CANYON FUEL COMPANY, LLC

DUGOUT CANYON MINE
METHANE DEGASSIFICATION AMENDMENT
Wells G-25 and G-26

C/007/0039

April 2009

File in:
☐ Confidential
☒ Shelf
☐ Expandable
Refer to Record No 0024 Date 04302009
In C/0070039, 2009, Incoming
For additional information

0024

C/007/039 Incoming

#3274

COPY

Canyon Fuel Company, LLC
Dugout Canyon Mine
P.O. Box 1029
Wellington, Utah 84542

April 30, 2009

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

RE: Revisions to Degas Well Amendment to Add Degas Wells G-25 and G-26
Dugout Canyon Mine, Canyon Fuel Company, LLC, C/007/039, Carbon County, Utah

Dear Sirs:

Enclosed please find four copies of a revision to the Methane Degassification Amendment to add Degas Wells G-25 and G-26. Complete copies of chapters 1, 2, 3, 4, 5, and 7 have been submitted with this amendment, for ease of review.

Chapter 1, pages 1-9 and 1-10 of the M&RP have also been provided with a replacement of the legal description also provided for insertion into Appendix 1-4. Plate 1-4 has been revised and provided in the submittal. The bond calculations have been revised and calculations have been provided for degas wells G-25 and G-26.

The archeological information for site G-25 and G-26 are provided in reports SPUT 577, which have been approved by SHPO and incorporated into the confidential folders.

A copy of this submittal has been delivered to the Price field office.

If you have any questions please call me at (435) 636-2869.

Sincerely yours,

Vicky S. Miller

Vicky S. Miller

cc: Dave Spillman

File in:
C/007/039 2009 Incoming
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☐ Expandable
Date 04 30 09

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SUFCO Mine

For additional information
Skyline Mines
Dugout / Soldier Canyon Mines

APPLICATION FOR COAL PERMIT PROCESSING

COPY

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

Permittee: Canyon Fuel Company, LLC
Mine: Dugout Canyon Mine **Permit Number:** C/007/039
Title: Revision to Degas Well Amendment to Add Wells G-25 and G-26
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: 3.6 ☒ 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 four (4) review copies of the application. If the mine is on or adjacent to Forest Service land please submit five (5) copies, thank you. (These numbers include a copy for the Price Field Office)

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.

David Spillman
Print Name

David Spillman, Engineering Manager 4/27/09
Sign Name, Position, Date

Subscribed and sworn to before me this 27 day of APRIL, 20 09

Vicky Sue Miller
Notary Public

My commission Expires: 1-2, 20 12

Attest: State of UTAH } ss:
County of CARBON

VICKY SUE MILLER
NOTARY PUBLIC-STATE OF UTAH
1776 KENILWORTH RD.
HELPER, UTAH 84526
COMM. EXP. 01-02-2012

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
		RECEIVED APR 30 2009 DIV. OF OIL, GAS & MINING

Form DOGM- C1 (Revised March 12, 2002)

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

COPY

Permittee: Canyon Fuel Company, LLC
Mine: Dugout Canyon Mine **Permit Number:** C/007/039
Title: Degas Wells Amendment to Add Wells G-25 & G-26

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	Degas Wells - Chapter 1
☐ Add	☒ Replace	☐ Remove	Figure 1-1
☐ Add	☒ Replace	☐ Remove	Degas Wells - Chapter 2
☒ Add	☐ Replace	☐ Remove	Attachment 2-1 - Soil Inventory and Assessment - add to back of existing information
☒ Add	☐ Replace	☐ Remove	Attachment 2-2 - Topsoil Calcualtions - add to back of existing information
☐ Add	☒ Replace	☐ Remove	Degas Wells - Chapter 3
☒ Add	☐ Replace	☐ Remove	Attachment 3-1 - Vegetation Report - Add to back of existing information
☒ Add	☐ Replace	☐ Remove	Degas Wells - Chapter 4
☐ Add	☒ Replace	☐ Remove	Degas Wells - Chapter 5 and Figure 5-26
☐ Add	☒ Replace	☐ Remove	Attachment 5-1, Figures 1, 2 and 3 for Wells 25 and 26
☒ Add	☐ Replace	☐ Remove	Degas Wells - Chapter 7
☐ Add	☒ Replace	☐ Remove	Attachment 7-1 - Contain. and Hydrologic Calculations Degas for Wells G-21 and G-22
☒ Add	☐ Replace	☐ Remove	
☐ Add	☒ Replace	☐ Remove	
☒ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	THIS INFORMATION GOES IN THE M&RP
☐ Add	☒ Replace	☐ Remove	M&RP - Chapter 1, Pages 1-9
☐ Add	☒ Replace	☐ Remove	M&RP - Appendix 1-4
☐ Add	☒ Replace	☐ Remove	M&RP - Appendix 5-6, Degas Well G-22 Bond Calculations, Page 1, 2 and 63
☒ Add	☐ Replace	☐ Remove	M&RP - Appendix 5-6, Degas Well G-22 Bond Calculations , Pages 84, 85 and 55H, 55I
☐ Add	☒ Replace	☐ Remove	M&RP - Plate 1-4
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	ARCHEOLOGICAL REPORT SPUT-577 WAS PROVIDED FOR INCORPORATION INTO THE CONFIDENTIAL FOLDER PREVIOUSLY AS A SEPARATE AMENDMENT AND HAS BEEN REVIEW AND ACCEPTED BY SHPO. Please refer to the confidental folder for review.
☐ 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.

4/29/09 The Degassification Amendment is a stand alone document, pages in this submittal will be incorporated into the existing binder. Also in the submittal are pages to be added to the M&RP in Chapter 1 and Appendix 1-4 and in Appendix 5-6, Plate 1-4 goes in Chapter 1 of the M&RP.

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Section 20: W1/2W1/2W1/2, W1/2E1/2W1/2W1/2

T13 S., R13 E., SLBM, Utah (Added to Permit Area in 2005, approximately 2,360 acres)

Section 17: E1/2SW1/4, SW1/4SE1/4, E1/2E1/2W1/2SW1/4

Section 20: E1/2W1/2, E1/2, E1/2E1/2W1/2W1/2

Section 21: SW1/4NW1/4, SW1/4

Section 28: NW1/4, N1/2SW1/4, SW1/4SW1/4

Section 29: All

Section 30: E1/2, E1/2W1/2

State Lease ML-50582-OBA - (320 acres)

T13 S., R13 E., SLBM, Utah

Section 16: W1/2

Waste Rock Storage Facility

T. 14 S., R. 12 E., SLBM, Utah (Approximately 26.8 acres)

Section 18: Portions of NE1/4, SW1/4 and SE1/4 of the NE1/4

All of Lease ML-42648, except the E1/2 of Section 8 and the NE1/4 of Section 17, is included within the Dugout Canyon Mine permit boundary. However, only the S1/2 SE1/4 of Section 9 from Lease ML-42649 is within the permit boundary. The ten acres described in UTU-76601 are also described in UTU-77985. The U.S. Department of Interior, Bureau of Land Management (BLM) right-of-way application UTU-76601 is included in Appendix 1-3.

The disturbed area encompasses 20.80 acres (Mine Facility area, including Gilson well pad and small substation), ~~33.9~~ 37.5acres (G-2, G-3, G-4, G-5, G-6, G-7, G-9, G-10, G-11, G-12, G-13, G-14, G-15, G-16, G-17, G-18, G-19, G-22 (including access road), G-25, G-26 and G-31 Degas Well), 14.25 acres (AMV Road) 0.85 (Topsoil Stockpile), 1.8 acres (Leach field/pipeline area), 2.7 acres (Pace Canyon Fan Facility) and 26.8 acres (Refuse Pile area) totaling approximately ~~101.1~~ 104.7acres. That acreage includes a pre- and post mining road with an area of 1.6 acres and 2.03 acres of undisturbed land within the mine facilities disturbed area and 11.2 acres within the refuse pile disturbed area.

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Refer to Record No 0024 Date 04302009
In C/0070039, 2009, Incoming
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APPENDIX 1-4

Disturbed Area Legal Description

LEGAL DESCRIPTION OF BONDED AREA:

Waste Rock Storage Facility
T. 14 S., R. 12 E., SLBM, Utah (Approximately 26.8 acres)
Section 18: Portions of NW1/4NE1/4NE1/4
Portions of NE1/4NE1/4NE1/4
Portions of SW1/4NE1/4NE1/4
Portions of SE1/4NE1/4NE1/4
Portions of NW1/4SE1/4NE1/4

Leachfield and Pipeline
T. 13 S., R. 12 E., SLBM, Utah (Approximately 1.8 acres)
Section 22: Portion of SE1/4SE1/4NE1/4SE1/4
Portion of NE1/4SE1/4NE1/4SE1/4
Portion of N1/2NE1/4SE1/4SE1/4;
Portion of SW1/4NE1/4SE1/4SE1/4;
Portion of S1/2NW1/4SE1/4SE1/4;
Portion of SE1/4NE1/4SW1/4SE1/4;
Portion of N1/2SE1/4SW1/4SE1/4;
Portion of NE1/4SW1/4SW1/4SE1/4;
Portion of S1/2SW1/4SW1/4SE1/4
Section 23: Portion of SW 1/4NW1/4NW1/4SW1/4;
Portion of SE1/4NW1/4NW1/4SW1/4;
Portion of NW1/4SW1/4NW1/4SW1/4;
Section 27: Portion of W1/2NW1/4NW1/4NE1/4
Portion of SE1/4NE1/4NE1/4NW1/4
Portion of E1/2SE1/4NE1/4NW1/4
Portion of SW1/4SE1/4NE1/4NW1/4

Main Facilities Area T. 13 S., R. 12 E., SLBM, Utah (Approximately 20.80 acres)

Section 23: A Portion of the following:
NE1/4NE1/4NW1/4SW1/4; NE1/4NW1/4NW1/4SW1/4;
NW1/4NE1/4NW1/4SW1/4;SW1/4SE1/4SW1/4NW1/4;
SE1/4SE1/4SW1/4NW1/4;NW1/4SE1/4SW1/4NW1/4;
NE1/4SE1/4SW1/4NW1/4;SW1/4SW1/4SE1/4NW1/4;
SE1/4SW1/4SE1/4NW1/4;NW1/4SW1/4SE1/4NW1/4;
NE1/4SW1/4SE1/4NW1/4;SW1/4NW1/4SE1/4NW1/4;
SE1/4NW1/4SE1/4NW1/4;NE1/4NW1/4SE1/4NW1/4;
SW1/4NE1/4SE1/4NW1/4;NW1/4NE1/4SE1/4NW1/4;
NE1/4NE1/4SE1/4NW1/4;W1/2SE1/4NE1/4NW1/4;
SW1/4NE1/4NE1/4NW1/4;NW1/4NE1/4NE1/4NW1/4;
NE1/4NE1/4NE1/4NW1/4

Section 14: A Portion of the following:
SE1/4SE1/4SE1/4SW1/4;
NE1/4SE1/4SE1/4SW1/4;
NW1/4SW1/4SW1/4SE1/4

G-2 Thru G-17 Degas Well, (Approximately 28.35 acres)

G-2	Portion of N1/2SW1/4NE1/4 Section 24	Township 13 South, Range 12 East, SLBM
G-3	Portion of N1/2SW1/4NW1/4 Section 19	Township 13 South, Range 13 East, SLBM
G-4	Portion of N1/2NE1/4NW1/4 Section 24	Township 13 South, Range 12 East, SLBM
G-5	Portion of N1/2NW1/4NE1/4 Section 24	Township 13 South, Range 12 East, SLBM
G-6	Portion of S1/2SW1/4NW1/4 Section 18	Township 13 South, Range 13 East, SLBM
G-7	Portion of SW1/4NE1/4SE14 Section 24	Township 13 South, Range 12 East, SLBM
G-9	Portion of NW1/4NW1/4SW1/4 Section 21	Township 13 South, Range 13 East, SLBM
G-10	Portion of NE1/4NE1/4SE1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-11	Portion of NE1/4SE1/4SW1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-12	Portion of SE1/4NW1/4SW1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-13	Portion of NW1/4NE1/4SE1/4 Section 19	Township 13 South, Range 13 East, SLBM
G-14A	Portion of SW1/4SW1/4SE1/4 Section 17	Township 13 South, Range 13 East, SLBM
G-15	Portion of NW1/4SE1/4NE1/4 Section 19	Township 13 South, Range 13 East, SLBM
G-16	Portion of SW1/4SE1/4SE1/4 Section 18	Township 13 South, Range 13 East, SLBM
G-17	Portion of SE1/4NW1/4SE1/4 Section 18	Township 13 South, Range 13 East, SLBM
G-18	Portion of NE1/4SE1/4NW1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-19	Portion of SW1/4NW1/4SE1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-22	Portion of NE1/4SE1/4SE1/4 Section 18	Township 13 South, Range 13 East, SLBM
G-22	Access Road Portions of SE1/4 Section 18	Township 13 South, Range 13 East, SLBM
G-31	Portion of NW1/4SW1/4NW1/4 Section 20	Township 13 South, Range 13 East, SLBM
AMV	Portion of S1/2NW1/4 Section 20	Township 13 South, Range 13 East, SLBM
Road	Portion of SW1/4SW1/4NE1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-25	Portion of SW1/4SE1/4SE1/4 Section 20	Township 13 South, Range 13 East, SLBM
G-26	Portion of NE1/4NE1/4NW1/4 Section 29	Township 13 South, Range 13 East, SLBM

Pace Canyon Fan Facility Township 13 South, Range 13 East, SLBM (Approximately 2.7 acres)
Section 30: Portion of E1/2NW1/4NW1/4

Total Approximately ~~101.1~~ 104.7Acres

APPENDIX 5-6

Reclamation Bond Estimate

Bonding Calculations

Direct Costs		
Subtotal Demolition and Removal	$1,154,907.00	
Subtotal Backfilling and Grading	$827,141.00	
Subtotal Revegetation	$485,062.00	
Direct Costs	$2,467,110.00	
Indirect Costs		
Mob/Demob	$246,711.00	10.0%
Contingency	$123,356.00	5.0%
Engineering Redesign	$61,678.00	2.5%
Main Office Expense	$167,763.00	6.8%
Project Mainagement Fee	$61,678.00	2.5%
Subtotal Indirect Costs	$661,186.00	26.8%
Total Cost	$3,128,296.00	
Escalation factor		0.016
Number of years		2
Escalation	$100,906.00	
Reclamation Cost Escalated	$3,229,202.00	
Reclamation Cost (rounded to nearest $1,000) 2010 Dollars	$3,229,000.00	
Bond in 2010 dollars	$3,300,000.00	
Difference Between Cost Estimate and Bond	$71,000.00	
Percent Difference	2.20%	

Ref.	Description	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Mine Belt BC-1 No 1																		19359
	Transfer Building No 2																		34970
	Feed Belt BC 2 No3																		13812
	Stack Tubes 2 No4																		3673
	Head House 1 No 5																		6687
	Transfer Belt BC 2 No 6																		8800
	Head House 2 No 7																		1632
	Reclaim Tunnel No 8																		33969
	Reclaim Belt BC 4 No 9																		12015
	Escape Tunnel 60 inch No 10																		953
	Crusher Building No 11																		31287
	Truck Loadout Belt BC 5 No 12																		9946
	Truck Loudout and Scale No 13																		25633
	Bathhouse No 14																		138047
	Substation No 15																		1803
	Power Lines and Poles No 16																		1958
	Retaining Wall No 17																		698
	Gabion Wall No 18																		59675
	Pump House No 19																		2708
	Paved Road No 20																		141491
	Stream Culvert 72 inch No 21																		46216
	Water Tanks No 22																		3097
	Rock Dust Bin No 23																		1092
	Storage Bolts & Bits																		2848
	Fuel Tank and Fuel Station No 24																		2000
	Holding Tank No 25																		331
	Ventilation Fan No 26																		2260
	Magnet 27																		491
	Water System 28																		73801
	Sewage System 29																		24734
	Item 30 removed																		
	Storage Containers 31																		9800
	Gilson Well No 32																		1517
	Shop Building No 33																		5053
	Switch House No 34																		1035
	Portals No 35																		26000
	Storage Building No 36																		1795
	Sampling System No 37																		1335
	Stoker Storage Bin No 41																		822
	Substation No 2 No 42																		2654
	Gabion Baskets No 43																		982
	Pace Fan Culvert																		2031
	Pace Fan Generator																		52771
	Pace Fan Portal																		5200
	Refuse Site No 44																		9913
	Degas Well G2																		12297
	Degas Well G3																		7990
	Degas Well G4																		7670
	Degas Well G5																		11058
	Degas Well G6																		8324
	Degas Well G7																		12314
	Degas Well G9																		11054
	Degas Well G10																		2301
	Degas Well G11																		9287
	Degas Well G12																		9081
	Degas Well G13																		13065
	Degas Well G14																		12924
	Degas Well G15																		11354
	Degas Well G16																		10369
	Degas Well G17																		10043
	Degas Well G18																		21636
	Degas Well G19																		13857
	Degas Well G31																		27825
	AMV Road																		67999

	Degas Well G22 & Road																	23373
	Degas Well G25																	12563
	Degas Well G26																	11629
	Total																	1154907

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Degas Well G25																			
	Grade and	Front end	02315 424	1.43	/CY						1406					CY		1406	CY	2011
	Fill in Mud	Backfill Tre	02315 610	1.58	/CY						430					CY		430	CY	679
	Subtotal																			2690
	Plug Well	Concrete F	03310 220	196	/CY						21					CY		21	CY	4116
	Subtotal																			4116
	Spread To	Front end	02315 424	1.43	/CY						1406					CY		1406	CY	2011
	Subtotal																			2011
	Fence																			
	Remove B	Fencing B	02220 220	1.59	/LF	1300										FT		1300	FT	2067
	Subtotal																			2067
	Support																			
	Pickup Tru	Pickup Re	01 54 33 4	80.42	/day									24		hr		3	day	241
	Foreman	Foreman A	Foreman	$59.90	HR									24		hr		24	hr	1438
	Subtotal																			1679
	Total																			12563

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Degas Well G26																			
	Grade and	Front end	02315 424	1.43	/CY						1080					CY		1080	CY	1544
	Fill in Mud	Backfill Tre	02315 610	1.58	/CY						430					CY		430	CY	679
	Subtotal																			2223
	Plug Well	Concrete F	03310 220	196	/CY						21					CY		21	CY	4116
	Subtotal																			4116
	Spread To	Front end	02315 424	1.43	/CY						1080					CY		1080	CY	1544
	Subtotal																			1544
	Fence																			
	Remove Ba	Fencing Ba	02220 220	1.59	/LF	1300										FT		1300	FT	2067
	Subtotal																			2067
	Support																			
	Pickup Tru	Pickup Re	01 54 33 4	80.42	/day									24		hr		3	day	241
	Foreman	Foreman A	Foreman	$59.90	HR									24		hr		24	hr	1438
	Subtotal																			1679
	Total																			11629

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Dugout Mine Vegetation																			151810
	Dugout Mine Refuse Pile																			104889
	Pace Canyon Fan Portal																			7231
	Degas Well G2																			6260
	Degas Well G3																			5179
	Degas Well G4																			4143
	Degas Well G5																			4143
	Degas Well G6																			4143
	Degas Well G7																			5159
	Degas Well G9																			10350
	Degas Well G10																			8280
	Degas Well G11																			8482
	Degas Well G12																			6245
	Degas Well G13																			12574
	Degas Well G14																			9520
	Degas Well G15																			11536
	Degas Well G16																			9520
	Degas Well G17																			6394
	Degas Well G18																			6870
	Degas Well G19																			12574
	Degas Well G31																			13116
	AMV Road																			57981
	Degas Well G22 & Access Road																			7873
	Degas Well G25																			5395
	Degas Well G26																			5395
	Total:																			485062

Ref.	Description	Materials	Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Degas Well G-25																			
	Soil Preparation																			
	Pocking	Excavation	M0231542	1.74	/CY					1						AC		1613	CY	2807
	Subtotal																			2807
	Seed Mix No 1																			
	Hydroseed	Hydro Spre	Reveg002	19.8	/MSF					1						AC		44	MSF	871
	Hydroseed	Dugout Se	Dugout 07	394.75	/AC					1						AC		1	AC	395
	Hay Mulch	Hay 1" mat	Reveg001	69.85	/MSF					1						AC		1	ton/AC	70
	Subtotal																			1336
	Direct Vegetation																			4143
	Reseeding																			
	Assume 25% reveg rate																			1252
	Total																			5395

Ref.	Description	Materials	Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Degas Well G-26																			
	Soil Preparation																			
	Pocking	Excavation Bulk Bank 2 CY (322BL)	M023154240260	1.74	/CY					1						AC		1613	CY	2807
	Subtotal																			2807
	Seed Mix No 1																			
	Hydroseed Equipment and Labor	Hydro Spreader (equip. & labor) B-81 80MS	Reveg002	19.8	/MSF					1						AC		44	MSF	871
	Hydroseed Material	Dugout Seed Mix No 1	Dugout 07391S	394.75	/AC					1						AC		1	AC	395
	Hay Mulch	Hay 1" material only 029105000250	Reveg001	69.85	/MSF					1						AC		1	ton/AC	70
	Subtotal																			1336
	Direct Vegetation																			4143
	Reseeding																			-
	Assume 25% reveg rate																			1252
	Total																			5395

CHAPTER 1

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

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

111 Introduction

The degassification wells will be located on property owned by the Milton and Ardith Thayn Trust. The well locations are found in Table 1-1 and are shown in Figure 1-1.

112 Identification of Interests

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.100 Business Entity

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.200 Applicant and Operator

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.300 Officers of the Applicant

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

TABLE 1-1

Degas Well Locations

Pine Canyon, Utah Quadrangle, Salt Lake Meridian

Hole Number	Section	Township and Range
G-1	Portion of N1/2SE1/4NW1/4 Section 24	Township 13 South, Range 12 East
G-2	Portion of N1/2SW1/4NE1/4 Section 24	Township 13 South, Range 12 East
G-3	Portion of N1/2SW1/4NW1/4 Section 19	Township 13 South, Range 13 East
G-4	Portion of N1/2NE1/4NW1/4 Section 24	Township 13 South, Range 12 East
G-5	Portion of N1/2NW1/4NE1/4 Section 24	Township 13 South, Range 12 East
G-6	Portion of S1/2SW1/4NW1/4 Section 18	Township 13 South, Range 13 East
G-7	Portion of SW1/4NE1/4SE14 Section 24	Township 13 South, Range 12 East
G-8	Portion of NE1/4NE1/4NE14 Section 26	Township 13 South, Range 12 East
G-9	Portion of NW1/4NW1/4SW1/4 Section 21	Township 13 South, Range 13 East
G-10	Portion of NE1/4NE1/4SE1/4 Section 20	Township 13 South, Range 13 East
G-11	Portion of NE1/4SE1/4SW1/4 Section 20	Township 13 South, Range 13 East
G-12	Portion of SE1/4NW1/4SW1/4 Section 20	Township 13 South, Range 13 East
G-13	Portion of NW1/4NE1/4SE1/4 Section 19	Township 13 South, Range 13 East
G-14	Portion of SW1/4SW1/4SE1/4 Section 17	Township 13 South, Range 13 East
G-15	Portion of NW1/4SE1/4NE1/4 Section 19	Township 13 South, Range 13 East
G-16	Portion of SW1/4SE1/4SE1/4 Section 18	Township 13 South, Range 13 East
G-17	Portion of SE1/4NW1/4SE1/4 Section 18	Township 13 South, Range 13 East
G-18	Portion of NE1/4SE1/4NW1/4 Section 20	Township 13 South, Range 13 East
G-19	Portion of SW1/4NW1/4SE1/4 Section 20	Township 13 South, Range 13 East
G-22 Access Rd.	Portion of NE1/4SE1/4SE1/4 Section 18 Portions of SE1/4 Section 18	Township 13 South, Range 13 East Township 13 South, Range 13 East
G-25	Portion of SW1/4SE1/4SE1/4Section 20	Township 13 South, Range 13 East
G-26	Portion of NE1/4NE1/4NW1/4Section 29	Township 13 South, Range 13 East
G-31	Portion of NW1/4SW1/4NW1/4 Section 20	Township 13 South, Range 13 East

AMV Road	Portion of S1/2NW1/4 Section 20 Portion of SW1/4SW1/4NE1/4 Section 20	Township 13 South, Range 13 East

112.400 Coal Mining and Reclamation Operation Owned or Controlled

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.500 Legal or Equitable Owner of the Surface and Mineral Properties

The legal and equitable owner of the surface and mineral properties to be affected by this operation during the duration of the permit period are list below.

Milton & Ardith Thayn Trust
7730 East US Highway 6
Sunnyside Star Route
Price, Utah 84501

Gil L. Conover
450 So. State
Ferron, Utah 84523

United States of America
State of Utah, Department of Interior
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

State of Utah
School and Institutional
Trust Lands Administration
675 East 500 South
Salt Lake City, Utah 84102-2818

112.600 Owners of Record of Property Contiguous to Proposed Permit Area

Owners of record for surface and mineral properties contiguous to the proposed permit area are list below.

United States of America
Department of Interior
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

State of Utah
School and Industrial
Trust Lands Administration
675 East 500 South
Salt Lake City, Utah 84102-2818

George and Alice Conover, Et Al
2701 Georgia Way
Sandy, Utah 84092

KFJ Ranch Partnership
C/O Kerwin Jensen
Cleveland, Utah 84518

J. George Conover
275 West Main
Ferron, Utah 84523

Gil L. Conover
450 So. State
Ferron, Utah 84523

112.700 MSHA Numbers

Refer to the same section of the approved M&RP.

112.800 Interest In Contiguous Lands

Canyon Fuel Company, LLC has no interest in contiguous lands other than those currently owned as shown on Plate 1-1 of the approved M&RP.

112.900 Certification of Submittal Information

No information has changed in the approved M&RP because of this submittal. Refer to the same section of the approved M&RP.

113 Violation Information

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

114 Right-of-Entry Information

Refer to the same section of the approved M&RP.

See Table 1-2 for disturbed acreage for each well site. The disturbed acres will be added to the total disturbed acreage for the Dugout Mine as each site is constructed.

Additional correspondence pertaining to right-of-entry is located in Attachments 2-3, 4-2, 5-3, and 5-4.

Although notification of mining activities is required under R645.301.525.700, response when requested from landowner or others concerning right-of-entry is entirely at their discretion. The landowner agreement between the permittee and the Thayn Trust can be reviewed in Appendix 4-2 of the Methane Degassification Amendment.

115 Status of Unsuitability Claims

Refer to the same section of the approved M&RP.

116 Permit Term

Refer to the same section of the approved M&RP.

The disturbed acreage for the AMV access road is approximately 14.25 acres including areas for topsoil storage and turnouts.

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

The certificate of insurance(s) for each well will be obtained if required when the well is drilled. The certificate of insurance(s) will be included in Appendix 1-2 of the approved M&RP and General Chapter 1.

118 Filling Fees

Refer to the same section of the approved M&RP.

120 PERMIT APPLICATION FORMAT AND CONTENTS

This amendment submittal will comply with R645-301-120.

130 REPORTING OF TECHNICAL DATA

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

140 MAPS AND PLANS

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

150 COMPLETENESS

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

TABLE 1-2

Disturbed Acres by Well Site

Well Site	Disturbed Acres
G-1	0.6
G-2	1.21
G-3	0.97
G-4	0.85
G-5	0.75
G-6	0.32
G-7	1.25
G-8	0.9
G-9	2.2
G-10	1.7
G-11	1.6
G-12	2
G-13	2.75
G-14	2
G-15	2.5
G-16	2
G-17	1.25
G-18	1.4
G-19	2.3
G-22 and Access Road	3.5
G-25	1.8
G-26	1.8
G-31	1.75

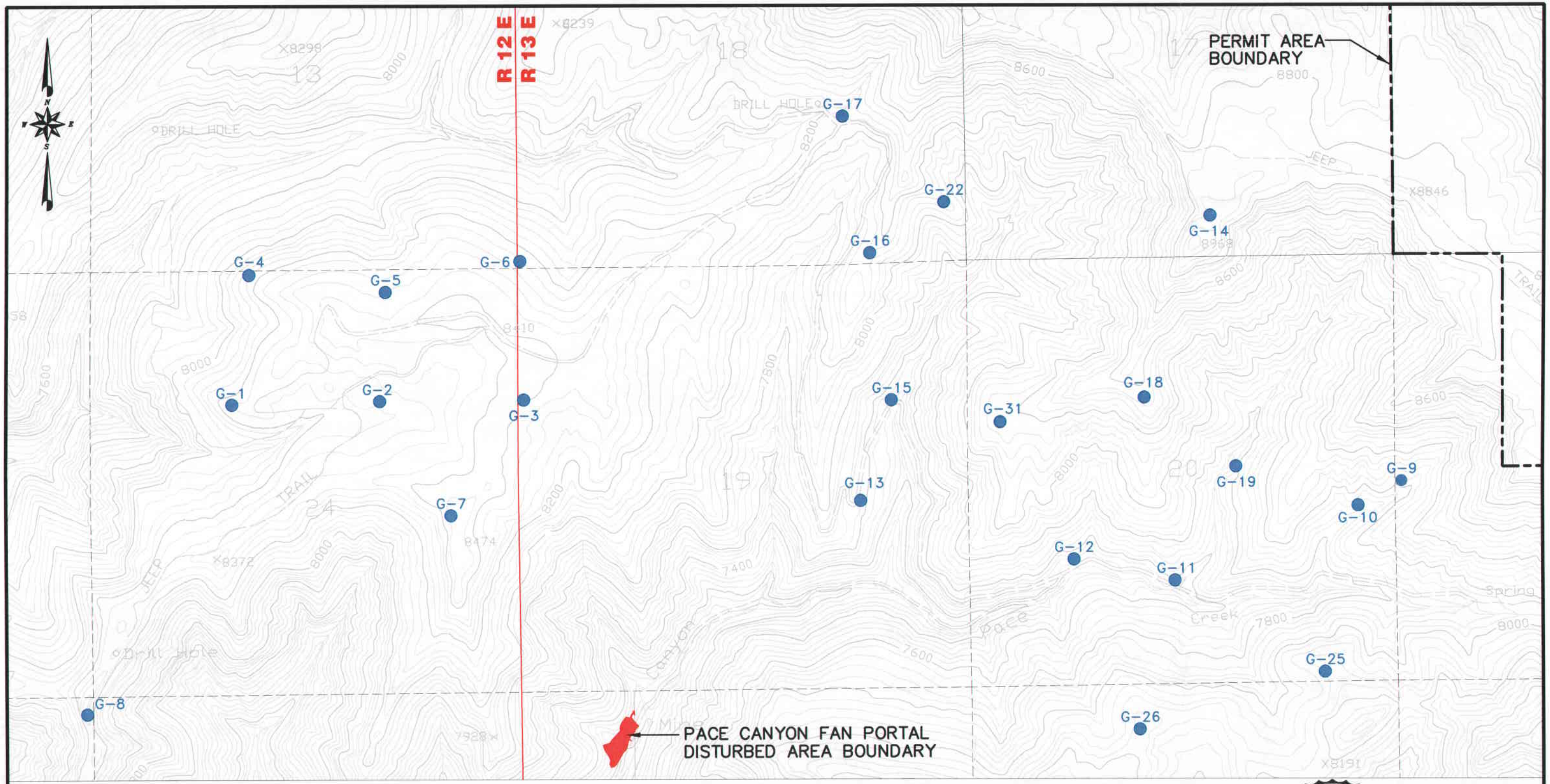

FIGURE 1-1. METHANE DEGAS BORE HOLE LOCATIONS

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B. WHITE
NOT VALID WITHOUT A SIGNATURE
29 Apr 2009
STATE OF UTAH

EarthFax

TOWNSHIP 13 SOUTH

G:\UC1098\03 Access Road\VICKY\FIG1-1-BHL.dwg, 4/29/2009 11:24:14 AM

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210 INTRODUCTION

This chapter and associated attachments address the pertinent data required for the addition of the degassification well sites for the Dugout Canyon Mine. Only those sections of the Division regulations that apply to the well sites have been addressed. The remainder of the regulations have already been addressed in the existing M&RP. The M&RP and this document contain pertinent information relating to the identification, management, and reclamation activities associated with the soil resources.

220 ENVIRONMENTAL DESCRIPTION

The well sites range in elevation from approximately 7400 to 9000 feet. The well sites are located in the Pace Canyon area of the Book Cliffs. General vegetation includes sagebrush, serviceberry, aspen, Douglas-fir, and snowberry.

221 Prime Farmland Investigation

Due to limiting terrain, lack of water for irrigation and no evidence of past cultivation of the sites, it is concluded that no prime farmland exists within the area of the well site disturbance.

222 Soil Survey

222.100 Soils Map

The soils have been mapped as part of the Soil Survey of the Carbon Area, Utah by the Soil Conservation Service (1988), at an Order III intensity level.

A description of the soils is included in Appendix 2-2 of the approved M&RP and in Attachment 2-1, which includes a report by Dan Larsen, Soil Scientist, entitled "Soil Inventory and Assessment Six

Methane Degassification Borehole Sites". An additional report for well site G-6 was prepared in 2004 and is incorporated into Attachment 2-1. Soil information for Well G-7 is incorporated into Attachment 2-1. A photograph of the G-7 site is included in Attachment 3-1. Well site G-3 and the access road can be seen on the photograph.

The soils report prepared by Dan Larsen, Soil Scientist for wells G-8 thru G-13 is provided in Attachment 2-1. Wells are being permitted in groups: G-8 thru G-10, G-11 thru G-12 and G-13 thru G-17.

222.200 Soil Identification

Well No.	Soil Map Unit	Soil Components
G-1	62/88	Midfork-Comodore complex, Rabbitex-Datino Varient
G-2	7	Brycan, Beje-Trag complex, 3-30% slopes
G-3	7	Beje-Trag complex, 3-30% slopes
G-4	62/103	Midfork-Comodore complex, Senchert-Toze complex
G-5	103	Senchert-Croydon
G-6	62	Midfork-Comodore complex
G-7	7	Beje-Trag complex, 3-30% slopes
G-8	21	Croydon Loam, 8 to 30% slopes
G-9	97/62	Midfork-Comodore complex, Rottulee family-Trag complex
G-10	97	Rottulee family-Trag complex
G-11	11, 26	Cabba- family, 40 to 70 percent slopes, Doney family, 50 to 70 percent slopes
G-12	47, 88	Guben-Rock outcrop complex, Rabbitex family-Datino Variant complex

G-13	23	Curecanti family
G-14~~A~~	62	Midfork family - Comodore complex
G-15	115, 62	Trag stony loam, 30 to 60 percent slopes, Midfork family - Comodore complex
G-16	26	Doney family
G-17	103	Senchert-Toze family Complex
G-18	97	Rottulee family-Trag complex
G-19	62	Midfork family - Comodore complex
G-22	97	Rottulee Series (Stubbs Series)
G-25	7	Beje-Trag Complex (3 to 30 percent slopes)
G-26	7	Beje-Trag Complex (3 to 30 percent slopes)
G-31	97	Rottulee family-Trag complex
Access Road	97	Rottulee family-Trag complex
	62	Midfork family - Comodore complex

222.300 Soil Description

Refer to Attachment 2-1 of the submittal for soil descriptions.

222.400 Soil Productivity

The depth of topsoil at each site was measured to determine the amount of growth medium available for reclamation. The following table lists each well site and the approximate amount of growth medium available.

TABLE 2-1

Topsoil Volumes*

Well No.	Cubic Yards of Material
G-1	415
G-2	3,104
G-3	1,182
G-4	1,100
G-5	1,909
G-6	792
G-7	1251
G-8	543
G-9	1,574
G-10	2,344
G-11	254
G-12	563
G-13	2,162
G-14	1,544
G-15	1,475
G-16	1,092
G-17	797
G-18	2,195
G-19	2,037
G-22 & Access Road	2,103
G-25	230 X 230'
G-26	230 X 230'
G-31	4,624
Access Road	9,167

* These total do not include soil salvaged from short roads accessing well sites which is bladed to the side of the road.

Figure 5-1 through Figure 5-25 show the layout and approximate size of well pads for G-1 thru G-6. Figures 5-27 thru 5-29 show the layout and size for well G-7. The figures for wells G-8 thru G-19, ~~and~~ G-22 (Including access road), G-25 and G-26 are located in Attachment 5-1. Topsoil volume calculations can be found in Attachment 2-2.

Estimated topsoil salvage from the G-1 well site will average about 7". This site on a ridge top has previously been disturbed for exploration drilling. The site has pockets of fractured sandstone bedrock at the surface and stony subsoils, which are the limiting factors in the quantity of salvageable topsoil. The average topsoil depth at well site G-2 is 30". The average topsoil thickness for well site G-3 is 10". However, enough soil will be stripped to allow 12" of soil to be placed during reclamation. Thus some subsoils will be stripped with the topsoil to generate the required volume. The estimated topsoil salvage from well site G-4 area will be 28" except on the area of the exiting road(s). The average salvageable topsoil at well site G-5 is 22". Well site G-6 will be established on a pre-existing drill pad, with a portion of the new pad extending onto undisturbed area. Topsoil on the pre-existing drill pad ranges from 0 to 30 inches, on the north edge in from 20 to 28 inches and on the cut slope on the south edge from 6 to 30 inches. The slope will be restored to original contour with the application of topsoil, the entire site will receive at least 12 inches of topsoil. Twelve inches was used to calculate the volume of topsoil to be salvaged and to determine the size of the topsoil pile for drill site G-6. Degas well G-7 will be developed on a site with soils consistent with G-3. There is a pre-existing road to well G-3 that continues on to the G-7 proposed site. There are signs of previous vehicle disturbance at the site, however the majority of the site is undisturbed. Topsoil available for salvage has been estimated to be 10 to 12 inches. Available topsoil will be salvaged and if necessary some subsoils will be stripped with the topsoil to generate the required volume to place a minimum of 12 inches during site reclamation. Available topsoil at each site will be salvaged, stockpiled and redistributed.

Twelve inches of soil will be salvaged at well site s G-9. Well site G-9 has no topsoil over approximately half of the site, thus requiring the salvage of subsoil to generate the foot of soil proposed for reclamation. Suitable soil for salvage at site G-10 is approximately 15 inches with

some areas having 24 inches of soil. Where available soil will be salvaged to a minimum of 15 inches and approximately 18 inches will be available to cover the G-10 disturbed area at the time of reclamation. G-8 was not constructed, however the available topsoil at site was estimated at about six inches.

The majority of the area at well site G-11 has been disturbed by road construction and the major part of the undisturbed portion has shallow eroded soils, except for a small area on the west side of the site. The shallow eroded soils are approximately 5 inches deep and the soils in the small area are between 10 and 16 inches deep. Approximately fifty percent of the G-12 well site is a road with no topsoil or vegetation. Between 12 and 30 inches of soil is suitable for salvage from the other fifty percent of the pad area for site G-12.Twelve inches will be returned to the reclamation slope at G-11 and between 12 and 15 inches at G-12. Large boulders are suspected to be present at the G-12 site.

At well site G-13, parent materials for soil formation are primarily colluvial deposits derived from sandstone and shale. The surface ranges from relatively smooth and non-stoney to very stoney. Suitable soil for salvage ranges from about 8 to 28 inches, limitation are due to high rock fragment content and low organic matter. Portions along the southeast edge are too stony for soil salvage. Well site G-14 (DUG205), is relatively uniform with soils of and similar to the Midfork family. Topsoil thickness range from 12 to 24 inches, with the typical depth being 15 to18 inches. The G-14 well site has been disturbed by logging. Between 14 and 16 inches of topsoil will be placed at well sites G-13 and G-14 during reclamation.

The road to G-13 and G-14 are existing roads, however, the soil will be bladed to the side of the road at site G-14 and replaced during reclamation.

Well site G-15 is about 50 percent disturbed by a road, slope cut and fill. The undisturbed portion of the site is a slope with a southeast aspect (35 to 45 percent gradient). The topsoil on this slope is typically 13 to 20 inches thick, with a loam texture. Approximately 14 inches of topsoil will be replaced during reclamation.

Well site G-16 was previously the site of an exploration hole, having been disturbed and reclaimed. Approximately, 14 inches of soil will be salvaged as topsoil and replaced during reclamation. The topsoil on the access road will be bladed to one side of the road and replaced during reclamation.

At well site G-17 approximately one-third of the site is an existing road. Sufficient topsoil will be salvaged to replace 12 inches over the area of disturbance during reclamation.

The entire area of well site G-19 was previously disturbed by logging activities with two roads crossing through the area. During the soil survey it was determined that the topsoil was 8 inches in depth. Approximately 12 inches of topsoil and subsoil will be salvaged for replacement during reclamation. Although, two soil pits were samples only SP-2 is representative of the site. SP-1 is not within the G-19 site's disturbed area.

The report for sampling completed May 1 and 5, 2007 summarizes the methodology and results of the soil survey conducted by Clement Drilling & Geophysical, Inc. for the proposed access road and G-18 and G-31 wells (Attachment 2-1, May 22, 2007).

The proposed road (AMV) and drill pads for wells G-31 and G-18 were evaluated using the United States Department of Agriculture (USDA), Natural Resources Conservation Services (NRCS) WEB Soil Survey (WSS) utility. NRCS Order III descriptions for the soil series that occur in the study area are presented in Appendix A of the May 22, 2007 report located in Attachment 2-1.

Soil test pits were excavated at the two proposed well locations. The soil test pit at well G-31 was excavated by hand on May 1, 2007. The soil test pit for well G-18 was excavated by hand on May 5, 2007. Soil test pits were also excavated in areas representative of each of the three soil map units that occur in the vicinity of the proposed road and vent wells. The three test pits were excavated by hand on May 5, 2007. The coordinates of each test pit collected using a GPS receiver are presented in the test pit logs. The test pit logs are presented in Appendix B and

photographs of the excavations in Appendix C. The soils observed in the test pits appear to generally correlate to the NRCS Order III Map Units. Soil samples were collected from each test pit from each horizon, where possible, for laboratory analysis. The analyses will be incorporated into Attachment 2-1. Two additional soils samples were taken along the road corridor, these samples were labeled AMV SP-1 and AMV SP-2. These samples were dug by hand with a shovel and pick. The lab analysis of these samples is included in Attachment 2-1.

Per the review of aerial photography taken of the area in November 2006, there does not appear to be rock outcrops along the path of the AMV access road. When Mr. Clements walked the road area in conjunction with the soil survey, he identified no concerns with the soil map units designated on Plate 1 included in Attachment 2-1.

The soils report for G-22 including the access was prepared by Ryan Sweetwood (Attachment 2-1). The soil text pits for well site G-22 and access road (SP10 thru SP13) provided two soil series, soil pits SP-11 and SP-12 closely matched the soil series designated in the NRCS, Web Soil Survey. SP-10 has a profiles not characteristic of Rottulee Series, the physical and chemical properties match more closely to the Stubbs Series.

Well sites G-25 and G-26 share the same NRCS soil map unit, Beje - Trag complex (3 to 30 percent slopes). The soil reports located in Attachment 2-1 for these sites were written by Robert Long. The soil erosion is moderate to severe on the north slope of site G-25 and the east slope and much of the bench is severely eroded at site G-26.

223 Soil Characterization

The topsoil evaluation described in this chapter was performed by Daniel M. Larsen, Professional Soil Scientist and Dean Stacy, NRCS Range Management Specialist in accordance with the standards of the National Cooperative Soil Survey. The topsoil evaluation for Wells G-18, G-19, G-31 and the Access Road were performed by Craig Clement, P.G. and Dean Stacy, NRCS

Management Specialist in accordance with the standards of the National Cooperative Soil Survey and using the USDA/NRCS WEB Soil Survey utility.

The topsoil evaluation for well G-22 and access road was performed by Ryan Sweetwood, his resume is included in the report for the G-22 well and access road in Attachment 2-1. The soil evaluation located in Attachment 2-1 for well sites G-25 and G-26 were performed by Robert Long.

224 Substitute Topsoil

Dugout Canyon does not plan to use substitute topsoil as growth media except as described in Section 222.400.

230 OPERATION PLAN

231 General Requirements

231.100 Removing and Storing Topsoil Methods

The topsoil will be removed, stockpiled and protected with a berm and/or silt fence. A qualified person will be on site during soil salvage to monitor and supervise the operation for the purpose of maximizing salvage volumes. Prior to topsoil salvage shrubs/vegetation will be removed and placed/wind rowed along the inside perimeter of the disturbed area.

After the topsoil is removed, the mud pit will be excavated and the soils from the mud pit excavation will be stored immediately adjacent to the mud pit. Mud pit excavation of subsoil will be approximately 110 CY at each well site (G-2 thru G-6).

The subsoil excavation for the mud pits at G-7 thru G-19, G-22, G-25, G-26 and G-31 was approximately 430 CY. A portable container for drilling fluids will be used if necessary, should there not be sufficient subsoil depth to excavate a mud pit.

Topsoil beneath the topsoil stockpiles will not be removed. Ribbon or a marking fabric will be placed on top of the topsoil prior to placement of the topsoil from the well pad area.

The approximate volume of subsoil to be salvaged and used to create berms around the perimeter of the well site including the topsoil stockpile perimeter is: G-1 - 161 CY; G-2 - 254 CY, G-3 - 208 CY, G-4-165 CY, G-5 - 191 CY, G-6 - 156 CY, G-7 - 107 CY, G-8 - 143 CY, G-9 - 182 CY, G-10 - 137 CY, G-11 - 185 CY, G-12 - 260 CY, G-13 - 142 CY, G-14A - 123 CY, G-15 - 101 CY, G-16 - 98 CY, G-18 - 39 CY excludes topsoil pile, G-19 - 48 CY, G-22 and Access Road - 140 CY, G-25 and G-26, G-31 - 62 CY excludes topsoil pile, Topsoil Stockpiles T-2 thru T10 - 300 CY and Access Road - 248 CY.

At the G-19 drill pad there is a variance between the disturbed area acreage and the acreage where topsoil will be salvaged. Portions of the site have no topsoil, due to previous disturbance by logging, these areas include roads, a gully and skid trails. In addition there is a perimeter buffer area that will not be disturbed and thus will not have topsoil removed from the area unless it becomes necessary due to unforseen issues during construction, such as buried outcrops, large boulders, tree root systems, etc. An area within the northeastern portion of the disturbed area has two road forks extending from the end of the existing road, these two forks have no topsoil on them and the area between them will not be disturbed and therefore will not have topsoil salvaged. A sketch of these areas is located in Attachment 2-1.

There is a difference between the topsoil volumes totals and the estimated inches to be salvaged on pads G-18, G-31 and the AMV road. The topsoil volume totals assume that the entire disturbed area will be stripped of 12 inches of topsoil/growth medium. Any areas within the disturbed area boundary which can remain undisturbed will remain undisturbed. In addition, the soils to be salvaged are assumed to be the same depth as the test pit or 12 inches. The available soil for

salvage is likely to vary throughout the areas to be salvaged. A commitment is made to salvage available topsoil or 12 inches of growth medium. Sketches of the well pads are included in Attachment 2-1.

The topsoil for the G-22 pad and access road ~~will be~~ is stored on the permitted pad of ~~either G-16 or~~ G-17. ~~The determination will need to be made at the time of removal and dependent upon the access to G-17, considering weather conditions. If the topsoil can be removed prior to winter snows it will be stored on G-17, if there is snow and access to G-17 is restricted, the topsoil will be stored on drill pad G-16. There will be no new disturbance in the G-17 pad area.~~ The soils ~~will be~~ are stored on a wide turnout on an existing road in an area immediately adjacent to an existing soil stockpile placed on the turnout by the landowner. The topsoil pile will be bermed and protected as are the other stockpiles associated with degas holes and roads.

231.200 Suitability of Topsoil Substitutes/Supplements

See Section 224.

231.300 Testing of Topsoil Handling and Reclamation Procedures Regarding Revegetation

Dugout will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability on graded slopes. Erosion control measures will include silt fences, berms, seeding, straw bales, soil roughening, and mulching of the soils.

Topsoil will be redistributed and the original soil surface beneath the topsoil stockpile will be roughened as presented in Section 242.100 and seeded with the seed mix described in Chapter 3, Section 352.

Methods used to evaluate success of revegetation and stabilization are discussed in Chapter 3, Section 356.

231.400 Construction, Modification, Use, and Maintenance of Topsoil Storage Pile

Topsoil removed from the drill pad sites will be stockpiled on the site, except at well site G-14 where it will be stockpiled approximately 1/10 mile away. The estimated volumes of topsoil stockpile for each site are shown in Table 2-1. The stockpiles will be sized as shown in Table 2-2.

The slopes of the stockpile will be 1H:1V or approximately 45^0 during the construction phase. Soils in these areas generally have an angle of repose greater than 50 degrees, making a stockpile with 1:1 slopes feasible. The steeper slope also help minimize the area to be disturbed. When space is available topsoil will be stockpiled with slopes of 2H:1V.

232 Topsoil and Subsoil Removal

232.100 Topsoil Removal and Segregation

All topsoil will be removed as a single layer with no segregation. Topsoil will be removed using a dozer and/or loader. Refer to Section 231.100 for additional details.

232.200 Poor Topsoil

No poor soils exist at the well sites see Attachment 2-1.

232.300 Thin Topsoil

Not applicable see Attachment 2-1.

232.400 Minor Disturbances Not Requiring Topsoil Removal

Topsoil will not be removed along the fence line at the wells sites.

232.500 Subsoil Segregation

The B and C soil horizons will not be removed. Any small quantity of subsoil removed with the topsoil will not be segregated.

TABLE 2-2

Topsoil Stockpile Dimensions*

Well No.	Length (ft)	Width (ft)	Height (ft)
G-1	55	35	16
G-2	156	50	20
G-3	70	60	17
G-4	110	35	17
G-5	90	65	21
G-6	105	30	13
G-7	80	70	6 to12
G-8	168	60	6
G-9	160	90	30
G-10	170	80	65
G-11	40	50	12
G-12	60	80	18
G-13	120	100	17
G-14A	120	60	11

TABLE 2-2 (Continued)

Topsoil Stockpile Dimensions*

Well No.	Description	Length (ft)	Width (ft)	Height (ft)
G-15	Pad	90	90	19
G-16	Pad	100	80	12
G-17	Pad	85	55	10
G-18	T-10	118	80	20
G-19	Lower Road	235	8	5
	Pad	140	52	35
G-22 and Access Road	Pad & road	85	65	12
G-25	Pad			
G-26	Pad			
G-31	T-8	85	67	7
	T-9	128	100	13
Access Road	T-2	40	90	8
	T-3	108	95	11
	T-4	12	45	5
	T-5	95	110	13
	T-6	95	138	14
	T-7	110	150	21

*The height represents the elevation difference between the lowest point and highest point of the topsoil stockpile. The topsoil thickness will vary with the slope of the native ground surface. When stored on steep slopes the topsoil thickness will be much less than the estimated height of the stockpile.

See Section 234.200 for detailed information on the topsoil stockpile(s).

232.600 Timing

Topsoil removal will take place after all vegetation that could interfere with salvaging the topsoil has been grubbed.

232.700 Topsoil and Subsoil Removal Under Adverse Conditions

The topsoil will be removed first and stockpiled and the remaining soil horizons will be left in place, except where natural conditions render removal operations hazardous or detrimental to soils outside the disturbed area then topsoil will not be removed.

Conventional Machines - In locations where steep grades, adverse terrains, severe rockiness, limited depth of soils, or other adverse conditions exist that render soil removal activities using conventional machines hazardous, soils will not be salvaged and stockpiled. Such conditions are not likely to occur in these areas.

Substitute Topsoil - Importing of substitute topsoil is not anticipated (Section 224).

233 Topsoil Substitutes and Supplements

233.100 Overburden Materials Supplementing and/or Replacing Topsoil

No overburden material will be used.

233.200 Suitability of Topsoil Substitutes and Supplements

No substitute topsoil is planned.

233.300 Physical and Chemical Analysis

See Section 243.

233.400 Testing of Substitute Topsoil

No substitute topsoil is planned.

234 Topsoil Storage

234.100 Topsoil Stockpiling

Topsoil will be stockpiled for later use in reclamation operations. The topsoil will be stored and treated as outlined in Section 234 of this amendment. Refer to Sections 231 through 234 of the M&RP for additional information pertaining to the topsoil at the Pace Canyon Fan site.

234.200 Topsoil Stockpile

Stable Stockpile Site - Stockpiled material will be placed on a stable site.

Protection from Contaminants and Compaction - To protect the topsoil from contaminants and unnecessary compaction that could interfere with vegetation, the stockpile will be isolated from the main surface area by a berm and/or silt fence. A sign designating "topsoil" will be installed on the stockpile.

The topsoil stockpile will be constructed in such a manner as to allow access for repair of the pile surfaces and diversion structures.

Wind and Water Erosion Protection - The topsoil stockpile will be protected from water erosion by berms, which trap sediment runoff from the stockpile. The berms have been designed to completely contain the 10-year 24-hour storm event (see Attachment 7-1). The stockpile will be

surface pitted, gouged and/or roughened and revegetated using the grass seeds listed in Table 3-2 to prevent wind erosion.

Topsoil Redistribution - Stockpile soil will not be moved until redistribution during contemporaneous or final reclamation operations unless approved by the Division.

At well pad G-19 a portion of the salvaged topsoil will be stored on a fork of the existing road. There is no topsoil remaining on the road and the road will remain following reclamation of the G-19 pad site. Wide flagging will be used as a marker to identify the separate between the road surface and the stored topsoil. Landowner correspondence pertaining to topsoil storage on the existing road is contained in Attachment 2-3.

Cross-sections of topsoil piles T-2 thru T-10 are shown on Plate 3, in Attachment 5-4. As-built cross sections with horizontal and vertical scales equal with two perpendicular cross sections provided for each of the topsoil stockpiles T-2 thru T-10 (Attachment 5-4, Plate 3). The perpendicular cross sections will extend through the area where the stockpiles join the road, except T-8, T-9 and T-10 which do not join a road but are on degas well pads.

To minimize the area of disturbance for well pad G-22 the topsoil for the pad and access road will stored as described in Section 231.100.

234.300 Topsoil Stockpile Relocation

Stockpiled soil in jeopardy of being detrimentally affected in terms of its quantity and quality by drilling operations may be temporarily redistributed or relocated on approval by the Division and modification of this M&RP.

240 RECLAMATION PLAN

As-built cross section where both horizontal and vertical scales are equal and an as-built road profile were provided following completion of the AMV road construction. The AMV as-built road cross sections are provided on Plates 2 and 3 in Attachment 5-4.

241 General Information

Reclamation of the degassification sites (topsoil redistribution, amendments, and stabilization) is discussed in Sections 242, 243, and 244 respectively.

242 Soil Redistribution

242.100 Soil Redistribution Practices

The topsoil will be placed after recontouring of the site has occurred. Topsoil will be handled when they are loose or in a friable condition. The moisture content will be visually monitored and water will be added as needed to enhance the soil's condition for handling. The approximate amount of topsoil available for each site is shown in Table 2-1. The reclamation time line can be found on Figure 5-15 for sites G-2 and G-3 and on Figure 5-26 for sites G-4 thru G-19, G-22 (including access road), G-25, G-26, and G-31. Figure 5-26 has been revised to include the access road (AMV).

The topsoil will be distributed in two phases at well site G-2, the first phase will be the contemporaneous reclamation of a portion of the pad area used during well construction (see Figures 5-4, 5-8 and 5-12). During contemporaneous reclamation topsoil from the stockpile will be distributed in the depths shown in Table 2-3.

Final reclamation will occur at all well sites after venting of the methane gas is complete, venting equipment has been removed and the well has been plugged. Well plugging will be delayed at well sites G-2, G-5 and G-7, to allow additional time for venting of the gob behind the sealed panels and

to provide surface access to the mine. The surface at well sites G-2 and G-5 will be reclaimed in 2007/2008, however the wells will not be plugged. The surface at well site G-7 will be reclaimed in 2008, but the wells will not be plugged. The topsoil stockpile storage area and access road (G-2 and G-5) will be reclaimed during this final phase. The access roads to G-3, G-4, G-6, G-7, G-8, G-9, G-10, G-11, and G-12 are pre-existing and will not be reclaimed.

The topsoil stockpile storage area and access road (G-2, G-5 and G-22) will be reclaimed following the plugging of the wells . The access roads to G-3, G-4, G-6, G-7, G-8, G-9, G-10, G-11, G-12, G-13, G-15, G-17, G-19, G-25 and G-26 are pre-existing and will not be reclaimed. The access road joining the pre-existing road to G-16 and the portion of the access road between the topsoil stockpile and the well site at G-14 will be pocked/gouged and seeded during final reclamation of the site.

The AMV access road will be reclaimed using the technology discussed in Section 240 of this amendment following the sealing and reclamation of well pads G-18 and G-31. The G-22 access road will be reclaimed using the technology discussed in Section 240 of this amendment following the sealing and reclamation of well pad G-22.

Refer to Section 341 for additional information.

Soil Thickness - The topsoil will be distributed during contemporaneous and final reclamation in the thickness shown in Table 2-3.

Compaction - Prior to the application of topsoil, compacted subsoils will be roughened or loosened for a depth of 18 to 24 inches. To prevent compaction of topsoil, soil moving equipment will refrain from unnecessary operation over spread topsoil. The topsoil will be in a loosened condition prior to seeding.

Following the drying of the mud pit materials, the dirt excavated to create the mud pit will be mixed with the drill cutting and returned to the pit to prevent a boundary of hard material from forming in the mud pit area that would hamper root penetration and then compacted to minimize settling.

Erosion - Care will be exercised to ensure the stability of topsoil on graded slopes to guard against erosion during and after topsoil application. Post reclamation (contemporaneous and final) erosion control measures will be surface roughing, mulching and seeding.

242.200 Regrading

The areas will be graded to their approximate original topographic configuration, except as approved by the Division.

242.300 Topsoil Redistribution on Impoundments and Roads

The mud pits will be dismantled and filled following completion of drilling. See Section 242.100, Compaction for additional information. Mud pits will be covered with the same amount of topsoil as the rest of the site. The roads existing prior to starting the drilling program will not be reclaimed. Access roads built to allow entrance to the drilling pads will be reclaimed and will receive topsoil in the same depth as their corresponding pad areas, unless specified otherwise .

243 Soil Nutrients and Amendments

The soils will be analyzed directly following salvage to determine if amendments are needed. Testing of the topsoil will be done according to Table 6 of the Division's Topsoil and Overburden Guidelines. The topsoil will be tested at a minimum for the following parameters: pH, electrical conductivity, total carbon, SAR, water holding capacity, plant available nitrogen, and phosphorus. Results of these analyses will be incorporated into Attachment 2-1 and 2-2.

244 Soil Stabilization

244.100 Protection and Stabilization of Surface Area

All reclaimed areas will be stabilized to control erosion by application of mulch, tackifier, and roughening of the surface. The areas will be graded to the approximately original topographic configuration. Seeding will be accomplished with the application of seeds and mulch with a long fiber tackifier or broadcast. Methods of protection and stabilization are further discussed in Chapter 3, Section 341.

244.200 Mulch Application

Mulch/tackifier will be applied to stabilize the soil on all areas that have been regraded and covered with growth media. For further discussion of revegetation practices to be utilized, see Chapter 3, Section 341.

244.300 Rills and Gullies

Postmining Land Use and Revegetation - Rills and gullies that are approximately nine (9) inches in depth and disrupt the postmining land use or reestablishment of vegetative cover will be regraded and seeded. In addition, the repair of rills and gullies will assist in the maintenance of water quality standards.

TABLE 2-3

Approximate Topsoil Distribution Thickness

Well Site No.	Topsoil Thickness (Inches)
G-1*	7
G-2	30
G-3	12
G-4	28
G-5	22
G-6	12
G-7	12
G-8*	12
G-9	12
G-10	18
G-11	12
G-12	15
G-13	14 - 16
G-14A	14 - 16
G-15	14
G-16	14
G-17	12
G-18	12
G-19	12
G-22, Access Road	10 - 13
G-25	6
G-26	6
G-31	15
AMV Access Road	12

* Wells G-1 and G-8 were never constructed.

250 PERFORMANCE STANDARDS

251 Topsoil, Subsoil, and Topsoil Supplements Management

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

252 Stockpiled Topsoil and Subsoil

All stockpiled topsoil and subsoil will be managed according to plans outlined in Sections 230 and 240.

ATTACHMENT 2-1
SOIL INVENTORY AND ASSESSMENT

add to the back of existing information

Soil Resource Assessment
Exploration and Degas Locations
Dugout Mine Area

Prepared by

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for

CANYON FUEL COMPANY, LLC.
DUGOUT CANYON MINE
P.O. Box 1029
Wellington, Utah 84542

September 16, 2008

and

December 8, 2008

Introduction

An assessment of the soil resources was conducted on sixteen areas identified by Canyon Fuels. Six of the sites were exploration sites (DUG). One of the sites was an exploration with the adjacent road also evaluated. Four of the sites were a combination exploration and degas. Five of the sites were degas locations only. Each location was flagged in the field by staff from the Dugout mine.

Seven of the sites were in the Dugout Creek area, eight were in the Pace Canyon and Lion ridge area, and one site was in the Left fork of Rock Creek.

The eight exploration sites evaluated during this soil resource assessment were:

DUG-H-01 DUG-H-02 DUG-H-03 DUG-01 DUG-04 DUG-07
DUG-08 DUG-09

The exploration site and adjacent road was:

DUG-05 & Road

The four combination exploration and degas sites were:

DUG-02/G-29 DUG-03/G-27 DUG-06/G-25 DUG-10/R-1

The five sites which were evaluated as only degas sites were:

G-26 G-28 G-30 R-2 R-4

Purpose of Soil Resource Assessment

The purpose of this soil resource assessment was to determine how closely the soils at each site correlated with the Carbon County Soil Survey produced by the Natural Resource Conservation Service (USDA 2007). Topsoil and subsoil salvage depths were estimated for each site. Soil types vary across each site and monitoring should be part of all topsoil and subsoil operations.

The potential for reclamation success at each site was a secondary objective of this assessment.

The identification of hazardous or toxic materials was not part of this soil resource assessment.

Assessment Methods

This assessment was made by comparing the soil map unit mapped by the NRCS in the Carbon County Soil Survey with the soils actually identified at each site. A discussion was held with the NRCS staff in Price, Utah to discuss soil series that would fit the soils identified in the assessment area (NRCS, personal communication 2008). Full soil profile descriptions were completed for the degas locations using the Field *Book for Describing and Sampling Soils* (Schoeneberger, P.J., et. al., 2002).

The soil resource assessment was conducted by Robert E. Long, Certified Professional Soil Scientist (CPSS).

Soil colors were compared with color chips in the *Munsell Soil Color Charts* (Munsell 2000).

Digital photographs were taken at each site to document current conditions.

Sketches were made to illustrate the relationships between different areas and vegetation at each site. These sketches were not drawn to scale.

Dominant vegetation was listed for each site. A separate quantitative vegetation assessment is being prepared by Mt. Nebo Scientific.

Site locations were recorded with a Garmin GPSmap 60CSX in UTM, NAD 1983. Elevations were also recorded with the GPS meter.

References

Munsell Soil Color Charts, 2002.

Schoeneberger, P.J., Wysocki, D.A., Benham, E.C., and Broderson, W.D. (editors), 2002. Field Book for describing and sampling soils, Version 2.0. Natural Resource Conservation Service, National Soil Survey Center, Lincoln, NE.

USDA - Natural Resource Conservation Service, Soil Survey Staff. 2006. Keys to Soil Taxonomy, Tenth Edition.

USDA - Natural Resource Conservation Service, August 28, 2008, personal communication.

USDA – Natural Resource Conservation Service, 2008. National cooperative Soil Survey, Web Soil Survey. Carbon Area, Utah, Parts of Canbon and Emery Counties. Accessed July 12, 2008.

DUG-06 / G-25

Exploration and De-Gas Site

Location:	Easting	544762
	Northing	4391432
	Zone	12 S
	NAD	1983
	Township	13 South
	Range	13 East
	Section	20
	Meridian	Salt Lake
	USGS Quad:	Mount Bartles, Utah

Elevation: 8,142 feet

General Site Description

This exploration (DUG-06) and de-gas (G-25) site is located on a mountain sidelslope structural bench. Slopes are 10 percent downhill to the north, west, and south; and 10 to 15 percent uphill to the east. The area appears to have been used in the past and is now being used as a cattle salt lick. Soil erosion is moderate to severe on the north slope.

NRCS Soil map Unit

Map Unit 7: Beje – Trag complex (3 to 30 percent slopes)

This map unit does not fit the evaluation area. Beje and Trag soils have mollic epipedons and argillic horizons. Neither of these features was identified at the representative profile location.

Helper soils were identified at soil profile location G-25-1 The surface of G-25-1 had mollic colors to 4 inches, which is typical of Helper soils. Soil with soft shale was encountered at 18 inches and hard shale at 31 inches.

Trag soils were observed in the roadcut east of the evaluation area.

Topsoil Resource
Soil profile G-25-1 is representative of the native soils at the G-25 de-gas site. The surface is a grayish brown (dry) loam to 4 inches. The subsurface is a pale yellow (dry) loam to 18 inches. The subsoil is a light gray (dry) clay loam to soft shale at 31 inches.

Topsoil salvage will average 2 to 5 inches. Subsoil will be clayey and contain soft shale para-channers. The soil is shallow to soft shale and has hard shale at 20 to 40 inches.

Reclamation will be limited, but possible, due to previous topsoil erosion and shallow depth to soft shale.

Vegetation
The following plant species were observed in the disturbed and native portions of the site. The vegetation report written by Mt. Nebo Scientific contains a more detailed quantitative description of the site vegetation.

Mountain big sagebrush
Mountain snowberry
Utah serviceberry
Salina wildrye
Sandberg bluegrass
Lupine
Douglas fir (young trees)

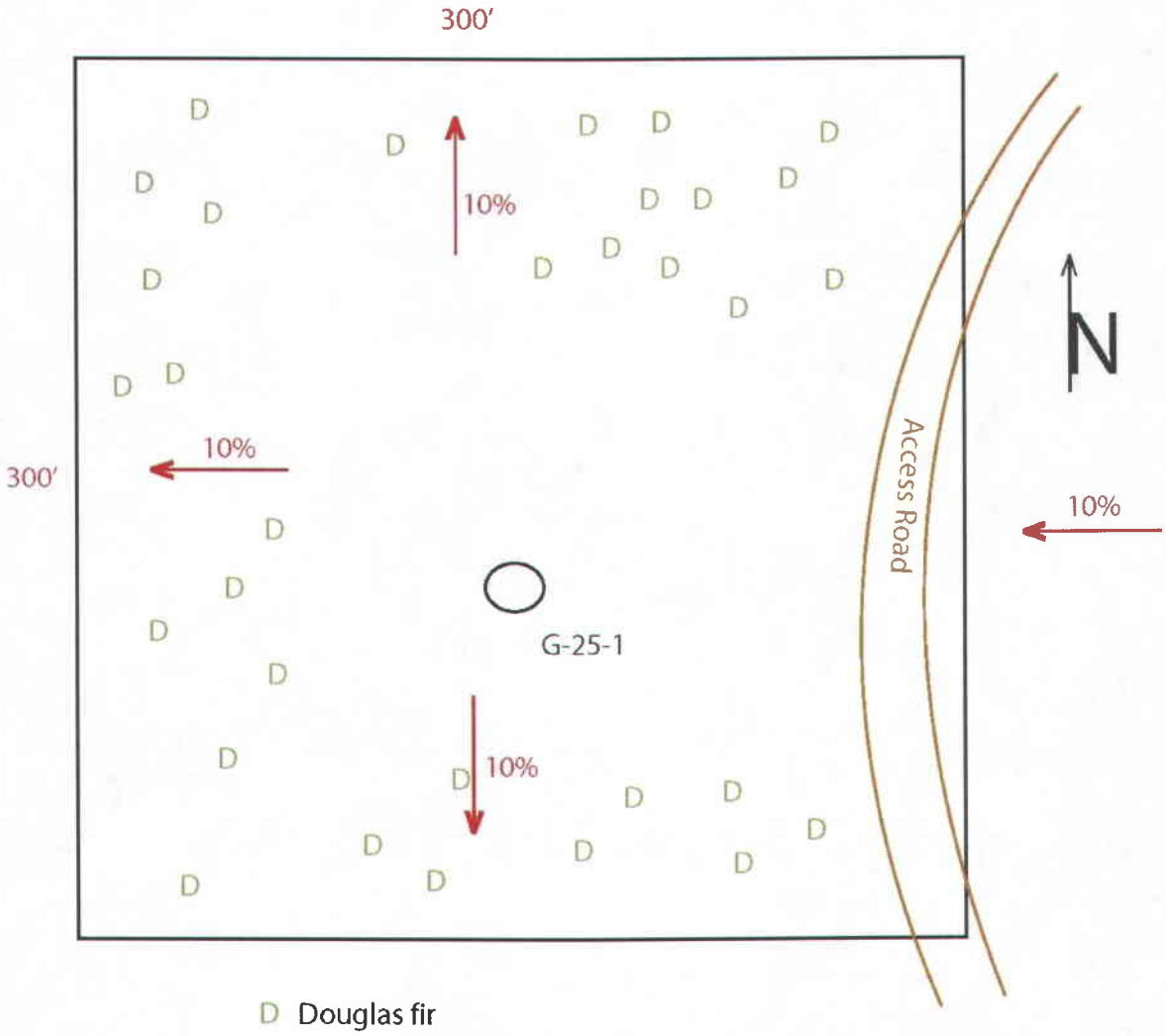
Site Sketch

This site sketch was prepared during the site visit on August 21, 2008. Distances and locations are approximate (not to scale). The vegetation report written by Mt. Nebo Scientific contains a more detailed quantitative description of the site vegetation.

G-25

August 21, 2008

Elevation 8142'



Site Photos

Photo 1. Looking north across salt lick area.

Photo 2. Looking east past access road to slope with Trag soils behind grader.

Photo 3. Looking south downhill at 10 percent slope. Mountain big sagebrush is the dominant vegetation in this area with scattered young Douglas fir.

Photo 4. Looking west downslope toward young Douglas firs.

Photo 5. Soil profile G-25-1, Helper soil.

USDA-NRCS

PEDON DESCRIPTION

PEDON ID #: G-25-1 DRAFT 3/2002

Series or Component Name: Helper	Map Unit Symbol:	Photo #:	Classification: Typic Haplustepts f-loamy, mix, super, frigid	Soil Moist. Regime (Tax.): Ustic
Describer(s): Bob Long	Date: 8-21-08	Weather: Clear	Temp.: Air: Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W
Datum: 1983	Location: Sec. 20 T. 13S R. 13E	UTM: Zone: mE: mN: 12/544262/4391432	Topo Quad: Pine Canyon	Site ID: Yr: State: County: Pedon #: 2007 UT
Soil Survey Area: Dugout	MLRA / LRU: 48A	Transect: ID: Stop #: Interval:		
Landscape: MO	Landform: Bench	Microfeature:	Anthro:	Elevation: 8142
Aspect: SW	Slope (%): 10	Slope Complexity: Simple	Slope Shape: (Up & Dn / Across) Convex / Convex	
Hillslope Profile Position: SU	Geom. Component: TR	Microrelief:	Physio. Division:	Physio. Province:
Physio. Section:	State Physio. Area:	Local Physio. Area: Pace Canyon		
Drainage: well	Flooding: No	Ponding: No	Soil Moisture Status: Dry	Permeability: K_{sat}: mod slow
Land Cover / Use: Shrub / grazing	Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: soft shale	Lithostrat. Units: Group: Formation: Member:	
Erosion: Kind: Degree: sheet / mod	Runoff: mod	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: 5 — — — — —	Diagnostic Horz. / Prop.: Kind: Depth: paralithic 31"	
P. S. Control Section: Depth Range: 10-31	Ave. Clay %: 30%	Ave. Rock Frag %: 60%		

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Mtn big sage	
	Mtn snowberry	
	Lupine	
	Sandberg bluegrass	
	Saline / Wildrye	

MISCELLANEOUS FIELD NOTES / SKETCH:

G-25-1

Component Name:	Helper	Map Unit Symbol:		Date:	8-21-08

	Obser. Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Mottles % Sz Cn Col Mst Sp Loc
1	SS	0-1"	A1	cs	10YR 5/2	10YR 3/2	L	5GR	1fgr			SS	SP	—
2	SS	1-4"	A2	as	10YR 5/2	10YR 3/2	L	—	2m sbk			SS	SP	—
3	SS	4-18	Bk	cs	2.5Y 7/3	2.5Y 6/3	L	—	2m sbk			SS	SP	—
4	SS	18-31"	C	cs	2.5Y 7/2	2.5Y 6/3	CL	10 PCN				S	P	—
5	SS	31" +	Cr		hard shale									
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth)	Effer (agent)	Clay %	CCE	Notes
1	—	—	—	3vf 1fm	2vfi		ST	20		
2	—	—	—	2vff 1m	1vft		ST	22		
3	—	10fm CAM	—	1vff	1vft		VE	27		
4	—	10fm CAM	—	1vf	1vft		ST	32		
5										
6										
7										
8										
9										
10										

G-26

De-Gas Site

Location:	Easting	543998
	Northing	4391428
	Zone	12 S
	NAD	1983
	Township	13 South
	Range	13 East
	Section	29
	Meridian	Salt Lake
	USGS Quad:	Mount Bartles, Utah

Elevation: 8,170 feet

General Site Description

This de-gas site is located on a gently sloping structural bench on Lion Ridge. The perimeter of the site slopes away steeply on the east, north, and west. This site has been impacted by a previous use. The east slope is severely eroded, photo 2, as well as much of the bench, photo 1. Slope on the bench is downward at 10 percent to the north.

The access road traverses the north edge and then turns south across the west portion of the site.

NRCS Soil map Unit

Map Unit 7: Beje – Trag complex (3 to 30 percent slopes)

The Beje and Trag soils have mollic epipedons, but no mollic epipedons were observed on the G-26 site. Beje soils are shallow to sandstone. The dominant soil is the eroded phase of Beje and has been correlated to the Moonshine soil series.

Topsoil Resource

Profile G-26-1is representative of soils on the G-26 location. It is shallow to sandstone and does not have a mollic epipedon. This soil is the eroded phase of Beje and has been correlated to the Moonshine soil series. The surface is grayish brown (dry)

gravelly loam to 2 inches. The subsurface is light brownish gray (dry) gravelly loam to 8 inches. The subsoil is Light gray (dry) very gravelly loam to sandstone at 11 inches.

Topsoil salvage depths range from 0 to 6 inches and vary over short distances. Depth to sandstone is 8 to 24 inches.

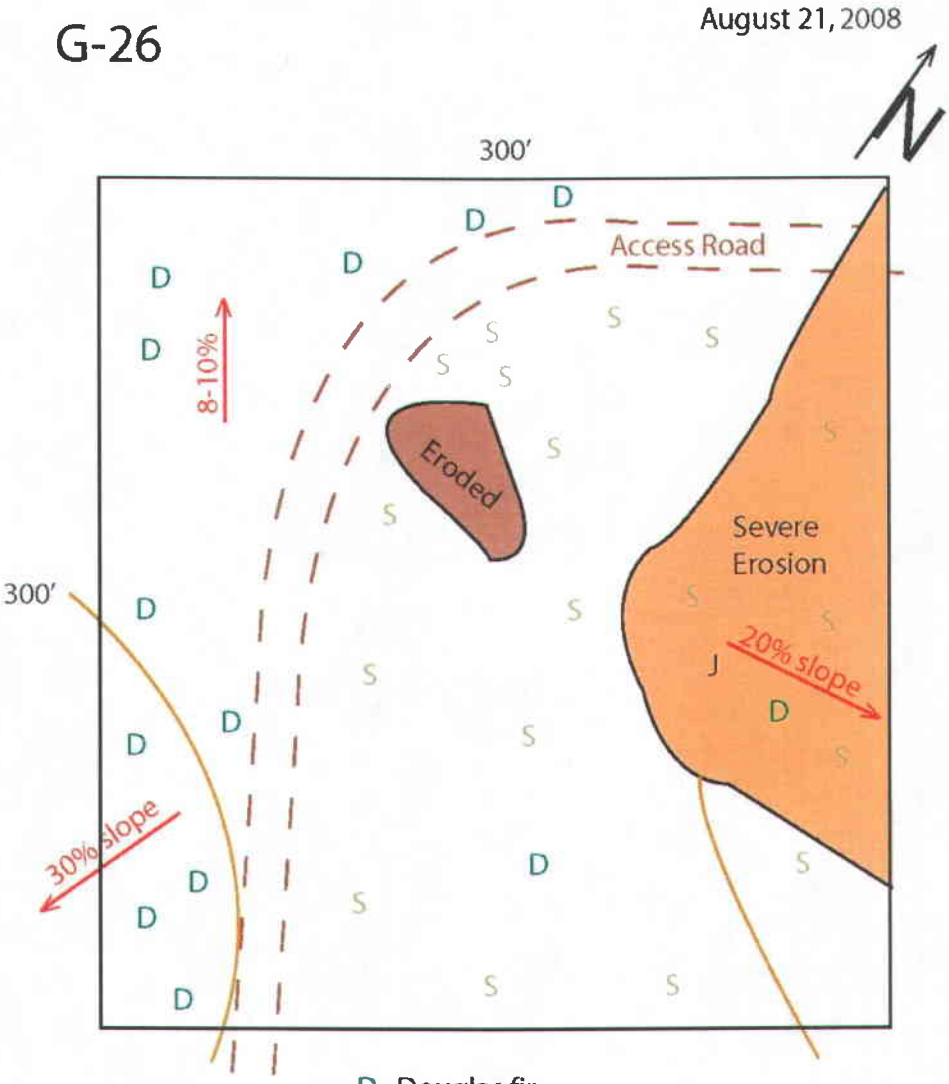
Reclamation will be difficult, since a large amount of topsoil has been eroded away exposing the very calcareous subsoil in localized areas.

Vegetation
The following plant species were observed in the disturbed and native portions of the site. The vegetation report written by Mt. Nebo Scientific contains a more detailed quantitative description of the site vegetation.

Mountain big sagebrush
Utah serviceberry
Alderleaf mahogany
Mountain snowberry
Douglas fir
Utah juniper

Site Sketch

This site sketch was prepared during the site visit on August 21, 2008. Distances and locations are approximate (not to scale). The vegetation report written by Mt. Nebo Scientific contains a more detailed quantitative description of the site vegetation.



D Douglas fir
S Utah Serviceberry
J Utah Juniper
Slope arrows point downhill

Site Photos

Photo 1. Looking north across mountain big sagebrush area. Light soil surface area in background has been eroded.

Photo 2. Looking east down eroded gully area. DUG-05 is at the base of this slope. Road to DUG2/G-29 and DUG-05 is on ridge in middle of photo.

Photo 3. Looking south upslope across mountain big sagebrush to Utah serviceberry with Douglas fir in the background.

Photo 4. Looking west from eroded area on bench toward access road.

Photo 5. Soil profile G-26-1, Moonshine soil.

USDA-N[illegible] **PEDON DE[illegible]RIPTION** PEDON ID #: G-26-1 DI[illegible] 3/2002

Series or Component Name: Moonshine	Map Unit Symbol:	Photo #:	Classification: Aridic Lithic Ustorthent Loamy, mix, super, calc, frigid	Soil Moist. Regime (Tax.): Ustic

Describer(s): Bob Long	Date: 8-21-08	Weather: Clear Temp.: Air: 80 Soil: Depth:	Latitude: ° ' " N Longitude: ° ' " W Datum: 1983	Location: Sec 29 T. 13S R. 13E

UTM: Zone: 12 mE: 0543998 mN: 4391428	Topo Quad: Mt. Bartles	Site ID: Yr: State: County: Pedon #:	Soil Survey Area: Dugout	MLRA / LRU: 48A	Transect: ID: Stop #: Interval:	

Landscape: MN	Landform: MN	Microfeature:	Anthro:	Elevation: 8170	Aspect: N 16	Slope (%): 10	Slope Complexity: complex	Slope Shape: (Up & Dn / Across) Smooth / Convex

Hillslope Profile Position: SU	Geom. Component: TR	Microrelief:	Physio. Division:	Physio. Province:	Physio. Section:	State Physio. Area:	Local Physio. Area: Lion Ridge

Drainage: well	Flooding: No	Ponding: No	Soil Moisture Status: Dry	Permeability: K_{sat}: mod slow	Land Cover / Use:

Parent Material: Residuum	Bedrock: Kind: Fract.: Hard.: Depth: Sandstone	Lithostrat. Units: Group: Formation: Member:	

Erosion: Kind: sheet gully Degree: SV	Runoff: Mod → Rapid	Surface Frag %: GR: CB: ST: BD: CN: FL: Kind: B 7	Diagnostic Horz. / Prop.: Kind: Depth:	

P. S. Control Section: Depth Range: 0-11"	Ave. Clay %: 26%	Ave. Rock Frag %: 25

VEGETATION :

SYMBOL	COMMON NAME	% Ground Cover
	Mtn Big Sage	
	Ut Serviceberry	
	Douglas Fir	
	Snowberry	
	Utah Juniper	
	Birchleaf	
	Common Juniper	

MISCELLANEOUS FIELD NOTES / SKETCH :

Non-eroded area, but impacted by grazing

G-26-1

Component Name: Moonshine **Map Unit Symbol:** **Date:** 8-21-8

	Meter Method	Depth (in) (cm)	Horizon	Bnd	Matrix Color Dry	Matrix Color Moist	Texture	Rock Frags Knd % Rnd Sz	Structure Grade Sz Type	Consistence Dry	Consistence Mst	Consistence Stk	Consistence Pls	Notes % Sz Cn Col Mst
1	SS	0-2"	A	CS	2.5Y 5/2	2.5Y 4/2	GR L	GR 10 Ang CN 5 Sandstone	1 m sbk 2 f gr	sh	vfr	SS	SP	—
2	SS	2-8"	Bw	CS	10YR 6/2	10YR 5/2	L	GR 20	2 m sbk	h	fr	SS	SP	—
3	SS	8-11"	Bk	as	2.5Y 7/2	2.5Y 6/2	GRV L	GR 30 CN 10	1 m sbk	h	fr	SS	SP	—
4	SS	11"+	R		Sandstone									
5														
6														
7														
8														
9														
10														

	Redoximorphic Features % Sz Cn Hd Sp Kd Loc Bd Col	Concentrations % Sz Cn Hd Sp Kd Loc Bd Col	Ped / V. Surface Features % Dst Cont Kd Loc Col	Roots Qty Sz Loc	Pores Qty Sz Shp	pH (meth) Effer (agent) Clay % CCE	Notes
1	—	—	—	2vf 1fm	2vft	7.8 ST 24	
2	—	—	—	2vff 1m	1vft	8.0 ST 26	
3	—	12f CAM PF	—	2vf 1fm	1vft	8.2 VE 28	
4							
5							
6							
7							
8							
9							
10							

ATTACHMENT 2-2
TOPSOIL CALCULATIONS

add to the back of existing information

HYDROLOGY CALCULATIONS
FOR
DEGAS WELL G-25

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B.
WHITE
14 Apr 2009
STATE OF UTAH

Pad G-25 Summary

Area within Disturbed Area Boundary (ac)	1.8
Disturbed Area Acreage (ac)	
Pad 25	0.9
Salvage Soil Excavation Volume Assuming 12 in. Salvage Depth (cyd)	1,406
Subsoil Volume for Berms (cyd)	136
Salvage Soil Stockpile Dimensions:	191'L X 40'W X 10'H

Salvage Soil Volume Calculation

Disturbed Area (ft^2)	Average Salvage Soil Depth (in)	Salvage Soil Volume (yd^3)
37,968	12	1,406

Notes
Average salvage soil depth is taken from a site-specific soil survey of performed at the degas well pad.
Salvage Soil Volume = Disturbed Area * Average Salvage Soil Depth

Salvage Soil Stockpile Capacity Calculation

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Pad on G-25	191	40	10	1,415

Notes
Salvage Soil stockpile will be sloped at approximately 2H:1V
Volume calculated as 0.5*length of base * width * height of pile.

Subsoil Volume Calculation for Berm Construction

Berm	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Stockpile	446	3	1.5	37
Pad-25	670	4	2	99
TOTAL				136

Notes
Stockpile berm volume includes the berm around the salvage soil stockpile. The stockpile berm volume was assumed to have 1H:1V side slopes.
Pad-25 berm volume includes the berm around the pad and not the berm around the salvage soil stockpile. The pad berm volume was assumed to have 1H:1V side slopes.

HYDROLOGY CALCULATIONS
FOR
DEGAS WELL G-26

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B.
WHITE
14 Apr 2009
STATE OF UTAH

Pad G-26 Summary

Area within Disturbed Area Boundary (ac)	1.6
Disturbed Area Acreage (ac)	
Pad 26	0.7
Salvage Soil Excavation Volume Assuming 12 in. Salvage Depth (cyd)	1,080
Subsoil Volume for Berms (cyd)	152
Salvage Soil Stockpile Dimensions:	75'L X 65'W X 12'H

Salvage Soil Volume Calculation

Disturbed Area (ft^2)	Average Salvage Soil Depth (in)	Salvage Soil Volume (yd^3)
29,168	12	1,080

Notes
Average salvage soil depth is taken from a site-specific soil survey of performed at the degas well pad.
Salvage Soil Volume = Disturbed Area * Average Salvage Soil Depth

Salvage Soil Stockpile Capacity Calculation

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Pad on G-26	75	65	12	1,083

Notes
Salvage Soil stockpile will be sloped at approximately 2H:1V
Volume calculated as 0.5*length of base * width * height of pile.

Subsoil Volume Calculation for Berm Construction

Berm	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Stockpile	257	6	3	86
Pad-26	450	4	2	67
TOTAL				152

Notes
Stockpile berm volume includes the berm around the salvage soil stockpile. The stockpile berm volume was assumed to have 1H:1V side slopes.
Pad-26 berm volume includes the berm around the pad and not the berm around the salvage soil stockpile. The pad berm volume was assumed to have 1H:1V side slopes.

CHAPTER 3

BIOLOGY

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310 INTRODUCTION

This chapter presents a description of the biological resources found on the Dugout Canyon degas well site areas, G-22 access road and the AMV road.

311 Vegetative, Fish and Wildlife Resources

Vegetative, fish, and wildlife resource conditions in and adjacent to the proposed degassification wells are discussed in Section 320 of this submittal and the approved M&RP.

312 Potential Impacts to Vegetative, Fish, and Wildlife Resources

Potential impacts to vegetative, fish, and wildlife resources and the associated mitigation plan is presented in Sections 330 and 340 of this chapter.

313 Description of Reclamation Plan

The reclamation plan used to restore the vegetative, fish, and wildlife resources to a condition suitable for the post mining land use is presented in Section 340.

320 ENVIRONMENTAL DESCRIPTION

321 Vegetation Information

This section and the approved M&RP contain the environmental descriptions of the vegetation for the permit and adjacent areas.

321.100 Plant Communities Within the Proposed Permit Area

During June 2003, the degassification well sites were surveyed by Patrick Collins, Mt. Nebo Scientific. The report and survey for the areas are included in Attachment 3-1. The site for G-6 was moved to a pre-disturbed exploration well pad, the plant communities described in Mr. Collins report reflect the undisturbed portions on the north and south edges of the well pad. Vegetation information for G-7 was obtained from a report prepared by the NRCS Range Management Specialist, Dean Stacy (refer to Attachment 2-1 and 3-1) and the Patrick Collins survey prepared for well site G-3. A photograph of the G-7 site is included in Attachment 3-1. Well site G-3 and the access road can be seen on the photograph.

A vegetation survey of well sites G-8 thru G-12 was completed in July 2005 by Patrick Collins, Mt. Nebo Scientific. These sites have all been pre-disturbed, with a road running through the center of G-8 and remnants of logging activity at both G-9 and G-10. Approximately fifty percent of the well pads at sites G-11 and G-12 are existing roads which have no topsoil or vegetation. The remaining area at site G-11 has been disturbed, except for a small portion on the west side of the site. Well site G-12 has evidence of disturbance above the road cut however both soil and vegetation are intact. The reports and surveys for the areas will be included in Attachment 3-1.

The vegetation survey of well sites G-13 thru G-17 were completed between July and September 2005. The reports and surveys for the areas are included in Attachment 3-1. At well site G-13, the surface ranges from relatively smooth and non-stoney to very stoney. Portions along the southeast edge are too stony for soil salvage. The G-14 well site has been disturbed by logging. The road to G-13 and G-14 are existing roads, however, the soil will be bladed to the side of the road at site G-14 and replaced during reclamation.

Well site G-15 is about 50 percent disturbed by a road, slope cut and fill. The undisturbed portion of the site is a slope with a southeast aspect (35 to 45 percent gradient). Well site G-16 was previously the site of an exploration hole, having been disturbed and reclaimed. The topsoil on

the access road to G-16 will be bladed to one side of the road and replaced during reclamation. At well site G-17 approximately one-third of the site is an existing road.

The entire area of well site G-19 was previously disturbed by logging activities with two roads crossing through the area. Well site G-18 appears to be undisturbed, while G-31 has evidence of disturbance by logging and evidence of use by cattle. The AMV access road to pad G-31 has been used by cattle and hunters to access the top of the ridge. The portion of the AMV road which accesses well site G-18 appears to be undisturbed.

Per an exception granted by the Division during a meeting on April 16, 2007, vegetation on the AMV is being compared to quantitative vegetative analysis information surveyed for degassification well pads. Qualitative data recorded on the access road is discussed in "Vegetation of the De-Gas Sites G-18, G-31 & Reference Area", located in Attachment 3-1. The reference area for the AMV road is the same area as G-16, G-17, G-18 and G-31. The path of the AMV road is a trail used by livestock, hunters, wildlife and a length was disturbed by logging activities, as well as the other activities.

The vegetation on the AMV is similar if not identical to the vegetation analysis presented for degas wells pads G-18, G-19 and G-31. Segment A (approximately 1100 feet) of the road parallels a drainage, the road is on the west side of the drainage and drill pad G-19 is on the east side of the same drainage. The vegetation on Segment A is similar to the vegetation surveyed on Degas pads G-18 and G-31. Segment B approximately 700 feet mimics the soil type and vegetation on the G-19 pad site. A second similarity to the G-19 pad is that Segment B of the road has also been disturbed by logging, containing slash piles and skid trails, this area has experienced natural recovery, except for the width of the trail. Segment C, includes the remainder of the road. Segment C mimics the vegetation on drill pads G-18 and G-31. Segments A and C have a trail running through them, the trail is approximately six feet wide and runs the entire length of the road, including running through Segment B. A drawing of the road, being included to show the segments described above, is provided in Attachment 3-1.

An area approximately 100 x 100 feet on drill pad G-18 was disturbed by logging activity and has experienced natural recovery.

Mountain brush/snowberry plant community is representative of well site G-22 and access road. Woody species, big sagebrush and snowberry dominated the drill site. The access road to pad G-22 woody species includes serviceberry. The vegetation report is provided in Attachment 3-1.

The vegetation report in Attachment 3-1 for degas well sites G-25 and G-26 were prepared by Patrick Collins, Mt. Nebo Scientific. Attachment 3-2 contains a letter dated June 16, 2008 from Dean
Stacy of the NRCS which discusses vegetation production for sites G-25 and G-26.

TABLE 3-1
Land Productivity

Well No.	Productivity (lbs.) Per Acre
G-1 (Previously Disturbed)	100
G-2	1,500*
G-3	1,500*
G-4 (Previously Disturbed)	150
G-5	1500*
G-6 (Majority Previously Disturbed)	300*
G-7	1200*
G-8 (Previously Disturbed)	1200
G-9 (Previously Disturbed)	1000*
G-10 (Previously Disturbed)	1000*
G-11 (Previously Disturbed)	1000*

G-12 (Previously Disturbed)	1000*
G-13	1000*
G-14 (Previously Disturbed)	1000*
G-15 (Previously Disturbed)	1000*
G-16 (Previously Disturbed)	1000*
G-17 (Previously Disturbed)	1000*
G-18	900 - 1200*
G-19 (Previously Disturbed)	500 - 800*
G-22 and Access Road	1000*
G-25 (Previously Disturbed)	900 - 1200*#
G-26 (Previously Disturbed)	1500*
G-31 (Previously Disturbed)	900 - 1200*
Access Road - AMV (Previously Disturbed)	900 - 1200*
Reference Areas	
Sagebrush/Snowberry/Grass (G-2, G-3, G-4, G-5, G-7 and G-25)	1500*
Aspen/Maple/Douglas Fir (G-1, G-6, and G-8)	300*
Mountain Brush/Conifer (G-9 thru G-11)	1200
Conifer/Mountain Brush/Pinyon Juniper (G-12, G-13 and G-15)	1100
Aspen/Conifer (G-14 and G-19)	300
Mountain Brush/Snowberry (G-16, G-17, G-18, G-22, G-26 and G-31, AMV Access Road)	1400
Alternate Standard for Success G-22 and G-25, refer to Section 356.100	

* Community composition is experiencing a declining trend, with decrease in herbaceous production, increase in shrub/tree production.

The range in productivity is used because the majority of the area where the drill pad will be constructed is disturbed, has sparse vegetation and has historically been used as a salt lick, in addition the top soil in the area is only 2 - 5" deep. A photograph of the G-25 site is provided in the soils report in Appendix 3-1.

321.200 Land Productivity Prior to Mining

Productivity of the well site lands, G-22 access road and the AMV road prior to mining are shown in Table 3-1. Refer to Appendix 3-1 for a copy of the NRCS letter pertaining to productivity.

322 Fish and Wildlife Information

Fish and wildlife information associated with the degas wells is provided in this chapter. A summary of the fish and wildlife resource information for the permit and adjacent areas is contained in Sections 322.100 through 322.200 of the approved M&RP.

322.100 Level of Detail

The scope and level of detail within the "Methane Degassification Amendment" are sufficient to design the protection and enhancement plan for wildlife and fish associated with the degas wells. Additional information pertaining to fish and wildlife in the permit area is located in the M&RP.

322.200 Site-Specific Resource Information

Raptors - A survey of raptor nests will be conducted in the immediate area of the well pads each year that the wells are in operation, except in areas where the DWR has previously inventoried and

no nest were found or nests have been determined inactive or were not surveyed. Raptor survey information will be placed in the confidential folders of the M&RP.

An aerial raptor nest survey was done of the area by the Utah Division of Wildlife Resource (DWR, Chris Colt, Leroy Mead) and CFC personnel in May of 2003, refer to the Confidential Folder. Surveys were completed in May of 2004 and 2005, the information has been incorporated into the Confidential Folder.

No raptor nests were recorded during the survey (2003) in the area (portions of N1/2SE1/4NW1/4 and N1/2SW1/4NE1/4 of Section 24; a portions of N1/2SW1/4NW1/4 Section 19, Township 13 South, Range 13 East) of the degas wells. Refer to Figure 1-1 for mapped well locations.

During the 2004 raptor survey, there were no active or tended nests identified in the vicinity of the degas wells. During the 2005 raptor survey (May 12 & 20), there were no active or tended nests identified in the vicinity of degas wells G-9 and G-10. Two golden eagles nests were observed in the cliffs adjacent to degas well G-8 (Nest 9, DWR 2005 Raptor Survey). A single young eagle was observed, but habitually vacates the nest within 45 days of birth.

A raptor survey was performed by Division of Wildlife Resources personnel in May 2006, a copy of the written log is included with deficiencies for Task ID #2456 (located in the confidential folder). Nest 424 when inventoried during the 1998 annual raptor survey was determined to be an inactive raven nest and was not found or inventoried again until 2004 when it was listed as inactive. Nest 424 was not inventoried or found during the annual raptor surveys in 2005 and 2006 by the Division of Wildlife Resources.

During a ground-truthing by Leroy Mead of the Division of Wildlife Resources on July 11, 2006, the two well sites with potential habitat for NSO and northern goshawks were G-14 and G-17. A calling survey will be performed if drilling at either of these sites will begin prior to the end of the exclusionary period, described as July 15. Wells on the G-14 pad ~~will be~~ were drilled in 2006 and 2008 after July 15. ~~If a calling survey is performed, the results will be incorporated into the confidential folder.~~

A Northern Goshawk calling survey was performed in July of 2003 for four weeks in the area of well site G-17. According to the survey there was no response from a northern goshawk. A copy of this survey is located in the confidential binder.

On July 12, 2006, Nest 9 a golden eagle nest was inventoried on the ground by Leroy Mead, although there is evidence of disturbance associated with subsidence in the area, the nest was not disturbed. The 2006 raptor survey lists Nest 9 as being tended.

The G-19 well site was inventoried by Leroy Mead in November 2006 and on June 11, 2007, no wildlife concerns were noted. The area was part of the annual raptor survey, no nest are located in the area(2006 - 2008, DWR).

Well sites G-18, G-31 and the AMV access road were inventoried by Leroy Mead on June 11, 2007, no wildlife concerns were noted. Cattle were observed along the road and on the G-31 well pad site. The area was part of the annual raptor survey, no nests are located in the area (2007 - 2008, DWR).

A raptor survey was done by the Division of Wildlife Resources in May 2008, an inactive(since 2004) redtail hawk and two inactive (since 2004)raven nests are located near the area proposed for construction of degas pad G-22 and the associated access road.

The degas wells to be drilled or operating in 2009 include G-14B, G-16B, G-22, G-25 and G-26. The area of degas wells G-14B, G-16B, G-22, G-25 and G-26 was inventoried during the raptor survey in 2008. No nests were located during the survey by the DWR in Sections 20 and 29 where G-25 and G-26 are located. The raptor activity at well pad G-22 is described previously. No raptor nests were inventoried in Section 19 where degas well pad G-16 was constructed. Pad G-14 has one inactive red-tailed hawk nest (2006 - 2008) within 0.25 miles of the pad.

Although, wells G-18 and G-31 operated in 2009, the pumps were shut down in the winter prior to the raptor nesting period.

Bats - No known open mine shafts, caves, adits or other man made structures that might provide habitats for bats are known to exist in the degas project area.

During June of 2005 a bat survey was performed by JBR Environmental Consultants, Inc, on Pace Creek. Site/stop #6 was in the W1/2SE1/4 of Section 20, Appendix 3-3 of M&RP, Confidential Folder, Figure 1, this stop was the closest to the proposed AMV road and drill pads G-18 and G-19. In the summary of the report it states "the nearly constant bat activity at the Stop #7 pond suggests that this water feature is an important resource for bats in terms of both water and feeding." The Stop #7 pond is approximately one mile east of Site/stop #6, drill sites G-18, G-19 and the AMV road and will not be disturbed in association with these mining activities. The same pond is approximately 1.5 miles from drill pad G-31 and the portion of the AMV road which connects the G-31 and G-18 pads. According to the JBR consultants the pond surveyed at Site/stop #7 which is at a minimum one mile east of the road and drill sites is likely one of the water source used by the bats in the area.

According to the 2005 survey only the Fringed Myotis is listed as a bat species of concern when compared with the Utah Sensitive Species list dated October 17, 2006. "Concerning the fringed syotis, of the 3,246 recordings, 10 were identified as showing nearly conclusive patterns to that known for the species. The 10 good recordings occurred over 3 consecutive nights at Station 7, located at the east edge of the Inventory Area. It is unknown if the species actually utilizes the Inventory Area for roosting or if it just visits the pond for foraging (JBR, 2005)."

On the nights of May 21 and 22, 2007 JBR Environmental Consultants, Inc conducted bat surveys along the northern cliffs of Pace Creek Canyon. The inventory area of the survey included portions of Sections 16, 17, 18, 19, 20 and 21 T13SR13E. Pads G-19 and G-22 were within the area inventoried. During the two night of recording bat calls, no bat call files were produced (Attachment 3-2).

Mexican Spotted Owl - In the Summer of 2003, a calling point survey was conducted in the degas well area by EIS Environmental and Engineering Consulting. The survey report concluded that " within the project area, a thorough search did not reveal the presence of any Mexican spotted

owls". The report is included in Attachment 3-2. A second survey was completed in May of 2004, the information is incorporated into Appendix 3-3 of the M&RP.

Threatened and Endangered Plant and Wildlife Species - There are no known federally or state listed threatened and endangered plant and wildlife species within the sites planned for degassification wells, G-22 access road or for the AMV road. A listing of T & E species for Carbon County and justification as to why they are not in the area of the G-22 and access road, well site G-25 and G-26 is provided in Attachment 3-2.

Bureau of Land Management Environmental Assessment No. UT-070-2001-83 and UT-070-2004-49 contain determination in accordance with the United States Fish and Wildlife Service's protocols, for sites G-11, G-15, G-16 and G-17. The sites were inventoried for the presence of threatened, endangered, and sensitive faunal, and floral species in June of 2001, April, May and June of 2004, no species were found. In the assessment the sites were being used for exploration holes and were referenced by a different number which is in parenthesis following the degas well number G-11 (DT-2), G-15(DUG0204), G-16 (E) and G-17 (DUG0304).

Mt. Nebo Scientific, Inc. conducted a survey of Pad G-18, G-19, G-22 (including access road), G-25, G-26, G-31 and the AMV access road no rare, endemic, threatened or endangered or otherwise sensitive species were found in the study area (Attachment 3-1).

There are no known groundwater or surface water flows to the Colorado or Green Rivers with potential for impact by the drilling of the degas wells. Potential adverse affects to the four Colorado River endangered fish species (refer to table below) would not be likely since there is no direct route to the Colorado River or Green River from the proposed well locations. Per the Windy Gap Process (referenced by personal communication Jerriann Ernstsen, 8/19/03) consumption estimates for the degas wells: evaporation from ventilation - zero, drill holes will not intersect the coal seam being mined, therefore no access to mine ventilation until after area is sealed; coal preparation - zero, no coal preparation at degas sites (see Sections 522 and 523) ; sediment pond evaporation - zero, no sediment pond at degas sites (see Section 732.200); subsidence effects on springs - zero, no anticipated subsidence at degas sites (see Section525); alluvial aquifer

abstractions into mines - zero, no alluvial aquifer abstractions associated with degas drill holes (see Sections 513.500 and 600); postmining inflow to workings - zero, no workings for postmining inflow associated with degas wells (see Sections 513.500 and 600); coal moisture loss - zero, no coal therefore no moisture loss (see Sections 522 and 523); direct diversion - zero, no direct diversions associated with degas wells (see Sections 522 and 523). Water **purchased** for drilling is estimated at 420,000 gallons per hole. Mitigation will not be required since the estimated loss for the construction and reclamation of the degas holes is zero acre feet per year.

Windy Gap Process as it Applies to Existing Coal Mines in the Upper Colorado River Basin
Per meetings with Division of Water Quality personnel during application for a UPDES permit in 2004, "there is no data supporting the premise that surface waters associated with the area of the mine operations reached the Price River or Colorado River prior to or since mining disturbance". Refer to the Dugout Canyon Mine M&RP for the most resent calculations associated with the "Windy Gap Process".

322.300 Fish and Wildlife Service Review

If requested, Dugout Canyon 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. On the 25th of May 2005, Leroy Mead of the DWR toured degas well sites G-8, G-9, G-10, G-11 thru G-14. During the tour no wildlife concerns were noted.

The G-18, G-19 and G-31 well sites, as well as, the AMV access road was inventoried by Leroy Mead on June 11, 2007 and no concerns were noted.

323 Maps and Aerial Photographs

Location of the well sites can be seen in Figure 1-1 of this submittal. The AMV road is shown on Plate1 , in Attachment 5-4.

Utah's Federally (US F&WS) Listed
Carbon County, Utah - County of Occurrence
08/27/07

Common Name	Scientific Name	Status	Habitat Present*
Plants Species			
Uinta Basin Hookless Cactus	Sclerocactus glaucus	T	No habitat available
Fish Species			
Humpback Chub	Gila cypha	E	No habitat available
Bonytail	Gila elegans	E	No habitat available
Colorado Pikeminnow	Ptychocheilus lucius	E	No habitat available
Razorback Sucker	Xyrauchen texanus	E	No habitat available
Birds			
Yellow-billed Cuckoo	Coccyzus americanus	C	No habitat available
Mexican Spotted Owl	Strix occidentalis lucida	T	Habitat possible in general area
Mammals			
Black-footed Ferret	Mustela nigripes	E/EXP	No habitat available

* Habitat availability in Carbon County/Dugout Mine/Degas Well Sites and AMV road.

E = A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the possibility of worldwide extinction.

E/EXP = E Experimental - An endangered taxon that is considered by the U.S. Fish and Wildlife Service to be experimental and non-essential in its designated use areas in Utah.

T = A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered.

C = A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as and endangered or threatened.

Source: Utah Division of Wildlife Resources - created 8/27/2007(Attachment 3-2)

Refer to Attachment 3-2 for a listing of Federal and State Listed, Threatened, Endangered and Candidate Species and Sensitive Species.

323.100 Location and Boundary of Proposed Reference Area

Reference areas for the degassification wells were established during the vegetative study conducted in the Summer of 2003. Well sites G-2, G-3, G-4, G-5, and G-7 will be compared to the Sagebrush/Snowberry/Grass reference area and G-1, G-6, G-8 and G-25 to the Aspen/Maple/Douglas Fir reference area. Mountain Brush and Conifer is the reference area for well sites G-9 thru G-11. The reference area for Degas Well G-12 , G-13 and G-15 is Conifer, Mountain Brush and Pinyon Juniper. The reference area for Degas Well G-14, and G-19 is Aspen/Conifer, the reference area for G-16 thru G-18, G-22 (including access road), G-26 and G-31 and the AMV access road is Mountain Brush/Snowberry. Refer to Attachment 3-1 and Figure 3-1 for the location of the reference areas associated specifically with the degas wells. Reference areas are also shown on Plate 3-1 and 3-1E in the M&RP.

323.200 Elevation and Locations of Monitoring Stations

Refer to Section 323.200 of the approved M&RP.

323.300 Facilities for Protection and Enhancement

Section 333.300 and 358.500 of the approved M&RP contain additional discussion pertaining to protective measures to be taken by Dugout Canyon on behalf of wildlife.

323.400 Vegetation Type and Plant Communities

Vegetative types and plant communities are outlined in the vegetative report in Attachment 3-1. Figure 3-2 and the vegetation drawing in Attachment 3-1 (Vegetation, Sections 19 and 20, Township 13 S R13 E)give details of the vegetation types located adjacent to the well sites and the AMV road.

330 OPERATION PLAN

331 Measures Taken to Disturb the Smallest Particle Area

The well sites will be sized to disturb the smallest acreage possible and still meet the requirements for the drilling equipment. The AMV and G-22 access road will be constructed disturbing the small area possible. The drainage control required will be built to satisfy the environmental requirements.

332 Description of Anticipated Impacts of Subsidence

Refer to Section 525.

333 Plan to Minimize Disturbances and Adverse Impacts

General control and mitigation measures addressing potential related biological impacts will include the following:

- Minimizing the total area of disturbance,
- Design, construction, and operation of the well sites, access roads and AMV road to minimize impacts
- Establishment of stream buffer zones
- Control of surface discharges
- Exclusion of wildlife from potentially hazardous areas, and
- Reclamation of disturbed areas when they are no longer needed.

All water associated with the drilling of these wells will be appropriated and hauled and/or pumped to the sites by a licensed contractor. Since the drilling of degas wells does not involve the mining of coal, the USWFS consumption requirements for underground operations do not apply (i.e., evaporation form ventilation, coal preparation, sediment pond evaporation, subsidence of springs,

alluvial aquifer abstractions into the mine, postmining inflow to workings, coal moisture loss, direct diversions).

As inventoried by the Division of Wildlife Resources in 2003, 2004, 2005, 2006, 2007 and 2008, Nest 424 was determined to be a raven's nest , which was either inactive, not inventoried or found. Wells G-13, G-14 were drilled post July 15th. Wells G-18, G-19 and G-31 ~~will be~~ were drilled post September 1st.

333.100 Minimize Disturbance to Endangered or Threatened Species

Dugout Canyon will apply all methods necessary to minimize disturbances or any adverse effects to threatened or endangered species. See Section 322.200.

333.200 Species and Habitats

All species and habitats within the permit area will be protected to the best of Dugout Canyon's ability.

333.300 Protective Measures

Refer to Section 333.300 of the approved M&RP.

<u>AMV Road - Protection of Upper Channel</u>

Probable Hydrologic Consequences within the area associated with the road is discussed in Section 728.300 and Attachment 7-1, buffer zone designation is discussed in Section 731.600, road drainage is further discussed in Sections 732.400 and 742.400.

Silt fencing will be used at the down hill toe of the slope of the road fill during road construction and reclamation to capture loose soils and rocks. A diagram of the AMV road is provided in Attachment 7-1, during the operation phase the road will have a ditch, berm and culverts with rip rapped outlets

to collect and treat road runoff. Outslopes and ditches associated with the road will be seeded during operations to encourage the establishment of vegetation and for erosion control.

A spring designated at SC-96 on Plate 7-1 (M&RP) was not flowing during the months of permitting preparations for the AMV road. Employees of Dugout Canyon Mine were traversing the area in May thru August, during that time no flow from the spring was observed.

340 RECLAMATION PLAN

341 Revegetation

Revegetation of the sites will occur in two phases at drill site G-2. The first phase is to redistribute topsoil and seed the well area not needed for access and operation of the gas exhaust blower. The second phase will consist of plugging the well and distributing the remaining topsoil and seeding on the remaining pad area. Complete final reclamation at well sites G-2, G-5 and G-7 will be delayed, refer to Section 242.100 for additional detail and Attachment 5-2. Sites G-3, G-4, G-6, G-8 (never constructed), G-9, G-10, G-11thru G-19, G-22 (including access road) G-25, G-26 and G-31 will be reclaimed in one phase. A separate reclamation schedule has been proposed for the AMV road, it will be needed to access the degas wells during and following reclamation (Figure 5-26).

The short-term goal of this revegetation plan is the immediate stabilization of the disturbed sites through erosion control. This objective will be achieved through controlled grading practices, proper seedbed preparation to encourage rapid plant establishment, inclusion of rapidly establishing species in the seed mixture to be planted, and mulch application.

The long-term goals are to establish useful, and productive range. These goals will be attained through the selection and placement of desirable and productive plant species and a commitment to monitor and maintain revegetated areas throughout the bond liability period.

The well sites will be fenced to discourage wildlife and livestock from grazing the reclaimed areas until bond release.

341.100 Schedule and Timetable

The reclamation timetable is shown in Figures 5-15 (G-2)and 5-26 (G-3 thru G-19, G-22 (including access road), G-25, G-26 and G-31 and AMV access road) of this submittal and the reclamation monitoring schedule is found in Chapter 3, Table 3-3 of the approved M&RP.

341.200 Descriptions

Species and Amounts of Seed - The well sites, G-22 access road and AMV road will be planted with the seed mix listed on Table 3-2. The seed mix will be used in both contemporaneous and final reclamation phases. The seed will be incorporated with a small amount of wood fiber mulch and applied by hydroseeding equipment or broadcast. Refer to Section 234.200 for topsoil stockpile seeding description.

Methods Used for Planting and Seeding - The degassification sites will be graded to final contour, then ripped to relieve compaction. The depth of ripping will be from 18 to 24 inches. Following ripping, topsoil will be applied to the ripped surface and left in a gouged and roughened state.

Mulching Techniques - Wood fiber mulch will be applied on top of the seed with hydroseeding equipment at the rate of 2,000 pounds per acre and anchored with a tackifier in amounts specified by the manufacturer.

Irrigation, Pest, and Disease Control - No irrigation is planned and pesticides will not be used unless previously approved by the Division.

Measures Proposed for Revegetation Success - Refer to Section 356.

341.300 Greenhouse Studies, Field Trials or Other Equivalent Studies

Refer to the Section 341.300 of the approved M&RP.

342 Fish and Wildlife

342.100 Enhancement Measures

Post bond release enhancement measure will include the establishment of vegetation for wildlife food, cover, and the break up of large blocks of monoculture to diversify habitat. The current blocks of monoculture include large area of sagebrush and mixed brush. According to Dean Stacy, Range Management Specialist, USDA-NRCS "past management practices have allowed the shrub (mainly mountain sage brush) to surpass the 25-35%, while the herbaceous production has declined". By planting reclamation seed mixes with grasses and forbs the planted areas will breakup the monocultures and provide a future seed source.

In consultation with UDWR (Tony Wright, July 6, 2004) and UDOGM (Jerriann Ernstsen, July 6, 2004) a mitigation project was designated for the Northern Saw Whet Owl to compensate for drilling during the exclusionary period. The project will be completed prior to October 1, 2004. The project will include the construction and installation of 6 to 10 nest boxes on property owned by Canyon Fuel Company, LLC. Because of the UDWR knowledge and experience their personnel will choose the location and install the boxes. Information (goals, procedures, agencies, dates, box locations - township, range, section) concerning the owl mitigation project will be included in the annual report for 2004.

342.200 Plants Used for Wildlife Habitat

Nutritional Value - The nutritional value will be consistent with that of vegetation in the surrounding areas.

Cover - Cover will be comparable to the cover on the associated reference area.

342.300 Cropland

Cropland is not a postming land use.

342.400 Residential, Public Service, and Industrial Land Use

No residential, industrial or public service use is planned.

350 PERFORMANCE STANDARDS

351 General Requirements

Dugout Canyon commits to conduct all operations in accordance with the plans submitted in Sections R645-301-330 through R645-301-340 of the permit application.

352 Contemporaneous Reclamation

Reclamation activities prior to final reclamation will to the extent feasible, be preformed contemporaneously. Contemporaneous reclamation will be performed at the well sites following construction of the wells. Refer to Section 341 for additional details.

353 Revegetation: General Requirements

A vegetative cover will be established on all reclaimed areas to allow for the designated postmining land use of grazing. Refer to Section 411 for additional information.

353.100 Vegetative Cover

The seed mix proposed for revegetation is intended to provide vegetative cover that will be diverse, effective, and permanent. The seed mixture was selected with respect to the climate, potential seedbed quality, erosion control, drought tolerance, and the mixture's ability for quick establishment and spreading.

Native Species - The reclamation vegetation mixture will be comprised of species indigenous to the area and capable of achieving the postmining land use. Diversity of species should allow utilization of plants by wildlife and domestic livestock. The recommended seed mix is comprised of native species.

Extent of Cover - The vegetative cover will be at least equal in extent to the cover at the designated reference areas.

Stabilizing - The vegetative cover mixture is capable of stabilizing the soil surfaces from erosion.

353.200 Reestablished Plant Species

Compatible - The reestablished plant species have been selected to insure their compatibility with the approved postmining use.

Seasonal Characteristics - The revegetation plant species will have the same growing season as the adjacent areas.

Self-Generation - The reestablished plants are species capable of self-generation and plant succession.

Compatibility - The seed mix suggested 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 mix purchased to revegetate the degassification well sites, G-22 access road and AMV road will contain no poisonous or noxious plant (see Section 234.200). No species will be introduced in the area without being approved by the Division.

353.300 Vegetative Exception

Dugout Canyon does not require vegetative exception at this time.

353.400 Cropland

The permit area contains no land designated as cropland.

354 Revegetative: Timing

Dugout Canyon will follow the recommended guidelines for revegetation and planting during the first normal period for favorable planting conditions after replacement of the topsoil. In Utah the planting period is usually Fall due to the precipitation events.

355 Revegetation: Mulching and Other Soil Stabilizing Practices

Mulch and/or other soil stabilizing practices (roughing, etc.) will be used on all areas that have been regraded and covered by topsoil (Section 341.200). Dugout Canyon Mine will exercise care to guard against erosion during and after application of topsoil.

Table 3-2

Reclamation Seed Mix

SPECIES	# pls/acre	# pls/sq. ft.**
Grasses, Forbs, and Shrubs		
Kentucky Bluegrass (1,390,000 seeds/lb)*	0.5	16
Mountain Brome (64,000 seeds/lb)*	2.0	3
Sandberg Bluegrass (1,100,000 seeds/lb)*	1.0	25
Bluebunch Wheatgrass (126,000 seeds/lb)*	4.0	12
Bottlebrush Squirreltail (192,000 seeds/lb)*	1.0	4
Rocky Mountain Penstemon (478,000 seeds/lb)*	1.0	11

Mountain Lupine (12,000 seeds/lb)*	3.0	1
Mtn. Snowberry (54,000 seeds/lb)*	4.0	5
Wyoming Big Sage (2,500,000 seeds/lb)*	0.5	29
TOTAL	17	106

* Native Plants

** Rounded nearest whole seed

Grass seed quantities will be doubled if the area is broadcast seeded.

356 Revegetation: Standards for Success

356.100 Success of Revegetation

The success of revegetation will be judged on the effectiveness of the vegetation for postmining land use, the extent of cover on each degassification well site, access roads and the AMV road compared to their respective reference areas.

Sampling Techniques - Dugout Canyon will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outline in the Division's "Vegetation Information Guidelines, Appendix A" for sampling.

The sampling methods to be used during reclamation will be specific to the requirements at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots) and productivity (clipping). The Jaccard's Community Coefficient will be used to calculate acceptable plant similarity and diversity.

Standards for Success - The standards for success will include criteria representative of undisturbed lands in the area of the degas wells as means to evaluate ground cover, production and stocking of the reclaimed site.

A recommendation was made by Patrick D. Collins, Ph. D., Biologist/Consultant who performed the vegetation survey of the G-22 degas site, he stated that although similar the Mountain Brush/Sagebrush(Snowberry) reference area did not match the site exactly and therefore a lower percent of total living cover should be considered as a success standard. A decision was made by the permittee in consultation with Joe Helfrich, UDOGM and Patrick Collins, Ph. D. that the G-22 degas pad and associated access road once reclaimed will be considered adequate once it reaches 77 percent of the total living cover of the Mountain Brush/Sagebrush(Snowberry) Reference area.

In a report prepared for degas well sites G-25 a recommendation was made by Patrick D. Collins, Ph. D., Biologist/Consultant who performed the vegetation survey. Per the recommendation the permittee proposes that the revegetation success standards for the G-25 degas site be: Total Living Cover: 47%, to be dominated by desirable, non-weedy plant species; Woody Species Density of 2,000 individuals per acre; Diversity: None, but living cover must be dominated by desirable, non-weedy plant species. The permittee proposes that the standard of success for G-26 will be as described below for grazing land.

356.200 Standards for Success

Standards of success will be applied in accordance with the approved postmining land use as described in this section.

Grazing Land and Pasture Land - The ground cover and production of living plants on the revegetated area will be at least equal to the reference area.

Cropland - There is no area designated as cropland within the degassification well sites, on associated access roads or the area of the AMV road.

Fish and Wildlife Habitat - The postmining land use for the degas well sites, G-22 access road and AMV road will be grazing, except on pre-existing roads or trails. Pre-existing roads will be returned to their approximate original contour and compacted.

Industrial, Commercial or Residential - The postmining land use for the permit area is not designated for industrial, commercial, or residential use.

Previously Disturbed Areas - Site G-1 (never constructed), G-4, G-6, G-7, G-8 (never constructed), G-9, G-10, G-11, G-12, G-14, G-15, G-16, G-17, G-19, G-25, G-26, G-31 and AMV access road have been previously disturbed. The AMV access road was previously used for logging, as a trail for hunting and for cattle to access the site of degas well G-31, the road from G-31 to G-18 has not been disturbed. Sites G-2, G-3, G-5, G-13, G-18 and G-22 (including access road) have not been previously disturbed. Standards of success for all sites will be applied in accordance with the postmining land use of grazing or as described in this section.

356.300 Siltation Structures

Siltation structures will be maintained until the disturbed areas have been stabilized and revegetated. For additional details on siltation structures, see Sections 542 and 763 of this amendment.

356.400 Removal of Siltation Structures

The land on which siltation structures are located will be revegetated in accordance with the reclamation plan discussed in Section 353 and 357. Refer to Section 763 for addition information pertaining to the removal of siltation structures.

357 Revegetation: Extended Responsibility Period

Dugout Canyon will be responsible for the success of revegetation for a period of 10 years following seeding of the reclaimed area or upon Division bond release.

357.100 Extended Period Begins

The period of extended responsibility will begin after disturbed areas have been reseeded.

357.200 Vegetation Parameters

Vegetation parameters will equal or exceed the approved success standard during the last 2 years of the responsibility period. The success standards are outline in Section 356 of this application.

357.300 Husbandry Practices

The use of husbandry practices are not being requested by Dugout Canyon for the degas well sites, G-22 access road and the AMV road.

358 Protection of Fish, Wildlife, and Related Environmental Values

Dugout Canyon will minimize disturbances and adverse impacts on wildlife and their related environments as outline in Section 333 of the approved M&RP and Sections 333 and 342 of this

submittal. See Chapter 7, Section 731.100 of the approved M&RP for methods to protect water sources in the area.

358.100 Existence of Endangered or Threatened Species

The well sites, G-22 access road and the AMV road will not be constructed or operated where they might jeopardize the existence of any endangered or threatened species. Refer to Section 322.200 and Attachments 3-1, 3-2 and 3-3 for additional information pertaining to threatened, endangered, and sensitive species.

State or federally listed endangered or threatened species will be reported to the Division upon its discovery.

358.200 Bald and Golden Eagles

Dugout Canyon understands that there is no permission implied by these regulations for taking of bald or golden eagles, their nests, or eggs. If found, nests will be reported to the Division.

358.300 Taking of Endangered or Threatened Species

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

358.400 Replacement of Wetland or Riparian Vegetation

The sites and G-22 access road contain no wetland or riparian vegetation, unless specifically noted in the vegetation survey. The disturbed area of the AMV road, outlined on Plate 1 (Attachment 5-4) contains no wetland or riparian vegetation.

358.500 Manmade Wildlife Protection Measure

Electric Power Lines - No utilities will exist at the well sites, G-22 access road or on the AMV road.

Potential Barriers - No potential barriers will exist at any of the well sites, on the G-22 access road or on the AMV road, except for the perimeter fence at the well sites. No ponds exist at the well sites or on the G-22 access road, or AMV road. Refer to Sections 231.100 and 242 for information pertaining to the mud pit.

ATTACHMENT 3-1

VEGETATION INVENTORY

NRCS LETTER

add to the back of existing information

VEGETATION OF DE-GAS DRILL SITES: G-25, G-26, G-29 & REFERENCE AREAS

FOR THE DUGOUT CANYON MINE

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INTRODUCTION

History of Vegetation Sampling in the Area

This is the next document in a sequence of vegetation reports prepared for Canyon Fuel Company. The mining company has been constructing borehole drill sites as part of a de-gasification process that facilitates coal mining operations for safety considerations in the Dugout Canyon Mine. Permitting of the "de-gas" drill sites, or in some cases exploration holes, has been done in consecutive order on a site-by-site basis and has been driven by their location and role in the mine plan. Earlier reports have been submitted beforehand to address the plant communities to be impacted by previously constructed drill sites. The first of these reports was called *Vegetation of the Dugout Canyon Mine De-gas Borehole Sites* (July 2003). This report quantitatively described the vegetation proposed for disturbance and reference areas chosen to represent future revegetation success standards on the following drill sites: G-1, G-2, G-3, G-4, G-5, G-6. A study was later conducted for the next drill sites to be constructed. The final report for these sites was called *Vegetation of the De-gas Borehole Sites: G-8, G-9, G-10 & Reference Areas* (August 2005). The next report in the sequence provided vegetation data for sites G-11, G-12, and the reference areas associated with them [the final report was titled *Vegetation of the De-gas Borehole Sites: G-11, G-12 & Reference Areas* (November 2005)]. The next document of the sequence quantified and described boreholes sites G-13, G-14, G-15, G-16, G-17 and the reference areas chosen for future revegetation success standards. Next, a

document was prepared that reported results from sampling De-gas Site G-19. The last document contained quantitative information for De-gas Drill Sites G-21, G-22 and associated reference areas.

The information herein quantitatively describes De-gas Sites G-25 (also called DUG-06), G-26 and G-29 (also called DUG-02) along with their reference areas.

Drill Pad Construction

In order to develop the drill pads, a small amount of land has been proposed to be disturbed at each de-gas site location. Most of the proposed drill pads have been approximately 200 ft. x 300 ft in size, but some are about half that size. The plant communities proposed for disturbance at each of these sites have been described and sampled with the results provided in this report. A sensitive plant species survey was also conducted at the sites.

Like the earlier developed de-gas borehole and exploration sites, attempts have been made to minimize disturbance to the native plant communities by planning proposed construction of the new sites in areas where previous disturbance had already been caused by logging, road construction or other activities.

Revegetation Success Standards

As mentioned, reference areas were chosen to represent future standards for final revegetation success. These reference areas were chosen with respect to their similarities in geology, soils, slopes, aspects and plant community composition to the areas that are proposed for disturbance. In those cases where the proposed new disturbances existed in areas that were previously disturbed by other activities, *attempts were made to choose the reference areas to represent the native plant communities that were present at the site prior to these perturbations*. Therefore, undisturbed plant communities have been chosen as the reference areas for de-gas drill pads – even though the current condition of the proposed pad may be much less than pristine. In other areas where the soils have limited characteristics due to disturbances or topsoil removal, revegetation to match the plant communities where soils remain undisturbed may be difficult. In these instances, specific success standards have been recommended (more details will be given about this later in this report).

As mentioned above, vegetation sampling has been conducted on proposed de-gas sites for the past few years. Consequently, many of the plant communities that were sampled previously on the earlier drill sites are the same, or very similar to, those that have been proposed for new drilling activities. Because the earlier drill sites have reference areas associated with them that will be used for final revegetation success standards, and because these reference areas were very similar plant communities of the currently proposed drill pads, data from the same reference areas have been used for comparisons herein. Accordingly, some of the existing reference areas

will also be used for revegetation standards for the new drill sites at the time of final reclamation.

METHODS

Methodologies used for this study were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM). Quantitative and qualitative data were recorded within the plant communities proposed for disturbance at De-gas Sites G-25, G-26 and G-29 in June and July, 2008. The reference area for these sites were sampled in the growing season of 2005.

Proposed drill sites were surveyed, mapped and staked in the field by Canyon Fuel prior to the vegetation sampling. The reference areas chosen were approximately one acre in size and were marked in the field using a GPS instrument. The coordinates for the proposed de-gas drill pads and reference areas are provided below.

GPS COORDINATES FOR DUGOUT CANYON MINE DE-GAS BOREHOLE SITES: G-25, G-26, G-29 & REFERENCE AREAS
(UTM, ZONE 12, NAD 27)

Waypoint Name	Easting (m)	Northing (m)	Notes
DUGG0825	0544771	4391426	De-gas Drill Site G-25
DUGG0826	0544042	4391192	De-gas Drill Site G-26
DUGG0829M	0544323	4391059	De-gas Drill Site G-29
DUG16R	0542993	4392921	Mtn. Brush/Sagebrush Reference Area for G-26 & G-29 (also G-16, G-17 & G-22).

Sampling Design and Transect/Quadrat Placement

Transect lines for vegetation sampling were placed randomly within the boundaries of the proposed disturbed and reference areas. The sample boundaries included 100 ft outside the proposed drill site. The transect placement technique was employed with the goal to adequately sample a representative subset of the entire site. Once the transects were established, quadrat locations for sampling were chosen using random numbers from the transect lines with the objective to record data without preconceived bias.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition, cover by species, and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets notes such as: slope, exposure, grazing use, disturbance and/or other appropriate notes. Plant nomenclature follows "A Utah Flora" (Welsh et al., 2003).

Woody Species Density

Density of woody plant species for the proposed disturbed and reference areas were estimated using the point-quarter method. 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 number of individuals per acre was the end results of the calculations.

Sample Size & Adequacy

Sampling adequacy for cover and density was attempted by using the formula given below.

$$nMIN = \frac{t^2 s^2}{(dx)^2}$$

where,

nMIN	= minimum adequate sample
t	= appropriate confidence t-value
s	= standard deviation
x	= sample mean
d	= desired change from mean

With the values used for "t" and "d"above, the goal was to meet sample adequacy with 80% confidence within a 10% deviation from the true mean. In areas where sample viability was unnaturally high (e.g. previous disturbance sites), these parameters sometimes prove to be too stringent.

Statistical Analyses

Student's t-tests were employed to compare the total living cover and total woody species density

of each proposed disturbed de-gas site with its reference area.

Photographs

Color photographs of the sample areas were taken at the time of sampling and have been submitted with this report.

Threatened & Endangered Plant Species

Prior to recording quantitative data on the plant communities, a sensitive plant species survey was conducted. To initiate the study, appropriate agencies had been consulted (e.g. *Utah Natural Heritage Program*) and other sources were reviewed (sensitive species files at *Mt. Nebo Scientific, Inc.*) for potential plant species that are known to be rare, endemic, threatened, endangered or otherwise sensitive in the study area.

Raw Data

The raw data for cover have been summarized on a spreadsheet and is available upon request.

RESULTS

De-gas Site G-25 (DUG-06)

Once the site of an undisturbed sagebrush/grass community, this site now appears to have been disturbed by man's activities such as providing a staging area for heavy equipment, or perhaps merely an area where cattle gather for grazing and salt block consumption. At any rate, the common representation of "weedy" or exotic plant species and the relatively low living cover suggests previous disturbance to the site of some type.

Table 1 shows that De-gas Site G-25 was dominated by sagebrush (*Artemisia tridentata*), Kentucky bluegrass *(Poa pratensis*) and dandelion (*Taraxacum officinale*). Total living cover of the site was estimated to be 47.00% (Table 2-A). Of that living cover, lifeform representation was nearly equal; shrubs constituted 39.59%, forbs 30.86% and grasses 29.55% (Table 2-B).

The total woody species density of this site was estimated at 2,074 individuals per acre and was dominated by a wide margin by sagebrush (Table 3).

Reference Area Considerations

Several reference areas, including sagebrush communities, have been chosen previously to represent revegetation success standards for de-gas sites studied earlier. These reference areas

were reviewed as candidates to also represent standards for De-gas Site G-25. In doing so, it became evident that cover, diversity and woody species density of the existing sagebrush/grass or and sagebrush/grass/mountain brush reference areas were much higher than that of the existing data revealed for the previously disturbed sagebrush/grass community studied for De-gas Site G-25, and therefore may represent too stringent and unjust standards for revegetation success. It is therefore recommended that the revegetation success standards for this site be set as the following:

Total Living Cover:	47.00% (must be dominated by desirable, non-weedy plant species).
Woody Species Density:	2,000 individuals per acre.
Diversity:	None (but living cover must be dominated by desirable, non-weedy plant species).

De-gas Site G-26

This proposed site supports a mountain brush/sagebrush plant community. From Table 4, the dominant plants associated with this community were sagebrush, Utah serviceberry (*Amelanchier utahensis*) and snowberry (*Symphoricarpos oreophilus*). The total living cover of this community was estimated at 56.50%, of which 14.00% was from overstory and 42.50% was from understory cover (Table 5-A). The understory cover was comprised of 54.55% shrubs, 32.51% forbs and 12.94% grasses (Table 5-B).

As shown on Table 6, the woody species density of this site was estimated at 3,463 individuals per acre dominated by sagebrush and followed by Wood's rose (*Rosa woodsii*), Utah serviceberry and Douglas fir (*Pseudotsuga menziesii*).

De-gas Site G-29

This site, called De-gas Site G-29 (or DUG-02), supported a sagebrush/grass community where scattered pinyon pine, Utah juniper and Douglas fir trees were also common (Table 7). The community was dominated by sagebrush, Utah serviceberry and Watson's penstemon (*Penstemon watsonii*).

The total living cover of this community was estimated at 67.00%, of which consisted of 13.00% overstory and 54.00% understory (Table 8-A). The living cover's lifeform was comprised of 78.28% shrubs, 15.50% forbs and 6.23% grasses (Table 8-B).

Total woody species density was estimated at 3,538 individuals per acre. The dominant plants for this parameter were sagebrush, snowberry and Utah serviceberry (Table 9).

Mountain Brush/Sagebrush/Snowberry Reference Area

The reference area chosen for future revegetation success standards for De-gas Site G-26 and G-29 (as well as G-16, G-17 and G-22 in previous reports) was located in a mountain

brush/sagebrush plant community. The most common species in this reference area were big sagebrush, Watson's penstemon, snowberry and serviceberry (Table 10).

The total living combined cover here was 64.50%; 57.00% was from understory and 7.50% from overstory (Table 11-A). Woody species dominated the composition at 54.44%, followed by forbs at 28.08% and grasses at 17.49% (Table 11-B). The woody species density was estimated at 5,137 plants per acres and was dominated by big sagebrush and snowberry (Table 12).

Table 1: Dugout Mine De-gas Site G-25 (DUG-06).
Total cover, standard deviation and frequency by species (2008).

Previously Disturbed Sagebrush/Grass Community	**Mean Percent**	**Standard Deviation**	**Frequency**
TREES & SHRUBS			
Amelanchier utahensis	1.75	4.82	15.00
Artemisia tridentata	15.00	9.75	95.00
Symphoricarpos oreophilus	3.50	8.08	25.00
FORBS			
Achillea millefolium	0.25	1.09	5.00
Cynoglossum officinale	0.50	1.50	10.00
Eriogonum sp.	1.00	4.36	5.00
Penstemon palmeri	4.25	8.10	35.00
Penstemon watsonii	0.50	2.18	5.00
Phlox longifolia	1.25	2.68	20.00
Senecio integerimus	1.50	3.20	20.00
Taraxacum officinale	6.00	7.52	45.00
GRASSES			
Poa pratensis	10.25	5.80	85.00
Poa secunda	1.25	3.83	10.00

Table 2: Dugout Mine De-gas Site G-25 (DUG-06).
Total cover, standard deviation and sample size (2008).

Previously Disturbed Sagebrush/Grass Community	Mean Percent	Standard Deviation	Sample Size
A. TOTAL COVER			
Total Living Cover	47.00	18.87	20
Litter	23.60	19.41	20
Bareground	27.20	23.19	20
Rock	2.20	1.83	20
B. % COMPOSITION			
Shrubs	39.59	20.72	20
Forbs	30.86	17.42	20
Grasses	29.55	19.23	20

Table 3: Dugout Mine De-gas Site G-25 (DUG-06).
Woody Species Density.

Previously Disturbed Sagebrush/Grass Community	
SPECIES	**Individuals Per Acre**
Amelanchier utahensis	155.53
Artemisia tridentata	1710.79
Pseudotsuga menziesii	77.76
Symphoricarpos oreophilus	129.61
TOTAL	**2073.68**

Table 4: Dugout Mine De-gas Site G-26. Total cover, standard deviation and frequency by species (2008).

Mountain Brush/Sagebrush Community	Mean Percent	Standard Deviation	Frequency
OVERSTORY			
Amelanchier utahensis	9.25	17.63	25.00
Pinus edulis	1.00	4.36	5.00
Pseudotsuga menziesii	3.75	16.35	5.00
UNDERSTORY			
TREES & SHRUBS			
Amelanchier utahensis	3.50	7.72	25.00
Artemisia tridentata	12.90	10.69	80.00
Mahonia repens	0.50	2.18	5.00
Pseudotsuga menziesii	0.25	1.09	5.00
Symphoricarpos oreophilus	6.10	4.90	75.00
FORBS			
Achillea millefolium	0.25	1.09	5.00
Antennaria microphylla	0.50	1.50	10.00
Astragalus sp.	0.25	1.09	5.00
Cynoglossum officinale	1.00	2.55	15.00
Gilia aggregata	1.75	3.27	25.00
Haplopappus richardsonii	0.50	1.50	10.00
Lupinus argenteus	3.50	5.72	35.00
Penstemon watsonii	5.00	5.00	60.00
Swertia radiata	1.50	4.77	10.00
GRASSES			
Elymus salinus	0.50	2.18	5.00
Koeleria nitida	0.25	1.09	5.00
Poa pratensis	0.25	1.09	5.00
Poa secunda	3.00	4.00	40.00
Stipa columbiana	1.00	2.55	15.00

Table 5: Dugout Mine De-gas Site G-26. Total cover, standard deviation and sample size (2008).

Mountain Brush/ Sagebrush Community	Mean Percent	Standard Deviation	Sample Size
A. TOTAL COVER			
Overstory (o)	14.00	22.39	20
Understory (u)	42.50	13.83	20
Litter	21.55	10.73	20
Bareground	23.20	16.72	20
Rock	12.75	13.43	20
o + u	56.50	20.50	20
B. % COMPOSITION			
Shrubs	54.55	20.06	20
Forbs	32.51	17.66	20
Grasses	12.94	11.28	20

Table 6: Dugout Mine De-gas Site G-26. Woody Species Density (2008).

Mountain Brush/Sagebrush Community	
SPECIES	**Individuals Per Acre**
Amelanchier utahensis	389.61
Artemisia tridentata	2164.52
Cercocarpus montanus	43.29
Pinus edulis	43.29
Pseudotsuga menziesii	259.74
Rosa woodsii	562.77
TOTAL	**3463.23**

Table 7: Dugout Mine De-gas Site G-29 (DUG-02). Total cover, standard deviation and frequency by species (2008).

Sagebrush/Mtn. Brush/ Pinyon-Juniper Community	Mean Percent	Standard Deviation	Frequency
OVERSTORY			
Amelanchier utahensis	1.25	5.45	5.00
Cercocarpus montanus	1.00	4.36	5.00
Juniperus osteosperma	3.50	11.52	10.00
Pinus edulis	2.00	8.72	5.00
Pseudotsuga menziesii	5.25	13.74	15.00
UNDERSTORY			
TREES & SHRUBS			
Amelanchier utahensis	7.00	14.61	25.00
Artemisia tridentata	12.75	15.37	65.00
Cercocarpus montanus	5.25	11.01	20.00
Juniperus osteosperma	5.50	11.50	20.00
Pinus edulis	2.75	6.80	15.00
Pseudotsuga menziesii	4.00	10.07	15.00
Symphoricarpos oreophilus	5.50	9.21	35.00
FORBS			
Cirsium sp	0.25	1.09	5.00
Gilia aggregata	0.50	2.18	5.00
Penstemon watsonii	7.00	14.53	30.00
Phlox longifolia	0.25	1.09	5.00
Senecio integerimus	0.25	1.09	5.00
Streptanthus cordatus	0.25	1.09	5.00
GRASSES			
Bromus carinatus	0.50	2.18	5.00
Elymus salinus	0.25	1.09	5.00
Poa pratensis	1.50	5.50	10.00
Poa secunda	0.50	2.18	5.00

Table 8: Dugout Mine De-gas Site G-29 (DUG-02).
Total cover, standard deviation and sample size (2008).

Sagebrush/Mtn. Brush/ Pinyon-Juniper Community			
A. TOTAL COVER	**Mean Percent**	**Standard Deviation**	**Sample Size**
Overstory (o)	13.00	17.99	20
Understory (u)	54.00	11.25	20
Litter	13.89	10.12	20
Bareground	11.30	10.06	20
Rock	21.50	15.50	20
o + u	67.00	21.18	20
B. % COMPOSITION			
Shrubs	78.28	27.63	20
Forbs	15.50	25.10	20
Grasses	6.23	14.38	20

Table 9: Dugout Mine De-gas Site De-gas Site G-29 (DUG-02).
Woody Species Density.

Sagebrush/Mtn. Brush/ Pinyon-Juniper Community	
SPECIES	**Individuals Per Acre**
Amelanchier utahensis	353.80
Artemisia tridentata	2122.80
Ceratoides lanata	88.45
Juniperus osteosperma	176.90
Pinus edulis	44.22
Pseudotsuga menziesii	132.67
Symphoricarpos oreophilus	619.15
TOTAL	**3537.99**

Table 10. Dugout Mine: Mtn. Brush/Sagebrush Reference Area for De-gas Site G-26 & G-29 (also for G-16, G-17 & G-22).
Total Cover, Standard Deviation and Sample Size (2005).

Mtn. Brush/Sagebrush/Snowberry Reference Area	Mean Percent	Standard Deviation	Percent Frequency
OVERSTORY			
Amelanchier utahensis	6.75	12.58	25.00
Juniperus scopulorum	0.75	3.27	5.00
UNDERSTORY			
TREES & SHRUBS			
Amelanchier utahensis	7.00	16.16	35.00
Artemisia tridentata	15.25	14.79	75.00
Juniperus scopulorum	0.25	1.09	5.00
Symphoricarpos oreophilus	10.50	15.96	50.00
FORBS			
Astragalus sp.	0.25	1.09	5.00
Lupinus argenteus	4.05	4.60	55.00
Penstemon watsonii	10.70	7.89	80.00
GRASSES			
Elymus salinus	0.25	1.09	5.00
Elymus spicatus	2.00	3.67	25.00
Elymus trachycaulus	2.00	3.67	25.00
Poa pratensis	2.25	5.36	20.00
Poa secunda	2.50	6.22	20.00

Table 11. Dugout Mine: Mtn. Brush/Sagebrush Reference Area for for De-gas Site G-26 & G-29 (also for G-16, G-17 & G-22). Total cover, standard deviation and sample size (2005).

Mtn. Brush/Sagebrush/Snowberry Reference Area	Mean Percent	Standard Deviation	Sample Size
A. TOTAL COVER			
Overstory (U)	7.50	12.60	20
Understory (O)	57.00	12.08	20
Litter	18.60	7.52	20
Bareground	15.65	13.13	20
Rock	8.75	9.59	20
O + U	64.50	19.49	20
B. % COMPOSITION			
Trees & Shrubs	54.44	26.60	20
Forbs	28.08	17.03	20
Grasses	17.49	14.43	20

Table 12. Dugout Mine: Mtn. Brush/Sagebrush Reference Area for for De-gas Site G-26 & G-29 (also for G-16, G-17 & G-22). Woody Species Densities (2005).

Mtn. Brush/Sagebrush/Snowberry Reference Area	
Species	**Individuals Per Acre**
Amelanchier utahensis	834.68
Artemisia tridentata	2375.64
Juniperus scopulorum	64.21
Symphoricarpos oreophilus	1861.99
TOTAL	5136.52

Threatened & Endangered Plant Species Survey

State databases revealed only one potential sensitive species to be located in the vicinity of the proposed disturbed borehole sites. This plant was canyon vetch (*Hedysarum occidentale* var.*canone*). Each proposed disturbed area was surveyed in the field for canyon vetch (or any other unusual or sensitive plants). This survey was done prior to recording the quantitative data used to describe the major plant community of the study area. In addition, more searching for sensitive species was done during quantitative sampling of the areas. No rare, endemic, threatened or endangered or otherwise sensitive species were found in the study areas.

DISCUSSION & CONCLUSIONS

As mentioned in the RESULTS section, **De-gas Site G-25** has been disturbed previously and none of the reference areas appeared to be appropriate for future revegetation success standards. Accordingly, success standards for cover and woody species density have been recommended as follows:

Total Living Cover:	47.00% (must be dominated by desirable, non-weedy plant species).
Woody Species Density:	2,000 individuals per acre.
Diversity:	None (but living cover must be dominated by desirable, non-weedy plant species).

De-gas Site G-26 was an undisturbed mountain brush/sagebrush plant community. An area similar to this community, called **Sagebrush/Mtn. Brush/Pinyon-Juniper Reference Area**, had been chosen previously and used for standards of other proposed disturbance areas. Therefore the datasets from the Sagebrush/Mtn. Brush/Pinyon-Juniper Reference Area were reviewed and compared statistically with De-gas Site G-26. However, because the overstory from the reference area was much more of a component of the total living cover than it was in De-gas Site G-26, only the understory cover values were compared. Accordingly, when the understory of the reference area was compared to the proposed de-gas site, the values were statistically non-significant (Figure 1). Therefore, at the time of final reclamation, the understory cover of the reference area should then also be compared to the understory cover of the reclaimed site.

When the total woody species density of De-gas Site G-26 was compared to the density of Sagebrush/Mtn. Brush/Pinyon-Juniper Reference Area, the differences were significantly greater in the reference area (Figure 2). The densities of both areas were quite high; a value closer to 2,500 individuals per acre may be more appropriate for both domestic livestock use and wildlife species habitat. The suggestion for using a lower number for a woody species density standard could be reviewed and discussed with the biologists from the State of Utah, Division of Oil, Gas & Mining (DOGM) and Division of Wildlife Resources (DWR).

The total living cover, including overstory and understory combined, for **De-gas Site G-29** (a sagebrush/mtn. brush/pinyon-juniper community) and the same reference area described above (**Sagebrush/Mtn. Brush/Pinyon-Juniper Reference Area**) have been compared statistically. The living cover value differences were non-significant (Figure 1).

When the woody species density values were compared, they again were higher in the reference area. The same idea for lowering the number of woody species for a final revegetation success standard as described above for De-Gas Site G-26 should be considered.

To summarize, results of sampling the vegetation of areas proposed for disturbance by drilling activities and subsequent construction of de-gasification wells have been reported in this document. Additionally, reference areas or final standards to be used for revegetation success standards have also been proposed for the sites following final reclamation of the sites.

Figure 1. A statistical comparison (Student's t-tests) of the **total living cover** between the proposed disturbed de-gas sites and their reference areas.

	$\bar{x}$	s	n	t	df	SL
De-gas Site G-25						
Previously Disturbed:	47.00	18.87	20			
Reference Area:	Pre-SS					
t-test				n/a	n/a	n/a
De-gas Site G-26						
Proposed Disturbed:	56.50(u+o)	20.50	20			
Reference Area (MB/SB):	57.50(u)	12.08	20			
t-test				-0.188	38	N.S.
De-gas Site G-29						
Proposed Disturbed:	67.00(u+o)	21.18	20			
Reference Area (MB/SB):	64.50(u+o)	19.49	20			
t-test				0.388	38	N.S.

$\bar{x}$ = mean
s = standard deviation
n = sample size
t = Student's t-value
df = degrees of freedom
n/a = not applicable
p = probability
SL= Significance Level
N.S.=Non-Significant
MB/SB = Mtn. Brush/Sagebrush
u = understory
o = overstory
Pre-SS = Pre-set standards
(see "REFERENCE AREA CONSIDERATIONS" in the RESULTS section)

Figure 2. A statistical comparison (Student's t-tests) of the **woody species density** between the proposed disturbed de-gas sites and their reference areas.

	$\bar{x}$	s	n	t	df	SL
De-gas Site G-25						
Proposed Disturbed:	2073.68	4086.20	20			
Reference Area:	Pre-SS					
t-test				n/a	n/a	n/a
De-gas Site G-26						
Proposed Disturbed:	3463.23	1655.25	20			
Reference Area (MB/SB):	5136.52	2140.91	20			
t-test				-2.765	38	p<.01
De-gas Site G-29						
Proposed Disturbed:	3537.99	1263.50	20			
Reference Area (MB/SB):	5136.52	2140.91	20			
t-test				-2.876	38	p<.01

$\bar{x}$ = mean
s = standard deviation
n = sample size
t = Student's t-value
df = degrees of freedom
n/a = not applicable
p = probability
SL= Significance Level
N.S.=Non-Significant
MB/SB = Mtn. Brush/Sagebrush
u = understory
o = overstory
Pre-SS = Pre-set standards
(see "REFERENCE AREA CONSIDERATIONS" in the RESULTS section)

COLOR PHOTOGRAPHS OF THE SAMPLE AREAS

De-gas Site G-25

De-gas Site G-26

De-gas Site G-29

Mtn. Brush/Sagebrush Reference Area

CHAPTER 4

LAND USE AND AIR QUALITY

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LIST OF ATTACHMENTS

Attachment 4-1 Information Moved to Confidential Folder in 2005
Attachment 4-2 Surface Land Owner Agreement

410 LAND USE

411 Environmental Description

A statement of the conditions and capabilities of the land to be affected by mining and reclamation operations follows in this section.

411.100 Preming Land Use

The area is utilized for the landowners private use, including hunting and as open range for livestock and wildlife.

411.110 Land Use Map and Narrative

Refer to the same section of the approved M&RP.

411.120 Land Capability

The major plant communities at the well sites are identified in Section 321. No cultivated lands lie within the well boundaries, due to the limiting terrain and lack of water for irrigation. Refer to Section 321.200, Table 3-1 of this submittal for forage production per acre for each well site.

The well site areas are located on the flatter mesa tops and rolling terrain. This type of terrain receives heavier pressure because of more available forage and easier movement by livestock.

411.130 Land Use Description

The wells are located on land administered by Milton & Ardith Thayn Trust and zoned by Carbon County for mining and grazing (MG-1).

No industrial or municipal facilities are located on or immediately adjacent to the well sites.

411.140 Cultural and Historic Resources Information

Cultural and Historic Resource Maps - Archaeological surveys were conducted in 2003 of the well sites G-1 through G-6. Nothing was found that required future investigation. There are no cemeteries, public parks, or units of the National System of Trails or the Wild and Scenic Rivers System located within the well site boundaries. The reports can be found in Attachment 4-1 of this submittal, Appendix 4-1 and 4-3 of the M&RP and in the Confidential Folder. Well site G-7 and G-8 were inventoried by AERC in 1980 (see below), a letter from John Senulis of Senco-Phenix to SHPO has been written requesting proof of clearance for the G-7 and G-8 sites. A copy of the Senco-Phenix letter is included in the confidential folder.

Previous research in 1980 by "AERC surveyed several sample blocks in Sections 13 and 24, T13S, R12E and Sections 18, 19 and 30 T13S, R13E. They also surveyed the access road into the Snow Mine site. One archeological site (42CB292) was located. The site was described as "Coal mine located in Pace Canyon consists of one known mine portal which has been closed. Site of historic Snow Mine in Pace Canyon which was active in 1906 but had its primary production period from 1932-1940." The site was relatively pristine at the time and still contained a standing coal loadout and foundation with depth potential. Avoidance was recommended pending further historic research. <u>As noted the site has since been extensively modified</u>" (Attachment 4-1, Senco-Phenix, June 24, 2003, SPUT-455, page 2).

Access to the degas holes will not impact or disturb what remains of the archeological site (42CB292). The road in the bottom of Pace Canyon passes the archeological site, but the closed

portal is not visible from the road, therefore there is nothing to draw attention to the site. The loadout referenced in the survey no longer exist at the site.

During June 2005 a Class III intensive walkover survey was performed of the access roads and degas well sites G-9 thru G-13 and site DUG0105/DUG0205 (G-14) by Senco-Phenix. The well sites are being permitted in groups. Wells G-8 thru G-10 are the group currently being presented for consideration for approval. In the canyon where degas well sites G-9 and G-10 are located near site 42CB2435. The major portion of the site has been removed and there is little potential for further information. The site is not considered eligible for the NRHP. Reference the Confidential Binder for further information pertaining to the aforementioned survey. Per the survey "No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended" by Senco-Phenix to SHPO for the G-8 thru G-14 degas well sites. Site 42CB1595 was recommended for archeological clearance without stipulations by Senco-Phenix to SHPO and was not recommended as eligible for the NRHP.

The sites of G-11 and G-16 were previously used for coal exploration holes. No "areas of critical environmental concern" or "native american religious concerns" were identified for either site in the archeological inventory of the area conducted by Senco-Phenix Archeological Consulting Services in June 20, 2001(SPUT-387, Confidential Binder) and no cultural or historical properties were listed by NRHP. Site G-11 was labeled as "DT-2" and site G-16 was labeled as "E" in SPUT-387.

Sites G-15(DUG0204), G-17 (DUG0304) were previously used for coal exploration holes. An archeological inventory of the area was conducted by Senco-Phenix Archeological Consulting Services in 2001 (SPUT-387, Confidential Binder) and no historical or cultural resources were identified for listing by NRHP/SHPO per the BLM EA UT-070-2004-49, provided for incorporation into Attachment 3-3. Site G-15 was labeled as "DUG0204" and site G-17 was labeled as "DUG0304" in the Environmental Assessment prepared by the BLM for the drilling of these exploration holes. The areas for the exploration holes were presumably cleared by the BLM prior to the drilling of the exploration holes.

In SPUT-387 the drill pad areas are not labeled with a number but are designated as being inventoried by a blue outline on the drawing provided in the sput. A IMACS site form was prepared and submitted to SHPO for a site at well pad G-17 (42CB1596), this site was "Determined NR ineligible and non-significant for National Register Status.

A drawing has been prepared by archeological consultants "Senco-Phenix" designating areas including roads surveyed for archeological and cultural resources. The drawing entitled"Previous Archeological Surveys, July 2006" is included in the confidential binder. The road used for access to all degas drill sites have been surveyed.

SPUT-553 prepared by Senco-Phenix contains an intensive survey on 14 acres. Part of this survey was an access road connect the existing road to well pad G-19 and a trail to G-31 and on to well pad G-18. " A finding of no effect is appropriate and archeological clearance without stipulations is recommended" for the area associated with the sites listed above.

The G-31 well pad was surveyed in 2001 by Senco-Phenix (SPUT-387). In the report, the site is referenced as DT-3 and was inventoried as a location for a potential exploration well. A copy of SPUT-387 is on file at the Division and was submitted to SHPO in association with the Pace Canyon Fan Portal amendment. In the report it states that, "a finding of no effect is appropriate and archeological clearance without stipulations is recommended" for this site.

SPUT-555 also includes a survey of the existing road to G-22. Cultural resources (42CB2621) were located during this survey, but are not related to the AMV access road, well site G-22, G-31 or G-18. The information for this site was provided to the Division on June 14, 2007 under separate cover for submittal to SHPO.

A cultural resource survey (SPUT-573) and inventory of G-22 was performed in June 2008. Two fragments (under ½ inch) of broken glass were located but were likely displaced from their original location. No other cultural resources were located and a finding of <u>no effect</u> is appropriate and archeological clearance without stipulation is recommended by the consulting archeologists.

SPUT-542 is an intensive cultural resource survey covering three drill holes and a staging area. The site for Degas well G-19 (G-190) is part of this survey. The refer to the drawing within the survey and Figure 1-1 of this amendment for verification of the surveyed location. "No cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended."

SPUT-577 is an intensive cultural resource survey covering access corridors and sites G-25, G-26, G-28, G-30, DUG-01, DUG-02, DUG-05(Block), DUG-07/R-02, DUG-8 and DUG-09. Two isolated cultural resource findings were located, neither were recommended for nomination to the National Register of Historic Places. The survey report in located in the confidential folder.

Dugout Canyon agrees to notify the Division and State Historical Preservation Office (SHPO) of previously unidentified cultural resources discovered in the course of operations. Dugout Canyon also agrees to have any such cultural resources evaluated in terms of NRHP eligibility criteria. Protection of eligible cultural resources will be in accordance with Division and SHPO requirements. Dugout Canyon will also instruct its employees that it is a violation of federal and state law to collect individual artifacts or to otherwise disturb cultural resources.

411.200 Previous Mining Activity

Dugout Canyon has no knowledge of previous removal of coal or other minerals in the well site areas.

412 Reclamation Plan

412.100 Postming Land-Use Plan

All uses of the land prior to the wells construction/operation and the capacity of the land to support prior alternate uses will remain available throughout the life of the sites.

Dugout Canyon intends the postmining land use to be livestock and wildlife grazing and other uses as dictated by the land owner (hunting, roads, corrals, stock ponds, etc.). Final reclamation activities will be completed in a manner to provide the lands able to parallel the premining land use.

412.200 Land Owner or Surface Manager Comments

Milton & Ardith Thayn Trust is the landowner. Canyon Fuel Company, LLC has a surface land owner agreement with the Thayne Trust for the drilling of degassification holes (Attachment 4-2). Prior to drilling the landowner will be contacted and the requirements related to drilling as outlined in the surface land owner agreement will be met. A copy of the letter will be included in Attachment 4-2.

413 Performance Standards

413.100 Postmining Land Use

Postmining land uses are discussed in Section 412.100. The postmining lands will be reclaimed in a timely manner and capable of supporting such uses (see Chapters 2, 3, 5, and 7).

413.200 Determining Premining Uses of Land

Refer to Section 411.100.

413.300 Criteria for Alternative Postming Land Uses

No alternative postmining land uses have been planned.

414 Alternative Land Use

No alternative postmining land uses have been planned.

420 AIR QUALITY

421 Air Quality Standards

Dugout Canyon activities will be conducted in compliance with the requirements of the Federal Clean Air Act and the Utah Air Conservation Rules.

422 Compliance Efforts

See Fugitive Dust Control Plan, Section 424.

423 Monitoring Program

Refer to the same section in the approved M&RP.

424 Fugitive Dust Control Plan

Operational areas that are used by mobile equipment will be water sprayed to control fugitive dust. The application of water will be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition unless it is below freezing.

425 Additional Division Requirements

Refer to the same section of the approved M&RP.

CHAPTER 5

ENGINEERING

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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 degassification well sites. The activities associated with the construction and reclamation of the well sites have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

511 General Requirements

The permit application includes descriptions of construction, maintenance, and reclamation operations of the proposed well sites with maps and plans. Potential environmental impact as well as methods and calculations utilized to achieve compliance with the design criteria are also presented.

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 persons were assisted by experts in the fields of hydrology, geology, biology, etc.

512.100 Cross Sections and Maps

Cross sections for the degassification well pads are shown on Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24 and typical road cross sections are shown on Figures 5-13 and 5-14. Cross sections for the degassification well pads G-8, G-9, G-10, G-11 thru G-19, G-22, G-25, G-26 and G-31 are shown on figures located in Attachment 5-1.

512.200 Plans and Engineering Designs

Excess Spoil - No excess spoil will be generated from the well sites.

Durable Rock Fills - No durable rock fills will exist at the well sites.

Coal Mine Waste - No coal mine waste will exist at the well sites.

Impoundments - Refer to Section 733.200 of this submittal.

Primary Roads - Short sections of road are required to access well sites G-2, G-5, G-16 and G-22. The G-2 and G-5 road segments are within the footprint of the drill pad and therefore are included within the pads disturbed area boundary. Refer to Attachment 5-4, Plate 4 for the road system accessing the degas well sites. Well sites G-1 and G-8 (not drilled), G-3 thru G-15, and G-19 are on existing roads, no primary access roads will be constructed. Refer to Section 527.200 for additional information.

Variance from Approximate Original Contour - No variance from approximate original contour is required for the well sites.

513 Compliance with MSHA Regulations and MSHA Approval

513.100 Coal Processing Waste Dams and Embankments

No coal processing waste dams and embankments will exist at the well sites.

513.200 Impoundments and Sedimentation Ponds

Refer to Section 733.200 of this submittal.

513.300 Underground Development Waste, Coal Processing Waste, and Excess Spoil

No underground waste, coal processing waste, and excess spoil will exist at the well sites.

513.400 Refuse Piles

No refuse piles will exist at the well sites.

513.500 Underground Openings to the Surface

The well will be equipped with a valve that will be closed and locked when not in use. A typical well head is shown in Figure 5-16.

513.600 Discharge to Underground Mine

No discharge to the underground mine will occur at the well sites.

513.700 Surface Coal Mining and Reclamation Activities

No surface coal mining, or reclamation activities associated with surface coal mining will occur at the well sites.

513.800 Coal Mine Waste Fire

No coal waste will be developed, therefore, no coal waste fires will occur at the well sites.

514 Inspection

514.100 Excess Spoil

No excess spoil will be stored at the well sites.

514.200 Refuse Piles

No refuse piles will exist at the well sites.

514.300 Impoundments

Refer to Section 733.200 of this submittal.

515 Reporting and Emergency Procedures

515.100 Slides

Refer to Section 515.100 in the approved M&RP.

515.200 Impoundments Hazards

No impoundments will exist at the well sites.

515.300 Temporary Cessation of Operations

If temporary cessation of the mining operations does occur, the wells will remain open. Once liberation of the methane gas is completed, the wells will be sealed as discussed in Section 542.700 of this submittal.

520 OPERATION PLAN

521 General

See Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-19, G-22, G-25, G-26 and G-31) for the contour map showing pre-disturbance and drilling phase contours. These figures also show the disturbed area boundary and the new access road contours. Figures 5-3, 5-7, 5-11, 5-19, 5-22, 5-25, 5-29 and Attachment 5-1 (G-8 thru G-19, G-22, G-25, G-26 and G-31) show the layout of the well sites during the drilling phase. Figures 5-4, 5-8, 5-12 show the layout of the well sites during the operational phase and the area to be reclaimed at the completion of drilling. Cross sections for each site can be found on Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24, 5-28 and Attachment 5-1 (G-8 thru G-19, G-22, G-25, G-26 and G-31). Attachment 5-1 contains figures showing the road to be constructed to access drill pad G-22, as well as the G-22 drill pad. Cross-sections and profile of the road to degas pad G-22 are located in Attachment 5-1(Figures 2A through 2-E) .

521.100 Cross Sections and Maps

Existing Surface and Subsurface Facilities Features - No buildings are located on or within 1,000 feet of any of the well sites.

Landowner, Right-of-Entry, and Public Interest - The land which the wells will be drilled on is owned by the Milton and Ardith Thayn Trust. Canyon Fuels, LLC has reached an agreement with

the Thayn trustees to allow access for the construction and drilling of the wells (see Attachment 4-2).

Mining Sequence and Planned Subsidence - Refer to Section 525. Mining sequence maps showing the location of drilled degas wells are submitted to the BLM and UDOGM as part of their annual reports. A drawing representing the drill holes previously permitted for drilling and those currently proposed for drilling in 2007 are shown on a drawing included in Attachment 5-4. The drawing shows the pad locations not the location where the drill hole will be completed. Drill holes from the G-9 pad were or are being drilled to release gas from the Gil-5 and Gil-6 panels. Drill holes from the G-10, G-11, G-12, and G-13 pads were drilled to release gas from the Gil-5 panel. Drill holes from the G-15, G-18, G-19, and G-31 pads will be drilled to release gas from the Gil-6 panel.

Drill hole(s) from the G-22 pad will be drilled to release gas from the Gil-8 panel. Gil-? panel will have degas wells G-25 and G-26 drilled into the panel to release gas.

Land Surface Configuration - Surface contours of undisturbed well sites are included in Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-19, G-22 (including access road), G-25, G-26 and G-31).

Surface Facilities - No permanent surface facilities will exist at the well sites.

Degas Well Site Road System - Refer to Attachment 5-4, Plate 4 for the road system accessing the degas well sites.

521.200 Signs and Markers

Mine and Permit Identification Signs - A mine and permit identification sign will be displayed at each well site. This sign will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until after the release of all bonds for the well site areas. The sign will contain the following information:

- Mine name,
- Company name,
- Company address and telephone number
- MSHA identification number, and
- Permanent program permit identification number

Perimeter Markers - The perimeter of all areas affected will be clearly marked before beginning mining activities. The markers will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until after the release of all bonds for the permit area.

Buffer Zone Markers - Stream buffer zone markers will not be required at the G-2 thru G-10, G-13, G-14, G-16, G-17, G-22 G-25, and G-26 well sites. Stream buffer zone markers will be placed at G-11, G-12 , G-15, G-19 and on the AMV road where required by regulation.

Topsoil Markers - Markers will be placed on all topsoil stockpiles. These markers will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until topsoil is redistributed on the well sites.

Construction Markers - Not applicable.

Hazard Signs - Signs will be place at the degas wells with open degas holes, declaring danger, no smoking, etc.

522 Coal Recovery

No coal recovery will be performed at the well sites. The operator has been contact by the BLM, in reference to changes in Operator's R2P2 associated with Federal Regulation 43 CFR Chapter 11, Subpart 3484. Degas wells G-11, G-12, G-18, G-19, G-22 (including access road) G-25, G-26 and G-31 are on the SITLA lease and not on a federal lease, therefore changes in the R2P2 are not required.

523 Mining Methods

No mining will be performed at the well sites.

524 Blasting and Explosives

No explosives are to be used at the well sites.

525 Subsidence

No subsidence will occur at the well sites, as a result of drilling and development of the degassification well sites. Subsidence could occur at the well site because of underground mining see Section 525 of the approved M&RP.

526 Mine Facilities

526.100 Mine Structures and Facilities

No buildings exist or are proposed at the well sites; therefore, no existing building will be used in connection with or to facilitate this proposed coal mining and reclamation plan.

526.200 Utility Installation and Support Facilities

No utilities are to be installed at the well sites. A portable methane exhaust unit will be temporarily installed to draw methane to the surface from the mined panel. The exhaust blower will be started by using propane from portable tanks. Once started and running, the unit will be powered by burning the extracted methane gas. The level of extracted methane required to operate the exhaust blower is greater than 30%. Excess methane will be vented to the atmosphere. The blower is approximately 12-feet long by 6-feet wide and about 10-feet tall. It is not known how long the degassification of the longwall panel will take.

527 Transportation Facilities

527.100 Road Classification

Well sites will be developed near existing private roads as shown on Figures 1-1, 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-17 and G-19). The new short segments of access roads will be classified as primary roads and will be maintained by the permittee (see Figure 5-14). The AMV access road will be classified as an ancillary road per a discussion with Wayne Western during a meeting at the UDOGM offices on April 16, 2007. The road is improving a trail used for hunting, cattle and for logging. There are small slash piles along segments of the trail.

The access road to the G-22 pad will be classified as an ancillary road.

527.200 Description of Transportation Facilities

The well sites were chosen close to existing roads in the area to limit surface disturbance. The existing roads were constructed and are maintained by the land owner. The existing roads are approximately 20 feet wide and are shown on Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and

Attachment 5-1 (G-8 thru G-17, and G-19). See Figure 5-13 for a typical cross section of the existing roads.

The access road to the G-16 well site follows an existing road which has been reclaimed. The incised road is approximately 500 feet long, 15 to 20 feet wide and will be constructed on compacted subsoil. Topsoil will be stripped from the road alignment and either wind rowed adjacent to the road or stored with the topsoil stripped from the pad area. The access road will have a maximum grade of 10% and an average grade of 5%. The road will be constructed as shown on Figure 5-14 in the approved methane degassification amendment. As needed, water bars will be used to direct flow off the road and either silt fences or strawbales will be used to treat runoff . Refer to Chapter 5, Attachment 5-1 for drawings of well site. The access road to G-16 is also discussed in Chapter 7, Section 732.400.

The AMV access road will be classified as an ancillary road per a discussion with Wayne Western during a meeting at the UDOGM offices on April 16, 2007. The road is improving a trail used for hunting, cattle and for logging. A drawing showing the alignment of the road can be found in Attachment 5-4, as Plate 1. The drawing outlines the disturbed area and shows the road center line, culvert locations, turnouts and topsoil stockpile locations. Topsoil will be removed from the road and stockpiled along the road as shown on Plate 1. The cut and fill volumes for the road have been determined to be close, making it unlikely that subsoil will need to be stored. However, should it be necessary to store subsoil a pile will be created on one of the proposed turnouts. The subsoil pile will be bermed, pocked, gouged and seeded. The topsoil piles will be treated as described in Chapters 2 and 3 of the Methane Degassification Amendment.

A typical road cross section for the AMV road and the G-22 access road is found in Attachment 5-4 as Figure 1. The road will be at a minimum 12 feet wide, with two addition feet of the road width being added as a berm and two feet being used as a ditch, making the road approximately 16 feet wide. Additional descriptive information for the road is located in Attachment 5-4, including cross-sections of the road on Plates 2 and 3 within the attachment.

The steepness of access road cut slopes on the AMV road and access road to G-22 will depend on the stability of the exposed subsurface material. Cuts into competent material such as bedrock will be sloped at angles of approximately 0.5H:1V (63.4 degrees). Cut into unconsolidated material such as soils will be sloped at angles of approximately 1H:1V (45 degrees). The steepness of these slopes is justified by the presence of several near-vertical bedrock outcrops and naturally steep (approximately 1H:1V) colluvial slopes along road cuts in the vicinity of the proposed access road. Furthermore, the nearby cut slopes along access roads have maintained such slopes for several years. Cut slopes will be maintained along the length of the proposed access road. Area determined to be unstable will be regraded to a stable configuration.

When necessary during the normal use of the AMV road and access road to G-22, it will be graded, berms will be repaired, culverts inlets/outlets and ditches will be cleaned. The materials excavated during road maintenance will be stockpiled to be used for either repair or during reclamation. The AMV road and G-22 access road are not likely to be used during winter due to the access from below the road being impassable, therefore snow removal and storage has not been discussed. Damage to the AMV access road and G-22 access road will be repaired as soon as practical following a catastrophic event. The Division will be notified of a catastrophic event involving the failure of the AMV road, G-22 access road and/or drill pads.

On the AMV road silt fences were placed in the ditch upstream of the approach to the culverts to treat road runoff during construction and removed following the completion of road construction. Silt fences were placed at the toe of fill slopes prior to road construction to reduce the amount of loose soil material and sediment laden runoff from entering the drainage. Outslopes and ditches associated with the road will be seeded during operations to encourage the establishment of vegetation and erosion control.

The access road to drill pad G-22 is approximately 0.21 miles long, constructed along the contour of the hillside. The road will begin at the edge of permitted drill pad G-16 and proceed west to drill pad G-22. A typical road cross section is found in Attachment 5-4 as Figure 1. The road will be at a minimum 12 feet wide, with two addition feet of the road width being added as a berm and two

feet being used as a ditch, making the road approximately 16 feet wide. Outslopes associated with the road will be seeded during operations to encourage the establishment of vegetation and erosion control.

528 Handling and Disposal of Coal, Excess Spoil, and Coal Mine Waste

No disposal of coal, excess spoil, and coal mine waste will occur at the well sites.

529 Management of Mine Openings

The perimeter of the sites, including the topsoil stockpiles will be fenced with gates on the access roads. The well casing will have a valve that is closed and locked. The valve will also prevent access by animals or other material. Mine openings will be monitored in accordance with Federal and State Regulations.

During the life of the methane wells, the sites will be inspected as needed by mine personnel to verify the continued operation of the pumping equipment and general site conditions. Motorized vehicles to access the methane wells may include trucks, four-wheelers, a snow cat, snowmobiles and etc.

530 OPERATIONAL DESIGN CRITERIA AND PLANS

531 General

This section contains the general plans for the construction of sediment controls and general construction and maintenance of the well sites.

The decision to construct each well will be based on the amount of methane encountered during mining. If small amounts of methane are encountered and the mine's ventilation system can dilute the methane, no well will be drilled. The proposed well site locations are shown on Figure 1-1.

The topography above the Dugout Canyon Mine severely limits the selection of methane drainage drill sites (degas wells). Various other factors also affect the drill site locations. These include proximity to the mining area, existing access verses new access, site slope, meeting reclamation success standards, etc. Sites with exiting access are given preference over sites without, where possible sites are located along existing roads and at other pre-disturbed areas. In addition, drill methods are often modified (using directional drilling methods vs. conventional vertical drilling methods) to allow drilling along existing access and to reduce environmental impacts. Directional drilling methods allow the surface site to be located as described yet allow the bottom of the hole to be completed in the required mining area.

532 Sediment Control

Sediment control measures for the well sites are described in Sections 732 and 742 of this submittal. Runoff control structures at the well sites have been designed to convey runoff in a non-erosive manner. Sediment yields in the well permit area are minimized by:

- Disturbing the smallest practicable area during the construction of the well site and
- Contemporaneously reclaiming areas suitable for such reclamation.

The structures to be used for sediment/runoff control at the degas well sites and associated access roads (constructed by the permittee) are berms, silt fences and/or straw bale dikes. Sediment controls will be installed prior to construction, except as noted and will remain in place during the operational and reclamation phases of the degas pads and associated constructed roads. Sediment controls used to treat degas pad runoff during the operational phase and as shown on pad construction drawings in Attachment 5-1, Figures 5-1 thru 5-25 and Figures 5-27 thru 5-29 will be constructed following the removal of topsoil. Removal of the structures during reclamation is addressed in Section 761.

Structure Inspection

The sediment control measures installed by the permittee will be periodically inspected at degas drill sites and associated access roads (constructed by the permittee). The inspections will include but not be limited to inspections following major precipitation events. Based upon the inspections, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

In addition, Division staff qualified in the construction and maintenance of structures commits to bi-annual inspections, one inspection in the spring/early summer and one in the fall. Based upon the inspections and in a timely fashion, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

The runoff control measures for the AMV access road are discussed in Attachment 5-4 , Attachment 7-1, Sections 732.400 and 742. The runoff control measure for the G-22 access road are shown on figure in Attachment 5-1, Attachment 7-1, Sections 732.400 and 742.

Silt fences will be placed at the toe of fill slopes of the G-22 access road prior to construction and remain in place to contain loose soils and reduce sediment laden runoff until designated for removal as defined in Section 761.

533 Impoundments

No impoundments will exist at the well sites or on the AMV road, or G-22 access road.

534 Roads

Refer to Section 527 and 532 of this submittal.

535 Spoil

No spoil will be generated at the well sites.

536 Coal Mine Waste

No coal mine waste will be stored at the well sites.

537 Regraded Slopes

537.100 Division Approval

No mining or reclamation activities will be conducted in the permit area that requires approval of the Division for alternative specifications or for steep cut slopes.

537.200 Regrading of Settled and Revegetated Fills

Upon completion of the well site, the areas not required for the exhaust blower will be regraded to approximate original contour. Because of the nature of the well site, settling is not anticipated. However, if settlement does occur, these areas will be regraded.

540 RECLAMATION PLAN

541 General

541.100 Commitment

Upon the permanent cessation of methane venting, Dugout Canyon Mine will seal the wells and permanently reclaim all affected areas in accordance with the R645 regulations and this reclamation plan.

541.200 Surface Coal Mining and Reclamation Activities

Not applicable.

541.300 Underground Coal Mining and Reclamation Activities

Upon completion of the methane venting activities the wells will be reclaimed.

541.400 Environmental Protection Performance Standards

The plan presented is designed to meet the requirements of R645-301 and the environmental protection performance standards of the State Program.

542 Narratives, Maps, and Plans

542.100 Reclamation Timetable

A timetable for the completion of each major step in the reclamation plan is presented in Figure 5-15 (G-2 and G-5) and 5-26 (G-3, G-4, G-6 thru G-19, G-22, G-22 Access Road, G-25, G-26, G-31 and the AMV access road). Per Task ID #2408, "the Division requires notification and a reasonably specific time to initiate the reclamation activities associated with degassification well sites." In addition to the two figures referenced above, information pertaining to reclamation timing for methane degas wells is provided in Attachment 5-2 of this amendment.

542.200 Plan for Backfilling, Soil Stabilization, Compacting, and Grading

Following completion of the venting activities, the well site will be prepared for contouring and soil distribution. Details regarding topsoil placement and revegetation are provided in Section 242 and Section 353, respectively.

Sedimentation Pond Removal and Interim Sediment Control - See Section 542.500 of this submittal.

542.300 Final Surface Configuration Maps and Cross Sections

The sites will be regraded to the approximate original contour, the contours representing the pre-disturbance topography also represent the reclamation topography. Refer to Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24, 5-28 and Attachment 5-1 (G-8 thru G-19, G-22, G-22 access road, G-25, G-26 and G-31) to see cross sections representing the final surface configuration. Refer to Attachment 5-4, Plates 1 thru 3 for the surface configuration of the road and cross sections showing pre-mining, operational and post-mining contours.

542.400 Removal of Temporary Structures

The well sites will not have surface structures.

542.500 Removal of Sedimentation Pond

No sediment pond will be constructed at the well sites.

542.600 Roads

The roads which existed prior to the drilling program will be retained after reclamation. The access roads established during the drilling program will be reclaimed after methane extraction has been completed. See Section 242 for additional detail concerning the reclamation plan.

The road to well site G-16 is pre-existing however it has been reclaimed, the road to access well sites G-13, G-14, G-15, G-17, and G-19 are existing roads. Subsoil being cut in order to construction the pad for well G-15 will be placed on the existing road, causing it to be elevated. Refer to Section 527.200 and Attachment 5-4 for a description of the AMV access road.

Once the degassification is completed at wells G-18 and G-31 the AMV road will be reclaimed. To begin, the segment of the road will be reclaimed which joins pad G-18 to G-31, then reclamation of the road will continue on downhill until the road rejoins the existing road connecting the Pace Canyon road and degas pad G-19. The area of the road will be returned to approximate original contour, pocked and gouged and seeded (Section 350).

Once the degassification is completed at well G-22 and the pad has been reclaimed the access road will be reclaimed. To begin, the segment of the road nearest the pad will be reclaimed, then reclamation of the road will continue on towards the G-16 well pad until completed. The area of the road to drill pad G-22 will be returned to approximate original contour, pocked and gouged and seeded (Section 350). Pre-mining, post-mining and operational contours are shown on Figures 1, 2, and 2A through 2E in Attachment 5-1.

542.700 Final Abandonment of Mine Openings and Disposal Areas

Degas drill holes G-9 thru G-19, G-22, G-25, G-26 and G-31 will be sealed in accordance with Federal Regulations 43 CFR Ch. 11, Subpart 3484, (3) per a decision by the BLM and UDOGM.

The casings on degas well sites G-2 thru G-7 will be plugged at the bottom to hold concrete. A lean concrete mixture will be poured into the casing until the concrete is within five (5) feet of the surface. At that time the casing will be cut off at ground level and the rest of the casing will be filled with lean concrete. The concrete will be allowed to harden before final reclamation is completed.

A copy of 43 CFR Ch. 11, Subpart 3484, (3) and a discussion of how methane is removed from mines is contained in Attachment 5-2.

542.800 Estimated Cost of Reclamation

Refer to the Appendix 5-6 of the existing M&RP. It is anticipated that the cost of reclamation of the well sites, the G-22 access road and AMV road are adequately covered by the Dugout Canyon Reclamation Bond, refer to Chapter 8 for additional detail.

550 RECLAMATION DESIGN CRITERIA AND PLANS

551 Casing and Sealing of Underground Openings

Permanent sealing is described in Section 542.700.

552 Permanent Features

552.100 Small Depressions

No permanent small depressions will be created as part of the well site, G-22 access road or AMV road construction and reclamation.

552.200 Permanent Impoundments

See Section 515.200 of this submittal.

553 Backfilling and Grading

553.100 Disturbed Area Backfilling and Grading

Approximate Original Contour - The well sites, G-22 access road and AMV road will be returned to their approximate original contour after reclamation is completed.

Erosion and Water Pollution - Sediment controls will consist of gouging the surface to create depressions and mounds which store and impede the movement of water. As vegetation becomes established on the reclaimed surface, erosion potential will be further minimized.

Post-Mining Land Use - The disturbed area will be reclaimed in a manner that supports the approved post-mining land use. Refer to Sections 411 and 412 for additional detail.

553.200 Spoil and Waste

Spoil - No spoil will be generated within the well sites.

Coal Processing Waste - No coal processing waste will be generated within the well sites.

553.250 Refuse Piles

No refuse piles will exist at the well sites.

553.300 Exposed Coal Seams, Acid and Toxic Forming Materials and Combustible Materials

No coal seams will be left exposed at the well sites. All wells will be sealed according to Federal and State regulations.

553.400 Cut and Fill Terraces

No cut and fill terraces will be constructed at the well sites, G-22 access road or on AMV road.

553.500 Highwall From Previously Mined Areas

No highwalls exist or will be built at the well sites, G-22 access road or on AMV road.

553.600 Previously Mined Area

No previously mined areas exist at the well sites, G-22 access road or on AMV road.

553.700 Backfilling and Grading - Thin Overburden

No surface mining and reclamation activities involving thin overburden will occur at the well sites, G-22 access road or on AMV road.

553.800 Backfilling and Grading - Thick Overburden

No surface mining and reclamation activities involving thick overburden will occur at the well sites, G-22 access road or on AMV road.

553.900 Regrading of Settled and Revegetated Rills

If settlement or rills occur at the well sites, on the AMV road or the G-22 access road, they will be regraded and revegetatived. Refer to Section 244.300.

560 PERFORMANCE STANDARDS

Dugout Canyon Mine well sites will be conducted in accordance with the approved permit and the requirements of R645-301-510 through R645-301-553.

FIGURE 5-26

Reclamation Schedule - Wells G-3, G-4, G-6 thru G-19, G-22, G-22 Access Road G-25, G-26 and G-31

Task	Weeks to Complete from Start of Reclamation Activities		
	1	2	3
Plug Well			
Regrade Site to Original Contour			
Rip Subsoil			
Place Topsoil and Roughen			
Seed and Mulch			

The schedule assumes that weather conditions are conducive. Schedule is for each individual well not wells collectively. The first task does not apply to the reclamation of the access road to well site G-22, the road will follow the schedule for completion of tasks 2 thru 5. If necessary the timing may be extended.

Reclamation Schedule - AMV Access Road

Task	Weeks to Complete from Start of Reclamation Activities		
	1	2	3
Regrade Road to Original Contour			
Rip Subsoil			
Place Topsoil and Roughen			
Seed and Mulch			
Move to Next Road Segment, Repeat First Four Tasks.			

The schedule assumes that weather conditions are conducive. Schedule is for individual segments of the road not the entire road. The road will be broken up into 3 to 4 segments, thus the reclamation will take from six to eight weeks. If necessary the timing may be extended.

ATTACHMENT 5-1

Degas Wells G-8 thru G-19, G-22 (including access road), G-25, G-26 and G-31

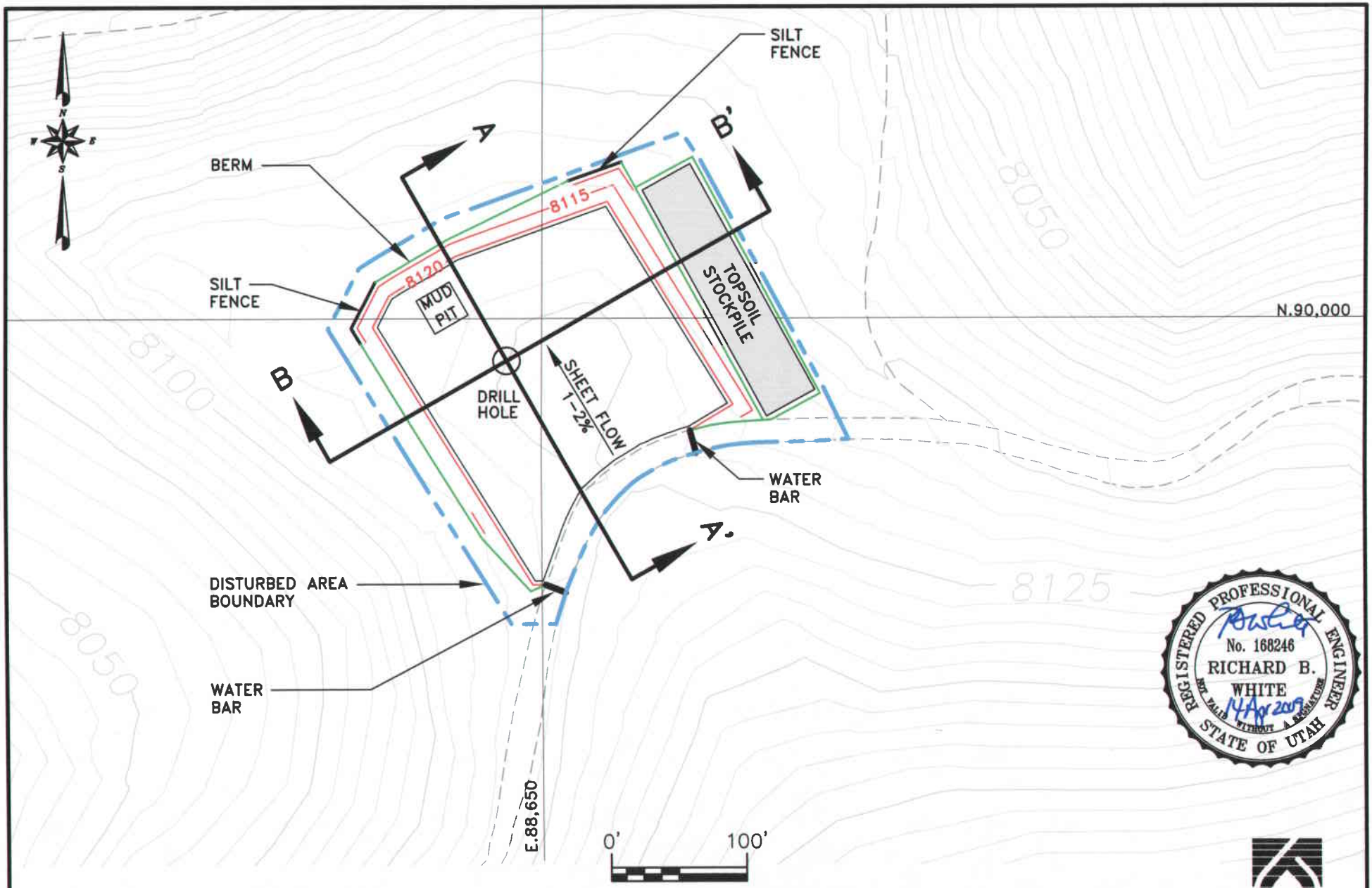

FIGURE 1. CONTOUR MAP FOR G-25

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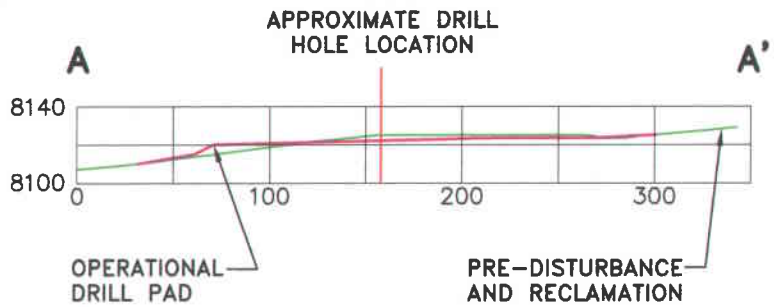

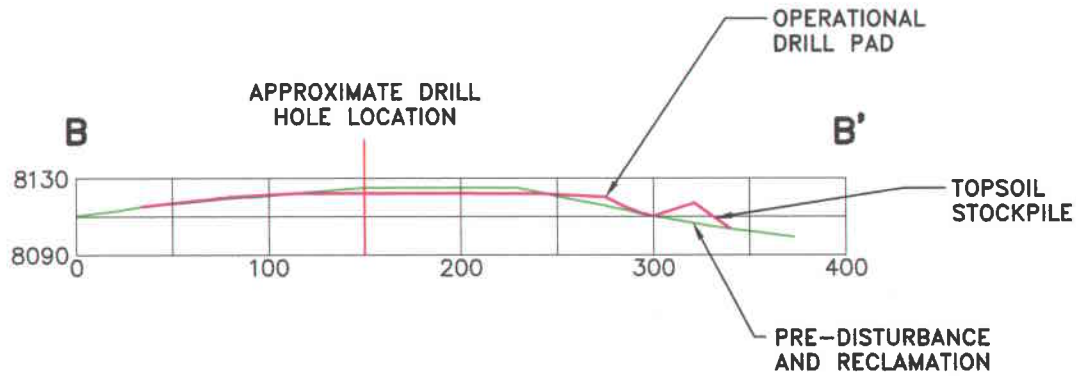

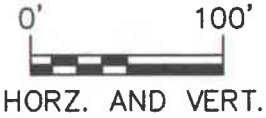

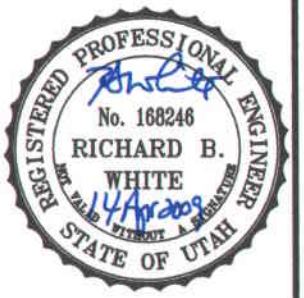

FIGURE 2. TYPICAL CROSS-SECTIONS FOR G-25

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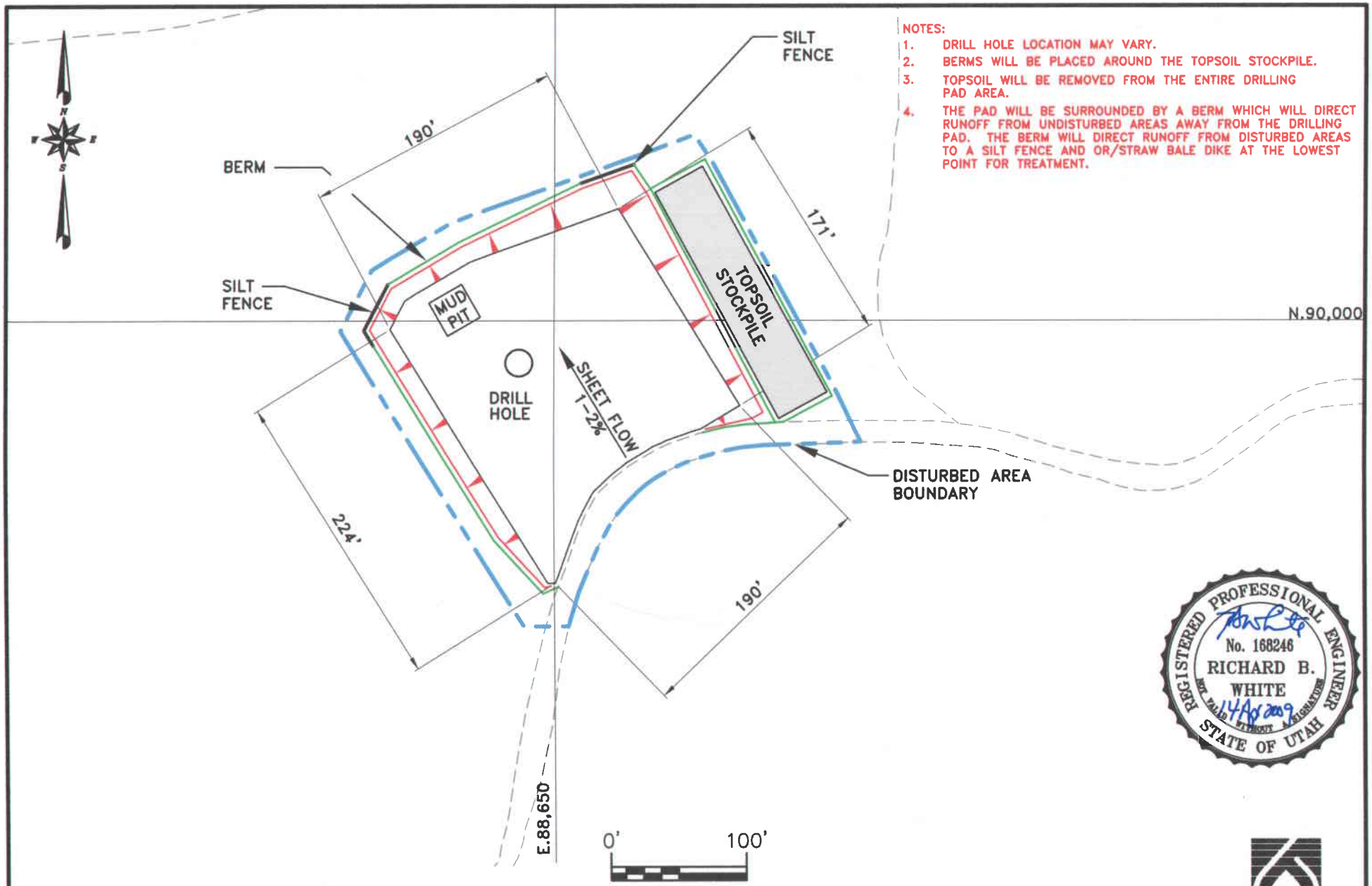
G:\UC1098\03 Access Road\G-25\G-25- FIG-2.dwg, 4/14/2009 10:44:00 AM



NOTES:

1. DRILL HOLE LOCATION MAY VARY.
2. BERMS WILL BE PLACED AROUND THE TOPSOIL STOCKPILE.
3. TOPSOIL WILL BE REMOVED FROM THE ENTIRE DRILLING PAD AREA.
4. THE PAD WILL BE SURROUNDED BY A BERM WHICH WILL DIRECT RUNOFF FROM UNDISTURBED AREAS AWAY FROM THE DRILLING PAD. THE BERM WILL DIRECT RUNOFF FROM DISTURBED AREAS TO A SILT FENCE AND OR/STRAW BALE DIKE AT THE LOWEST POINT FOR TREATMENT.

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14 Apr 2009
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FIGURE 3. APPROXIMATE DRILLING LOCATION FOR G-25

G:\UC1098\03 Access Road\G-25\G-25-FIG-3.dwg, 4/14/2009 10:42:05 AM

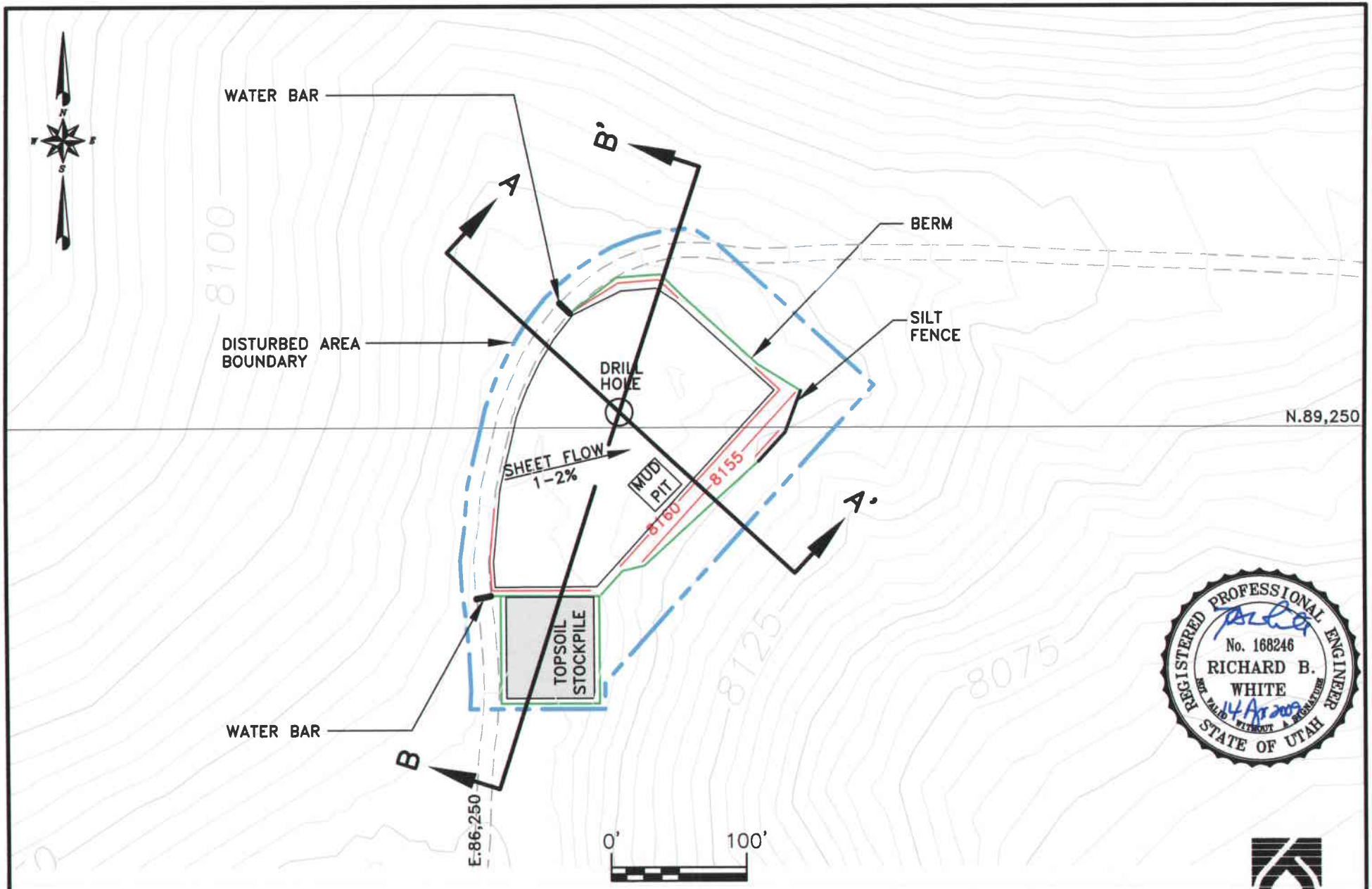
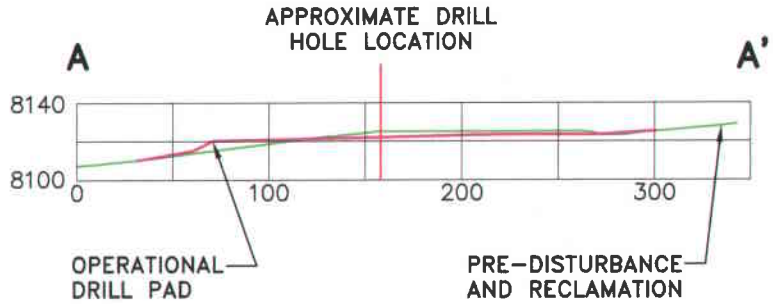
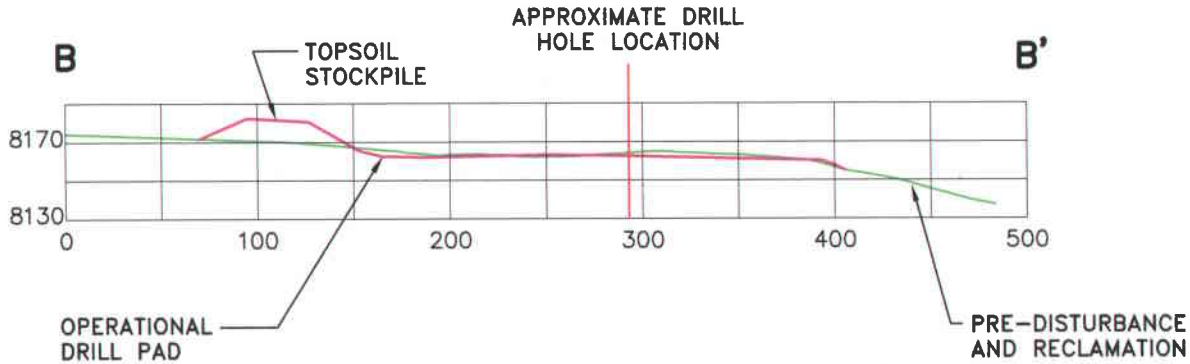
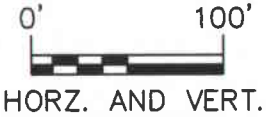


FIGURE 1. CONTOUR MAP FOR G-26

G:\UC1098\03 Access Road\G-26\G-26-FIG1.dwg, 4/14/2009 9:04:31 AM







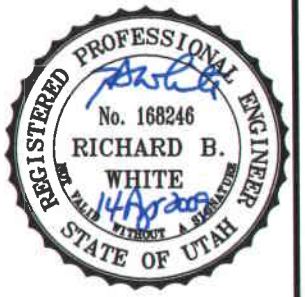


FIGURE 2. TYPICAL CROSS-SECTIONS FOR G-26

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G:\UC109B\03 Access Road\G-26\G-26- FIG2.dwg, 4/14/2009 9:39:20 AM

NOTES:

1. DRILL HOLE LOCATION MAY VARY.
2. BERMS WILL BE PLACED AROUND THE TOPSOIL STOCKPILE.
3. TOPSOIL WILL BE REMOVED FROM THE ENTIRE DRILLING PAD AREA.
4. THE PAD WILL BE SURROUNDED BY A BERM WHICH WILL DIRECT RUNOFF FROM UNDISTURBED AREAS AWAY FROM THE DRILLING PAD. THE BERM WILL DIRECT RUNOFF FROM DISTURBED AREAS TO A SILT FENCE AND OR/STRAW BALE DIKE AT THE LOWEST POINT FOR TREATMENT.

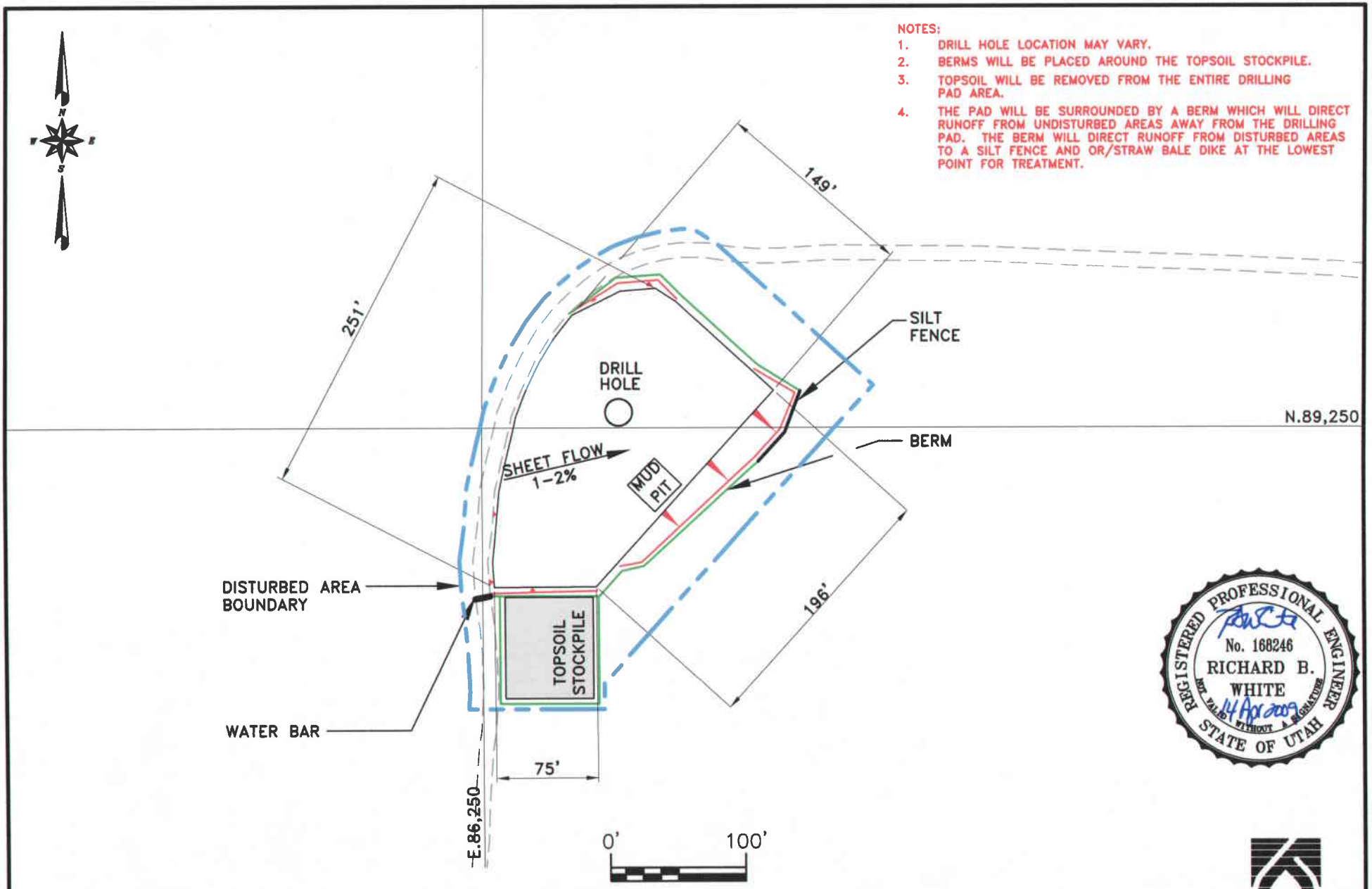

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FIGURE 3. APPROXIMATE DRILLING LOCATION FOR G-26

G:\UC1098\03 Access Road\G-26\G-26-FIG3.DWG, 4/14/2009 9:35:37 AM

Well No.	Year Constructed		Year Plugged		Contemporaneous Reclamation		Final Reclamation	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
G-2		2004			~~2007~~	2008	2009	
G-3		2004		2005		2005		2006
G-4		2004		2005				2005
G-5		2004			~~2007~~	2008	2009	
G-6		2004		2005				2007
G-7		2005		2008 (A)	2009		2009	
G-9		2005			2008			
G-10		2006			2007			
G-11		2006		2008				
G-12		2006			2007			
G-13		2006		2008				
G-14		2006			2008			
G-15	N/A				2008			
G-16		2008						
G-17	N/A							
G-18		2007			2009			
G-19		2007			2008			
G-22		2008						
G-25	2009							
G-26	2009							
G-31	2007				2009			

Dates are approximate, all events are subject to availability of contractors, weather, mining needs, etc.

Although permitted, wells G-1 and G-8 were never drilled/constructed.

CHAPTER 7

HYDROLOGY

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Attachment 7-1 Hydrology Calculations

710 INTRODUCTION

711 General Requirements

This chapter presents a description of the following:

- Proposed operations and the potential impacts to the hydrologic balance;
- Methods of compliance with design criteria and the calculations utilized to show compliance; and
- Applicable hydrologic performance standards.

712 Certification

All maps, plans, and cross sections presented in this chapter have been certified by a qualified, registered professional engineer.

713 Inspection

Inspections are not required since no permanent impoundments will exist at the well sites.

720 ENVIRONMENTAL DESCRIPTION

721 General Requirements

The application will include a description of the existing premining hydrologic resources with the proposed permit and adjacent areas that may be affected or impacted by the proposed coal mining and reclamation operations.

722 Cross Sections and Maps

722.100 Location and Extent of Subsurface Water

Figure 7-1 in the approved M&RP shows a generalized hydrostratigraphic cross section of the permit and adjacent areas including the well sites. Section 724.100 of the approved M&RP provides baseline groundwater conditions.

722.200 Location of Surface Water Bodies

Plate 7-2 in the approved M&RP shows the locations of surface-water bodies and existing or pending water rights. Section 724.200 of the approved M&RP provides baseline surface water conditions.

722.300 Locations of Monitoring Stations

Plate 7-1 in the approved M&RP shows the location of surface water and groundwater monitoring stations.

722.400 Locations and Depth of Water Wells

Refer to Section 722.400 and Plate 7-1 of the approved M&RP for information pertaining to the groundwater monitoring wells. Refer to Appendix 7-9 of approved M&RP for details pertaining to the Gilson well.

722.500 Surface Topography

Surface topography features at the well sites and adjacent areas are shown on Figures 1-1, 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and in Attachment 5-1 for Degas Wells G-8 thru G-19, G-22 access road, G-25, G-26, and G-31. Refer to Plate1-4 in the M&RP for well locations.

The surface topography for the AMV access road is shown on Plate 1 included in Attachment 5-4.

723 Sampling and Analysis

Refer to Section 723 of the approved M&RP.

724 Baseline Information

Refer to Section 724 of the approved M&RP.

G-25 and G-26

The G-25 pad is situated on a mountain side-slope structural bench immediately adjacent to an existing road. Slopes are 10 percent down hill to the north, west and south; and 10 to 15 percent uphill to the east. Ephemeral drainages exist both to the northeast and southwest.

An access road traverses the G-26 pad on the north edge and then turns south across the west portion of the site. The site is located on a gently sloping structural bench, with the perimeter sloping steeply on the east, north and west. The severely eroded east slope defines the top of a small ephemeral drainage.

There are no known groundwater sources within or immediately adjacent to the G-25 and G-26 pads. Through the baseline studies, seep and stream studies and periodic observations, there is

no evidence to suggest that the drainages in the immediate area of G-25 and G-26 are intermittent or perennial.

G-22 Access Road and Pad

Ephemeral drainages parallel the G-22 degas pad on the northeast and southwest sides of the pad. The drainage on the southwest will be crossed by the access road being constructed to the G-22 pad. The pad is located near the top of the ephemeral drainages. To further define the drainages as ephemeral, the watersheds adjacent to the road and pad are small and there is no riparian vegetation in the drainages.

Seep and spring studies of the area as discussed in Chapter 7 of the M&RP and locations are shown on Plate 7-1. Appendix 7-2, 7-3 and 7-7 contain data for the surface and groundwater located within the permit area, which includes the G-22 pad and access road. There are no known groundwater sources in the path of the road or in the immediate area of the G-22 road and drill pad. Through the baseline studies, seep and stream studies and periodic observations, no evidence of the drainages which parallel the G-22 pad or which cross the access road to the G-22 pad suggest that the drainages are intermittent or perennial.

724.100 Groundwater Information

Refer to Section 724.100 of the approved M&RP.

724.200 Surface Water Information

Refer to Section 724.200 of the approved M&RP.

724.300 Geologic Information

Geologic information related to the well sites and adjacent areas in presented in Chapter 6 of this submittal and in the approved M&RP.

724.400 Climatological Information

Climatological data are summarized in Appendix 4-1 behind the Air Quality Permit of the approved M&RP and RA Attachment 7-5 of the Refuse Pile Amendment.

724.500 Supplemental Information

Refer to Section 724.500 of the approved M&RP.

724.600 Survey of Renewable Resource Lands

Refer to Section 724.600 of the approved M&RP.

724.700 Alluvial Valley Floor Requirements

Information regarding the presence or absence of alluvial valley floors in the well sites and adjacent areas is presented in Chapter 9 of this submittal and the approved M&RP.

725 Baseline Cumulative Impact Area Information

The CHIA currently in place for the Dugout Canyon Mine covers the well sites. The hydrologic and geologic information required for the Division to develop a Cumulative Hydrologic Impact Assessment (CHIA) is presented in the approved M&RP.

726 Modeling

No groundwater or surface water modeling was conducted in support of this submittal.

727 Alternative Water Source Information

Not applicable.

728 Probable Hydrologic Consequences

This section addresses the probable hydrologic consequences of construction and reclamation operations at the well sites. Mitigation measures are discussed generally in this section and in detail in Section 730 of the approved M&RP.

728.100 Potential Impacts of Surface and Groundwater

Potential impacts of the well sites in this area on the quality and quantity of surface and groundwater flow may include contamination from materials associated with the drilling of the wells. Once installed, the wells are designed as an ambient vent of methane gas, having no affect on the surface or groundwater. The potential impact is addressed in Section 728.300 of this submittal and the approved M&RP.

728.200 Baseline Hydrologic and Geologic Information

Baseline geologic information is presented in Chapter 6 of the approved M&RP. Baseline hydrologic information is presented in Section 724.100 and 724.200 of the approved M&RP.

728.300 PHC Determination

Potential Impacts to the Hydrologic Balance - Potential impacts of the Dugout Canyon Mine on the hydrologic balance of the well sites and adjacent areas are addressed in the subsections of this

submittal and the approved M&RP. The PHC prepared by Mayo and Associates for the Dugout Canyon Mine is located in Appendix 7-3, Section 3 , of the approved M&RP. Refer to Chapter 3, Section 322.200 for information addressing water usage for degas well drilling, as well as mining. Little to no impacts to the Hydrologic Balance are anticipated since 1) the potential impacts are limited to the drilling and construction of the wells; 2) BTCA techniques for sediment control are implemented for the surface disturbance of the well pad; 3) hydrogeologic information from in-mine observations, Degas wells G-1 thorugh G-9, and PHC information included in the approved M&RP support that minimal groundwater is encountered in the geologic formations being drilled; and 4) any water encountered during drilling and construction of the well will need to be sealed for the well to function as an ambient vent of methane gas.

Acid and Toxic Forming Materials - No acid or toxic forming materials have been identified in the soils or strata of the Dugout Canyon Mine (Chapter 6, Section 623 of this submittal). Additional information is located in Appendix 6-2 of the approved M&RP.

Groundwater - When encountered during drilling groundwater aquifers will be sealed using drilling mud. At completion, the casing will be grouted and cement placed inside the well casing during reclamation. .

Once drilling is completed, the casing is grouted in the well hole, sealing aquifers to prevent groundwater migration, including groundwater migrating down the outside of the casing into the mine. Should water inflow greater than 15 gallon per minute be encountered during the drilling of the degas wells the depth and volume will be recorded and included in Attachment 7-1. No measurable inflows of water have been encountered during the drilling of degas wells G-1 thru G-9. Water was encountered while drilling degas wells G-18A and G-31A, but the inflows were not measurable.

The development and construction of degas wells does not have the potential to decrease creek flow or spring discharges, the wells are not designed to capture water, dewater aquifers or cause subsidence. Methane gas, not liquid (water) is pumped from the wells following construction.

Surface Water - Degas wells are not used to access water to be discharged to the surface. As mentioned above, no measurable water has been encountered during the drilling, construction and operation of degas wells G-1 thru G-9. Also, the well cannot function as a degas well if significant water is encountered, and will need to be abandoned.

Potential Hydrocarbon Contamination - Hydrocarbon products will not be stored at the well sites, however fuels, greases, and other oils may leak from equipment during drilling operations. Absorbent materials will be used for the collection of leaked fuels, greases, and other oils. The saturated absorbent materials will be disposed of at an appropriate landfill facility.

G-18, G-31 and AMV Access Road

728.300 The PHC Determination:

728.310 - The construction and operation of the G-18, G-31 well pads and associated access road is not anticipated to cause adverse impacts to the hydrologic balance. Several springs are located in the drainage in which the road begins. One small seep, SC-96, has been recorded a short distance down hill of a portion of the road near the center of Section 20, T13S R13E. However, this seep has not been observed flowing the past several year, which could be due to the dry climatic conditions the area has experienced. It should be understood that SC-96 is not a seep monitored on a quarter basis. It is unlikely the construction and operation of the road will impact the aquifer that has discharged at the seep since road construction will not require significant excavation or over the aquifer outcrop. Sediment control structures will be used to reduce the amount of suspended material that will leave that portion of the disturbed area of the road during runoff events that is directed to the small drainage where the seep is located. The remaining seeps and springs are located upstream of the road and near the canyon head. These groundwater discharge locations should not be impacted by road construction and operation since the aquifers feeding these discharges will either not be encountered during construction or minimal disturbance at the outcrops of the up-dip end of the aquifer will occur.

Sediment control structures will be used to reduce the likelihood of erosion and increased sediment loads greater than background to the ephemeral and intermittent drainage areas. Sediment controls have been designed to adequately address treatment of runoff from the steep hillsides and grades associated with the access road. The locations, designs, and descriptions of the sediment control structures to be implemented during road and pad construction, operation, and reclamation are contained in Attachments 5-4 and 7-1.

Examples of construction and operational sediment and erosion control on the road include building appropriately sized water bars or the canting of the road surface toward the uphill side of the road to divert runoff into the roadside ditch. When necessary the water bar outlets will be rip rapped with native rock. Native rock will be collected during the construction of the road to be used as rip rap. Culverts will be located at appropriate sites (Attachment 5-4, Plate 1) to direct flow from the ditch to drainages that would normally contain the area runoff. Where required appropriately sized rip-rap will be placed at the outlet of the culverts used to divert water into the existing ephemeral drainages.

According to calculations, culvert inlet velocities should be less then 5 fps, therefore no inlet protection is required. Silt fences were placed on the upstream end of the approach to the culverts to treat road runoff during construction and were removed following completion of the construction. Silt fences were placed at the toe of fill slopes during construction to reduce the amount of loose soil material and sediment laden runoff from entering the drainage. Outslopes and ditches associated with the road will be seeded during operations to encourage the establishment of vegetation and erosion control.

Erosion, runoff and sediment control at pads G-18 and G-31during construction, operation, and reclamation may include, but not necessarily be limited to, construction of berms around the disturbed areas and the use of silt fence to treat runoff.

Reclamation of the road and well pads is described in Sections 340 and 760. As part of the reclamation activities the reclaimed and resoiled surfaces will be deep gouged to reduce the length

of surface flow paths and trap runoff. The reclamation plan described in these sections have been designed to minimize erosion and runoff by encouraging timely revegetation of the disturbed areas. Silt fencing will be used as defined in the approved reclamation plan during reclamation activities to contain loose soils and reduce sediment laden runoff.

728.320 - Soil samples have been obtained from selected sites in the road and pad areas. Results of the soil analyses indicate the samples did not contain acid-forming or toxic-forming materials. Thus, the soils moved or exposed as a result of the construction of the road and pad will not result in the contamination of the surface or ground-water supplies. Refer to Section 231 and Attachment 2-1.

728.330 - The sediment control structures to be constructed as part of the access road and G-18 and G -31 well pads project should minimize the sediment yield from disturbed areas during runoff events. As described in Section 527 and above in Section 728.310, silt fencing will be used at the downhill toe of the slope of the road fill during road construction to capture loose soils and rock. This will prevent loose material from entering the channels.

As described in the preceding sections, acid forming materials will not be exposed or created as part of the construction, operation, or reclamation of the road and pad areas. Total suspended solids will be controlled through the use of sediment control structures. Dissolved solids within the runoff from the disturbed areas is not likely to noticeably increase above background levels since the disturbance is generally occurring within weathered soils and bedrock surfaces. Much of the soluble material will have naturally leached from the shallow soils prior to the proposed disturbance. The soil samples obtained and analyzed are located in Attachment 2-1 and referenced in Section 728.320 above do not contain significant volumes of highly soluble minerals. Therefore, it is unlikely exposing these soils to increased moisture will result in increased total dissolved solids in the surface water relative to known background levels. No significant volumes of highly soluble materials are proposed to be imported as part of the construction, operation, and reclamation of the road and pad.

No impoundments or restriction of stream flows are anticipated as part of the road and pad project, making it unlikely that unnatural flooding will occur as a result of this project. No additional or new perennial or intermittent stream channel alterations are anticipated as part of this project. Culverts are to be placed in ephemeral channels at road crossings. The culverts are adequately sized such that flooding due to the placement of the culverts should not occur. Only minimal alteration to the ephemeral channels will occur during the placement of the culverts.

No groundwater is anticipated to be encountered during construction of the road or pads, therefore no change in groundwater availability is anticipated. Minimal amounts of surface water will be used for dust suppression during construction and operation of the road and pads.

728.340 - The sediment controls installed during construction, operation, and reclamation of the road and pad will not proximately result in contamination, diminution or interruption of an underground or surface source of water within the proposed permit or adjacent areas which is used for domestic, agricultural, industrial or other legitimate purpose.

728.350 - Five ephemeral drainages will be diverted by culverts placed at various locations along the length of the AMV access road. Because of the installation of the sediment controls and since no ground water and only surface water as described previously will be diverted as a result of this project, the road and pad construction will result in imperceptible contamination, diminution or interruption of State-appropriated water in existence within the proposed permit or adjacent areas at the time the application is submitted.

G-22 Access Road and Pad

728.300 The PHC Determination:

The construction and operation of the G-22 well pad and associated access road is not anticipated to cause adverse impacts to the hydrologic balance. Sediment control structures will be used to reduce the amount of suspended material that will leave that portion of the disturbed area of the road during runoff events. Silt fences will be placed at the toe of fill slopes of the G-22

access road prior to construction and remain in place until designated for removal as defined in Section 761. There are no known springs in the path of the road or in the immediate area of the road and drill pad.

Sediment controls have been designed to adequately address treatment of runoff from the steep hillsides and grades associated with the access road. The locations, designs, and descriptions of the sediment control structures to be implemented during road and pad construction, operation, and reclamation are contained in Attachments 5-4 and 7-1.

Examples of construction and operational sediment and erosion control on the road include building appropriately sized water bars or the canting of the road surface toward the uphill side of the road to divert runoff into the roadside ditch. When necessary the water bar outlets will be rip rapped with native rock. Native rock will be collected during the construction of the road to be used as rip rap. Culverts will be located at appropriate sites (Figure 1, Contour Map for G-22, Attachment 5-1) to direct flow from the ditch to drainage(s) that would normally contain the area runoff. Figure 1 shows the location of a culvert to be installed in the ephemeral drainage, if determined necessary to assist in directing flow, one or two additional culverts may be installed in the drainage at the same location.
According to calculations, culvert inlet velocities should be less then 5 fps, therefore no inlet protection is required. Culvert outlet will be riprapped and filter fabric will be placed beneath the riprap as shown on Figure 2 in Attachment 7-1. The filter cloth will be installed per manufacturers recommended methods for the intended purpose(s). A copy of the Tencate Mirafi installation guidelines are provided in Attachment 7-1.

Erosion, runoff and sediment control during construction, operation, and reclamation may include, but not necessarily be limited to, construction of berms around the disturbed areas and the use of silt fence to treat runoff from the drill pads. The location of the silt fence to treat runoff from the drill pad are shown on Figure 1, G-22 in Attachment 5-1.

Reclamation of the road and well pads is described in Sections 340, 350 and 760. As part of the reclamation activities the reclaimed and resoiled surfaces will be deep gouged to reduce the length of surface flow paths and trap runoff. The reclamation plan described in these sections have been designed to minimize erosion and runoff by encouraging timely revegetation of the disturbed areas. Silt fences will be placed at the toe of fill slopes of the G-22 access road prior to construction and remain in place to contain loose soils and reduce sediment laden runoff until designated for removal as defined in Section 761.

Soil samples have been obtained from selected sites in the road and pad areas. Results of the soil analyses indicate the samples did not contain acid-forming or toxic-forming materials. Thus, the soils moved or exposed as a result of the construction of the road and pad will not result in the contamination of the surface or ground-water supplies. Refer to Section 231 and Attachment 2-1.

As described in the preceding sections, acid forming materials will not be exposed or created as part of the construction, operation, or reclamation of the road and pad areas. Total suspended solids will be controlled through the use of sediment control structures. Dissolved solids within the runoff from the disturbed areas is not likely to noticeably increase above background levels since the disturbance is generally occurring within weathered soils and bedrock surfaces. It is unlikely exposing these soils to increased moisture will result in increased total dissolved solids in the surface water relative to known background levels. No significant volumes of highly soluble materials are proposed to be imported as part of the construction, operation, and reclamation of the road and pad.

Since the drainages associated with the G-22 pad and access road are ephemeral no perennial or intermittent stream channel alterations are anticipated as part of this project. Culvert(s) are to be placed in an ephemeral channel at road crossings. The culverts are adequately sized such that flooding due to the placement of the culverts should not occur. If determined necessary to assist in directing flow, one or two additional culverts may be installed in the drainage in approximately the same location as shown on Figure 1 Contour Map for G-22 in Attachment 5-1. Only minimal alteration to the ephemeral channels will occur during the placement of the culverts.

No groundwater is anticipated to be encountered during construction of the road or pads, therefore no change in groundwater availability is anticipated. Minimal amounts of surface water will be used for dust suppression during construction and operation of the road and pads.

The groundwater/surface water discharge locations should not be impacted by road construction and operation since the aquifers feeding these discharges will either not be encountered during construction or minimal disturbance at the outcrops of the up-dip end of the aquifer will occur.

729 Cumulative Hydrologic Impact Assessment (CHIA)

The Cumulative Hydrologic Impact Assessment currently in place for the Dugout Canyon Mine includes the well sites and adjacent areas.

730 OPERATION PLAN

731 General Requirements

731.100 Hydrologic - Balance Protection

Groundwater Protection - The effect on groundwater at the well sites is expected to be minimal. Groundwater encountered during drilling will be sealed off, refer to Section 728.300.

Surface Water Protection - To protect the hydrologic balance, construction, maintenance, and reclamation operations will be conducted to handle earth materials and runoff in a manner that prevents, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area, and otherwise prevent water pollution.

During initial drilling, the sites will be graded to ensure that storm runoff will flow towards the berms surrounding the drilling pad area. The berms will direct the runoff to the lowest point(s) within the

pad area where a silt fence and/or straw bale dike(s) will treat the runoff (see Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1). The berm placed at the top of the drilling pad cut slopes will divert runoff around the drilling pad. Thus reducing the runoff affected by the drilling pad.

The pad will be re-graded to cause the storm runoff to sheet flow towards a silt fence and/or straw bale dike. A berm will be placed at the top of the fill slope to direct any runoff from the operational pad to the silt fence and/or straw bale dike(see Figures 5-4, 5-8, 5-12, 5-19, 5-22, 5-25, 5-29 and Attachment 5-1). The silt fences and/or straw bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. The sediment from the silt fence and/or straw bale dikes will be piled on the pad and will be used for fill during final reclamation of the well site. During the drilling phase a berm and silt fence will be installed at the toe of the fill slope as shown on Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 to treat any runoff from the drilling pad.

731.200 Water Monitoring

No water monitoring will be conducted at the degas well sites. Refer to approved M&RP for a description of water monitoring.

731.300 Acid or Toxic Forming Materials

No acid or toxic forming materials are anticipated at the well sites (see Section 728.300).

731.400 Transfer of Wells

Refer to Section 731.400 of the approved M&RP.

731.500 Discharge

No discharges to underground workings.

731.600 Stream Buffer Zones

Stream Channel Diversions - No stream channel diversions are planned at the well sites, unless specified in the runoff controls specific to each well site. Streams in five ephemeral drainages will be diverted with the installation of culverts at various locations along the AMV road.

Buffer Zone Designation - When drilling sites are adjacent to a perennial or an intermittent stream, a stream buffer zone will be established. Well sites G-11, G-12, G-15 and G-19 require buffer zone designation. The G-22 drill site and the associated access road are not adjacent to a perennial or an intermittent stream, therefore a buffer zone designation is not required, for additional information refer to Section 324. Refer to Chapter 5, Attachment 5-1 for drawings of well sites G-8 through G-17, G-19, G-22, G-22 access road, G-25, G-26, and G-31. A buffer zone designation will be required on approximately the first 1100 feet of the AMV road, signs will be placed along the road at intervals so that the previous sign is visible at the location of the current sign.

731.700 Cross Section and Maps

Not applicable.

731.800 Water Rights and Replacement

Refer to Sections 728.300 and 731.800 of the approved M&RP.

732 Sediment Control Measures

The sediment control measures within the well sites have been designed to prevent additional contributions of sediment to stream flow or to runoff outside the well sites. In addition, the well sites have been designed to minimize erosion to the extent possible.

The structures to be used for sediment/runoff control at the degas well sites and associated access roads (constructed by the permittee) are berms, silt fences and/or straw bale dikes. Sediment controls will be installed prior to construction, except as noted and will remain in place during the operational and reclamation phases of the degas pads and associated constructed roads. Sediment controls used to treat degas pad runoff during the operational phase and as shown on pad construction drawings in Attachment 5-1, Figures 5-1 thru 5-25 and Figures 5-27 thru 5-29 will be constructed following the removal of topsoil. Removal of the structures during reclamation is addressed in Section 761.

Structure Inspection

The sediment control measures installed by the permittee will be periodically inspected at degas drill sites and associated access roads (constructed by the permittee). The inspections will include but not be limited to inspections following major precipitation events. Based upon the inspections, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

In addition, Division staff qualified in the construction and maintenance of structures commits to bi-annual inspections, one inspection in the spring/early summer and one in the fall. Based upon the inspections and in a timely fashion, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

732.100 Siltation Structures

Berms, silt fences and straw bales dikes will be used to treat runoff.

732.200 Sedimentation Pond

The drilling sites will not have sedimentation ponds.

732.300 Diversions

Refer to Section 731.100 of this submittal.

732.400 Road Drainage

No diversion ditches will be constructed along the primary roads leading to the well sites. See Figures 5-13 and 5-14 for typical road cross sections. Where needed roads accessing the drill sites will have a water bar constructed at the base of the road to divert water off the road prior to the runoff reaching the drilling pad.

The incised road to well site G-16 will be constructed as shown on Figure 5-14 in the approved permit, water bars will be used to direct flow off the road and either silt fences or strawbales will be used to treat runoff . Refer to Chapter 5, Attachment 5-1 for drawings of well site G-16 showing the location of a single water bar, additional water bar(s) will be constructed as required to direct water from the road. Refer to Section 527.200 for road construction information.

Subsoil being cut in order to construction the pad for well G-15 will be placed on the existing road, causing it to be elevated, no new access road will be constructed to well site G-15.

The AMV access road will be classified as an ancillary road per a discussion with Wayne Western during a meeting at the UDOGM offices on April 16, 2007. The road is improving a trail used for hunting, cattle and for logging. Drawings showing the alignment and cross-sections of the road can be found in Attachment 5-4, as Plate 1 thru 3. A typical road cross section is found in Attachment 5-4 as Figure 1. The drawing outlines the disturbed area and shows the road center line, water bars, culverts, turnouts and topsoil stockpile locations.

Drawings showing the alignment and cross-sections of the G-22 access road can be found in Attachment 5-1 (G-22, Figures 1, 2 and 2A through 2E). A typical road cross section is found in Attachment 5-4 as Figure 1. Figure 1. Contour Map for G-22 outlines the disturbed area for the pad and road, and shows the road center line, proposed water bar and culvert.

The steepness of access road cut slopes will depend on the stability of the exposed subsurface material. Cuts into competent material such as bedrock will be sloped at angles of approximately 0.5H:1V (63.4 degrees). Cut into unconsolidated material such as soils will be sloped at angles of approximately 1H:1V (45 degrees). The steepness of these slopes is justified by the presence of several near-vertical bedrock outcrops and naturally steep (approximately 1H:1V) colluvial slopes in the vicinity of the proposed access road.

733 Impoundments

733.100 General Plans

Not applicable.

733.200 Permanent and Temporary Impoundments

No permanent impoundments will exist at the well sites.

734 Discharge Structures

A berm will surround the entire drill pad at each well site during the drilling phase (excepted as noted). The berm will divert undisturbed runoff around the drilling pad and direct runoff from the pad to a silt fence/straw bale dike at the lowest point within the well pad disturbed area. A silt fence and/or straw bale dike will be the discharge structure for each of the well sites during the operational phase.

735 Disposal of Excess Spoil

There will be no excess spoil generated at the well sites.

736 Coal Mine Waste

There will be no coal mine waste generated or stored at the well sites.

737 Non-Coal Mine Waste

There will be no non-coal mine waste disposed at the well sites.

738 Temporary Casing and Sealing of Wells

Refer to Section 542.700 of this submittal.

740 DESIGN CRITERIA AND PLANS

741 General Requirements

This submittal includes general well site plans that incorporate design criteria for the control of drainage.

742 Sediment Control Measures

742.100 General Requirements

Design - Sediment control measures have been formulated to prevent additional contributions of sediment to stream flow or to runoff outside the well site area; and minimize erosion to the extent possible.

Measures and Methods - Sediment control methods will include silt fences, berms, and straw bales to reduce runoff and trap sediment.

742.200 Siltation Structures

General Requirements - The structures to be used for sediment/runoff control at the degas well sites and associated access roads (constructed by the permittee) are berms, silt fences and/or straw bale dikes. Sediment controls will be installed prior to construction, except as noted and will remain in place during the operational and reclamation phases of the degas pads and associated constructed roads. Sediment controls used to treat degas pad runoff during the operational phase and as shown on pad construction drawings in Attachment 5-1, Figures 5-1 thru 5-25 and Figures 5-27 thru 5-29 will be constructed following the removal of topsoil. Removal of the structures during reclamation is addressed in Section 761.

Structure Inspection

The sediment control measures installed by the permittee will be periodically inspected at degas drill sites and associated access roads (constructed by the permittee). The inspections will include but not be limited to inspections following major precipitation events. Based upon the inspections, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

In addition, Division staff qualified in the construction and maintenance of structures commits to bi-annual inspections, one inspection in the spring/early summer and one in the fall. Based upon the inspections and in a timely fashion, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

Construction activities will not occur during major precipitation events.

Design - All hydrology calculations were made using the 10-year, 24-hour precipitation event. Hydrology calculations are in Attachment 7-1. Locations of the berms and silt fences are shown on Figures 5-1, 5-4, 5-5, 5-8, 5-9, 5-12, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1.

742.300 Diversions

No diversion ditches will be constructed as part of the drilling or operational phases, with the exception of the AMV road and G-22 access road.

742.400 Road Drainage

Refer to Section 732.400 of this submittal. The road design for G-16 is shown on drawings located in Chapter 5, Attachment 5-1 and Figure 5-16. The road design for the AMV access road is shown in Attachment 5-4. The G-22 access road design is located in Attachment 5-1 and additional information pertaining to the road drainage is located in Sections 728.300 ,732, 742, and 760.

743 Impoundments

No impoundments will exist at the well sites.

744 Discharge Structures

No discharge structures have been planned or designed.

745 Disposal of Excess Spoil

There will be no excess spoil generated at the well sites.

746 Coal Mine Waste

746.100 General Requirements

There will be no coal mine waste used at the well sites.

746.200 Refuse Piles

There will be no refuse piles at the well sites.

746.300 Impounding Structures

Refer to Section 733.200 of this submittal.

746.400 Return of Coal Processing Waste to Abandoned Underground Workings

No coal processing waste will be generated at the well sites.

747 Disposal of Non-Coal Mine Waste

All non-coal mine waste will be dispose of at an approved landfill.

748 Casing and Sealing Wells

Refer to Section 542.700 of this submittal.

750 PERFORMANCE STANDARDS

751 Water Quality Standards and Effluent Limitations

Water encountered during drilling and runoff water will be treated using silt fence and/or straw bale dikes prior to leaving the site. Should it become necessary the water encountered during drilling will be pumped into a tank and hauled from the site for disposal at a licensed facility.

752 Sediment Control Measures

The structures to be used for sediment/runoff control at the degas well sites and associated access roads (constructed by the permittee) are berms, silt fences and/or straw bale dikes. Sediment controls will be installed prior to construction, except as noted and will remain in place during the operational and reclamation phases of the degas pads and associated constructed roads. Sediment controls used to treat degas pad runoff during the operational phase and as shown on pad construction drawings in Attachment 5-1, Figures 5-1 thru 5-25 and Figures 5-27 thru 5-29 will be constructed following the removal of topsoil. Removal of the structures during reclamation is addressed in Section 761. Refer to Sections 728.300 ,732, 742, and 760 of this submittal for addition information pertaining to sediment control measures.

Structure Inspection

The sediment control measures installed by the permittee will be periodically inspected at degas drill sites and associated access roads (constructed by the permittee). The inspections will include but not be limited to inspections following major precipitation events. Based upon the inspections, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

In addition, Division staff qualified in the construction and maintenance of structures commits to bi-annual inspections, one inspection in the spring/early summer and one in the fall. Based upon

the inspections and in a timely fashion, the sediment controls will be repaired and accumulated sediment removed as needed in order to maintain functionality.

752.100 Siltation Structures and Diversions

Siltation structures will be located, maintained, constructed and reclaimed according to plans and designs presented in Sections 728.300,732, 742, and 763 of the submittal.

752.200 Road Drainage

Refer to Section 732.400 of this submittal.

753 Impoundments and Discharge Structures

Refer to Section 733.200 of this submittal.

754 Disposal of Excess Spoil, Coal Mine Waste and Non-Coal Mine Waste

There will be no excess spoil or coal mine waste generated at the well sites. Refer to Section 747 of this submittal regarding non-coal waste disposal.

755 Casing and Sealing

Refer to Section 542.700 of this submittal.

760 RECLAMATION

761 General Requirements

A detailed reclamation plan for the well sites is presented in Section 540. No structures will exist at the well sites.

The sediment control measures utilized at the degas pads and associated access roads will be maintained until removal is authorized by the Division and the disturbed area has been stabilized and revegetated.

762 Roads

Refer to Section 542.600.

762.100 Restoring the Natural Drainage Patterns

The natural drainage patterns will be restored after degassification is completed.

762.200 Reshaping Cut and Fill Slopes

Cut and fill slopes will be reshaped at the well sites.

763 Siltation Structures

763.100 Maintenance of Siltation Structures

All siltation structures will be maintained until removed in accordance with the approved reclamation plan.

763.200 Removal of Siltation Structures

When a siltation structure is removed, the land on which the siltation structure was located will be regraded and revegetated in accordance with the reclamation plan presented in Section 540.

764 Structure Removal

A timetable for the reclamation of the sites is presented in Figures 5-15 (G-2 and G-5) and 5-26 (G-3, G-4, G-6 thru G-19, G-22, G-22 access road, G-25, G-26, G-31 and AMV access road).

765 Permanent Casing and Sealing of Wells

Refer to Section 542.700 of this submittal.

ATTACHMENT 7-1
HYDROLOGY CALCULATIONS

add to the back of existing information

HYDROLOGY CALCULATIONS
FOR
DEGAS WELL G-25

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B.
WHITE
14 Apr 2009
STATE OF UTAH

Pad G-25 Summary

Area within Disturbed Area Boundary (ac)	1.8
Disturbed Area Acreage (ac)	
Pad 25	0.9
Salvage Soil Excavation Volume Assuming 12 in. Salvage Depth (cyd)	1,406
Subsoil Volume for Berms (cyd)	136
Salvage Soil Stockpile Dimensions:	191'L X 40'W X 10'H

Salvage Soil Volume Calculation

Disturbed Area (ft^2)	Average Salvage Soil Depth (in)	Salvage Soil Volume (yd^3)
37,968	12	1,406

Notes
Average salvage soil depth is taken from a site-specific soil survey of performed at the degas well pad.
Salvage Soil Volume = Disturbed Area * Average Salvage Soil Depth

Salvage Soil Stockpile Capacity Calculation

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Pad on G-25	191	40	10	1,415

Notes
Salvage Soil stockpile will be sloped at approximately 2H:1V
Volume calculated as 0.5*length of base * width * height of pile.

Subsoil Volume Calculation for Berm Construction

Berm	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Stockpile	446	3	1.5	37
Pad-25	670	4	2	99
TOTAL				136

Notes
Stockpile berm volume includes the berm around the salvage soil stockpile. The stockpile berm volume was assumed to have 1H:1V side slopes.
Pad-25 berm volume includes the berm around the pad and not the berm around the salvage soil stockpile. The pad berm volume was assumed to have 1H:1V side slopes.

Stockpile Runoff Volume Calculations

Stockpile	Watershed Area (sq. ft.)	Watershed Area (acres)	Precip. - ***P*** (in)	Curve Number (***CN***)	Potential Max. Retention - ***S*** (in.)	Runoff - ***Q*** (in)	Runoff Volume - ***V*** (ft^3)
Pad on G-25	8,224	0.19	2.05	87	1.49	0.94	648

Notes

Calculations have been performed for the 10-year, 24-hour design storm event.
Salvage Soil is derived from the Beje Loam and Trag Clay Loam Soils, as described in attached Natural Resources Conservation Service Survey.
Calculations based on Soil Conservation Service (SCS) Method, National Engineering Handbook Section 4, Chapters 9 & 10 by Victor Mockus, 1972

Precipitation for 10-year, 24-hour event taken from National Weather Service web site (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html)

CN = 87, based on Table 9.1, NEH s4 ch9. Use Hydrologic Soil Group C, given that the soil is a complex of both the Beje Loam (group D) and Traj Clay Loam (group B) from the published NRCS Surveys. Assume road, dirt surface (non-vegetated, conservative case).

$S = (1000/CN) - 10$

$L = [(I^{0.8} (S+1)^{0.7}]/(1900Y^{0.5})$

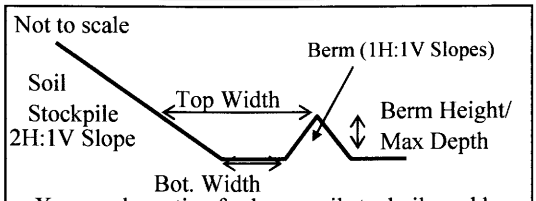
$T_c = 1.67L$

$Q = (P - 0.2*S)^2 / (P + 0.8*S)$

$V = Area * Q$

Stockpile Runoff Containment Volume Calculations

Stockpile	Bottom Width (ft)	Top Width (ft)	Max Depth (ft)	Impounding Length of Berm (ft)	Total Length of Berm (ft)	Fill Req'd for Berm (yd^3)	Cntnmt Vol. (ft^3)	Contain Vol > Runoff Vol ?
Pad on G-25	1	5.5	1.5	150	446	37	731	Yes



X-sec. schematic of salvage soil stockpile and berm

Notes

The bottom width is the distance between the toe of the salvage soil stockpile and the base of the berm. (see schematic)
The top width is the horizontal distance between the crest of the berm and the salvage soil stockpile. (see schematic)
The max depth is the height of the berm.

The Impounding Length of the berm accounts for the slope of the ground, and is the portion of the berm that will impound runoff.
The Total Length of Berm is its entire length around the salvage soil stockpile.

The Fill Required for Berm is the volume of subsoil required to construct each berm, and is based on the length, height, and width of each berm. Berms shall be constructed with 1H:1V slopes.
The Containment Volume = Length * Cross sectional area of the space between the salvage soil stockpile and the berm.

Stockpile Dimensions and Volumes

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
G-25	191	40	10	1,415

Notes

Assuming an average salvage soil thickness of 12 inches, and a disturbed area of 0.9 acres, a total of approximately 1,411 yd^3 of topsoil is expected to be stockpiled.

Stockpile dimensions are approximate, and site conditions may affect their sizes and locations.

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Utah 39.68175 N 110.48129 W 7946 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Tue Jun 26 2007

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Help | D

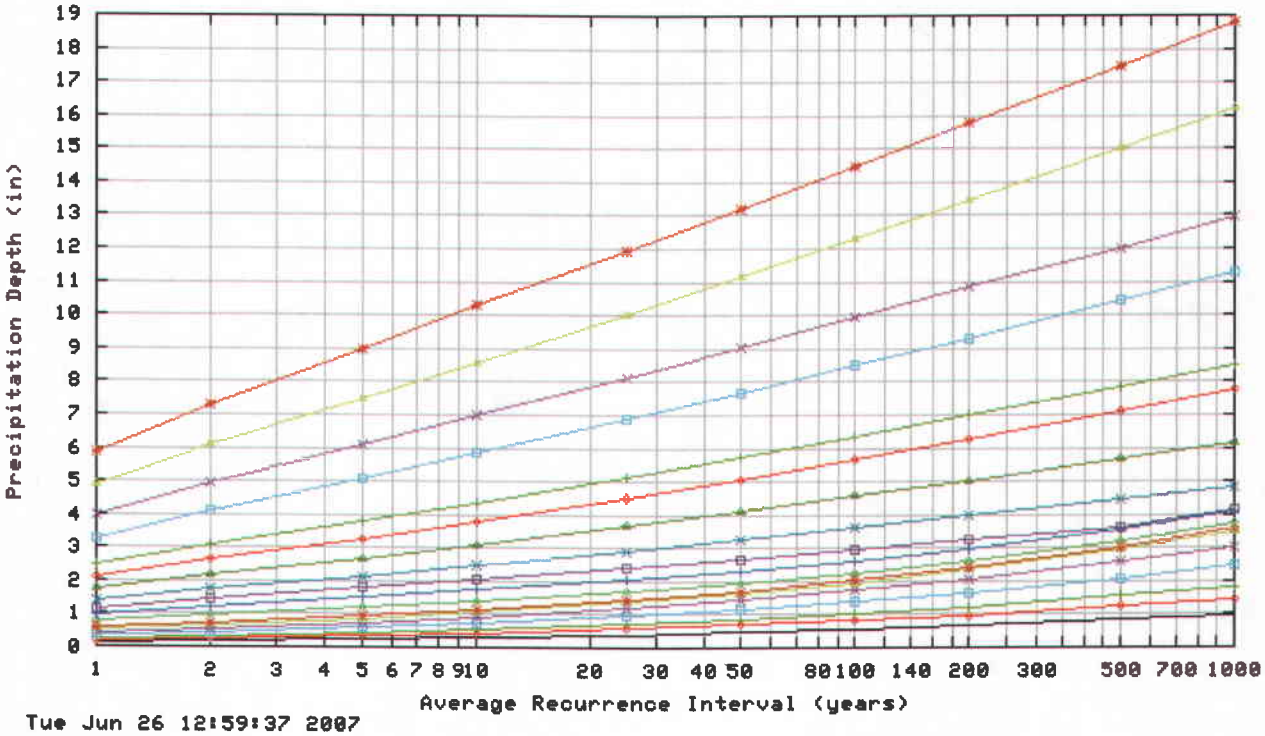
Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.14	0.20	0.25	0.34	0.42	0.52	0.59	0.77	0.99	1.18	1.40	1.74	2.12	2.44	3.26	3.97	4.88	5.83
2	0.17	0.26	0.33	0.44	0.55	0.65	0.74	0.96	1.23	1.46	1.74	2.16	2.65	3.06	4.08	4.95	6.10	7.31
5	0.24	0.36	0.45	0.60	0.74	0.86	0.95	1.19	1.50	1.78	2.13	2.67	3.29	3.78	5.05	6.09	7.50	9.00
10	0.29	0.45	0.55	0.74	0.92	1.06	1.15	1.38	1.73	2.05	2.46	3.08	3.80	4.36	5.82	6.98	8.59	10.29
25	0.38	0.58	0.72	0.97	1.20	1.36	1.45	1.67	2.05	2.40	2.89	3.65	4.52	5.14	6.86	8.15	10.04	11.96
50	0.46	0.70	0.86	1.16	1.44	1.64	1.72	1.92	2.32	2.68	3.24	4.09	5.08	5.74	7.66	9.04	11.15	13.22
100	0.55	0.83	1.03	1.39	1.72	1.96	2.04	2.22	2.60	2.96	3.60	4.55	5.67	6.36	8.48	9.94	12.29	14.50
200	0.65	0.99	1.23	1.66	2.05	2.33	2.41	2.57	2.94	3.25	3.96	5.03	6.28	7.00	9.31	10.84	13.44	15.78
500	0.82	1.24	1.54	2.08	2.57	2.93	3.03	3.18	3.53	3.64	4.45	5.67	7.11	7.86	10.44	12.03	14.99	17.48
1000	0.97	1.47	1.83	2.46	3.04	3.49	3.59	3.74	4.09	4.13	4.84	6.17	7.77	8.53	11.30	12.94	16.22	18.80

Text version of table

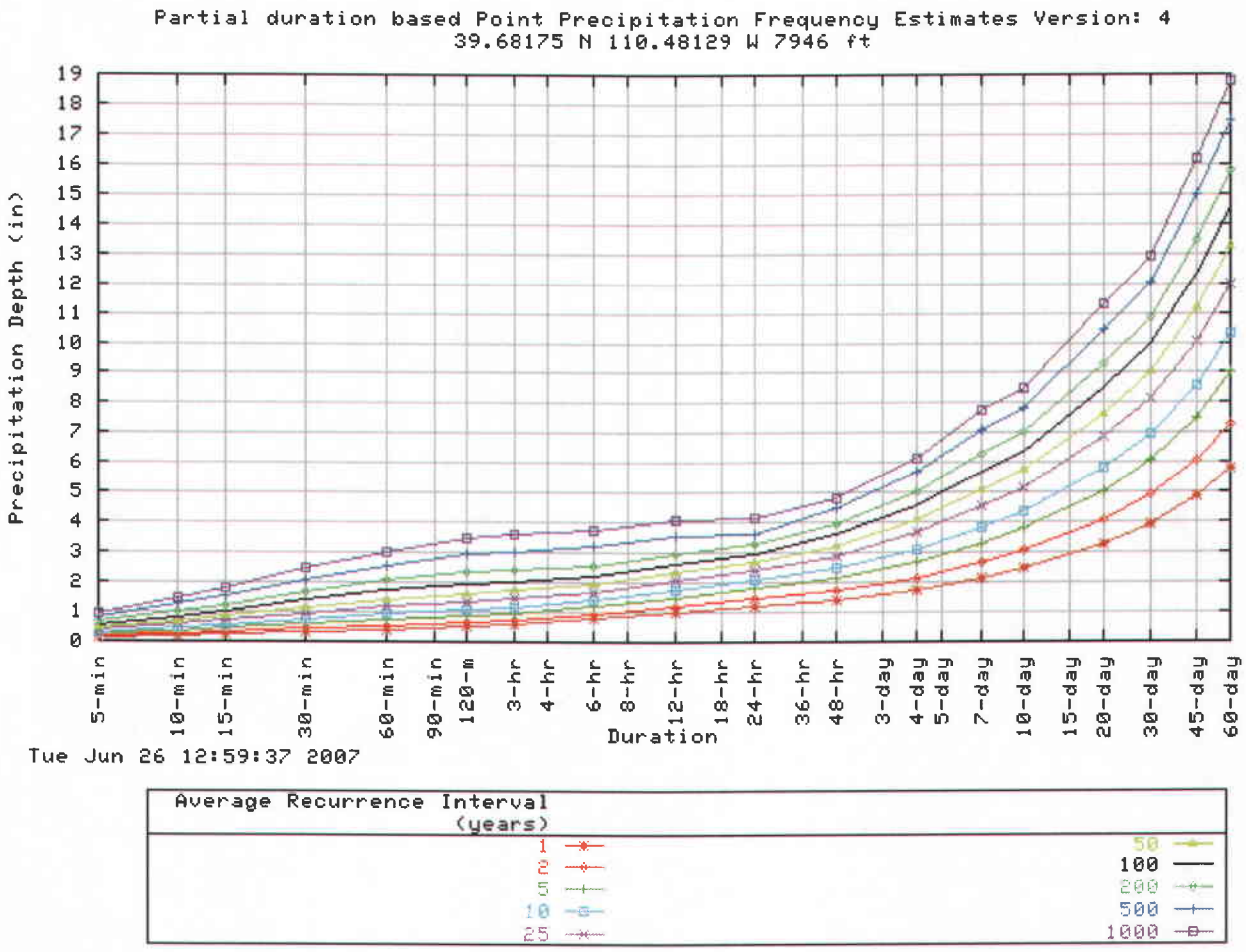
* These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.

Partial duration based Point Precipitation Frequency Estimates Version: 4
39.68175 N 110.48129 W 7946 ft



Tue Jun 26 12:59:37 2007

Duration			
5-min	120-m	48-hr	30-day
10-min	3-hr	4-day	45-day
15-min	6-hr	7-day	60-day
30-min	12-hr	10-day	
60-min	24-hr	20-day	



Confidence Limits -

*** Upper bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.16	0.24	0.30	0.41	0.51	0.60	0.69	0.88	1.11	1.31	1.56	1.94	2.41	2.74	3.65	4.43	5.44	6.49
2	0.21	0.32	0.39	0.53	0.65	0.76	0.86	1.09	1.38	1.63	1.94	2.42	3.01	3.42	4.56	5.54	6.80	8.12
5	0.28	0.43	0.53	0.72	0.89	1.01	1.11	1.35	1.68	2.00	2.38	2.98	3.73	4.24	5.66	6.80	8.37	10.00
10	0.35	0.53	0.66	0.89	1.10	1.24	1.33	1.58	1.94	2.29	2.74	3.44	4.33	4.89	6.53	7.79	9.60	11.44
25	0.46	0.69	0.86	1.16	1.43	1.60	1.69	1.91	2.32	2.69	3.23	4.08	5.15	5.76	7.70	9.12	11.24	13.33
50	0.55	0.83	1.04	1.40	1.73	1.93	2.01	2.21	2.63	3.00	3.62	4.58	5.80	6.45	8.61	10.14	12.51	14.77
100	0.66	1.00	1.24	1.67	2.07	2.33	2.40	2.58	2.97	3.33	4.03	5.11	6.50	7.17	9.55	11.18	13.80	16.25
200	0.79	1.20	1.49	2.01	2.49	2.79	2.87	3.01	3.38	3.66	4.45	5.65	7.22	7.91	10.53	12.23	15.15	17.77
500	1.01	1.54	1.90	2.56	3.17	3.59	3.67	3.79	4.13	4.17	5.04	6.42	8.24	8.93	11.88	13.66	17.01	19.80
1000	1.22	1.85	2.30	3.09	3.83	4.35	4.43	4.52	4.85	4.90	5.51	7.04	9.06	9.75	12.94	14.77	18.49	21.43

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

*** Lower bound of the 90% confidence interval**

Precipitation Frequency Estimates (inches)																		
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.12	0.18	0.22	0.29	0.36	0.45	0.52	0.69	0.90	1.07	1.26	1.56	1.89	2.19	2.94	3.59	4.41	5.28
2	0.15	0.23	0.28	0.38	0.47	0.57	0.65	0.85	1.11	1.32	1.57	1.95	2.36	2.75	3.68	4.48	5.51	6.61
5	0.20	0.31	0.38	0.52	0.64	0.75	0.84	1.05	1.34	1.61	1.92	2.39	2.92	3.38	4.53	5.49	6.75	8.10
10	0.25	0.38	0.47	0.63	0.79	0.90	1.00	1.22	1.54	1.84	2.20	2.75	3.37	3.88	5.22	6.26	7.69	9.22
25	0.32	0.48	0.59	0.80	0.99	1.14	1.24	1.45	1.81	2.15	2.58	3.23	3.97	4.55	6.10	7.27	8.94	10.66
50	0.37	0.56	0.70	0.94	1.17	1.34	1.44	1.65	2.02	2.39	2.86	3.60	4.43	5.05	6.76	8.02	9.86	11.71
100	0.43	0.66	0.82	1.10	1.36	1.56	1.67	1.88	2.23	2.62	3.15	3.97	4.90	5.55	7.41	8.75	10.78	12.73
200	0.50	0.76	0.94	1.27	1.57	1.81	1.93	2.13	2.48	2.85	3.44	4.34	5.36	6.06	8.07	9.47	11.69	13.73
500	0.60	0.91	1.13	1.52	1.88	2.17	2.32	2.56	2.93	3.15	3.81	4.82	5.99	6.71	8.90	10.36	12.86	15.01
1000	0.68	1.04	1.29	1.73	2.15	2.48	2.65	2.94	3.34	3.38	4.10	5.18	6.46	7.19	9.53	11.03	13.76	15.97

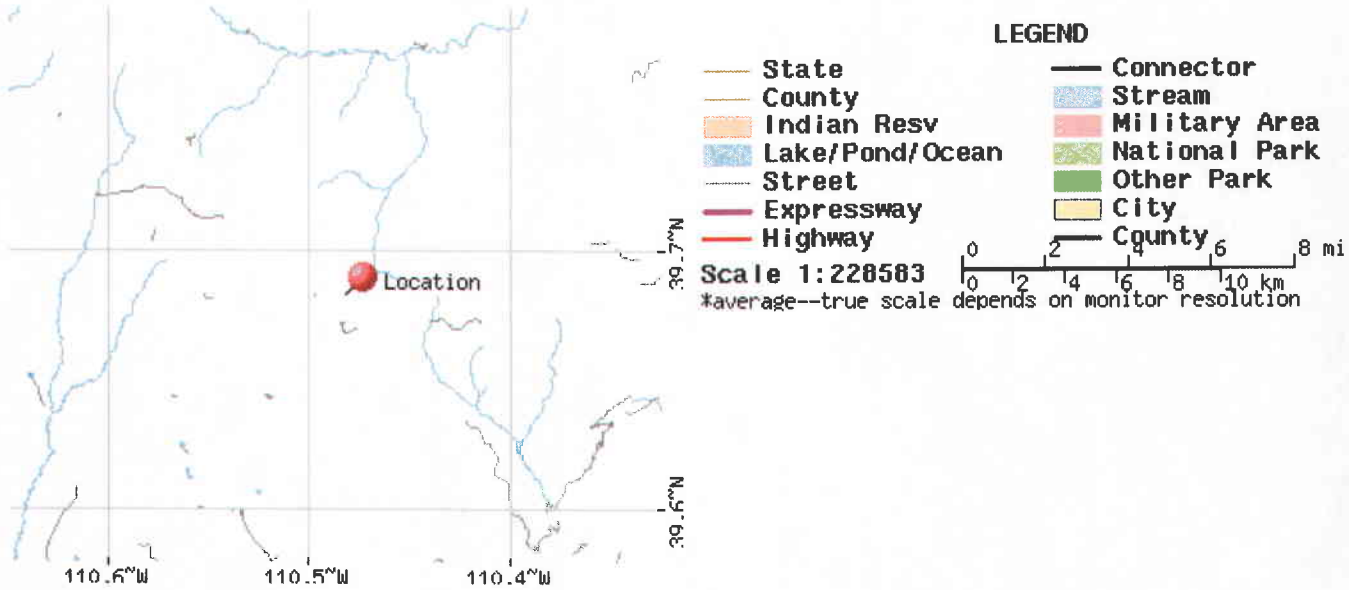
* The **lower** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **less** than.
** These precipitation frequency estimates are based on a partial duration maxima series. **ARI** is the Average Recurrence Interval.

Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -

These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources **Tiger Map Server**.

Please read disclaimer for more information.



Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available
from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information
about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study,
please refer to our documentation.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

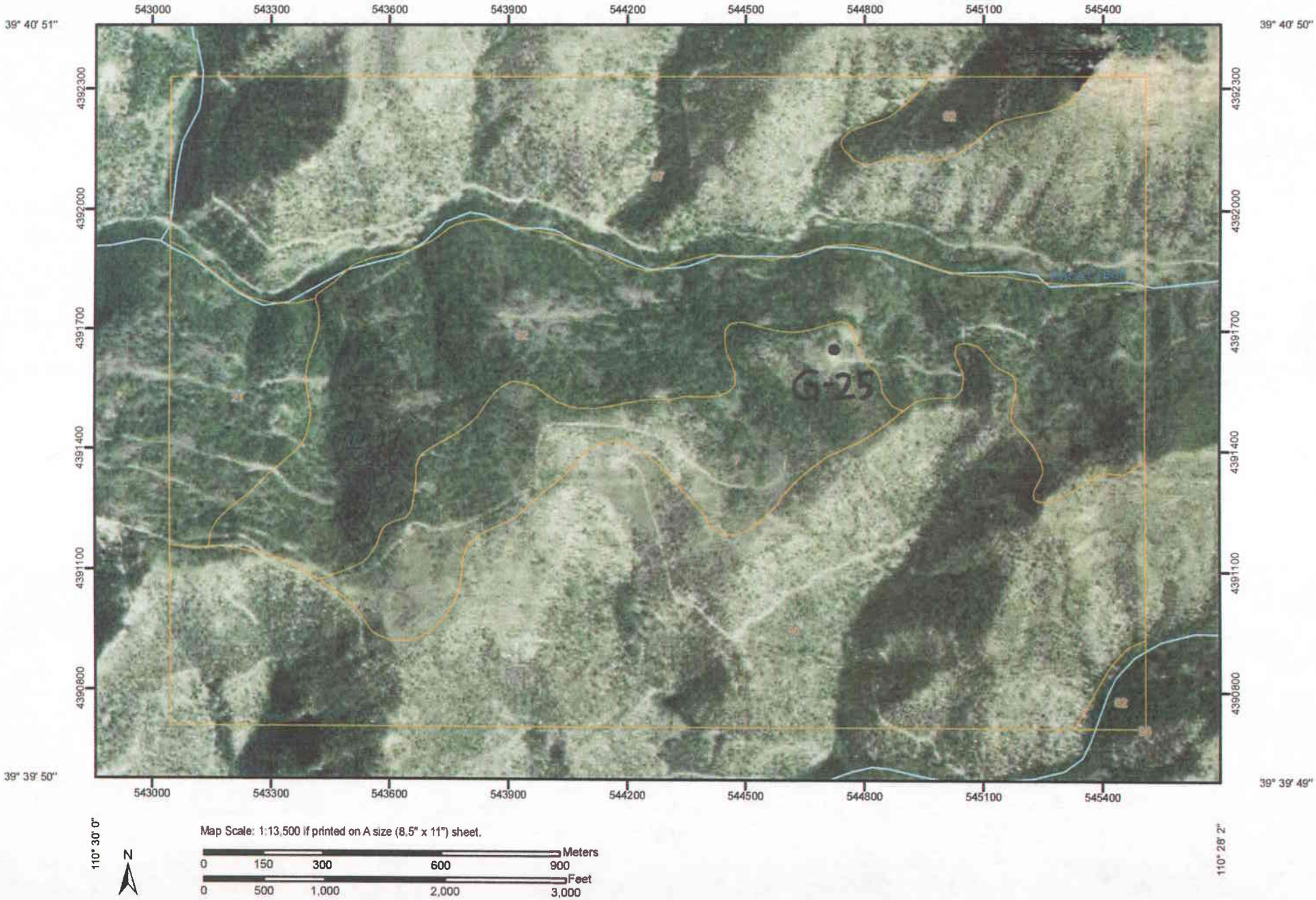
+/-30 minutes ...OR... +/-1 degree of this location (39.68175/-110.48129). Digital ASCII data can be obtained directly from **NCDC**.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the **Western Regional Climate Center's state-specific SNOTEL station maps**.

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910

(301) 713-1669
Questions?: HDSC.Questions@noaa.gov

Disclaimer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110° 28'
39° 40' 51"
39° 40' 50"
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543000
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4391100
4390800
G-23
110° 30' 0"
110° 28' 2"
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Map Scale: 1:13,500 if printed on A size (8.5" x 11") sheet.
Meters
0
150
300
600
900
Feet
0
500
1,000
2,000
3,000

MAP LEGEND

Soils

- Soil Survey Areas
- Soil Map Units

Water Features

- Streams and Canals

Transportation

- Local Roads

MAP INFORMATION

Map Scale: 1:11,100 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

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

Soil Survey Area: Carbon Area, Utah, Parts of Carbon and Emery Counties
Survey Area Data: Version 4, Jul 2, 2008

Date(s) aerial images were photographed: 8/28/2006

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.

RUSLE2 Related Attributes– Carbon Area, Utah, Parts of Carbon and Emery Counties							
Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
7—Beje-Trag complex							
Beje	55	D	.20	1	39.2	37.3	23.5
Trag	20	B	.15	5	35.4	33.6	31.0
62—Midfork family-Comodore complex							
Midfork	50	B	.20	5	39.8	37.7	22.5
Comodore	20	D	.20	1	42.1	37.9	20.0
96—Rock outcrop-Rubbleland-Travessilla complex							
Rock outcrop	35	D	—	—	—	—	0.0
Rubbleland	30	A	—	5	—	—	0.0
Travessilla	25	D	.24	1	68.8	16.2	15.0
97—Rottulee family-Trag complex							
Rottulee	60	C	.28	2	42.1	37.9	20.0
Trag	20	B	.20	5	39.8	37.7	22.5

HYDROLOGY CALCULATIONS
FOR
DEGAS WELL G-26

REGISTERED PROFESSIONAL ENGINEER
No. 168246
RICHARD B.
WHITE
14 Apr 2009
STATE OF UTAH

Pad G-26 Summary

Area within Disturbed Area Boundary (ac)	1.6
Disturbed Area Acreage (ac)	
Pad 26	0.7
Salvage Soil Excavation Volume Assuming 12 in. Salvage Depth (cyd)	1,080
Subsoil Volume for Berms (cyd)	152
Salvage Soil Stockpile Dimensions:	75'L X 65'W X 12'H

Salvage Soil Volume Calculation

Disturbed Area (ft^2)	Average Salvage Soil Depth (in)	Salvage Soil Volume (yd^3)
29,168	12	1,080

Notes
Average salvage soil depth is taken from a site-specific soil survey of performed at the degas well pad.
Salvage Soil Volume = Disturbed Area * Average Salvage Soil Depth

Salvage Soil Stockpile Capacity Calculation

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Pad on G-26	75	65	12	1,083

Notes
Salvage Soil stockpile will be sloped at approximately 2H:1V
Volume calculated as 0.5*length of base * width * height of pile.

Subsoil Volume Calculation for Berm Construction

Berm	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
Stockpile	257	6	3	86
Pad-26	450	4	2	67
TOTAL				152

Notes
Stockpile berm volume includes the berm around the salvage soil stockpile. The stockpile berm volume was assumed to have 1H:1V side slopes.
Pad-26 berm volume includes the berm around the pad and not the berm around the salvage soil stockpile. The pad berm volume was assumed to have 1H:1V side slopes.

Stockpile Runoff Volume Calculations

Stockpile	Watershed Area (sq. ft.)	Watershed Area (acres)	Precip. - ***P*** (in)	Curve Number (***CN***)	Potential Max. Retention - ***S*** (in.)	Runoff - ***Q*** (in)	Runoff Volume - ***V*** (ft^3)
Pad on G-26	5,451	0.13	2.05	87	1.49	0.94	429

Notes

Calculations have been performed for the 10-year, 24-hour design storm event.
Salvage Soil is derived from the Beje Loam and Trag Clay Loam Soils, as described in attached Natural Resources Conservation Service Survey.
Calculations based on Soil Conservation Service (SCS) Method, National Engineering Handbook Section 4, Chapters 9 & 10 by Victor Mockus, 1972

Precipitation for 10-year, 24-hour event taken from National Weather Service web site (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html)

CN = 87, based on Table 9.1, NEH s4 ch9. Use Hydrologic Soil Group C, given that the soil is a complex of both the Beje Loam (group D) and Traj Clay Loam (group B) from the published NRCS Surveys. Assume road, dirt surface (non-vegetated, conservative case).

$S = (1000/CN) - 10$

$L = [(I^{0.8} (S+1)^{0.7}]/(1900Y^{0.5})$

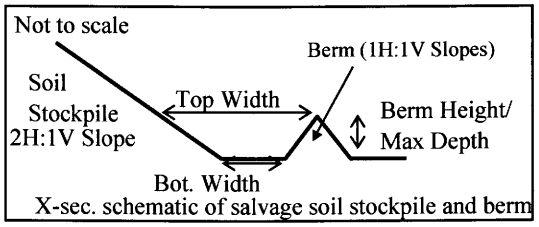
$T_c = 1.67L$

$Q = (P - 0.2*S)^2 / (P + 0.8*S)$

$V = Area * Q$

Stockpile Runoff Containment Volume Calculations

Stockpile	Bottom Width (ft)	Top Width (ft)	Max Depth (ft)	Impounding Length of Berm (ft)	Total Length of Berm (ft)	Fill Req'd for Berm (yd^3)	Cntnmt Vol. (ft^3)	Contain Vol > Runoff Vol ?
Pad on G-26	1	10	3	30	257	86	495	Yes



X-sec. schematic of salvage soil stockpile and berm

Notes

The bottom width is the distance between the toe of the salvage soil stockpile and the base of the berm. (see schematic)
The top width is the horizontal distance between the crest of the berm and the salvage soil stockpile. (see schematic)
The max depth is the height of the berm.

The Impounding Length of the berm accounts for the slope of the ground, and is the portion of the berm that will impound runoff.
The Total Length of Berm is its entire length around the salvage soil stockpile.

The Fill Required for Berm is the volume of subsoil required to construct each berm, and is based on the length, height, and width of each berm. Berms shall be constructed with 1H:1V slopes.
The Containment Volume = Length * Cross sectional area of the space between the salvage soil stockpile and the berm.

Stockpile Dimensions and Volumes

Stockpile	Length (ft)	Width (ft)	Height (ft)	Volume (yd^3)
G-26	75	65	12	1,083

Notes

Assuming an average salvage soil thickness of 12 inches, and a disturbed area of 0.7 acres, a total of approximately 1,080 yd^3 of topsoil is expected to be stockpiled.

Stockpile dimensions are approximate, and site conditions may affect their sizes and locations.

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

Utah 39.68175 N 110.48129 W 7946 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 4
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NOAA, National Weather Service, Silver Spring, Maryland, 2006

Extracted: Tue Jun 26 2007

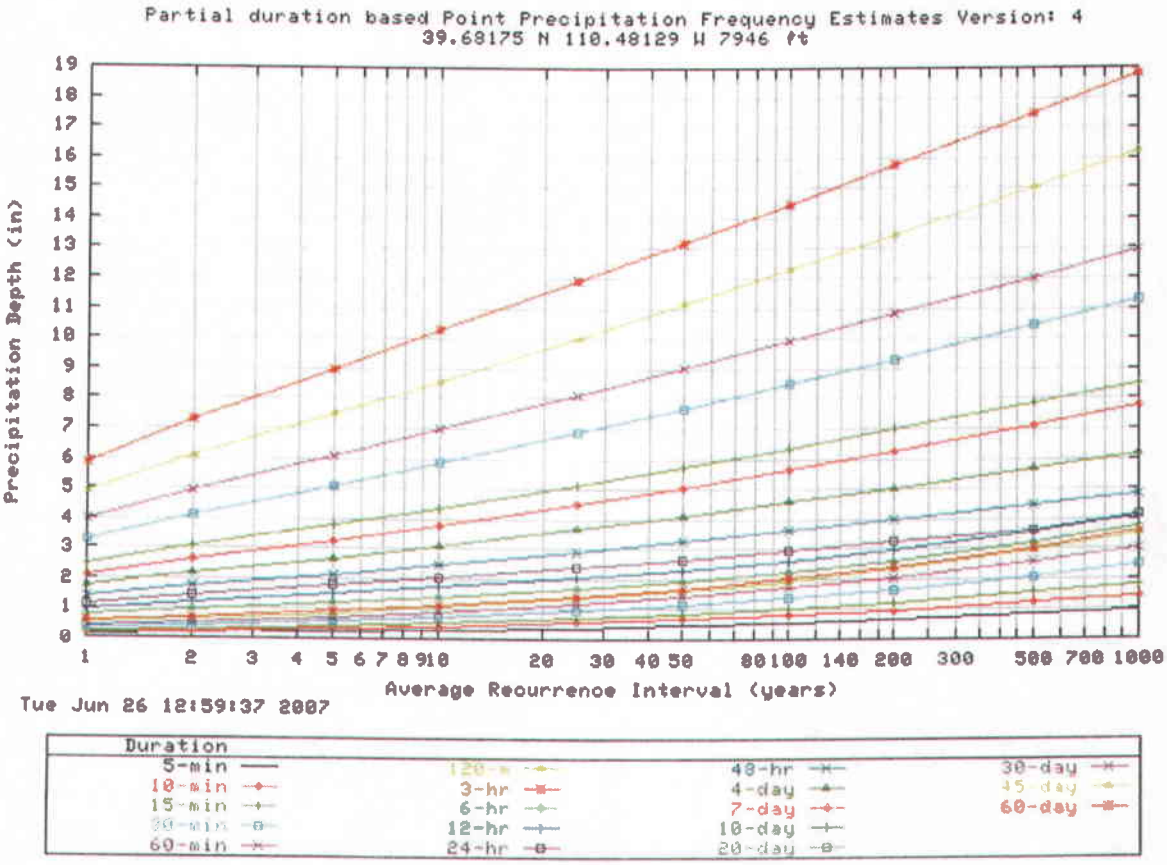
Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Help | D

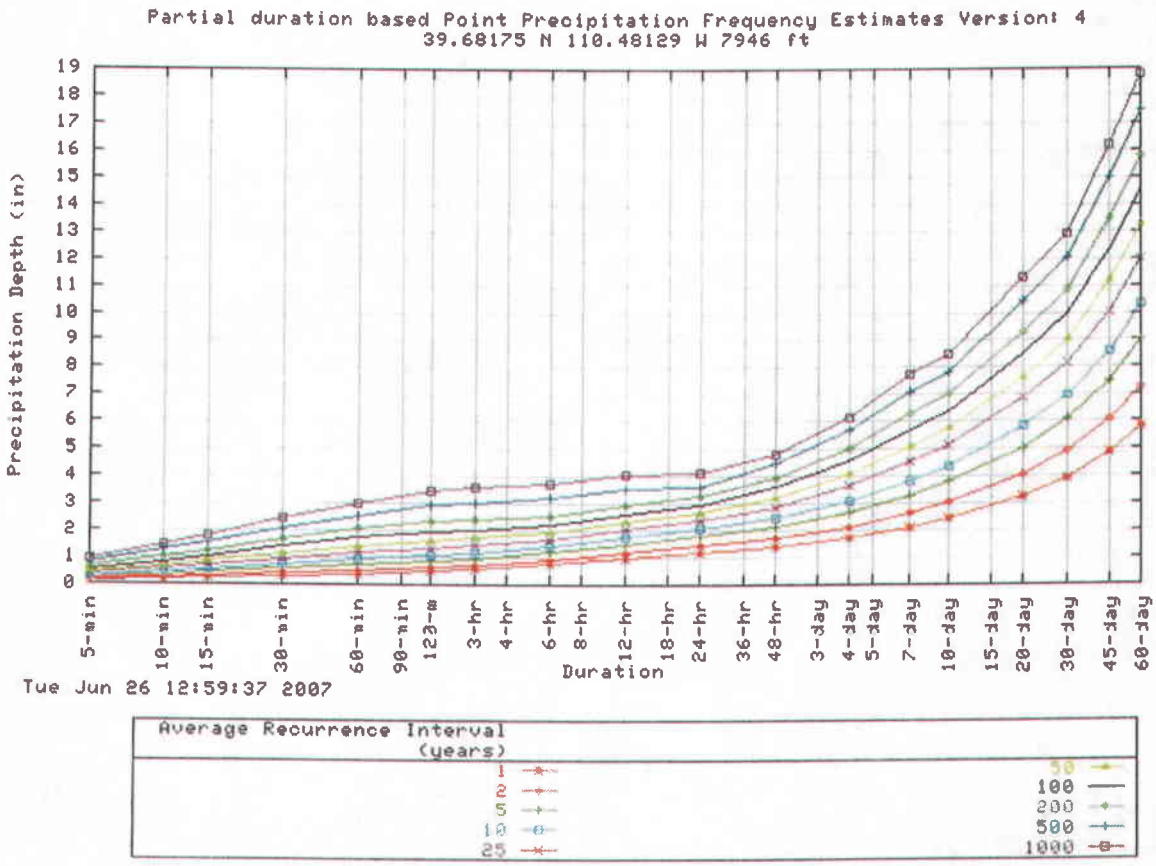
Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.14	0.20	0.25	0.34	0.42	0.52	0.59	0.77	0.99	1.18	1.40	1.74	2.12	2.44	3.26	3.97	4.88	5.83
2	0.17	0.26	0.33	0.44	0.55	0.65	0.74	0.96	1.23	1.46	1.74	2.16	2.65	3.06	4.08	4.95	6.10	7.31
5	0.24	0.36	0.45	0.60	0.74	0.86	0.95	1.19	1.50	1.78	2.13	2.67	3.29	3.78	5.05	6.09	7.50	9.00
10	0.29	0.45	0.55	0.74	0.92	1.06	1.15	1.38	1.73	2.05	2.46	3.08	3.80	4.36	5.82	6.98	8.59	10.29
25	0.38	0.58	0.72	0.97	1.20	1.36	1.45	1.67	2.05	2.40	2.89	3.65	4.52	5.14	6.86	8.15	10.04	11.96
50	0.46	0.70	0.86	1.16	1.44	1.64	1.72	1.92	2.32	2.68	3.24	4.09	5.08	5.74	7.66	9.04	11.15	13.22
100	0.55	0.83	1.03	1.39	1.72	1.96	2.04	2.22	2.60	2.96	3.60	4.55	5.67	6.36	8.48	9.94	12.29	14.50
200	0.65	0.99	1.23	1.66	2.05	2.33	2.41	2.57	2.94	3.25	3.96	5.03	6.28	7.00	9.31	10.84	13.44	15.78
500	0.82	1.24	1.54	2.08	2.57	2.93	3.03	3.18	3.53	3.64	4.45	5.67	7.11	7.86	10.44	12.03	14.99	17.48
1000	0.97	1.47	1.83	2.46	3.04	3.49	3.59	3.74	4.09	4.13	4.84	6.17	7.77	8.53	11.30	12.94	16.22	18.80

Text version of table

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.


Partial duration based Point Precipitation Frequency Estimates Version: 4
39.68175 N 110.48129 W 7946 ft
Precipitation Depth (in)
Average Recurrence Interval (years)
Tue Jun 26 12:59:37 2007
Duration
5-min
10-min
15-min
30-min
60-min
120-min
3-hr
6-hr
12-hr
24-hr
48-hr
4-day
7-day
10-day
20-day
30-day
45-day
60-day



Confidence Limits -

*** Upper bound of the 90% confidence interval**
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.16	0.24	0.30	0.41	0.51	0.60	0.69	0.88	1.11	1.31	1.56	1.94	2.41	2.74	3.65	4.43	5.44	6.49
2	0.21	0.32	0.39	0.53	0.65	0.76	0.86	1.09	1.38	1.63	1.94	2.42	3.01	3.42	4.56	5.54	6.80	8.12
5	0.28	0.43	0.53	0.72	0.89	1.01	1.11	1.35	1.68	2.00	2.38	2.98	3.73	4.24	5.66	6.80	8.37	10.00
10	0.35	0.53	0.66	0.89	1.10	1.24	1.33	1.58	1.94	2.29	2.74	3.44	4.33	4.89	6.53	7.79	9.60	11.44
25	0.46	0.69	0.86	1.16	1.43	1.60	1.69	1.91	2.32	2.69	3.23	4.08	5.15	5.76	7.70	9.12	11.24	13.33
50	0.55	0.83	1.04	1.40	1.73	1.93	2.01	2.21	2.63	3.00	3.62	4.58	5.80	6.45	8.61	10.14	12.51	14.77
100	0.66	1.00	1.24	1.67	2.07	2.33	2.40	2.58	2.97	3.33	4.03	5.11	6.50	7.17	9.55	11.18	13.80	16.25
200	0.79	1.20	1.49	2.01	2.49	2.79	2.87	3.01	3.38	3.66	4.45	5.65	7.22	7.91	10.53	12.23	15.15	17.77
500	1.01	1.54	1.90	2.56	3.17	3.59	3.67	3.79	4.13	4.17	5.04	6.42	8.24	8.93	11.88	13.66	17.01	19.80
1000	1.22	1.85	2.30	3.09	3.83	4.35	4.43	4.52	4.85	4.90	5.51	7.04	9.06	9.75	12.94	14.77	18.49	21.43

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than
** These precipitation frequency estimates are based on a partial duration series. **ARI** is the Average Recurrence Interval.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

*** Lower bound of the 90% confidence interval**

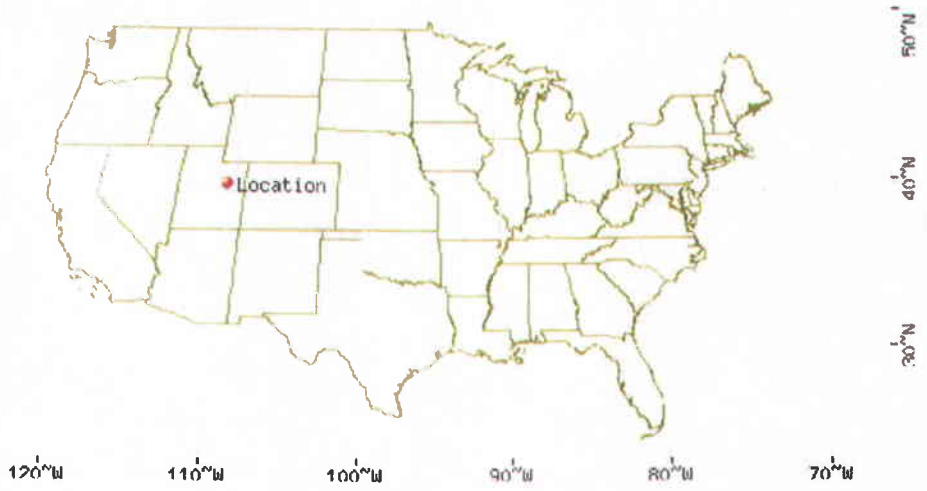
Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.12	0.18	0.22	0.29	0.36	0.45	0.52	0.69	0.90	1.07	1.26	1.56	1.89	2.19	2.94	3.59	4.41	5.28
2	0.15	0.23	0.28	0.38	0.47	0.57	0.65	0.85	1.11	1.32	1.57	1.95	2.36	2.75	3.68	4.48	5.51	6.61
5	0.20	0.31	0.38	0.52	0.64	0.75	0.84	1.05	1.34	1.61	1.92	2.39	2.92	3.38	4.53	5.49	6.75	8.10
10	0.25	0.38	0.47	0.63	0.79	0.90	1.00	1.22	1.54	1.84	2.20	2.75	3.37	3.88	5.22	6.26	7.69	9.22
25	0.32	0.48	0.59	0.80	0.99	1.14	1.24	1.45	1.81	2.15	2.58	3.23	3.97	4.55	6.10	7.27	8.94	10.66
50	0.37	0.56	0.70	0.94	1.17	1.34	1.44	1.65	2.02	2.39	2.86	3.60	4.43	5.05	6.76	8.02	9.86	11.71
100	0.43	0.66	0.82	1.10	1.36	1.56	1.67	1.88	2.23	2.62	3.15	3.97	4.90	5.55	7.41	8.75	10.78	12.73
200	0.50	0.76	0.94	1.27	1.57	1.81	1.93	2.13	2.48	2.85	3.44	4.34	5.36	6.06	8.07	9.47	11.69	13.73
500	0.60	0.91	1.13	1.52	1.88	2.17	2.32	2.56	2.93	3.15	3.81	4.82	5.99	6.71	8.90	10.36	12.86	15.01
1000	0.68	1.04	1.29	1.73	2.15	2.48	2.65	2.94	3.34	3.38	4.10	5.18	6.46	7.19	9.53	11.03	13.76	15.97

* The lower bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are less than
** These precipitation frequency estimates are based on a partial duration maxima series. ARI is the Average Recurrence Interval.

Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -



These maps were produced using a direct map request from the U.S. Census Bureau Mapping and Cartographic Resources **Tiger Map Server**

Please read disclaimer for more information.

Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available
from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information
about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study,
please refer to our documentation.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

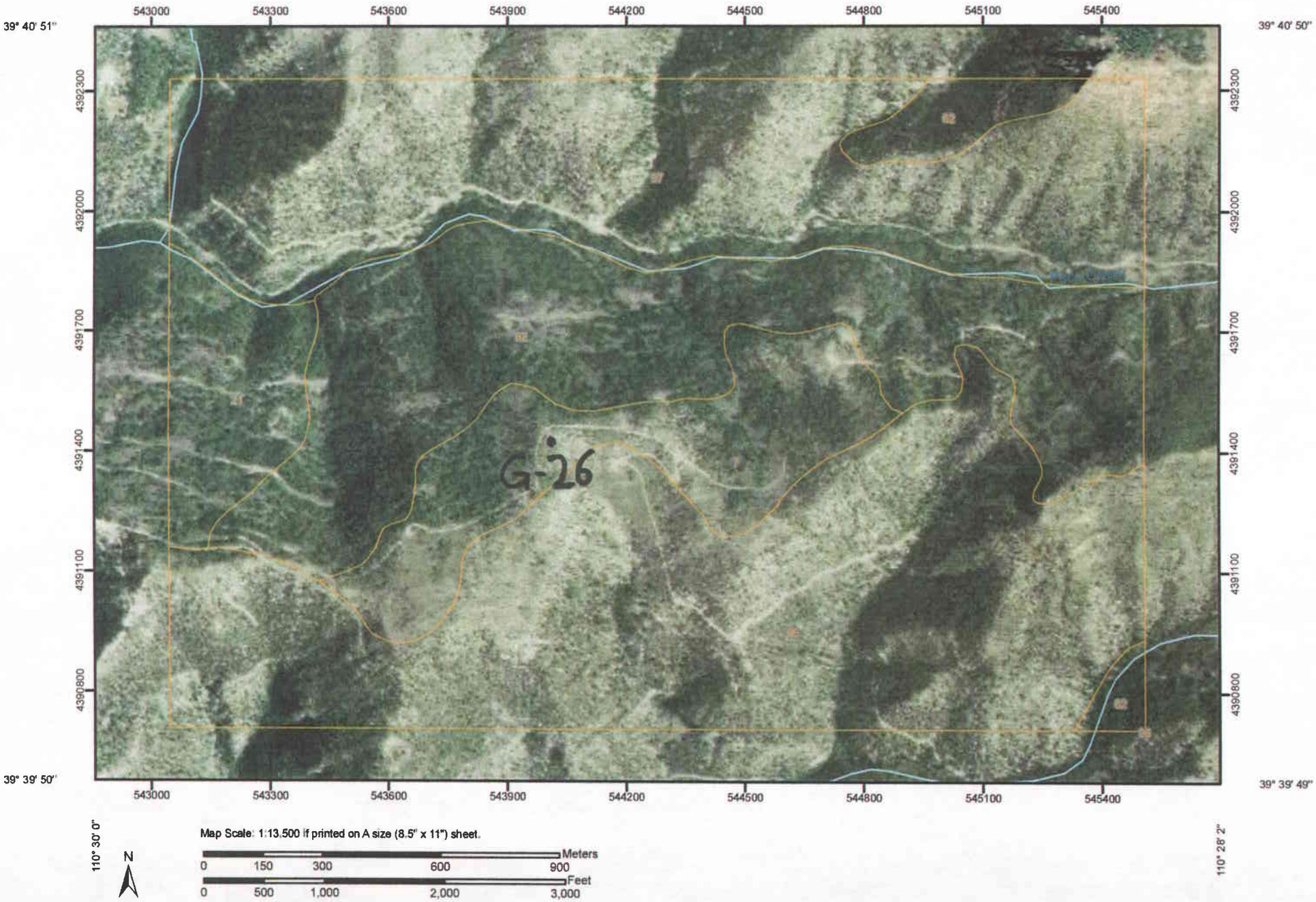
+/-30 minutes ...OR... +/-1 degree of this location (39.68175/-110.48129). Digital ASCII data can be obtained directly from **NCDC**.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the **Western Regional Climate Center's state-specific SNOTEL station maps**.

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910

(301) 713-1669
Questions? HDSC.Questions@noaa.gov

Disclaimer


110° 30'
110° 28'
39° 40' 51"
39° 40' 50"
39° 39' 50"
39° 39' 49"
543000
543300
543600
543900
544200
544500
544800
545100
545400
4392300
4392000
4391700
4391400
4391100
4390800
G-26
110° 30' 0"
110° 28' 2"
N
Map Scale: 1:13,500 if printed on A size (8.5" x 11") sheet.
Meters
0 150 300 600 900
Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Soils

- Soil Survey Areas
- Soil Map Units

Water Features

- Streams and Canals

Transportation

- Local Roads

MAP INFORMATION

Map Scale: 1:11,100 if printed on A size (8.5" × 11") sheet.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 12N NAD83

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

Soil Survey Area: Carbon Area, Utah, Parts of Carbon and Emery Counties
Survey Area Data: Version 4, Jul 2, 2008

Date(s) aerial images were photographed: 8/28/2006

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.

RUSLE2 Related Attributes– Carbon Area, Utah, Parts of Carbon and Emery Counties							
Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
7—Beje-Trag complex							
Beje	55	D	.20	1	39.2	37.3	23.5
Trag	20	B	.15	5	35.4	33.6	31.0
62—Midfork family-Comodore complex							
Midfork	50	B	.20	5	39.8	37.7	22.5
Comodore	20	D	.20	1	42.1	37.9	20.0
96—Rock outcrop-Rubbleland-Travessilla complex							
Rock outcrop	35	D	—	—	—	—	0.0
Rubbleland	30	A	—	5	—	—	0.0
Travessilla	25	D	.24	1	68.8	16.2	15.0
97—Rottulee family-Trag complex							
Rottulee	60	C	.28	2	42.1	37.9	20.0
Trag	20	B	.20	5	39.8	37.7	22.5