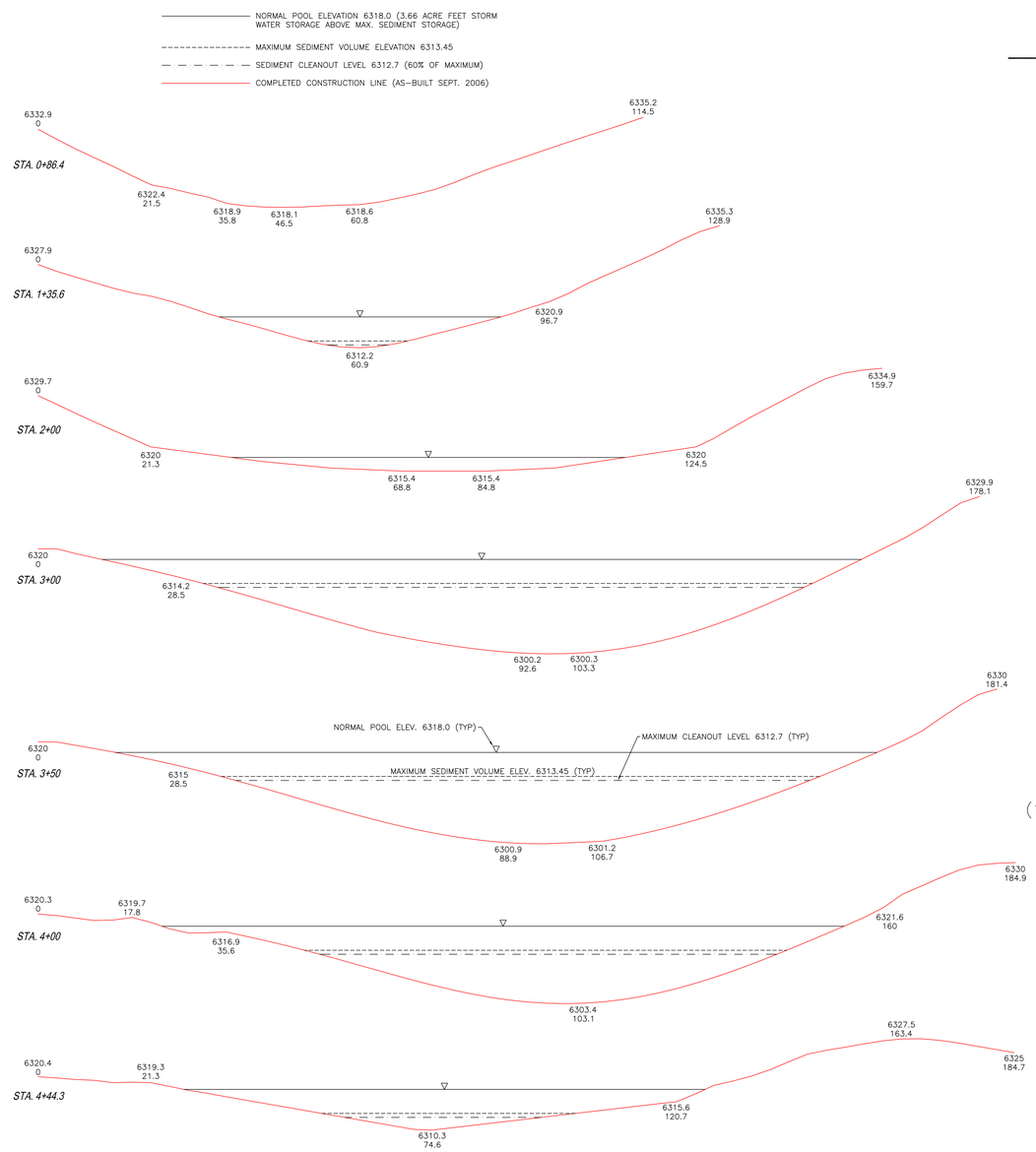
WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *GEOLOGY MAP*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 6-1



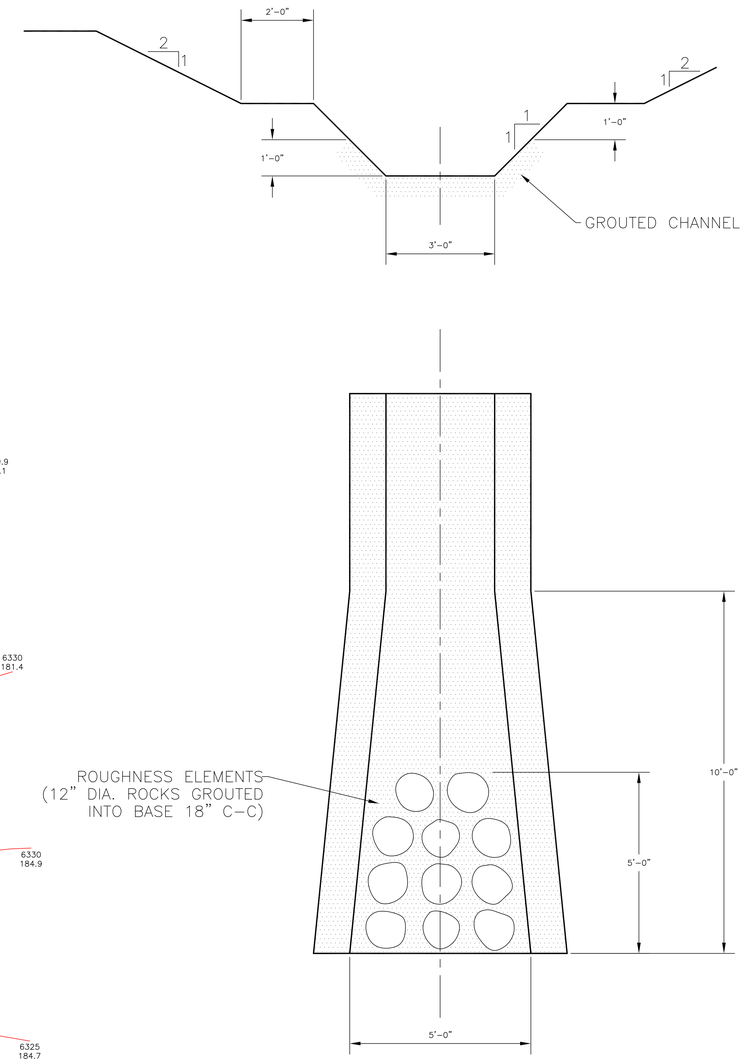
PLAN VIEW - SEDIMENTATION POND

SCALE: 1"=20'



SEDIMENT BASIN - CROSS SECTIONS

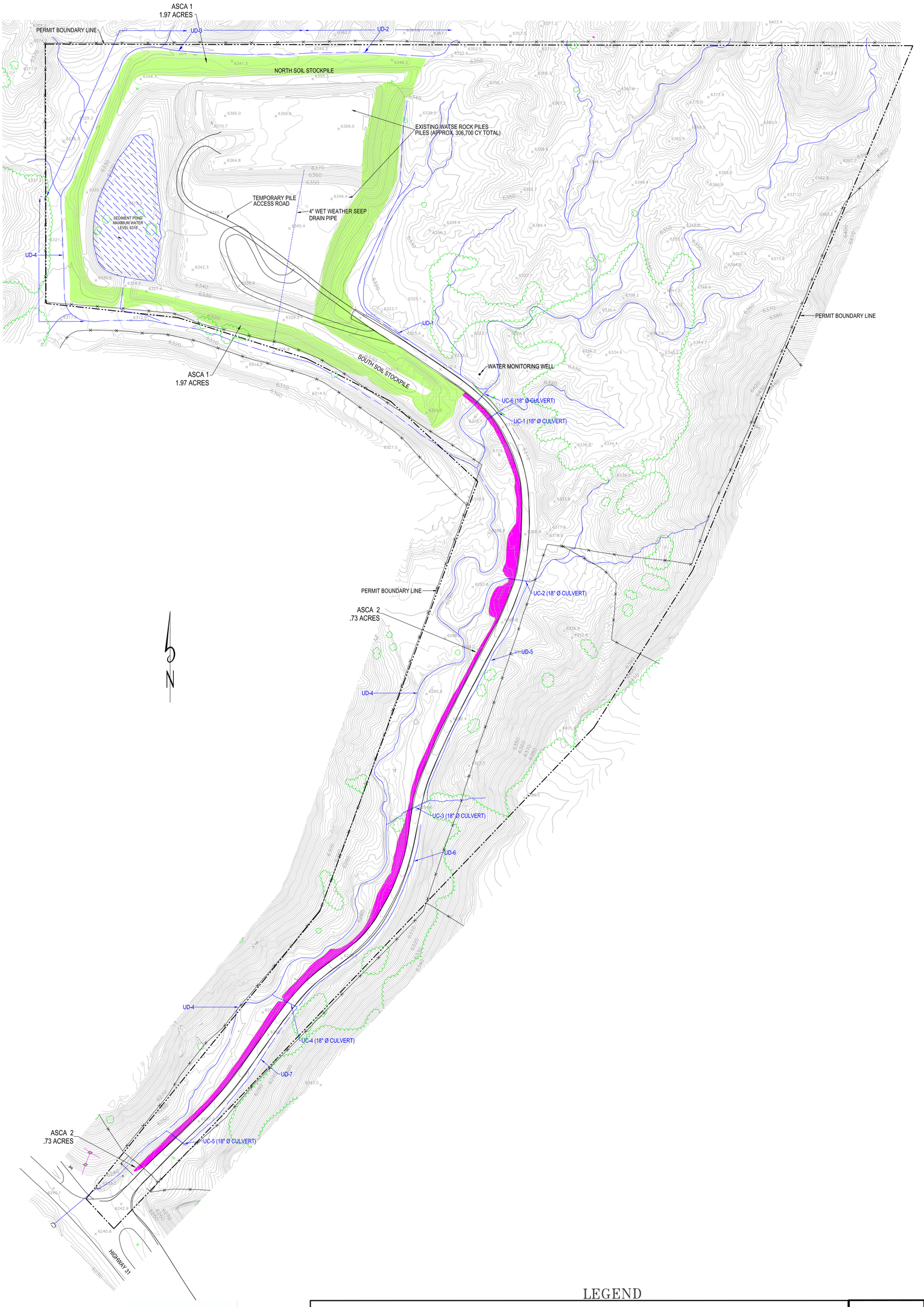
SCALE: 1"=10'



Spillway Details
Sediment Pond DP-1

PROFESSIONAL ENGINEER
No. 22-150267-2202
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

RHINO	Castle Valley Mining LLC *WASTE ROCK STORAGE FACILITY* *DOGM PERMIT#*
TITLE: *SEDIMENT DETENTION BASIN*	
SCALE: N/A	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 7-1



LEGEND

ASCA 1 ADJACENT TO WASTE ROCK PILE

ASCA 2 ADJACENT TO ROAD

CULVERT

DITCH

SEE PLATE 7-3 FOR DRAINAGE DETAILS

N

PROFESSIONAL ENGINEER
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STATE OF UTAH

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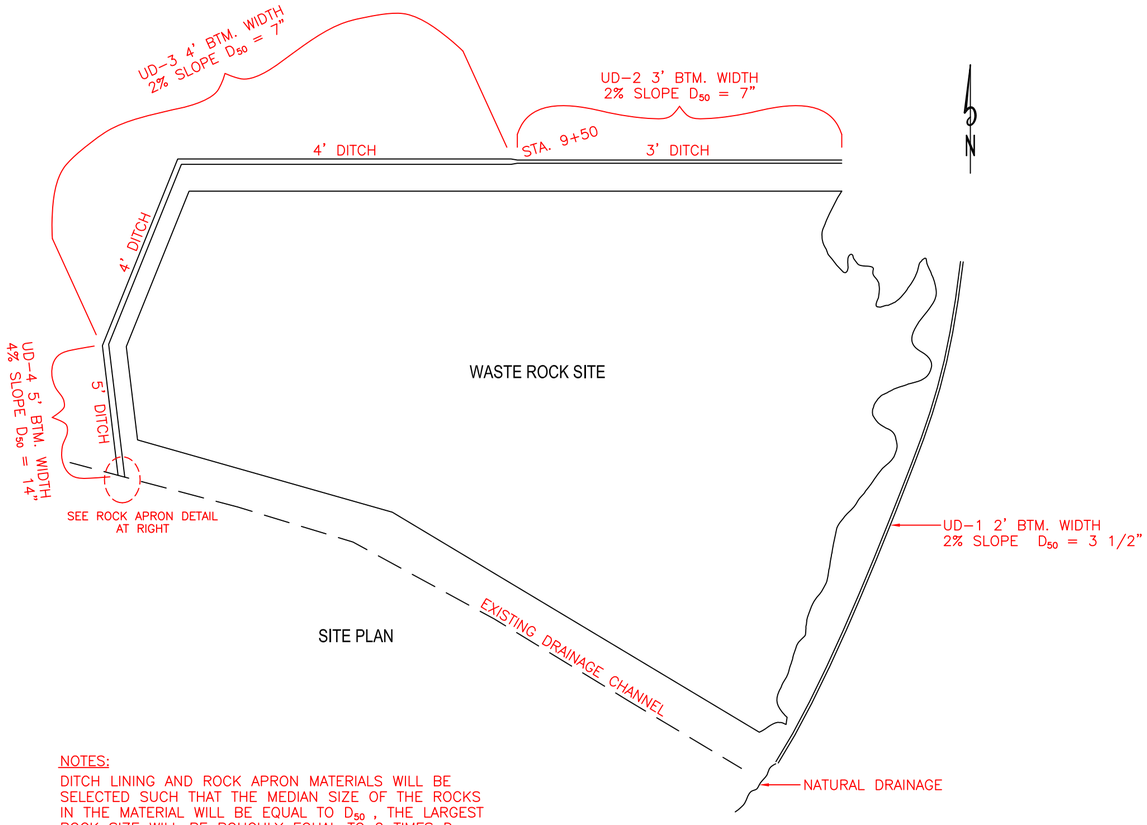
Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *SITE DRAINAGE MAP*	
SCALE: 1"=75'	DATE: 6-26-2018
DRAWN BY: J. JORGENSEN	PLATE: 7-2

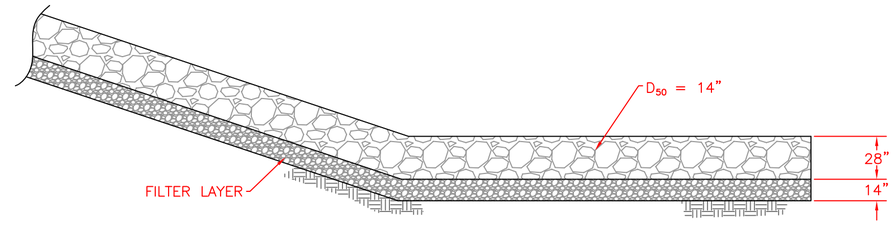


SITE PLAN

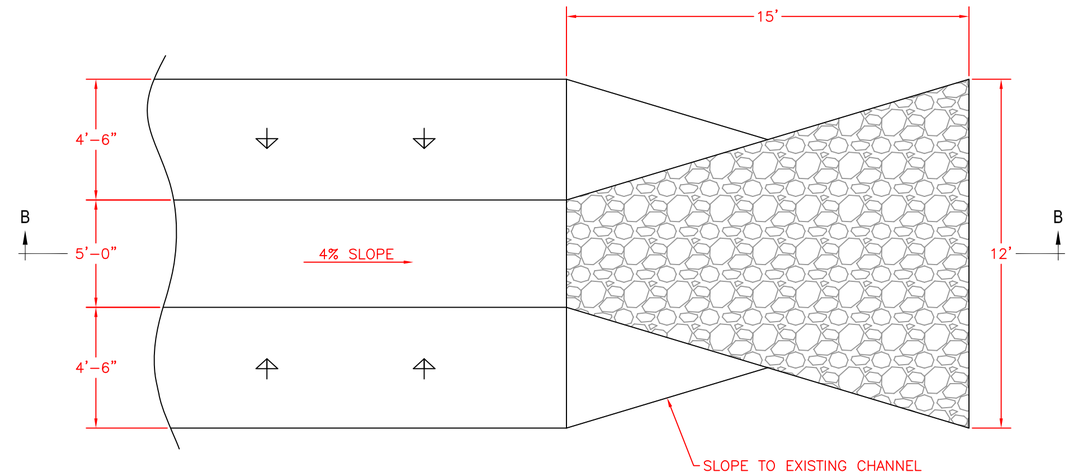
NOTES:

DITCH LINING AND ROCK APRON MATERIALS WILL BE SELECTED SUCH THAT THE MEDIAN SIZE OF THE ROCKS IN THE MATERIAL WILL BE EQUAL TO D_{50} , THE LARGEST ROCK SIZE WILL BE ROUGHLY EQUAL TO 2 TIMES D_{50} AND APPROXIMATELY 20% OF THE MATERAIL WILL BE ONE HALF OF D_{50} OR SMALLER IN DIAMETER.

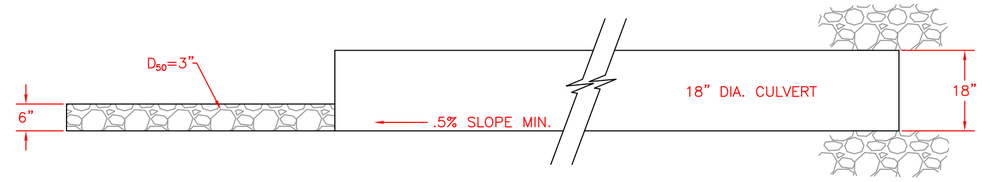
UD = UNDISTURBED DITCH



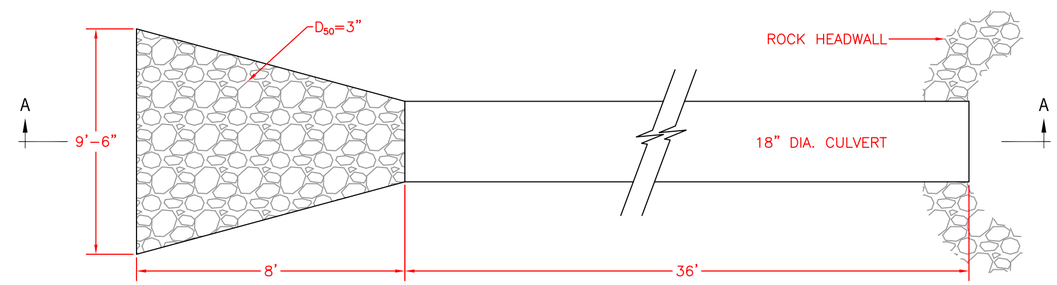
SECTION B-B



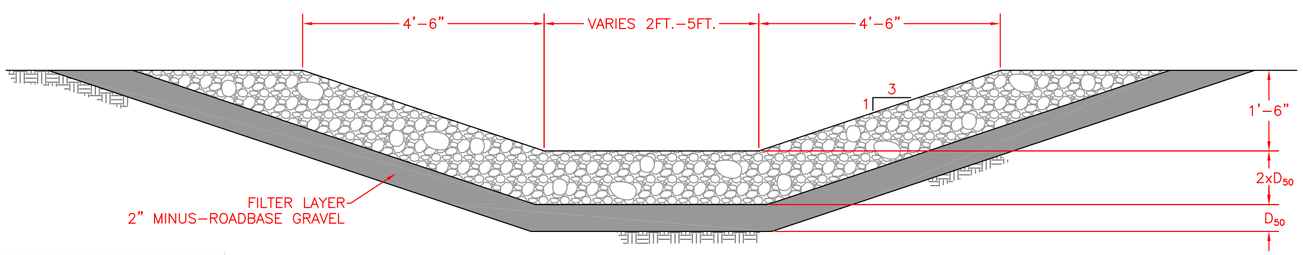
ROCK APRON



SECTION A-A



ROCK APRON AT CULVERT DISCHARGE



TYPICAL - DITCH CROSS SECTION

TYPICAL UNDISTURBED TRAPEZOIDAL DRAINAGE DITCH DIMENTIONS

DITCH	BOTTOM WIDTH (FT)	SIDE SLOPES	RIPRAP
UD-1	2	3:1	3.5
UD-2	3	3:1	7
UD-3	4	3:1	7
UD-4	5	3:1	14

PROFESSIONAL ENGINEER
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7/3/18
STATE OF UTAH

RHINO

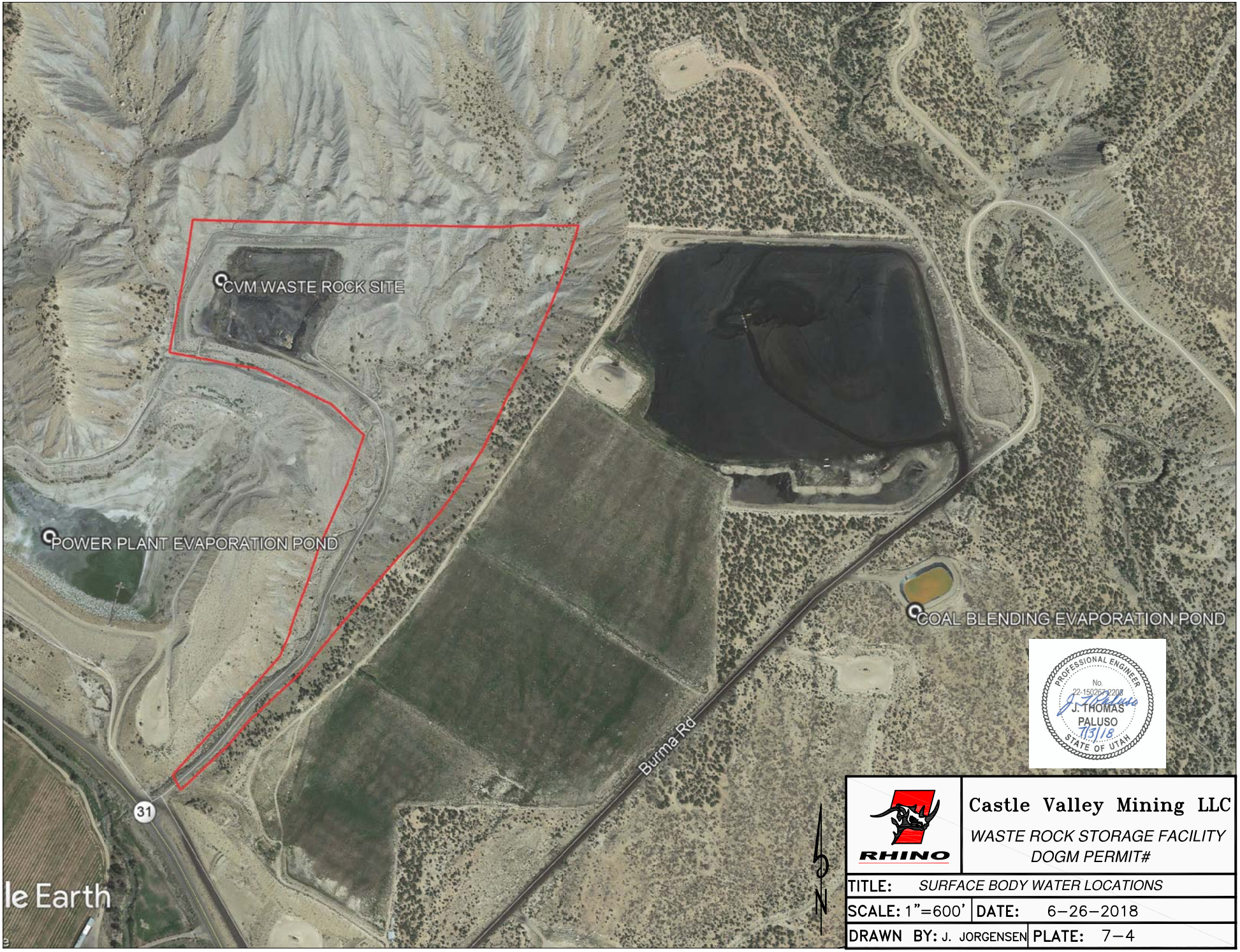
Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *DRAINAGE DETAILS*

SCALE: NONE | DATE: 6-26-2018

DRAWN BY: J. JORGENSEN | PLATE: 7-3



PROFESSIONAL ENGINEER
No. 22-150267-2208
J. THOMAS PALUSO
7/3/18
STATE OF UTAH

RHINO

Castle Valley Mining LLC

WASTE ROCK STORAGE FACILITY
DOGM PERMIT#

TITLE: *SURFACE BODY WATER LOCATIONS*	
SCALE: 1"=600'	DATE: 6–26–2018
DRAWN BY: J. JORGENSEN	PLATE: 7–4