C/025/005 Incoming

#5695

Alton Coal Development, LLC
463 North 100 West, Suite 1
Cedar City, Utah 84720
Phone (435) 867-5311 Fax (435) 867-1192

June 19, 2018

Daron R. Haddock
Coal Program Manager
Oil, Gas & Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

Subject: **Midterm Review Response, Alton Coal Development, LLC, Coal Hollow Mine, Kane County, Utah, C/025/0005, Task #5617**

Dear Mr. Haddock,

Alton Coal Development, LLC (ACD) is submitting the MRP changes in response to Midterm review Task #5617. Information from Table 1 of Chapter 2 has now been updated and incorporated in Drawing 2-2.

Changes to the MRP associated with this amendment have been uploaded to the DOGM's server for review. Upon approval, 2 (two) clean hard copies of the certified drawing for insertion into the MRP will be submitted. Please do not hesitate to contact me if you have any questions 435-691-1551.

Sincerely

B. Kirk Nicholes
Environmental Specialist

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APPLICATION FOR COAL PERMIT PROCESSING

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

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine **Permit Number:** C/025/0005
Title: Midterm Review Task #5617

Description, Include reason for application and timing required to implement:
Midterm Review Task #5617

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

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes ☒ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?
☐ Yes ☒ No 24. Does the application include confidential information and is it clearly marked and separated in the plan?

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) 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.

B. Kirk Nicholes	Environmental Specialist	06/19/2018	B. Kirk Nicholes
Print Name	Position	Date	Signature (Right-click above choose certify then have notary sign below)

Subscribed and sworn to before me this 19th day of June 2018

Notary Public: Sherrie Prisbrey, state of Utah.

My commission Expires: 9/26/2019
Commission Number: 685027
Address: 377 N Main St
City: Cedar City State: Ut Zip: 84721

} ss:

SHERRIE PRISBREY
Notary Public
State of Utah
Comm. No. 685027
My Comm. Expires Sep 26, 2019

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
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Form DOGM- C1 (Revised December 10, 2007)

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

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine **Permit Number:** C/025/0005
Title: Midterm Review Task #5617

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	MRP Vol. 2, Chapter 2, TOC
☐ Add	☒ Replace	☐ Remove	MRP Vol. 2, Chapter 2, Text
☐ Add	☒ Replace	☐ Remove	MRP Vol. 2, Chapter 2, Drawing 2-2
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.

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TABLE OF CONTENTS

Chapter 2

R645-301-200

SOILS

APPENDICES

DRAWINGS

R645-301-200. SOILS

210. INTRODUCTION

211. Soil Removal

In this section, the Alton Coal Project will present a description of the pre-mining soil resources as specified under R645-301-221. Topsoil and subsoil to be saved under R645-301-232 will be separately removed and segregated from other materials.

212. Soil Redistribution

After removal, topsoil will be immediately redistributed in accordance with R645-301-242 and stockpiled pending redistribution under R645-301-234. For details refer to Section 5 of Appendix 2-1.

220. ENVIRONMENTAL DESCRIPTION

221. Prime Farmland Investigation

The Natural Resource Conservation Service conducted a prime farmland assessment in October 2006 and determined that "No Prime Farmland or Soils of Statewide Importance were found within the study area (Coal Hollow Mine area), per criteria outlined in the National Survey Handbook Part 622 and Exhibit UT603-1, respectively (C. Meier, 2006)." The assessment stated that the soils "..could classify as Soils of Statewide Importance, if irrigated.."

"An available and reliable source of moisture to sustain crops common to the area is the primary limiting factor that excludes the observed soils from classifying as Prime Farmland or SSI (C. Meier, 2006)."

"In addition to a lack of a reliable source of water, soils did not classify as Prime Farmland due to high pH, high electrical conductivity, excessive erosion potential on steep slopes and slow permeability (C. Meier, 2006)."

On January 28, 2014, the Natural Resource Conservation Service provided a prime farmland assessment for the Dame Lease IBC. It was determined that "About 80 acres of the area of interest meets the definition of "Statewide Important Farmland, if irrigated" . It is in map unit "1103- Sili-Sidshow- Gypsic Haplustepts complex, 2 to 15 percent slopes" .

A copy of the NRCS Prime Farmland Determination for both the 2006 (Coal Hollow Mine) and the 2014 (Dame Lease IBC) is included in Section 1 of Appendix 2-1.

The Natural Resource Conservation Service (NRCS) conducted a Prime Farmland assessment in December 2012 and determined that soil map unit 1111 is considered Prime Farmland, if irrigated." NRCS soil map unit 1111 is Naplene-Termote-Arboles Oxyaquic Ustifluvent complex, 2 to 8 percent slopes. The NRCS determined that there is "...approximately 292 of soil map unit 1111" which is irrigated and "...will be converted." The NRCS Prime Farmland assessment can be seen in Appendix A of Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil*

Survey for the North Private Lease Expansion of the Coal Hollow Mine (November 2014).

The NRCS Prime Farmland assessment is based on a broad Order 2 and Order 3, Soil Survey of Kane County, Utah.

An evaluation of potential Prime Farmland areas within the North Private Lease was conducted using field and lab data collected for the soil survey. The results found a difference between the soils mapped as part of the Kane County Area, Utah Soil Survey and those identified by the more intensive North Private Lease soil survey. The project specific evaluation of potential *Prime Farmland* map units was conducted using field and laboratory analysis data from the North Private Lease area and the criteria set forth in the *Code of Federal Regulations Title 7, Part 657.5 Identification of important farmlands*. The results of this evaluation can be seen in Section 4 of Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

The results of this evaluation found that there is approximately 121 acres of Prime Farmland soil map units that are irrigated and approximately 130 acres of Farmland of Statewide Importance within the North Private Lease soil survey area. This total area of 251 acres is equivalent to the sum of all land that is currently under irrigation or has the potential of being irrigated with existing water rights. Handling procedures of Prime Farmland soils found in Area 2 of the NPL can be found in MRP, Chapter 9, Section R302-316 through R302-317.

222. Soil Survey

An order 2 soils survey has been completed in 2007 at the Coal Hollow Project. Appendix 2-1 contains a report that provides the details for this survey. Utilizing existing soils data, the soil map units were extended to include the Dame Lease IBC. Appendix 2-3 contains a report that provides details for this survey. The survey area is on private lands leased by Alton Coal Development (ACD) and adjacent lands. These soil surveys were prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3) develop a post mining reclamation plan using salvaged soil materials. These soil surveys cover approximately 716 acres.

An Order 2 soil survey was completed in the North Private Lease area in 2014. This soil survey report can be found in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014). The survey is on private lands leased by Alton Coal Development (ACD) and adjacent lands. This soil survey was prepared so that ACD could: 1) identify suitable sources of subsoil and topsoil; 2) determine topsoil and subsoil salvage depths and quantities; and, 3) develop a post mining reclamation plan using salvaged soil materials. These soil surveys cover approximately 428 acres.

A soil survey update was completed for approximately 27.9 acres of undisturbed soils in the Pit 10 Borrow Area. This update is described Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.*

222.100. Soils Map

A map with soil map unit delineations is shown on Drawing 2-1.

A map with soil map unit delineations for the North Private Lease is shown on Soils Map 2 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

An updated soil map for the Pit 10 Borrow Area was produced based on the July 26 and 27, 2016 field evaluation and subsequent laboratory analysis. This updated soil map is shown as Figure 2-4.1 in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.*

222.200. Soil Identification

Soils in the Coal Hollow project soil survey area have been grouped into thirteen soil map units based on taxonomic classification, depth to parent material, and slope. The composition of these map units is described in table 2-1. Detailed descriptions of each soil map unit are included in Appendix 2-1. The soil survey map is Drawing 2-1.

Table 2-1. Soil map unit composition for the Coal Hollow project area.

Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
1		**A Family – Wapiti Family complex, 3 to 8 percent slopes**		
	65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
	10	D	fine, mixed, superactive, mesic Aridic Calciustoll	33
	5	Manzanst Family	fine, mixed, superactive, mesic Aridic Haplustalf	48
	5	N Family	fine, mixed, superactive, frigid Aquic Calciustoll	26
2		**M Family - Calendar Family – D Family complex, 3 to 8 percent slopes**		
	60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3
	25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4
	15	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	2
3		**Cibeque Family – Wapiti Familiy complex, 3 to 8 percent slopes**		
	60	Cibeque Family	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6
	30	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
4		**Jonale Family - Graystone Cobbly Substratum Family - Wapiti Family complex, 3 to 8 percent slopes**		
	50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17
	25	Graystone cobbly substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39
	15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19

Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
	5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5		**Calendar Family - M Family – Drififty Family complex, 8 to 25 percent slopes**		
	40	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24
	30	M Family	fine, mixed, superactive, mesic Aridic Calciustept	25
	20	Drififty Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49
	10	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
6		**Graystone - Cookcan – Jonale Family complex, 1 to 5 percent slopes**		
	45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15
	20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B
	20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16
	15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14
7		**Happyhollow Family - Alamosa complex, 1 to 5 percent slopes**		
	55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38
	20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A
	10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
	10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40
	3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
	2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
8		**Brumley – Graystone - Snilloc complex, 3 to 8 percent slopes**		
	40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22
	30	Graystone Cobbly Substratum Family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20
	20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21
	10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
9		**D Family - Deacon complex, 5 to 30 percent slopes**		
	55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41
	30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42
	10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
	5		Creek bottom	
10		**Zigzag clay, 8 to 25 percent slopes**		
	85	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	50

Map Unit	Pct	Soil Type[1]	Taxonomic Classification[2]	Modal Pedon[3]
	10	Drififty Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	
	5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
11		**A family clay, 8 to 25 percent slopes**		
	85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28
	10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
	5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	
12		**Manzanst Taxadjunct Family clay, 3 to 12 percent slopes**		
	85	Manzanst Family	very fine, mixed, superactive, mesic Aridic Haplustalf	48
	10	Manzanst Family Deep	very fine, mixed, superactive, mesic Aridic Haplustalf	60
	5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
13		**A Family – Happyhollow Family complex, 1 to 5 percent slopes**		
	80	A Family	fine, mixed, superactive, mesic Aridic Calciustept	59
	15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
	5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52

Soils in the North Private Lease soil survey area were delineated with 12 soil map units and 1 miscellaneous land form. The composition of the soil map units is described in Table 6 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014). Detailed descriptions of the soil map units can be seen in Section Three in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

222.300 Soil Descriptions

Based on the order 2 soils survey that was completed on 2007, the following soil map unit descriptions and productivities apply. Additional information describing each soil map unit is contained in Appendix 2-1.

1 A Family – Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 1 is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1970). The depth to Tropic shale is greater than 40 inches in the major soils (A and Wapiti soil families), but minor inclusions with Tropic shale from 20 to 40 inches deep occur. The map unit is dominated by big sagebrush and grasses.

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities and establish topsoil and subsoil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
65	A Family	fine, mixed, superactive, mesic Aridic Calciustept	1*
20	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	32
10	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	33
5	M	fine, mixed, superactive, mesic Aridic Haplustepts	26
* Lab analysis of typifying soil pedon for map unit.			

Map unit 1 description is continued on page 2-5.

Typifying Soil Pedon Descriptions

Soil colors are for dry soil unless specified otherwise.

The typifying soil pedon for A family soils in map unit 1 is soil pedon 1. The surface is a grayish brown clay loam 12 inches thick, dark grayish brown (moist). The subsoil (calcic) consists of light brownish gray silty clay, light olive brown (moist). Decomposing Tropic shale occurs at 42 inches below the surface.

The typifying soil pedon for the Wapiti family soils in map unit 1 is soil pedon 32. The mollic surface is a brown loam 8 inches thick, very dark grayish brown (moist). The subsurface (argillic) is a pale brown clay loam and silty clay, brown (moist). The subsoil (calcic) is pink loam to 6 feet, brown (moist). The underlying soil to nearly 12 feet is light yellowish brown silty clay over pink coarse sands with 10 percent faint strong brown mottles.

Supporting Soil Pedons

Soil family A is also represented by soil pits 27 and 30 in map unit A. Soil pit 27 does not have Tropic shale within 140 inches of the surface. Soil pit 30 has decomposing Tropic shale at 105 inches below the surface.

Laboratory Analysis

Analysis of soil samples from soil pit 1 had a poor soil pH (8.7) from 24 to 42 inches and fair lime percents (22.6 to 28.3 percent) throughout the soil profile. The silty clay texture at 24 inches is in the poor category for texture. SAR increases gradually with depth to 4.02 in the 24 to 42 inch horizon and then reaches 12.3 in the tropic shale below 42 inches.

Soil Inclusions

Small inclusions of D Family and N Family soils occur within map unit 1. D Family soils are similar to the A Family soils, but have a mollic epipedon (dark surface). The N family soils are very deep, similar to the D Family soil, but have aquic soil conditions below 20 inches and are located in concave depressions within map unit 1.

2 M Family – Calendar Family - D Family complex, 3 to 8 percent slopes

General Description

This map unit is dominated by soils with Tropic shale parent material at 20 to 72 inches below the surface. The map unit is dominated by big sagebrush and grasses with some pinyon pine and Utah juniper encroaching along edges of the map unit near map unit 5. This map unit is dominated by clayey soils with very slow hydraulic conductivity rates of less than 0.04 inches per hour based on the silty clay soil texture (p. 91, Renard, 1997).

This map unit occurs at the north end of the map unit where the Coal Hollow project proposes to build facilities. A second small delineation of map unit 2 occurs along the south boundary of the proposed year 1 mining area west of the county road.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	M Family	fine, mixed, superactive, mesic Aridic Calciustepts	3*
25	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	4*
15	D family	fine, mixed, superactive, mesic Aridic Calciustoll	2*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for M family soils in map unit 2 is soil pedon 3. The surface is a brown loam 4 inches thick, dark brown (moist). The subsurface (cambic) is a grayish brown clay loam and silty clay loam 15 inches thick, brown (moist). The underlying subsoil to 33 inches is light brownish gray silty clay, light olive brown (moist). Tropic shale parent material occurs at 33 inches below the surface.

The typifying soil pedon for Calendar family soils in map unit 2 is pedon 4. The surface is pale brown silty clay 4 inches thick, dark grayish brown (moist). The subsurface (cambic) is light brownish gray silty clay moderate to strong structure, dark grayish brown (moist) to 31 inches. Tropic shale parent material occurs at 31 inches.

The typifying soil pedon for D family soils in map unit 2 is pedon 2. The surface (mollic) is brown clay loam 12 inches thick, very dark grayish brown (moist). The subsurface (cambic and calcic) is pale brown silty clay and clay to 48 inches deep, brown (moist).

The subsoil is white silty clay to 72 inches, brown (moist). Tropic shale parent material occurs at 72 inches below the surface.

Supporting Soil Pedons

Soil pedon 12 is representative of soil type M and is located in the delineation of map unit 2 along the south boundary of the year 1 mining area. The depth to Tropic shale in pedon 12 is 26 inches.

Laboratory Analysis

The main limiting feature of soils in map unit 2 is an increase of conductivity and SAR into the fair range as the soil depth reaches the interface with Tropic shale. The percent lime in the soil ranges from 18.6 to 27.5 above the Tropic shale. The saturation percentage increases with the percent clay, but remains in the fair range even with the clay and silty clay.

3 Cibeque Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 3 is characterized by very deep soils that show some indication of alluvial deposition most likely from the large alluvial fan that formed this portion of Sink Valley. Recent soil deposition from nearby Robinson Creek is indicated in pedon 6 by an increase of organic matter at 12 inches below the soil surface.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
60	Cibeque	fine-loamy, mixed, superactive, mesic Aridic Calciustept	6*
30	Wapiti	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	31
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Cibeque family soils in map unit 3 is soil pedon 6. The surface is brown loamy sand 12 inches thick, dark yellowish brown (moist). The subsoil (calcic) is pale brown loam and sandy loam to 34 inches deep, brown (moist). The underlying soil to 60 inches is light grayish brown silty clay, brown (moist).

The typifying soil pedon for Wapiti family in map unit 3 is soil pedon 31. The surface (mollic) is dark grayish brown loam 7 inches thick, dark brown (moist). The subsurface (argillic) is light yellowish brown clay loam to 17 inches, dark yellowish brown (moist). The subsoil (lower argillic and calcic) is light brownish gray and brown clay loam and loam to 52 inches, grayish brown and brown (moist). The underlying soil to 110 inches is

very pale brown sandy loam and loamy sand, brown and yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 13 is representative of Cibeque family in map unit 3.

Laboratory Analysis

Soil pH increases to the fair category (8.3 to 8.5) at 6 inches below the surface in pedon 6. The soil pH is consistent with percent lime in fair category (18.4 to 29.2). The loamy sand surface has a fair water holding capacity. Organic matter has an irregular increase at 12 inches from 0.7 in the A2 horizon to 2.6 in the upper Bk horizon.

Soil Inclusions

Small inclusions of A and Calendar soil families occur in map unit 3. A family soils are similar to Cibeque soils, but have a higher percentage of clay in the control section (10 to 40 inches). Calendar soils are very deep but do not have either an argillic horizon (increase in illuvial clays) or a calcic horizon within 40 inches of the soil surface.

4 Jonale Family – Graystone cobbly substratum Family - Wapiti Family complex, 3 to 8 percent slopes

General Description

Map unit 4 is characterized by very deep fine-loamy and coarse-loamy soils with mollic epipedons and calcic horizons. Lime accumulations below 12 to 22 inches are common in these soils. Soil pH is strongly alkaline below 22 inches in some soils. Vegetation in this map unit is big sagebrush and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
50	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	17*
25	Graystone cobbly substratum family	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	39*
15	Wapiti Family	fine-loamy, mixed, superactive, mesic Calcidic Argiustoll	19*
5	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	7*
5	A Family	fine, mixed, superactive, mesic Aridic Calciustept	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Jonale family in map unit 4 is soil pedon 17. The surface (mollic) is a brown clay loam 9 inches thick, dark brown (moist). The subsurface

(cambic) is a pale brown clay loam to 18 inches, brown (moist). The lower subsurface (Bwk) to 45 inches is light yellowish brown loam and clay loam, dark yellowish brown (moist). The underlying subsoil (calcic) is very pale brown clay loam and silty clay to 80 inches, yellowish brown (moist).

The typifying soil pedon for Graystone cobbly substratum family in map unit 4 is soil pedon 39. The surface is brown clay loam 12 inches thick, dark brown (moist). The subsurface (calcic) is a very pale brown to light yellowish brown sandy loam to 36 inches deep, yellowish brown (moist) with 0 to 15 percent gravels and cobbles. The underlying subsoil is very pale brown very cobbly loamy sand to 75 inches, brown (moist).

The typifying soil pedon for Wapiti family in map unit 4 is soil pedon 19. The surface (mollic) is a grayish brown loam 6 inches thick, very dark grayish brown (moist). The subsurface (upper argillic) is a brown and pale brown clay loam to 24 inches deep, dark grayish brown and yellowish brown (moist). The lower subsurface (lower argillic and upper calcic, Btk) is a pale brown loam to 37 inches deep, brown (moist). The underlying subsoil (calcic) is a pale brown and light yellowish brown sandy loam to 90 inches deep, yellowish brown (moist).

Supporting Soil Pedons

Jonale family is represented by soil pedons 5, 8, 10, 18B, 23, 34, and 35. Soil family H is represented by soil pedons 11, 36, and 37.

Laboratory Analysis

Jonale soil family is characterized by soil pH in the poor range of 8.6 to 9.0 (Utah DOGM, 2005) at depths below 22 to 40 inches. This strongly alkaline soil pH corresponds to lime percentages of greater than 30 in this same portion of the soil profile.

Graystone cobbly substratum soil family is dominated by sandy loam and loamy sand textures with some clay loam. Lime accumulation occurs below 12 to 16 inches, but percentages are lower relative to the fine-loamy type C soils. Soil pH becomes strongly alkaline at depths of 48 inches in some pedons. There is 15 to 45 percent gravels and cobbles below 36 inches.

Wapiti soil family has fair levels of carbonates throughout the soil profile. Soil pH was measured as poor below 68" in soil pedon 19.

Soil Inclusions

Soil family D is represented by pedon 7 in map unit 4. There are also small inclusions of soil family A where map unit 4 borders map units 1 and 11.

5 Calendar Family - M Family – Drififty Family complex, 8 to 25 percent slopes

General Description

These soils are moderately deep (20 to 40 inches) to shallow (less than 20 inches to Tropic shale. The moderately deep soils have clayey textures, while the shallow soils are loamy. Vegetation is pinyon pine, Utah juniper, black sage and grasses.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	24*
30	M family	fine, mixed, superactive, mesic Aridic Calciustept	25*
20	Drififty Family	loamy, mixed, superactive, calcareous, mesic Aridic Lithic Ustorthent	49*
5	Zigzag	Clayey, mixed, superactive, calcareous, mesic, shallow Aridic Ustorthent	

* Lab analysis of typifying soil pedon for map unit.

Typifying Soil Pedon Descriptions

The typifying soil pedon for Calendar family in map unit 5 is soil pedon 24. The surface is olive brown clay 5 inches thick, dark grayish brown (moist). The subsurface (cambic) is dark grayish brown and olive clay with moderate to strong blocky structure to 32 inches. Tropic shale parent material is at 32 inches.

The typifying soil pedon for M family in map unit 5 is soil pedon 25. The surface is covered with a half inch of decomposing needles and twigs. The soil surface is light brown clay 5 inches thick, brown (moist). The subsurface (calcic) is brown and strong brown clay with lime accumulations, dark brown (moist). Tropic shale parent material is at 32 inches.

The typifying soil pedon for Drififty family in map unit 5 is soil pedon 49. The surface light yellowish brown silty clay loam 3 inches thick, light olive brown (moist). The subsoil is a light olive brown loam to 10 inches, olive brown (moist). Interbeded sandstone and Tropic shale are at 10 inches.

Laboratory Analysis

Calendar soil family is characterized by percent clay of 44 to 47 with correspondingly high saturation percentages of 73.6 to 91.2. Conductivity increases to 7.8 at 17 inches below the surface.
Soil type M is characterized by percent clay of 40 to 47 with correspondingly high saturation percentages of 58.5 to 80.6 in the upper 20 inches of the soil profile. The percent clay decreases to 33 percent below 20 inches. Lime percentage is greater than 30 in the 5 to 20 inch depth, but less than 5 above and below this zone.

Drififty soil family is characterized by pH of 8.1 to 8.4, lime percentage of 18, and SAR of less than 0.1.

Soil Inclusions

There are some inclusions of Zigzag soils that are shallow (less than 20 inches) to Tropic shale. Zigzag soils are clayey.

6 Graystone – Cookcan – Jonale Family complex, 1 to 5 percent slopes

General Description

These medium to coarse textured soils are very deep. Wet soil conditions are present at varying depths in all of the map unit soils. The depth to wet soil conditions varies from 14 to 58 inches. This map unit is not a good source of subsoil. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is grasses, sedges, and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
45	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	15*
20	Cookcan	coarse-loamy, mixed, superactive, frigid Typic Calciaquoll	9B*
20	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	16*
15	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	14*
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for Graystone soils in map unit 6 is soil pedon 15. There is a dense root mat 1 inch thick on the surface. The surface is brown sandy loam 8 inches thick, dark brown (moist). The subsurface (cambic) is pale brown loam with moderate structure, dark yellowish brown (moist) to 20 inches. The subsoil (calcic) is very pale brown loam to 58 inches deep, yellowish brown (moist). The underlying soil is yellow and brownish yellow sandy loam with common prominent mottles to 96 inches, yellowish brown (moist).

The typifying soil pedon for Cookcan soils in map unit 6 is soil pedon 9B. The surface is dark grayish brown loam 6 inches thick, very dark grayish brown (moist). The lower surface is grayish brown sandy clay loam to 14 inches with few faint mottles, dark grayish brown (moist). The subsurface is light brownish gray sandy loam with common prominent mottles, dark gray (moist). The subsoil is light gray sandy loam with many prominent mottles, grayish brown (moist). The soil was wet below 48 inches.

The typifying soil pedon for Jonale soil family in map unit 6 is soil pedon 16. There is a dense root mat 1 ½ inch thick on the surface. The surface is dark grayish brown silty clay loam 8 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 18 inches, strong brown (moist). The subsoil is pink clay loam to 36

inches, brown (moist). The lower subsoil is pink silty clay loam and loam with few faint strong brown mottles to 68 inches, brown (moist). The underlying soil is light brownish gray clay loam with common prominent yellowish red mottles, grayish brown (moist).

Supporting Soil Pedons

Soil pedon 9A is similar to Graystone soils, but it has carbonates throughout the soil profile without any zone of accumulation.

Laboratory Analysis

Strongly alkaline soil pH (8.6 to 9.0) within 12 to 20 inches of the soil surface is the main limiting feature of the soils in map unit 6. Soil pedon 9A has very strongly alkaline pH (greater than 9.0) below 12 inches of the surface.

Lime percentage exceeds 30 in 3 of 5 pedons within 12 to 20 inches of the surface. Lime percentage ranges from 15 to 26 in the other two pedons from the surface to 48 inches.

Soil Inclusions

Soil pedon 14 is representative of I family soils within map unit 6 that do not have a mollic epipedon (dark surface) and have aquic (wet) soil conditions within 30 inches of the surface. These soils have a calcic horizon.

7 Happyhollow Family – Alamosa complex, 1 to 5 percent slopes

General Description

This soil map unit is located on a Tropic shale structural bench on the east side of the Sink Valley fault. Soils are characterized by clay and a high water table that is perched on top of the heavy clay soils. The high water table is at or within a foot of the soil surface during the wet period of the year. It is estimated that these soils are slower to warm up in the spring due to the wet soil conditions. Vegetation is sedges and forbs.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	38*
20	Alamosa	fine-loamy, mixed, superactive, frigid Typic Argiaquoll	18A*
10	Jicarilla Family	fine, mixed, superactive, frigid Typic Argiaquoll	43
10	Tetonview Family	fine-loamy, mixed, superactive frigid Aeric Calciaquoll	40*
3	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	
2	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for Happyhollow family soils in map unit 7 is soil pedon 38. The surface is dark grayish brown (moist) silty clay 6 inches thick. The subsurface is a yellowish brown (moist) silty clay 6 inches thick. The calcic horizon begins at 12 inches below the surface and is a light yellowish brown (moist) to very pale brown (moist) silty clay. The calcic horizon continues to 48 inches or deeper. The water table was at 29 inches when the pit was described in March 2007. Mottles and gleyed soil were observed below 12 inches. Vegetation is grasses, sedges, widely scattered Wyoming big sagebrush, and wild rose.

The typifying soil pedon for Alamosa soils in map unit 7 is soil pedon 18A. The mollic surface is a very dark grayish brown (moist) loam to 7 inches. The cambic horizon is a brown (moist) loam to 15 inches deep. The calcic horizon is a light olive brown (moist) sandy loam to 30 inches. The underlying soil is grayish brown (moist) clay loam and sandy clay loam to 60 inches deep. Mottles were observed below 7 inches. The water table was at 51 inches when the described in September 2006.

Supporting Soil Pedons

Happyhollow family soil type was observed in pedon 45 within map unit 7 and a similar clayey soil in pedon 44. The Alamoss soil was also observed in pit 46.

Laboratory Analysis

The Happyhollow family soil is characterized by silty clay from the surface down to 24 inches or greater. Soil pH is 8.3 to 8.5 in the 12 to 24" horizon. Saturation percentage ranges from 69.9 to 81.8 in the upper 24 inches. The calcium carbonate equivalent ranges from 17.8 to 28.3 in the upper 20 inches and then increases to 44.5 below 20 inches. This soil pit was not sampled below 24 inches, because of the high water table.

Alamosa soil is characterized by medium textured soils (loam, clay loam, and sandy clay loam) in the upper 60 inches. The calcium carbonate equivalent ranges increases from 20.2 percent in the upper 7 inches to 29.3 percent in the 30 to 45 inch horizon.

Soil Inclusions

A soil similar to Alamosa soils, but with more clay in the control section is in localized areas. Soil mottles were observed and water was flowing into pit 43 when it was described in April 2007. The water table appeared to be perched on top of the underlying clay horizon at 54 inches.

Tetonview family soils were identified in soil pit 40. Mottles were observed below 6 inches and a water table at 23 inches when the pit was described in March 2007. This soil has a dark surface (mollic) and a calcic horizon.

Dry soil profiles occur on small isolated mounds within map unit 7. These non-hydric soils include Brumley and Jonale family soils. Both are very deep soils with a calcic horizon. Jonale family soils have a dark surface (mollic).

8 Brumley – Graystone Cobbly - Snilloc complex, 3 to 8 percent slopes

General Description

These soils developed in very deep alluvium on the east side of the Coal Hollow project area. They are medium to coarse textured. Evidence of a fluctuating water table was observed in most soils below 48 to 60 inches, depending on location and physiographic setting. This map unit would be a good source of cover material, but most of the planned disturbance in this area will be limited to cover soil stockpiles.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
40	Brumley	fine-loamy, mixed, superactive, mesic Calcidic Haplustalf	22*
30	Graystone	coarse-loamy, mixed, superactive, mesic Aridic Calciustoll	20*
20	Snilloc	coarse-loamy, mixed, superactive, mesic Aridic Calciustept	21*
10	Jonale Family	fine-loamy, mixed, superactive, mesic Aridic Calciustoll	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

Colors are for dry soil unless otherwise noted.

The typifying soil pedon for the Brumley soils in map unit 8 is soil pedon 22. The surface is pale brown sandy loam to 6 inches. The argillic and upper calcic horizon is a light yellowish brown silty clay loam and sandy clay loam to 28 inches. The underlying soil is very pale brown sandy loam to 84 inches. Mottles increase significantly below 48 inches indicating that there is fluctuating water table during wet years. This soil supports Gamble oak, snowberry, grasses, and forbs.

The typifying soil pedon for the Graystone soil in map unit 8 is soil pedon 20. The surface is brown loam to 6 inches. The cambic horizon is light yellowish brown clay loam to 13 inches. The calcic horizon is very pale brown to light yellowish brown sandy loam and loamy sand to 54 inches. The underlying soil is a light yellowish brown loam to

72 inches and loamy sand to 96 inches. This soil supports Pinyon pine, Utah Juniper, Gamble oak, and snowberry.

The typifying soil pedon for Snilloc soils in map unit 8 is soil pedon 21. The surface is a light yellowish brown sandy clay loam to 8 inches. The calcic horizon is a pale brown sandy clay loam to 18 inches. The underlying soil is a pale brown strongly alkaline sandy loam to 96 inches. This soil was described in an opening of Wyoming big sagebrush within a larger area of Gamble oak.

Supporting Soil Pedons

A moist phase of the Brumley soil was observed in pit 47 in big sagebrush in map unit 8. A few faint mottles were observed below 24 inches. The amount of soil mottling increased significantly below 44 inches. This soil is on a low mound surrounded on three sides by wet soils in map unit 7. A water table was not observed when the pit was described in April 2007, but the mottles indicate that it is common for the water to rise within 44 inches of the surface in most years, and 24 inches in wet year.

Laboratory Analysis

The Brumley soil has calcium carbonate equivalents ranging from 17.5 to 23.8 percent.

The Graystone soil has a low saturation percentage in the 13 to 28 inch horizon (calcic). Calcium carbonate equivalents range from 16.5 to 25.4 percent. Available water capacity is 0.08 in layers of loamy sands below 28 inches.

The Snilloc family soil is characterized by strongly alkaline soil pH (8.7) below 36 inches. Calcium carbonate equivalents range from 16.8 to 29.8 percent.

Soil Inclusions

The Jonale family soils occur within this map unit. These soils are similar to Brumley soils, but have a dark surface (mollic).

9 D Family - Deacon complex, 5 to 30 percent slopes

General Description

These clayey soils are very deep and dominated by clayey textures. They have a dark surface (mollic epipedon). The D family soil has an increase in lime at 6 to 12 inches below the surface, while the Deacon soil has similar levels of lime throughout the soil profile. Soils in this map unit appear to have developed from the large alluvial fan that covers most of Sink Valley. The map unit is delineated along Robinson Creek and in an area south of the creek that could be the remnants of a historic channel. Vegetation is dominantly big sagebrush, rabbitbrush, and grasses with pinyon pine and Utah juniper encroaching from adjacent areas.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
55	D Family	fine, mixed, superactive, mesic Aridic Calciustoll	41*
30	Deacon	fine-loamy, mixed, superactive, mesic Aridic Haplustoll	42*
10	A Family	fine, mixed, superactive, mesic Aridic Calciustept	
5		Creek bottom	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for the D family soil in map unit 9 is soil pedon 41. The surface is brown sandy clay loam to 6 inches, dark brown (moist). The lower surface is brown clay to 12 inches, dark brown (moist). The subsurface (cambic) is pale brown silty clay to 36 inches, brown (moist). The subsoil (calcic) is very pale brown silty clay loam and sandy loam to 80 inches, yellowish brown (moist).

The typifying soil pedon for Deacon soils in map unit 9 is soil pedon 42. The surface is brown loam 9 inches thick, very dark grayish brown (moist). The subsurface (cambic) is pale brown silty clay to 24 inches, brown (moist). The upper subsoil (lower cambic) is pale brown sandy clay loam to 36 inches, brown (moist). The lower subsoil is light yellowish brown loam to 48 inches, yellowish brown (moist).

Supporting Soil Pedons

Soil pedon 29 is representative of the D family soil in map unit 9.

Laboratory Analysis

Poor soil pH at depth and clayey horizons characterize soils in map unit 9. Soil pH is poor below 64 inches in the D family soil (pit 41) and below 36 inches in the Deacon soil. Horizons of silty clay and clay occur in the D family soil (pit 41) between 6 and 36 inches. The clayey horizon in the Deacon soil is between 9 and 24 inches.

Soil Inclusions

The channel area of Robinson Creek comprises a small portion of this map unit. The creek bottom is not vegetated.

10 Zigzag clay, 8 to 25 percent slopes

General Description

These clayey soils are shallow to Tropic shale and formed along the Sink Valley escarpment. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Zigzag	clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	50*
10	Drififty Family	loamy, mixed, superactive, nonacid, mesic Aridic Lithic Ustorthent	
5	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the Zigzag soil in map unit 10 is soil pedon 50. The surface is light brownish gray clay to 4 inches, dark grayish brown (moist). The subsurface is light brownish gray clay to 19 inches, dark grayish brown and olive brown (moist). Tropic shale is at 19 inches.

Laboratory Analysis

Clayey soil texture is the main limiting feature to the Zigzag soil in map unit 10. Lime percentage is between 18 and 19 throughout the soil profile. SAR is less than 1. Soil pH is in the good to fair range (8.1 to 8.4).

Soil Inclusions

The Drififty family soil occurs along ridges where the Tropic shale is interbeded with sandstone. These soils are loamy and less than 20 inches deep.
Calendar family soil occur in concave toeslope areas. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

11 A Family clay, 8 to 25 percent slopes

General Description

These soils are very deep and are on the footslope and backslope of the Sink Valley fault escarpment. Vegetation is grasses, rabbitbrush, and big sagebrush.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	A Family	fine, mixed, superactive, mesic Aridic Calciustept	28*
10	Calendar Family	fine, mixed, superactive, mesic Aridic Haplustepts	
5	Zigzag	Clayey, mixed, superactive, nonacid, mesic, shallow Aridic Ustorthent	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the A family soil in map unit 11 is soil pedon 28. The surface is grayish brown clay to 8 inches, dark grayish brown (moist). The subsurface (cambic) is gray clay with moderate blocky structure to 24 inches, grayish brown (moist). The upper subsoil (calcic, Bwk) is gray clay with common fine soft calcium carbonate masses to 48 inches, grayish brown (moist). The lower subsoil (calcic, Bk) is light grayish brown clay with common fine and medium soft calcium carbonate masses to 102 inches, grayish brown (moist).

Laboratory Analysis

Clay texture is the primary limiting feature with the A family soil in map unit 11. SAR and conductivity increase significantly in the 24 to 48 inch horizon, but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

Inclusions of the Calendar family soil occur along shoulders of hills and ridges. These soils are clayey and moderately deep (20 to 40 inches) to Tropic shale.

Small inclusions of the Zigzag soil occur on the summits of ridges and hills. These soils are clayey and shallow (less than 20 inches) to Tropic shale.

12 Manzanst Taxadjunct Family clay, 3 to 12 percent slopes

General Description

These clayey soils are deep to very deep to Tropic shale and formed on gently sloping to moderately steep slopes along the west side of Sink Valley. Vegetation is pinyon pine, Utah juniper, black sage, and Indian ricegrass. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
85	Manzanst taxadjunct, very deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	48*
10	Manzanst taxadjunct, deep phase	very fine, mixed, superactive, nonacid, mesic, Aridic Ustorthent	60
5	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Description

The typifying soil pedon for the Manzanst taxadjunct soil in map unit 10 is soil pedon 48. The surface is grayish brown clay (moist) 3 inches, very dark grayish brown (moist). The subsurface is light brownish gray clay to 30 inches, dark grayish brown (moist). The substratum is light brownish gray clay with 3 to 10 percent very fine and fine calcium carbonate masses to 84 inches, dark grayish brown (moist).

The typifying pedon for the Manzanst taxadjunct deep phase is pedon 60. It is similar to pedon 48. Tropic shale is at 48 inches.

Laboratory Analysis

Clayey soil texture and SAR are the main limiting features of the Manzanst soil family in map unit 12. The SAR ranges from 10.80 to 12.70 below 12 inches.

Soil Inclusions

The A family soil occurs on the toeslopes and in swales where alluvium has accumulated. These soils are clayey and very deep (greater than 60 inches). They have an accumulation of carbonates in the subsoil.

13 A Family – Happyhollow Family complex, 1 to 5 percent slopes

General Description

These clayey soils are very deep to Tropic shale and formed on nearly level to gently sloping slopes in the south central portion of Sink Valley. Vegetation is grasses. The very deep phase is on the backslopes and footslopes. The deep phase (40 to 60 inches to Tropic shale) of Manzanst family soil occurs on the shoulders of the hill sideslopes.

Taxonomic Soil Classifications

Percent of Map Unit	Soil Series Family	Taxonomic Family	Typifying Soil Pedon
80	A Family	fine, mixed, superactive, mesic Aridic Calciustepts	59
15	Happyhollow Family	fine, mixed, superactive frigid Aeric Epiaquept	45
5	I Family	fine-loamy, mixed, superactive, frigid Aquic Calciustept	52
* Lab analysis of typifying soil pedon for map unit.			

Typifying Soil Pedon Descriptions

The typifying soil pedon for the A family soil in map unit 13 is soil pedon 59. The surface is light yellowish brown clay loam to 10 inches, dark grayish brown (moist). The subsurface is light yellowish brown and very pale brown clay loam to 45 inches, yellowish brown and pale brown (moist). The substratum is very pale brown and pale yellow sandy clay loam to 76 inches. Reddish yellow medium and coarse mottles were observed below 62 inches.

The typifying soil pedon for the Happyhollow family soil is soil pedon 45. The surface is light brownish gray loam to 12 inches, dark grayish brown (moist). The subsurface is light gray and very pale brown sandy clay loam to 48 inches, gray and light yellowish brown (moist). The substratum is very pale brown sandy clay loam to 84 inches, light yellowish brown (moist). The lower substratum is light gray silty clay to 100 inches, gray (moist). Yellow and brownish yellow medium and coarse mottles were observed below 5 inches.

Laboratory Analysis

Field conductivity (ECe) measurements for soil pit 59 ranged from 0.39 to 1.30 mmhos/cm.

Lab analysis of soil pit 28 is representative of the A family soil in map unit 13. Clay texture is the primary limiting feature with the A family soil in map unit 13. SAR and conductivity increase significantly in the 24 to 48 inch horizon (pedon 28), but both are still within the fair range (Utah DOGM, 2005). Lime percentage ranges from 17 to 19. Samples were not available for analysis for the 48 to 102 inch zone.

Soil Inclusions

The I family soils are similar to the A family soil, but they have aquic conditions below 20 inches. Reddish yellow fine mottles were observed in soil pedon 52 below 24 inches.

Soil map unit descriptions for the North Private Lease soil survey area are in Section Three in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

Soils in the Pit 10 Borrow were examined on July 26 and 27, 2016. Soil mapping in the southwest portion of the area was updated based on additional soil descriptions and

laboratory analysis. The results of this field examination and laboratory analysis are described in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.*

222.400 Present and Potential Productivity of Existing Soils

Soils in the Coal Hollow project area support big sagebrush, grasses (native and introduced species), pinyon pine, Utah juniper, and Gambel oak. Detailed descriptions of the present and potential productivity of the soils are detailed in Chapter 3, Section 321.200.

Soils in the northern portion of the North Private Lease area are in agricultural production of alfalfa and small grains, while soils in the southern portion support big sagebrush, rabbitbrush, grasses (native and introduced species), pinyon pine, Utah juniper, Russian olive, and Gambel oak. Detailed descriptions of the present and potential productivity are detailed in Chapter 3, Section 321.200.

223. Soil Characterization

This soil survey was made in accordance with the guidelines for an order 2 soil survey as detailed in the Soil Survey manual (USDA 1993). Soils were classified using the Keys to Soil Taxonomy, Ninth Edition (USDA 2003). Soils for the New Dame Lease IBC were classified using the Keys to Soil Taxonomy, Eleventh Edition (NRCS 2010). Representative soil samples were submitted for laboratory analysis of the parameters outlined by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (2005).

The North Private Lease soil survey was made in accordance with the guideline for an order 2 soil survey as detailed in the Soil Survey manual (USDA NRCS 1993). Soils were classified using the Keys to Soil Taxonomy, Twelfth Edition (USDA NRCS 2014d). Representative soil samples were submitted for laboratory analysis of the parameters outlined by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (2005).

The Pit10 Borrow Area soil survey update was made in accordance with the guidelines for an order 2 soil survey as detailed in the Soil Survey manual (USDA NRCS 1993). Soils were classified using the Keys to Soil Taxonomy, Twelfth Edition (USDA NRCS 2014d). Representative soil samples were submitted for laboratory analysis of the parameters outlined by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (2008).

224. Substitute Topsoil

Based on the 2006-2007 order 2 soil survey, sufficient quantities of suitable topsoil and subsoil are available for reclamation within the project area. The Coal Hollow Project does not plan to use substitute material for topsoil at the time of reclamation. However, if in the future the Coal Hollow mine plan proposes to use selected overburden materials as a supplement or substitute for topsoil, an application will be

provided to the DOGM that includes results of analyses, trials, and tests as described under R645-301-232.100 through R645-301-232.600, R645-301-234, R645-301-242, and R645-301-243. DOGM may also require the results of field-site trials or greenhouse tests as required under R645-301-233.

Based on the 2014 order 2 soil survey for the North Private Lease, sufficient quantities of suitable topsoil and subsoil are available for reclamation within the project area. The Coal Hollow mine does not plan to use substitute material for topsoil at the time of reclamation of North Private Lease expansion. However, if in the future the Coal Hollow mine plan proposes to use selected overburden materials as a supplement or substitute for topsoil, an application will be provided to the DOGM that includes results of analyses, trials, and tests as described under R645-301-232.100 through R645-301-232.600, R645-301-234, R645-301-242, and R645-301-243. DOGM may also require the results of field-site trials or greenhouse tests as required under R645-301-233.

A source of substitute subsoil was evaluated as part of the Pit 10 Borrow Area field evaluation on July 26, 2016 and subsequent laboratory analysis. This source of substitute subsoil is located on the interim reclamation slope at the top of the pit 10 highwall. The results of this evaluation and analysis are described in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.* There are no plans to use this material as substitute subsoil at this time due to Poor soil pH in some areas, but will remain a source of substitute subsoil until Pit 10 is reclaimed. Additional sampling and analysis will be conducted prior to moving forward with any plans to use the material as substitute subsoil.

230. Operation Plan

231. General Requirements

231.100. Methods for Removing and Storing Subsoil and Topsoil

The methods for removing and storing topsoil, subsoil, and other materials will be to first remove the woody plants from the area and place them in piles for later placement in pit backfills. Next, dozers or scrapers will remove the topsoil layer to a depth determined by the soil survey. The topsoil will be stockpiled and protected from wind and water erosion. Stockpiles that will be in place for less than 1 year will be planted with "Quick Guard" at the recommended rate of 10 lbs. /acre. Those stockpiles that will be in place for at least one year will be seeded and covered with mulch during the appropriate season. Side slopes of stockpiles will be sloped to 3h:1v: The suitable subsoil will then be removed and stockpiled separately from the topsoil. The depth of topsoil and subsoil salvage will be determined by the aforementioned soil survey and in the field during mining by the Coal Hollow environmental technician in consultation with a certified professional soil scientist. Quality control of topsoil salvage depth will be accomplished by leaving pedestals (small islands of topsoil left to verify soil removal depth). Stockpiling of topsoil and subsoil will only occur when direct placement (or live hauling) is not operationally practical. Drawing 2-2 shows planned topsoil stockpiles and topsoil removal plans. Drawing 2-4 shows planned topsoil stockpiles and topsoil removal plans in the North Private Lease.

For the North Private Lease prior to mining Pit 1 the following steps will be followed:

1. The A horizon (topsoil) will be salvaged along with B horizon (subsoil) to a depth of 14 inches (1.2 feet) from all active mining areas (pits, ponds, roadways, haul roads, storage and repair yards, etc.). The only exception is that topsoil can remain under topsoil storage piles.

2. For the area inside the excavation perimeter of Pit 1, Pond 5 and Pond 6, the remaining subsoil (the B & C horizon above lithic contact, approximately 2.6 feet) will also be removed and stockpiled in a subsoil stockpile. This means that roadways and the subsoil and spoil piles depicted in Drawing 2-4 will be placed on top of native subsoil. This native subsoil will be protected in place beneath the spoil stockpile by using a marker fence to delineate the subsoil surface on 100 ft. centers and by using a gps survey grid of the topography of the subsoil surface layer. The native subsoil will be protected in place on any roadway receiving surface treatment (ie. Gravel, additional fill) by placing marker fence along the roadway centerline. The native subsoil will then be recovered as part of the subsequent mining sequence and placed directly over regraded backfill to the cover depth required in section 232.

4. A soil scientist will monitor the topsoil and subsoil removal and placement of geo-marker.

5.A surveyor will map the surface elevation of the subsoil being protected in place.

Area 1 expanded increases Area 1 by 17.89 acres, all topsoil and subsoil will be salvaged and stockpiled as mining of Pits 7, 8 and 9 progress. Stockpile locations are shown and volumes tabulated for on Drawing 2-4. These stockpiles will remain and be utilized for final reclamation of the last pits mined.

Area 2 encounters Prime Farmland and Soils of Statewide Importance, these are required to be stockpiled by owner and by horizon. The location of these stockpiles can be found on Drawing 2-4. DRH_C, DRH_B, OGP_B, and OGP_A will be on top of an area that has been previously been top soiled and seeded. The remaining stockpiles will be placed on subsoil. All stockpiles from the Prime Farmland and Soils of Statewide Importance weather placed on previously top soiled or subsoiled areas, will be placed on a layer of organic material to demarcate the separation at the time they are replaced in reclamation of the Prime Farmland and Soils of Statewide Importance areas. Those that are placed on topsoil will have the topsoil in the travel paths windrowed to a berm which also will be seeded until final placement. Once the stockpiles on top soil are removed, the area of the stockpile and associated travel paths will require ripping 18" prior to being reseeded.

As with the Coal Hollow Mine, topsoil and subsoil will be removed with dozers and/or scrapers to a depth determined by the soil scientist.

Topsoil and subsoil in Pit B1 will be removed with dozers and/or scrapers to a depth determined by the soil scientist.

231.200. Suitable Substitute Topsoil

The use of substitute topsoil is planned for the Coal Hollow. Location of "Potential Substitute Topsoil" is shown on Drawing 2-2. Demonstration studies of the suitability of topsoil substitutes or supplements will be submitted to the DOGM if the use of topsoil substitutes becomes necessary for future reclamation and revegetation.

Subsoil will be used as interim reclamation cover for the Pit 10 Borrow Area. Organic mulches will be incorporated to improve fertility and soil quality, as detailed in R645-301-244.200. This improved subsoil will be salvaged and stockpiled as cultivated topsoil at the end of the interim reclamation phase of the Pit 10 Borrow Area project. Cultivated topsoil will be used as topsoil during reclamation of the Pit 10 Borrow Area. This operation is described in more detail in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area*. Salvage and stockpiling of the cultivated topsoil will be monitored by a Certified Professional Soil Scientist.

The use of substitute topsoil is not planned for the North Private Lease based on the 2014 soil survey information. Demonstration studies of the suitability of topsoil substitutes or supplements will be submitted to the DOGM if the use of topsoil substitutes becomes necessary for future reclamation and revegetation.

231.300. Soil Testing for Reclamation

The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil in the same order it existed prior to removal by the mining activities. Next, a basic topsoil (top 8 inches of reclamation profile) sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

Available phosphorus (P)
Soluble Potassium (K)
Nitrate-Nitrogen

One composite sample will be collected from approximately every 2 to 5 acres based on soil types and variability. Each composite will be comprised of at least 4 sub-samples.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1 (native topsoil and subsoil) and Table C-2 (samples from core hole/overburden pits) of Appendix 2-1.

Pre-testing of the soils has been conducted as part of the North Private Lease soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Appendix C of Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow*

Mine (November 2014).

Pre-testing of soils in the Pit 10 Borrow Area as part of the Order 2 Soil Survey of the Coal Hollow Mine Disturbance (2009) and as part of the July 26 and 27, 2016 evaluation of the Pit 10 Borrow Area as described in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.*

Additional sampling and testing of the subsoil used for interim reclamation will be done prior to its salvage as cultivated topsoil at the end of the interim reclamation phase. Samples will be collected on the basis of approximately one sample per 2.5 acres. Sampling depth will be to 4 feet. This testing will include all parameters listed in Tables 3 and 7 in *Guidelines for Management of Topsoil and Overburden* (DOGM January 2008). Suitability will be evaluated based on the laboratory analysis and parameter limits listed in Tables 4 and 8 in *Guidelines for Management of Topsoil and Overburden* (DOGM January 2008).

Soil pH will be monitored in all subsoil salvaged below 58 inches (147 cm or 4.8 feet) in map unit G. Subsoil with pH greater than 8.8 will not be salvaged, stockpiled, or used for subsoil in the reclamation soil profile. Placement of subsoil within a pH range of 8.6 to 8.8 will be only be placed in the bottom foot (3 to 4 foot depth) of the reclamation soil profile.

231.400. Topsoil Handling

The topsoil will be removed from the mine area and either live hauled to a reclamation area or stored separately. All soil stockpiles piles will be seeded with an appropriate interim seed mix to prevent loss and deterioration by wind and water erosion. Soil stockpiles will have side slopes graded to a maximum 3h:1v. Piles will be bermed or otherwise treated to prevent the transport of sediments away from the pile. Details about soil horizons and zones planned for use as subsoil are detailed in Appendix 2-1. A detailed map showing stockpile designs/locations and soil removal are shown on Drawing 2-2.

Details about soils horizons and zones planned for use as subsoil in the North Private lease are shown on Drawing 2-4 and detailed in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

232. Topsoil and Subsoil Removal

232.100. Separate Layers

All soil materials will be removed in separate layers from the area to be disturbed, and segregated.

Based on soil map units, average depths have been estimated and will be used as a guide and monitored in the field. Refer to Table 4-2 in Appendix 2-1. Soil will be salvaged and directly placed or stockpiled as either topsoil or subsoil.

Based on soil map unit, average depths have been estimated and will be used as a guide and monitored in the field. Quality control of topsoil salvage depth will be accomplished by leaving pedestals (small islands of topsoil left to verify soil removal depth). Refer to Tables 13 and 14 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

The estimated topsoil, subsoil, and substitute subsoil salvage and replacement depths for each mine area are shown in the following table.

Mining Area	Average Estimated Topsoil Salvage	Average Estimated Subsoil Salvage	Salvage of Upper Shale	Reclamation Soil Profile Depth	Notes
	inches	inches	inches	inches	
1	18	26	0	44	a
1extended	13	33	0	46	a
2	11	37	0	48	b
3	12	37	0	49	c

a. Salvage topsoil; salvage subsoil to depth of Tropic shale; follow sampling protocol for substitute subsoil in Section R645-301-232.720 for reclamation profile.
b. Salvage topsoil; salvage subsoil to 48 inches deep.
c. Salvage topsoil; salvage subsoil to 96 inches deep or bedrock.

Estimated topsoil and subsoil salvage depths were developed for the pit 10 Borrow Area and are detailed in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area*. Estimated depths of topsoil and subsoil available for salvage by soil map unit and area are detailed in Table 2-4.12. Soil will be salvaged and directly placed or stockpiled as either topsoil or subsoil.

The following table details the estimated topsoil and subsoil salvage depths by map unit in Area 1 Expanded. These salvage estimates were updated based on additional soil profile evaluations done in Area 1 during March 2016 (Appendix 2-5). The

subsoil salvage depth was increased to 4.8 feet in order to provide adequate subsoil for a total reclamation soil profile depth of 48 inches.

Estimated topsoil and subsoil salvage depths by soil map unit in *Area 1 Expanded.*

Map Unit	Estimated Topsoil Salvage Depth[1]	Estimated Subsoil Salvage Depth2	Map Unit Area[3]	Estimated Topsoil Salvage Volume	Estimated Subsoil Salvage Volume
	inches	inches	acres	cubic yards	cubic yards
A1	11	36	10.98	16,238	53,143
A2	11	36	30.46	45,047	147,426
A3	11	36	17.96	26,561	86,926
D	14	31	0.02	38	83
E	13	35	0.46	804	2,165
F	19	29	1.21	3,091	4,718
G	11	37	3.18	4,703	24,797
H	12	36	0.31	500	1,500
J	7	41	0.08	75	441
K	12	34	1.84	2,969	8,411
Total			66.5	100,025	329,611
			Inches	Feet	
Reclamation Depths		Topsoil	11.2	0.9	
		Subsoil	36.9	3.1	
		Profile	48.1	4.0	

1. Estimated topsoil salvage depths for map units A1, A2, and A3 are based on the average for soil profiles examined in March 2016 (Long 2016 in Appendix 2-5) and profiles within *Area 1 Expanded* which were examined during the *Order 2 Soil Survey of the North Private Lease* (Supplemental Volume 11). Estimated topsoil salvage depths for map units D thru K are based on estimated depths in Table 14 in the *Order 2 Soil Survey of the North Private Lease* (Supplemental Volume 11).
2. Estimated subsoil salvage depths for map units A1, A2, and A3 are based on the average for soil profiles examined in March 2016 (Long 2016 in Appendix 2-5) and profiles within *Area 1 Expanded* which were examined during the *Order 2 Soil Survey of the North Private Lease* (Supplemental Volume 11) . Estimated topsoil salvage depths for map units D thru K are based on estimated depths in Table 14 in the Order 2 Soil Survey of the North Private Lease (Supplemental Volume 11).
3. Measured map unit acres within Area 1 Expanded boundary.

232.200. Topsoil of Insufficient Quantity or Quality

Where the topsoil is of insufficient quantity or poor quality for sustaining

vegetation, other materials approved by the DOGM in accordance with R645-301-233.100 will be removed as a separate layer from the area to be disturbed, and segregated.

Based on the Soil Survey, there should be sufficient quantities of topsoil to place an average of eight inches of topsoil across all reclaimed areas.

Based on the 2014 Soil Survey of the North Private Lease, there should be sufficient quantities of topsoil to place an average of 13 inches of topsoil across all reclaimed areas. The estimated replacement topsoil depths for each mining area are 18 inches in Mine Area 1, 11 inches in Mine Area 2, and 12 inches in Mine Area 3 (based on soil profiles examined within each mine area).

Appendix 2-4 details that the amount of undisturbed topsoil that will be salvaged in the Pit 10 Borrow Area and available for final reclamation will provide an approximate depth of 3.5 inches. In order to increase the volume of topsoil available for final reclamation, organic mulches will be incorporated into subsoil used for interim reclamation to develop it into cultivated topsoil when it is salvaged at the end of the interim reclamation phase. These operations are detailed in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area.*

The estimated salvage depths listed for topsoil and subsoil in *Area 1 Expanded* will provide an estimated 11.2 inches (0.9 feet) of topsoil and 36.9 inches (3.1 feet) of subsoil for a total estimated reclamation soil profile of 48.1 inches (4.0 feet).

Soil pH will be monitored in all subsoil salvaged below 58 inches (147 cm or 4.8 feet) in map unit G. Subsoil with pH greater than 8.8 will not be salvaged, stockpiled, or used for subsoil in the reclamation soil profile. Placement of subsoil within a pH range of 8.6 to 8.8 will be only be placed in the bottom foot (3 to 4 foot depth) of the reclamation soil profile.

232.300. Shallow Topsoil Handling

If topsoil is less than six inches thick, the operator may remove the topsoil and the unconsolidated materials immediately below the topsoil and treat the mixture as topsoil.

Sufficient quantities of topsoil are estimated to be available for replacement of an average eight inches of topsoil across reclamation, with a minimum of six inches. Therefore, mixing of topsoil with subsoil is not anticipated to be necessary.

Localized areas of the Vessilla family soil in map unit C of the North Private Lease may be less than 6 inches thick. Topsoil and subsoil will be stockpiled together as topsoil. Mixing of topsoil with subsoil is not anticipated to be necessary in other areas of the North Private Lease area.

The estimated topsoil salvage and replacement depths for each mine area are shown in the table in Section R-645-301-232.100.

Localized areas of Vessilla clayey taxadjunct in map unit L and Zigzag in map unit 10 may be less than 6 inches thick in the Pit 10 Borrow Area. Topsoil and subsoil will be stockpiled together as topsoil. Mixing of topsoil with subsoil is not anticipated to be necessary in other areas of the Pit 10 Borrow Area.

232.400 - 232.420. Topsoil Removal Exceptions

UDOGM will not require the removal of topsoil for minor disturbances which occur at the site of small structures, such as power poles, signs, or fence lines. Removal of topsoil will not be required when the disturbances will not destroy the existing vegetation and will not cause erosion.

232.500. Subsoil Segregation

The Coal Hollow Project plans to remove soils as either topsoil or subsoil based on the completed soil survey. DOGM may require that the B horizon, C horizon, or other underlying strata, or portions thereof, be removed and segregated, stockpiled, and redistributed as subsoil in accordance with the requirements of R645-301-234 and R645-301-242 if it finds that such subsoil layers are necessary to comply with the revegetation requirements of R645-301-353 through R645-301-357.

Refer to Table 4-2 in Appendix 2-1, which contains estimated subsoil salvage depths. In addition, substitute subsoil has been identified in the layers between the identified topsoil layer and the Tropic Shale. Sufficient quantities of this material are available to live haul most of the subsoil with the exception of one stockpile that will be constructed from the initial mining area and reserved for reclamation of the final mining area and one temporary stockpile that will be constructed from removal of the NW/4, NE/4, Section 30. All substitute subsoil materials will be sampled and tested for pH, conductivity, SAR, percent lime, and texture, prior to salvage and stockpiling.

Refer to Appendix 2-4 for a summary of the amount of available subsoil, salvage depths, replacement, potential substitute subsoil needs, and potential sources of substitute subsoil in the Pit 10 Borrow Area. Sampling of the final graded overburden surface and the substitute subsoil source is described in Appendix 2-4. Table 2-4.14 summarizes the estimated amount of subsoil available for reclamation of the Pit 10 Borrow Area.

Refer to Table 14 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014) for subsoil salvage depths. The estimated average subsoil salvage and replacement depths for each mine area is listed in the table in Section R-645-301-232.100.

The majority of the soils in the North Private lease were sampled to 8 feet or bedrock. The soil analysis results can be seen in Appendix C of Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014). Additional testing of substitute subsoil materials will be

completed at the time of final reclamation by following the procedure outlined in R645-301-232.700. Analysis of substitute subsoil will include parameters listed in Tables 3 and 7 in the *Guidelines for Management of Topsoil and Overburden.*

The following soil sampling program will be conducted during the initial mining process in the Coal Hollow Mine and does not apply to the North Primate Lease area:

- Topsoil: Sampling will occur every 2 to 4 acres or approximately every 2,500 to 5,000 bank cubic yards.
- Subsoil: Sampling will occur every 2 to 3 acres or approximately every 10,000 to 15,000 bank cubic yards.

These samples are anticipated to be composites of individual samples taken throughout the week during the time frames that topsoil and subsoil are being salvaged. These individual samples would be taken five days a week and composited to a single sample representing the material moved each week. The parameters that will be analyzed for topsoil are found in Table 4-1 of Appendix 2-1.

Following the initial mining process (approximately 1 year), the sampling program was reviewed to determine the appropriate level of sampling necessary to ensure adequacy of topsoil and subsoil used in reclamation for all subsequent mining. It was determined that areas in the North or South Private Lease that exhibited a surface accumulation of salts after being placed, will be tested for elevated SAR ratio, this information will be reported with the topsoil sampling.

232.600. Timing

All material to be removed under R645-301-232 will be removed after the vegetative cover that would interfere with its salvage is cleared from the area to be disturbed, but before any drilling, blasting, mining, or other surface disturbance takes place. Drawing 2-2 shows the anticipated topsoil removal sequence and stockpiling.

Drawing 2-4 shows the anticipated topsoil removal sequence and stockpiling for the North Private Lease. Estimated average topsoil and subsoil salvage depths in the North Private Lease are detained in Soils map 10 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

Figure 2-4.1 in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area* details topsoil and subsoil salvage areas for the Pit 10 Borrow Area.

232.700. Topsoil & Subsoil Removal Under Adverse Conditions

An exception to the requirements of R645-301-232 to remove topsoil or subsoils in a

separate layer from an area to be disturbed by surface operations may be granted by UDOGM where the operator can demonstrate;

232.710. Unsafe Conditions

The removal of soils in a separate layer from the area by the use of conventional machines would be unsafe or impractical because of the slope or other conditions of the terrain or because of the rockiness or limited depth of the soils.

These conditions are not anticipated in the Coal Hollow project area.

232.720. Lack of On-Site Material Available

If the requirements of R645-301-233 have been or will be fulfilled with regard to the use of substitute soil materials unless no available substitute material can be made suitable for achieving the revegetation standards of R645-301-356, then the operator will, as a condition of the permit, be required to import soil material of the quality and quantity necessary to achieve such revegetation standards.

The soil survey indicates that there are sufficient quantities of topsoil and subsoil to adequately reclaim the mined area with 48 inches of combined cover. If additional materials are needed, then Alton Coal Development (ACD) will salvage suitable overburden for use as substitute subsoil material from the zone below the topsoil layer (8 inches thick average) to a maximum depth of 30 feet, excluding any Tropic shale materials. ACD will do additional sampling to identify the zones in which suitable materials occur for maximum salvage potential of substitute subsoil. Representative overburden samples will be analyzed for pH, conductivity, SAR, percent lime, and texture. A detailed description of subsoil sampling is provided in Section 232.500.

The estimated combined salvage depths for each soil map unit are listed in Table 14 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014). The table in Section R-645-301-232.100 details the estimated average depths of topsoil, subsoil, and substitute subsoil that will be salvaged and replaced in each mine area.

There are sufficient sources of native subsoil in adjacent soil map units to provide adequate amounts of native subsoil to cover mined areas 2 and 3 of the North Private Lease with a minimum 48 inches of combined cover.

Mine Area 1 may require an additional 4 inches and Mine Area 1 extended an additional 2 inches of substitute subsoil in order to achieve suitable material within the root zone. Also, for Mine Area 2 and 3 that will see more live haul, to ensure all areas achieve suitable material within the root zone, the following procedure will be followed. After backfill of the overburden has been complete, the upper 8 inches of Tropic Shale will be sampled on a basis of one sample per 2.5 acres as depicted in

Drawing 5-76A. Sample locations will be recorded with a GPS. Tropic Shale samples will be analyzed for the parameters listed in Tables 3 and 7 in the *Guidelines for Management of Topsoil and Subsoil* (Utah DOGM). Should a sample analysis indicate backfilled Tropic Shale are poor or unacceptable, samples will be taken half the distance between the unsuitable sample and the surrounding samples to delineate the extent of the unsuitable soil. Additional suitable subsoil or subsoil substitute will be placed over the delineated area to provide 48" of reclamation soil profile, as needed.

Subsoil will be used as interim reclamation cover for the Pit 10 Borrow Area. Organic mulches will be incorporated to improve fertility and soil quality, as detailed in R645-301-244.200. This improved subsoil will be salvaged and stockpiled as cultivated topsoil at the end of the interim reclamation phase of the Pit 10 Borrow Area project. Cultivated topsoil will be used as topsoil during reclamation of the Pit 10 Borrow Area. This operation is described in more detail in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area*. Salvage and stockpiling of the cultivated topsoil will be monitored by a Certified Professional Soil Scientist.

233.100 - 400 Topsoil Substitutes and Supplements.

Based on the Soil Survey contained in Appendix 2-1, topsoil substitutes and supplements are not anticipated to be necessary. This survey estimates that nine inches of topsoil can be replaced across the reclamation area.

Based on the Soil Survey, topsoil substitutes and supplements are not anticipated to be necessary. The North Private Lease soil survey estimates that thirteen inches of topsoil can be place over the entire mined area. Table 14 in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014) details the estimated depth of topsoil that can be salvaged from each soil map unit. The estimated average topsoil depth for soil map units C and J are 7 inches or less. However, the overall survey area estimated average topsoil salvage depth of approximately 13 inches. The estimated replacement topsoil depths for each mining area are 18 inches in Mine Area 1, 11 inches in Mine Area 2, and 12 inches in Mine Area 3 (based on soil profiles examined within each mine area).

Subsoil will be used as interim reclamation cover for the Pit 10 Borrow Area. Organic mulches will be incorporated to improve fertility and soil quality, as detailed in R645-301-244.200. This improved subsoil will be salvaged and stockpiled as cultivated topsoil at the end of the interim reclamation phase of the Pit 10 Borrow Area project. Cultivated topsoil will be used as topsoil during reclamation of the Pit 10 Borrow Area. This operation is described in more detail in Appendix 2-4 called: *Topsoil and Subsoil Sources and Substitute Sources in the Pit 10 Borrow Area*. Salvage and stockpiling of the cultivated topsoil will be monitored by a Certified Professional Soil Scientist.

The cultivated topsoil will be sampled and tested prior to salvage. Samples will be collected on the basis of approximately one sample per 2.5 acres. Sampling depth will be to 4 feet. This testing will include all parameters listed in Tables 3 and 7 in

Guidelines for Management of Topsoil and Overburden (DOGM January 2008). Suitability will be evaluated based on the laboratory analysis and parameter limits listed in Tables 4 and 8 in *Guidelines for Management of Topsoil and Overburden* (DOGM January 2008).

The following intermediate seed mix will be used to establish vegetation on the intermediate reclamation area in the Pit 10 Borrow where cultivated topsoil will be developed from subsoil. The Sweetpea milkvetch and alfalfa are legumes included for nitrogen fixation.

Intermediate Reclamation Seed Mix for Topsoil Cultivation Area			
		Seeds/Ft^2	Rate (PLS/Acre)
Astragalus cicer	Sweetpea milkvetch	9.99	3.00
Bromus carinatus	Mountain Brome	11.48	5.00
Elymus lanceolatus	Thickspike wheatgrass	10.61	3.00
Elymus smithii	Western wheatgrass	11.57	4.00
Elymus spicatus	Bluebunch wheatgrass	12.86	4.00
Medicago sativa	Alfalfa	14.46	3.00
Poa pratensis	Kentucky bluegrass	14.99	0.30
TOTAL		**85.96**	**22.30**

In the event that additional topsoil is needed to complete the required 48-inch reclamation profile, areas of interim reclamation have been identified as "Potential Topsoil" on drawing 2-2 that contain suitable topsoil. These areas potentially contain one foot of topsoil and have been accounted for on the soils accounting contained on drawing 2-2.

234. Topsoil Storage

234.100. Stockpiles

Materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 will be segregated and stockpiled when it is impractical to redistribute such materials promptly on regraded areas. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size.

Drawing 2-4 shows the planned stockpile areas, anticipated storage time, quantities and size for the North Private Lease.

Planned stockpile areas and quantities for the Pit 10 Borrow Area are shown on Drawing 2-2.

234.200. Requirements of Stockpiles

Stockpiled materials will be subject to the following conditions.

234.210. (a) They will be selectively placed on a stable site within the permit area. Areas are shown on Drawing 2-2.

Stockpile areas in the North Private Lease are shown on Drawing 2-4.

Stockpile areas for topsoil and subsoil salvaged from Pit B1 are shown on Drawing 2-2.

234.220. (b) They will be protected from contaminants and unnecessary compaction that would interfere with revegetation.

234.230. (c) They will be protected from wind and water erosion through prompt establishment and maintenance of an effective, quick growing vegetative cover. The side slopes will be graded to a maximum 3h:1v. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size. Drawing 2-4 shows the planned stockpile areas, anticipated storage time, quantities and size for the North Private Lease. Drawing 2-2 shows the planned stockpile areas, anticipated storage time, quantities and size for the Pit 10 Borrow Area. The interim seed mix for all the stockpiles is the following:

Stockpile Interim Seed Mix		
		Rate (PLS/Acre)
Bromus carinatus	Mountain Brome	6
Elymus lanceolatus	Thickspike wheatgrass	4
Elymus smithii	Western wheatgrass	5
Elymus spicatus	Bluebunch wheatgrass	6
Poa pratensis	Kentucky bluegrass	0.4
Total		**21.40**

Partially utilized stockpiles of topsoil, subsoil, and substitute subsoil will be reshaped and bermed within a reasonable time period following the end of use. The disturbance will be seeded during the next appropriate seeding period or by November 30th of that year. If the season is not appropriate for seeding after reshaping, the stockpile will then be coated with a tackifier at the manufacturer's suggested rate for dust control applications.

The following example balance sheet will be used to track salvage, stockpiling, and placement of topsoil, subsoil, and substitute subsoil in each mine area. Tracking of topsoil, subsoil, and substitute subsoil will be done for each Mine Area separately. The depth of topsoil and subsoil salvage will be determined by the soil survey and in the field during mining by the Coal Hollow environmental technician in consultation

with a certified professional soil scientist.

NPL AREA 1	Topsoil Stockpile	Subsoil Stockpile
Starting Stockpile Volume	74,953	41,378

BRP 1-10 = 12.21 ACRES

Source	NL Topsoil	Livehaul Topsoil*	Total Topsoil	NL Subsoil	Livehaul Subsoil	Total Subsoil	
	CY	CY	CY	CY	CY	CY	CY
Stockpile volume utilized	18,784	0	18,784	14,071	8,459	22,530	
Suitable spoil**							33,283
Remaining stockpile volume	56,169			27,307			

*Livehaul source: Area 1

**Suitable Spoil: Surface two feet of 9.38 acres represented by Soil Sample Pits 1, 2, and 3.5N

***Average topsoil cover depth 1.08 ft.

****Subsoil redistribution depth as shown on Drawing 5-76a

For the purpose of tracking soil balance in the Coal Hollow Mine, Figure 1with the addition of Table 1 of Appendix 2-2 has been revised to show soil placed in reclamation, topsoil sampled for fertility and includes a table indicating the soil remaining/planned in stockpiles including new stockpile address in Appendix 2-4 (Pit 10 Borrow amendment). As sampling and placement of soils progresses with reclamation, Figure 1 and Table 1of Appendix 2-2 will be updated with new information.

234.240. (d) They will not be moved until required for redistribution unless approved by the UDOGM. Anticipated storage time for each stockpile is shown on Drawing 2-2.

Drawing 2-4 shows the anticipated storage time for each stockpile in the North Private Lease. A portion of the topsoil stockpile in Area 1 will be relocated prior to mining Pit 11, ACD will notify the Division of the volume of stored topsoil to be moved and the timing for this movement.

Drawing 2-2 shows the anticipated storage time for each stockpile in the Pit 10 Borrow Area.

234.300. Long-Term Disturbance & Stockpiling

When long-term disturbed areas will result from facilities and preparation plants and when stockpiling of materials removed under 8645-301-232.100 would be detrimental to the quality or quantity of those materials, DOGM may approve the temporary distribution of the soil materials removed to an approved site within the permit area to enhance the current use of that site until later when needed for reclamation, provided that the following conditions occur.

234.310. Such action will not permanently diminish the capability of the topsoil of the host site.

234.320. The material will be retained in a condition more suitable for redistribution than if stockpiled.

240. Reclamation Plan (General Requirements)

A detailed Order 2 soil survey has been completed in 2006 and 2007 and extended to include the New Dame Lease IBC in 2014. This information provides detail for onsite soil suitability, salvage depths, and volumes available for reclamation of the mine site. Dozers or Scrapers will replace the subsoil and topsoil. The topsoil is estimated to average 8 inches and the subsoil will be approximately 39 inches in thickness. The total profile of topsoil and subsoil is estimated to average 48 inches.

A detailed Order 2 soil survey of the North Private Lease was completed in 2014 and is detailed in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014). This information provides detail for onsite soil suitability, salvage depths, and volumes available for reclamation of the mine site. Dozers or Scrapers will replace the subsoil and topsoil. The topsoil is estimated to average 13 inches and the subsoil will be approximately 31 inches in thickness. The total profile of topsoil and subsoil is estimated to average 44 inches.

A detailed Order 2 soil survey of the Pit 10 Borrow Area was completed in 2016 and is detailed in Appendix 2-4: *Topsoil and Subsoil Sources and Substitute Subsoil source in the Pit 10 Borrow Area* (September 2016). This information provides details for onsite soil suitability, salvage depths, and volumes available for reclamation of the mine site. Dozers or Scrapers will replace the subsoil and topsoil. The minimum final cover depths in the Pit 10 Borrow Area will be approximately 0.9 feet of topsoil and 3.1 feet of subsoil. The total reclamation profile of topsoil and subsoil is estimated to average 4.0 feet.

If soils balance information should indicate that less than 48 inches of soil is available for the total reclamation profile, the following plan will be implemented. After backfill of the overburden has been complete, the upper 8 inches of Tropic Shale will be sampled on a basis of one sample per 2.5 acres. Sample locations will be recorded with a GPS. Tropic Shale samples will be analyzed for the parameters listed in Tables 3 and 7 in the *Guidelines for Management of Topsoil and Subsoil* (Utah DOGM). Should a sample

analysis indicate backfilled Tropic Shale are poor or unacceptable, samples will be taken half the distance between the unsuitable sample and the surrounding samples to delineate the extent of the unsuitable soil. Additional suitable subsoil or subsoil substitute will be placed over the delineated area to provide 48" of reclamation soil profile, as needed.

241. General Requirements

Refer to R-645-301-242 for redistribution of soils, R-645-301-243 for soil nutrients and amendments, and R-645-301-244 for mulch use and application.

242. Soil Redistribution

242.100. Topsoil materials removed under R645-301-232.100, R645-301-232.200, and R645-301-232.300 and stored under R645-30I-234 will be redistributed in a manner that meets the following conditions.

242.110. (a) The material achieves an approximately uniform, stable thickness consistent with the approved postmining land use, contours, and surface-water drainage systems. All slopes will be appropriately graded and leveled prior to placement of topsoil and subsoil layers. Soil layer thicknesses will be regularly checked using a high precision GPS system and spot checking by the ACD environmental technician.

242.120. (b) Reduced material handling of the soil resource prevents excess compaction. Material handling will be minimized by direct hauling and placing materials when operationally practical rather than stockpiling. Materials will be spread by a dozer or scrapers and spread only as much as necessary to obtain the required uniform thickness. Traffic from rubber tired equipment across topsoil and subsoil will be minimized.

If heavy equipment operation results in excessive soil compaction at the surface of the reclaimed areas, they will then be ripped, disked, and harrowed to loosen the seedbed prior to seeding. Excessive compaction that could impact seeding success will be determined by observation and judgment of an environmental professional. In other areas where less compaction has occurred, the areas will be disked and harrowed. The disking and harrowing of all areas will be done parallel with the contour wherever possible to decrease the potential for water erosion downslope. In other areas where compaction is not a problem, dozer tracking can be used to roughen the surface, and to trap seed, fertilizer, mulch, and other amendments as well as decrease erosion by wind and water. In such cases seeding will be done immediately after this treatment, whereas soil amendments, where required, would be applied over the surface during seedbed preparations. Seeding will mainly occur in the early spring and late fall. Seeding will be accomplished by the seed drilling method followed by mulching as described in Section 244.200. Seed mixtures and rates can be viewed in Tables 3-37 through 3-42 in Chapter 3, Volume 2.

242.130. (c) Handling procedures will be implemented to protect the materials from wind and water erosion before and after seeding and planting.

Reclamation will be graded to the planned slope angles, not to exceed 3h:1v. Soil layers will be sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. If the season is not appropriate for seeding at the time of topsoil placement, the topsoil will then be coated with a tackifier at the manufacturer's suggested rate for dust control applications. Mulching will be implemented on all reclamation to control erosion following seeding.

242.200. Treatments of Material to be Redistributed

Before redistribution of the materials removed under R645-301-232, the regraded land will be treated if necessary to reduce potential slippage of the redistributed material and to promote root penetration. If no harm will be caused to the redistributed material and reestablished vegetation, such treatment may be conducted after the material is replaced. Potential for slippage is anticipated to be minimal based on the planned slope angles for reclamation.

In the North Private Lease, areas exceeding 3:1 slope, will have the underlying spoil ripped to a depth of 18" prior to placement of subsoil and the placed subsoil will be also be ripped to a depth of 18" prior to placement of topsoil. In all areas where the subsoil has become compacted, the subsoil will be ripped to a depth of 18" prior to placement of the topsoil.

When subsoil placement is not immediately followed by topsoil placement (within a month), the graded subsoil will be treated with mulch or tackifier (per Section 244.200) to prevent erosion in the interim; and the subsoil will be ripped to a depth of 18 inches prior to topsoil placement.

Area 2 encounters Prime Farmland and Soils of Statewide Importance, these are required to be stockpiled by owner and by horizon. The location of these stockpiles can be found on Drawing 2-4. DRH_C, DRH_B, OGP_B, and OGP_A will be on top of an area that has been previously been top soiled and seeded. The remaining stockpiles will be placed on subsoil. All stockpiles from the Prime Farmland and Soils of Statewide Importance weather placed on previously top soiled or subsoiled areas, will be placed on a layer of organic material to demarcate the separation at the time they are replaced in reclamation of the Prime Farmland and Soils of Statewide Importance areas. Those that are placed on topsoil will have the topsoil in the travel paths windrowed to a berm which also will be seeded until final placement. Once the stockpiles on top soil are removed, the area of the stockpile and associated travel paths will require ripping 18" prior to being reseeded.

242.300. Soil Redistribution on Impoundments & Roads

DOGM may not require the redistribution of topsoil or topsoil substitutes on the approved postmining embankments of permanent impoundments or roads if it determines the following.

242.310. (a) Placement of topsoil or topsoil substitutes on such embankments is

inconsistent with the requirement to use the best technology currently available to prevent sedimentation.

242.320. (b) Such embankments will be otherwise stabilized.

243. Soil Nutrients & Amendments

Nutrients and soil amendments will be applied to the redistributed material when necessary to establish the vegetative cover. The final seedbed of the reclaimed areas will be prepared by first replacing the subsoil and topsoil. Next, a basic topsoil (top 8 inches of reclamation profile) sampling regime will be implemented prior to seeding that should identify fertility problems and will provide a basis for determining necessary soil amendments. The parameters analyzed will be:

Available phosphorus (P)
Soluble Potassium (K)
Nitrate-Nitrogen

One composite sample will be collected from approximately every 2 acres based on soil types and variability. Each composite will be comprised of at least 4 sub-samples. This sampling will be completed within three months of topsoil placement.

Pre-testing of the soils has been conducted as part of the soils survey. Results from the pre-testing of topsoil and subsoil can be viewed in Table C-1 of Appendix 2-1 (native topsoil and subsoil) and Table C-2 (samples from core hole/overburden pits) of Appendix 2-1.

Results from the pre-testing of topsoil and subsoil can be seen in the laboratory analysis reports in Appendix C in Volume 11: Supplemental Report section of the MRP in the report called: *Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine* (November 2014).

Results from the pre-testing of topsoil and subsoil in the Pit 10 Borrow Area are in the laboratory analysis reports in Appendix 2-4: *Topsoil and Subsoil Sources and Substitute Subsoil source in the Pit 10 Borrow Area* (September 2016).

244. Soil Stabilization

244.100. Erosion Protection from Wind & Water

All exposed surface areas will be protected and stabilized to effectively control erosion and air pollution attendant to erosion. Reclamation will be regraded to the planned slope angles, not to exceed 3h:1v. Soil layers will be sloped as the material is relocated to the reclaim areas. Once soil is placed, seeding will occur at the earliest appropriate season suitable to planting conditions. Grass matting, mulching and/or cross ditches will be implemented as necessary to control erosion. Surfaces of stockpiles will be roughened by pocking, gouging or ripping. Soil stockpiles will be seeded with the temporary seed mix provided in Section 234.230 and mulched

by one of the methods described in Section 244.200.

Stockpiles of topsoil, subsoil, and substitute subsoil will be shaped, roughened, and bermed immediately following construction. The disturbance will be seeded during the next appropriate seeding period as described in the reclamation time table in Chapter 3 section 341.100. If the season is not appropriate for seeding the stockpile will be coated with a tackifier at the manufacturer's suggested rate for dust control applications.

The sideslopes of the temporary spoil pile will be roughened and coated with a tackifier at the manufacturer's recommended rate as the pile rises.

244.200. Mulch

Suitable mulch and other soil stabilizing practices will be used on all areas that have been regraded and covered by topsoil or topsoil substitutes. DOGM may waive this requirement if seasonal, soil, or slope factors result in a condition where mulch and other soil stabilizing practices are not necessary to control erosion and to promptly establish an effective vegetative cover.

Mulch will be placed on the seedbed surface once soil amendments have been incorporated. In most cases seeding will be accomplished after straw mulch has been placed to ensure seed is placed at the proper depth, exceptions would be for safety on steep slopes. Mulching treatments will occur by one or more of the following methods:

- Certified noxious weed free straw applied at a rate of 1 ton/acre anchored by crimping or a chemical binder.

- Wood fiber hydromulch at a rate of ¾ ton per acre for slopes flatter than 3:1 and 1 ton per acre for slopes at 3:1 which is the steepest slope planned at the project. This hydromulch would be anchored with a chemical binder at the manufacturer's suggested rate.

- Live mulch by use of quick growing sterile nurse crop such as "Quick Guard" with recommended rates of 5-10 lbs. /acre.

- The use of Nutri-Mulch® or equivalent product as an organic matter amendment and fertilizer. Application rate will be as recommended by the manufacturer.

The mulch should control erosion by wind and water, decrease evaporation and seed predation, and increase survivability of the seeded species. Since there is only one post mining land use, mulching will follow one of the above described methods for all reclaim areas. Although live mulch ("Quick Gard") has performed the best at the Coal Hollow Mine, other methods or combinations of the above listed methods will be used based on slope, climatic trends, soil moisture, soil texture, etc. and will be determined at the time of planting for each area.

244.300. Rills & Gullies

Rills and gullies that form in areas that have been regraded and topsoiled that cause the following conditions will have the topsoil replaced followed by reseeding or replanting if the following occurs.

244.310. (a) If they disrupt the approved postmining land use or the reestablishment of the vegetative cover.

244.320. (b) If they cause or contribute to a violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized; topsoil will be replaced; and the areas will be reseeded or planted.

250. PERFORMANCE STANDARDS

251. Topsoil & Subsoil Removed

All topsoil, subsoil and topsoil substitutes or supplements will be removed, maintained and redistributed according to the plan given under R645-301-230 and R645-301-240.

252. Topsoil & Subsoil Stockpiled

All stockpiled topsoil, subsoil and topsoil substitutes or supplements will be located, maintained and redistributed according to plans given under R645-301-230 and R645-301-240.

5/15/2018 Topsoil Accounting

Currently Disturbed (requires topsoil)

	sqft	acres	depth	cuyds
East CRoad	3892785	89.4	0.67	96,118
West CRoad	127874	2.9	0.67	3,157
Pond 3	180435	4.1	0.67	4,455
Pond 4	106953	2.5	0.67	2,641
Subtotal	4308047	98.9		**103,731**

To Be Disturbed with Pit 10 Borrow (requires topsoil)

	sqft	acres	depth	cuyds
Pit 10 Borrow	2700115	62.0	0.67	66,670
Subtotal				**66,670**

Total Topsoil Required **170,400**

Available Stockpiled

Topsoil	cuyds
#1	25,289
#2	71,392
#6	-
Subtotal	**96,681**

Other Sources Topsoil

	sqft	acres	depth	cuyds
Potential Topsoil	794629	18.2	1.0	29,431
Topsoil Cultivation Area	1548401	35.5	1.0	57,348
LAS 01	84557	1.9	0.7	2,088
Undist. Borrow Area	922542	21.2	varies	14,132
Subtotal				**102,998**

Total Topsoil Available **199,679**

5/15/2018 Subsoil Accounting

Currently Disturbed (requires subsoil)

	sqft	acres	depth	cuyds
pit 10	975430	22.4	3.3	119,219
Subtotal				**119,219**

To Be Disturbed with Pit 10 Borrow (requires subsoil)

	sqft	acres	depth	cuyds
Pit 10 Borrow	2700115	62.0	3.3	333,348
Subtotal				**333,348**

Total Subsoil Required **452,567**

Available Stockpiled

Subsoil	cuyds
#1	73,070
#2	47,690
#4	-
Subtotal	**120,760**

Other Sources Subsoil

	sqft	acres	depth	cuyds
Under Spoils	1010739	23.2	varies	209,836
Topsoil Cultivation Area	1548401	35.5	0.50	28,674
LAS 01	84557	1.9	3.33	10,439
Undist. Borrow Area	923000	21.2	varies	81,474
Subtotal				**330,423**

Total Subsoil Available **451,183**

Existing County Road 136

Topsoil Pile #1
23,000 cubic yards
Average Fill Depth = 7.4'
Footprint Area = 1.93 acres
Stockpile Duration = ~ 3years

Subsoil Pile #1
114,000 cubic yards
Average Fill Depth = 10.9'
Footprint Area = 6.5 acres
Stockpile Duration = ~3 years

Subsoil Pile #2
207,000 cubic yards
Average Fill Depth = 19.5'
Footprint Area = 6.5 acres
Stockpile Duration = ~ 3 Years

Topsoil Pile #2
134,000 cubic yards
Average Fill Depth = 6.4'
Footprint Area = 6.4 acres
Stockpile Duration = ~3 years

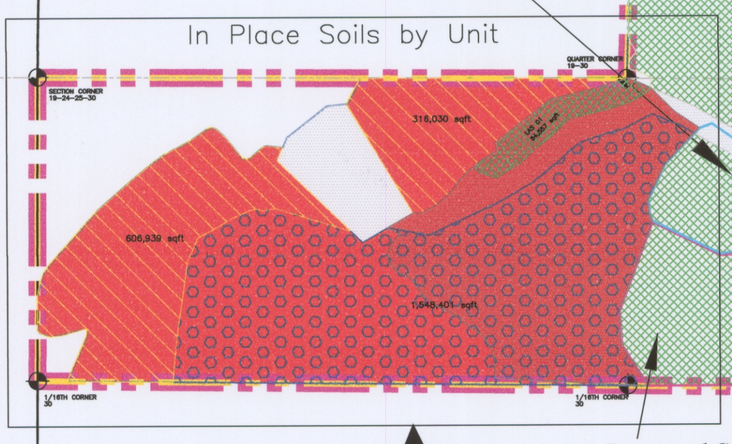
Proposed Topsoil Pile #6 - Borrow
73,400 cubic yards
Average Fill Depth = 10.0'
Footprint Area = 4.4 acres
Stockpile construction: approximately 2045
Stockpile Duration = ~6-12 Months

Proposed Subsoil Pile #4 - Borrow
374,600 cubic yards
Average Fill Depth = 30.0'
Footprint Area = 7.8 acres
Stockpile Duration = ~6-12 Months

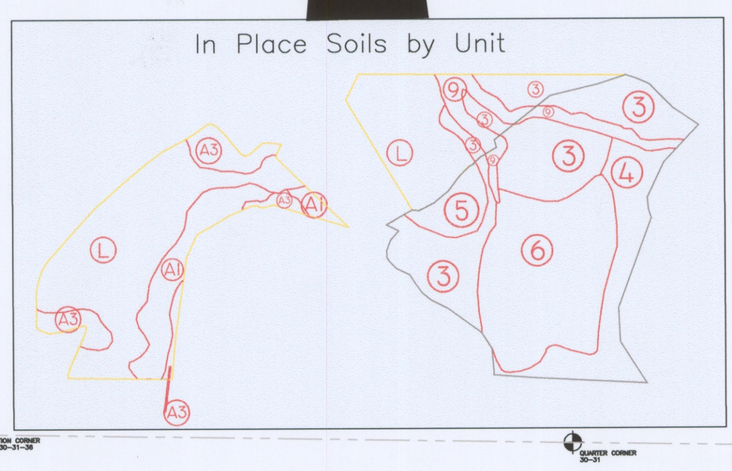
Range 6 West / Range 5 West

19 20 30 31 32

In Place Soils by Unit



In Place Soils by Unit



FINAL RECLAMATION
POTENTIAL SUBSTITUTE TOPSOIL
CULTIVATED SOIL IN BORROW AREA
REQUIRES TOPSOIL
REQUIRES SUBSOIL
PIT 10 BORROW
TOPSOIL STOCKPILED

Township 39 South

5/15/2018 In place soils Planned to be Recovered in Approved MRP

Undisturbed Borrow Area by Unit

Unit	sqft	Acres	TS depth	TS cuyds	SS depth	SS cuyds
L	187936	4.3	0.3	2,320	0.8	5,800
L	377554	8.7	0.3	4,661	0.8	11,653
A1	113807	2.6	0.6	2,459	3.4	14,402
A1	15022	0.3	0.6	325	3.4	1,901
A3	32330	0.7	1.0	1,197	6.4	7,683
A3	11894	0.3	1.0	441	6.4	2,827
A3	44029	1.0	1.0	1,631	6.4	10,464
A3	11878	0.3	1.0	440	6.4	2,823
9	49120	1.1	0.8	1,516	5.1	9,248
3	12984	0.3	0.5	240	7.0	3,366
3	14502	0.3	0.5	269	7.0	3,760
3	51487	1.2	0.5	953	7.0	13,348
	922542	21.2		14,132		81,474

Subsoil Under Spoils by Unit

Unit	sqft	Acres	TS depth	TS cuyds	SS depth	SS cuyds
3	95274	2.2	0.0	-	7.0	24,701
3	131198	3.0	0.0	-	7.0	34,014
3	129029	3.0	0.0	-	7.0	33,452
4	177792	4.1	0.0	-	5.0	32,925
5	57390	1.3	0.0	-	1.9	4,074
6	372437	8.5	0.0	-	7.0	96,558
9	34669	0.8	0.0	-	5.1	6,527
9	11509	0.3	0.0	-	5.1	2,167
	1009298	23.2		-		209,716

0 500 1000 1500

INCORPORATED
JUL 20 2018
Div. of Oil, Gas & Mining

LEGEND:
- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- BONDED DISTURBANCE
- SECTION LINE
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER

DRAWN BY:	CHECKED BY:
K.NICHOLES	LWJ
DRAWING: 2-2	DATE: 2/27/14
	SCALE: 1" = 500' Printed on 24"x 36"
JOB NUMBER: 1400	SHEET

REVISIONS

DATE:	BY:
12/04/14	KN
8/17/14	KN
10/17/14	KN
5/15/18	KN

TOPSOIL HANDLING

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 2-2

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