



OGMCOAL DNR <ogmcoal@utah.gov>

prime farmland productivity method Task 5369, Areas 2 & 3, Coal Hollow Mine C0250005

Priscilla Burton <priscillaburton@utah.gov>

Thu, May 18, 2017 at 6:07 PM

To: Meredith.Albers@ut.usda.gov

Cc: OGMCOAL DNR <ogmcoal@utah.gov>, Daron Haddock <daronhaddock@utah.gov>

Hello Ms. Albers,

NRCS comments on productivity measurement are requested in accordance with Utah Coal Mining Rules R645-302-317.210 which requires that the NRCS "establish specifications for prime farmland soil removal, storage, replacement, and reconstruction," and R645-302-317.620 et seq, Revegetation and Restoration of Soil Productivity. The NRCS approved the plan for salvage, storage and replacement of prime farmland soils from Area 2 in March of this year (correspondence from M. Domeier dated 3/21/2017). The method of measuring soil productivity was not available for review at that time.

A revised Chapter 9 has since been provided which includes productivity information in red-line/strikeout format. This information is currently under review as Task 5369. Chapter 9, Sections R302-316 to R302-317 are attached for your review. Utah Coal Mining Rules R645-302-626 requires establishment of a reference crop. Utah rule R645-302-627.1 requires comparison of the productivity of the reclaimed soil reference crop with reference crop yields from NRCS records of the surrounding area. In Chapter 9, a reference crop was specified as "pastureland" for measurement of productivity. The pasture seed mix is attached as Table 3-38. In Chapter 9, the Permittee has suggested using AUM as a measure of the soil productivity, as well as statistically evaluating the stated goals of 64.5% total living cover and 1,000 lbs/acre dry matter on the reclaimed pasture (refer to the attached Table of Success Standards). I welcome discussion of these methods for measuring soil productivity.

I have also attached some maps from the amendment to orient you and aid your review. Currently mining is taking place in Pit 8 shown on Dwg 5-53. Chapter 9 refers to the soil survey, which is found in Volume 11 and the vegetation survey which is found in Volume 12 of the MRP. Both are large documents that can be shared by Google Drive or other means, at your request.

After your review, please document your concurrence in writing or suggest improvements in the method or alternative methods of soil productivity measurement in writing also. I expect to complete my review by June 19, 2017.

Thank you for your assistance.

Priscilla Burton, MS, CPSSc
Environmental Scientist III
Utah Division of Oil, Gas & Mining
Price Field Office
phone: [435-613-3733](tel:435-613-3733)

11 attachments

 **DWG. 1-1 Location Map.pdf**
271K

 **DWG. 2-3 Soil Survey North Lease.pdf**
195K

-  **2017_0515 Chap 9 Task 5369.pdf**
109K
-  **2017_0515 Dwg 2-4 Soils handling Task 5369.pdf**
3871K
-  **2017_0515 Dwg 5-46 disturbance sequence 5369.pdf**
6859K
-  **2017_0515 Dwg 5-53 Coal removal sequence Task 5369.pdf**
1563K
-  **2017_0515 Dwg 5-76B reclamation sequence Task 5369.pdf**
9453K
-  **2017_0515 North area final reclamation Task.5369.pdf**
1894K
-  **2017_0515 Table 3-38 Pasture Mix Task5369.pdf**
75K
-  **2017_0515 Table success standards Sec 356-120 Task5369.pdf**
101K
-  **2017_0515 Dwg 3-11 monitoring locations Task5369.pdf**
180K

The planned post mining land use for all prime farmlands disturbed during mining will be for the same agricultural use as prior to mining.

316.200. The permit incorporates as specific conditions the contents of the plan submitted under R645-302-314, after consideration of any revisions to that plan suggested by the State Conservationist under R645-302-315.300;

316.300. The applicant has the technological capability to restore the prime farmland, within a reasonable time, to equivalent or higher levels of yield as nonmined prime farmland in the surrounding area under equivalent levels of management; and

316.400. The proposed coal mining and reclamation operations will be conducted in compliance with the requirements of R645-302-317 and other environmental protection performance and reclamation standards for mining and reclamation of prime farmland of the State Program.

316.500. The aggregate total prime farmland acreage shall not be decreased from that which existed prior to mining. Water bodies, if any, to be constructed during mining and reclamation operations must be located within the post-reclamation non-prime farmland portions of the permit area. The creation of any such water bodies must be approved by the Division and the consent of all affected property owners within the permit area must be obtained.

All planned water bodies will be constructed during or following mining in non-prime farmland portions of the permit area.

R645-302-317 Prime Farmland Performance Standards

317.100 Scope and Purpose

317.200 Responsible Agencies

The Natural Resources Conservation Service and UDOGM will consult with ACD on Prime Farmland areas within the North Private Lease mine permit area.

R645-302-315 makes clear that the authority with regard to prime farmland soils is the Secretary

of Agriculture through the Utah NRCS State Soil Conservationist. The Division has initiated consultation with the State Conservationist per R645-301-315.100 and R645-301-315.200. Prior to approval, the State Conservationist is required to review and comment on the details of the proposed plan.

317.210 Prime Farmland Specifications

The NRCS within Utah will establish specifications for prime farmland soil removal, storage, replacement, and reconstruction.

The Division is in consultation with the NRCS State Conservationist to determine the preferred Prime Farmland soil-reconstruction. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.

317.220 Implementation of Prime Farmland Specifications

UDOGM will use the soil-reconstruction specifications established by the NRCS to carry out its responsibilities in accordance with R645-302-310 through R645-302-~~344~~ 316 and R645-302-316 and R645-301-800.

317.300 Applicability

The requirements of the R645-302-317 will not apply to prime farmland that has been excluded in accordance with R645-302-311 and R645-302-312.

The current Coal Hollow mine was permitted after August 3, 1977.

317.400 Soil Removal and Stockpiling

Soil will be removed from Prime Farmland areas by horizon (A, B, and C) and stockpiled separately by landowner. Estimated salvage depths for the A, B, and C horizons for soil map units in the Prime Farmland areas 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).

Soil samples will be collected from the Prime Farmland areas prior to salvaging to a depth of 48 inches and analyzed by horizons for pH, density, sodium adsorption ratio (SAR), conductivity (ECe), texture, and available water capacity. Sample locations will be approximately one per 2 acres. Horizon samples will be limited to depths of approximately 12 inches. Additional analysis parameters may be included after consultation with UDOGM and the NRCS.

317.410 Timing

Prime farmland soils will be removed from the areas to be disturbed before drilling, blasting, or

mining.

317.420 Salvage Depth of Prime Farmland Soils

The minimum depth of soil and substitute soil material to be reconstructed will be 48 inches, or a lesser depth equal to the depth to a subsurface horizon in the natural soil that inhibits or prevents root penetration, or a greater depth if determined necessary to restore the original soil productive capacity.

Table 13 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 total salvage depths for Prime Farmland soil map unit. It is anticipated that the salvage depths of B and C horizons in adjacent Prime Farmland soil map units can be increased in order to achieve a minimum final reclamation soil profile depth of 48 inches. The estimated average soil depth that can be salvaged from soil map units A1, A2, N and D is limited by the depth to Tropic shale.

317.430 Soil Removal and Stockpiling

Soil removal and stockpiling will be conducted to:

317.431 Separate Removal and Stockpiling of Topsoil

The A horizon or topsoil in Prime Farmland areas will be removed and stockpiled separately by landowner in a manner that will create a final soil having a greater productive value than prior to mining. It is anticipated that the duration of stockpiling Prime Farmland topsoil will be of short duration, since the Prime Farmland areas are at the north end of the proposed mining sequence. Estimated average salvage depths of the A horizon or topsoil in Prime Farmland areas is detailed in Table 13 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).

317.432 Separate Removal and Stockpiling of B and C horizons

Removal and stockpiling of all Prime Farmland soil horizons will be directly monitored by a Certified Professional Soil Scientist.

The B and C horizons will be removed and stockpiled separately by landowner in a manner that will create a final soil having a greater productive value than prior to mining. It is anticipated that the duration of stockpiling Prime Farmland B and C soil horizons will be of short duration, since the Prime Farmland areas are at the north end of the proposed mining sequence. Estimated average salvage depths of the B and C horizons in Prime Farmland areas is detailed in Table 13 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 C horizon will be stockpiled and stockpiled as B horizon soil, if the depth of C horizon soil

to be stockpiled is less than 6 inches. It is anticipated that this consolidation of materials will not diminish the quality of the B horizon.

C horizon materials will primarily consist of soils with pH greater than 8.5.

317.440 Protection of Prime Farmland Stockpiles

Stockpiles of salvaged soil from the A, B, and C horizons will be placed at locations within the permit area where they will not be disturbed or be subject to excessive erosion. If left in place for more than 30 days, stockpiles will meet the requirements of R645-301- 232, R645-301-233.100, R645-301-234, R645-301-242, and R645-301-243.

Stockpiled Prime Farmland materials will be subject to the following conditions within 30 days of stockpiling.

(a) They will be selectively placed on a stable site within the permit area. Prime Farmland soils will be stockpiled by horizon and by landowner. Stockpile areas in the North Private Lease are shown on Drawing 2-4

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

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

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

(d) They will not be moved until required for redistribution unless approved by the UDOGM. Drawing 2-4 shows the anticipated storage time for each stockpile in the North Private Lease.

317.500 Soil Replacement

317.510 Soil Profile Reconstruction

Prime Farmland topsoil and subsoil will be replaced by horizons in the order that they existed prior to removal with the A horizon being on top, the B horizon in the middle, and the C horizon on the bottom of the reconstructed soil profile. Soil samples will be collected from the final graded surface in the Prime Farmland areas on a basis of approximately one sample per two acres on a random statistical grid. The soil samples will be analyzed for horizon depth, pH, density, sodium adsorption ration (SAR), conductivity (ECe), texture, and available water capacity. Horizon samples will be limited to depths of approximately 12 inches.

317.520 Depth of Reconstructed Soil Profile

The combined depth of the reconstructed A, B, and C horizons will be a minimum of 48 inches. Substitute subsoil from adjacent soil map units will be incorporated as either B or C horizon material in areas where the soil depth was less than 48 inches prior to mining. Table 13 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 soil profiles for each of the Prime Farmland soil map units.

317.530 Soil Compaction Monitoring

Soil compaction or density will be monitored during replacement of the A, B, and C horizons. The soil will be ripped or disked as needed to achieve soil densities similar to those documented in the Prime Farmland soils prior to removal and stockpiling as detailed in R645-302-317.400. The overlying soil horizon will not be reconstructed until the desired soil density has been achieved in the underlying soil horizon.

317.540 Replacement of B and C horizons

The combined depth of the B and C horizons will be sufficient to achieve a total minimum depth of 48 inches when the A horizon is included as part of the depth. ~~Substitute subsoil will be used as C horizon soil in areas where the combined original depth was less than 48 inches prior to mining.~~

317.550 Replacement of A horizon

The A horizon or topsoil will be replaced in Prime Farmland areas as the final soil surface layer. This surface soil layer will equal or exceed the thickness of the original surface soil layer. The thickness of the average original soil surface layer in Prime Farmland areas is detailed in Table 13 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).

317.600 Revegetation and Restoration of Soil Productivity

317.610 Vegetation Establishment

Following prime farmland soil replacement, the soil surface will be stabilized with a vegetative cover or other means that effectively controls soil loss by wind and water erosion. ~~Vegetation will be planted in consultation with the landowner following reconstruction and seedbed preparation of Prime Farmland areas.~~ Mulching and fertilization of prime farmland will be implemented as described in Chapter 2, Section 240. Unless the landowner specifies a change in the revegetation plans in the future, the pasture will be reclaimed with the existing pasture

land species mixture (see Table 3-38).

317.620 Restoration of Prime Farmland Productivity

317.621 Measurement of Prime Farmland Productivity

Productivity of the reconstructed Prime Farmland areas will be measured ~~implementing a monitoring program developed in consultation with UDOGM and the NRCS through the use of Animal Unit Months (AUM) for pasture as recommended by NRCS.~~

317.622 Productivity Monitoring Program

The productivity of the reconstructed Prime Farmland areas will be measured with a statistically valid program with 90 percent or greater confidence developed in consultation with UDOGM and the NRCS. These can be found in Chapter 3, Section 356.120.

~~The Division is in consultation with the NRCS State Conservationist to determine the preferred productivity monitoring program for the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~

317.623 Monitoring Period

The measurement period for determining average annual crop production will be a minimum of three years prior to release of the performance bond.

317.624 Management Level

The level of management applied to the reconstructed Prime Farmland during the measurement period will be equal to the management level on non mined similar adjacent areas.

317.625 Restoration of Soil Productivity

Restoration of soil productivity will be considered achieved when the average yield during the measurement period equals or exceeds the average yield of the reference crop established for the same period for non-mined soils of the same or similar texture or slope phase of the soil series in the surrounding area under equivalent management practices.

317.626 Reference Crop

The reference crop on which restoration of soil productivity is proven will be selected from the crops most commonly produced on the surrounding prime farmland. Where row crops are the dominant crops grown on prime farmland in the area, the row crop requiring the greatest rooting depth will be chosen as one of the reference crops. For the North Private Lease Prime Farm Land, the reference crop will be pasture as in surrounding prime farmland supporting pasture lands.

317.627 Reference Crop Yields

Reference crop yields for the selected reference crop will be determined from, either:

317.627.1 Yield Records

The current yield records of representative local farms in the surrounding area, with concurrence by the NRCS; ~~or~~

~~The Division is in consultation with the NRCS State Conservationist for the yield records of representative local farms in the surrounding area for the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~

317.627.2 Average County Yields

~~The average county yields recognized by the U.S. Department of Agriculture, which have been adjusted by the NRCS for local yield variation within the county that is associated with differences between non-mined prime farmland soil and all other soils that produce the reference crop; and~~

~~The Division is in consultation with the NRCS State Conservationist for the average county yields for the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~

317.628 Adjustment of Reference Yields

Average reference crop yields in R645-302-317.627 may be adjusted, with concurrence of the NRCS, for:

~~The Division is in consultation with the NRCS State Conservationist to determine if the average reference yields should be adjusted for the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~ ACD is not requesting adjustment of Reference Yields.

317.628.1 Environmental Impacts

Disease, pest, and weather-related seasonal variations; or

~~The Division will be in consultation with the NRCS State Conservationist for the to determine if an environmental impacts should be taken into account as part of the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~

317.628.2 Management Practices

Differences in specific management practices where the overall management practices of the crops being compared are equivalent.

~~The Division will be in consultation with the NRCS State Conservationist for the to determine if differences in management practices should be taken into account as part of the post mining land use evaluation. That coordinated review is ongoing and the recommendations made by the NRCS will be incorporated into the mining plan.~~

North Private Lease Areas 1, 2 & 3 Subsoil & Topsoil Salvage Quantities

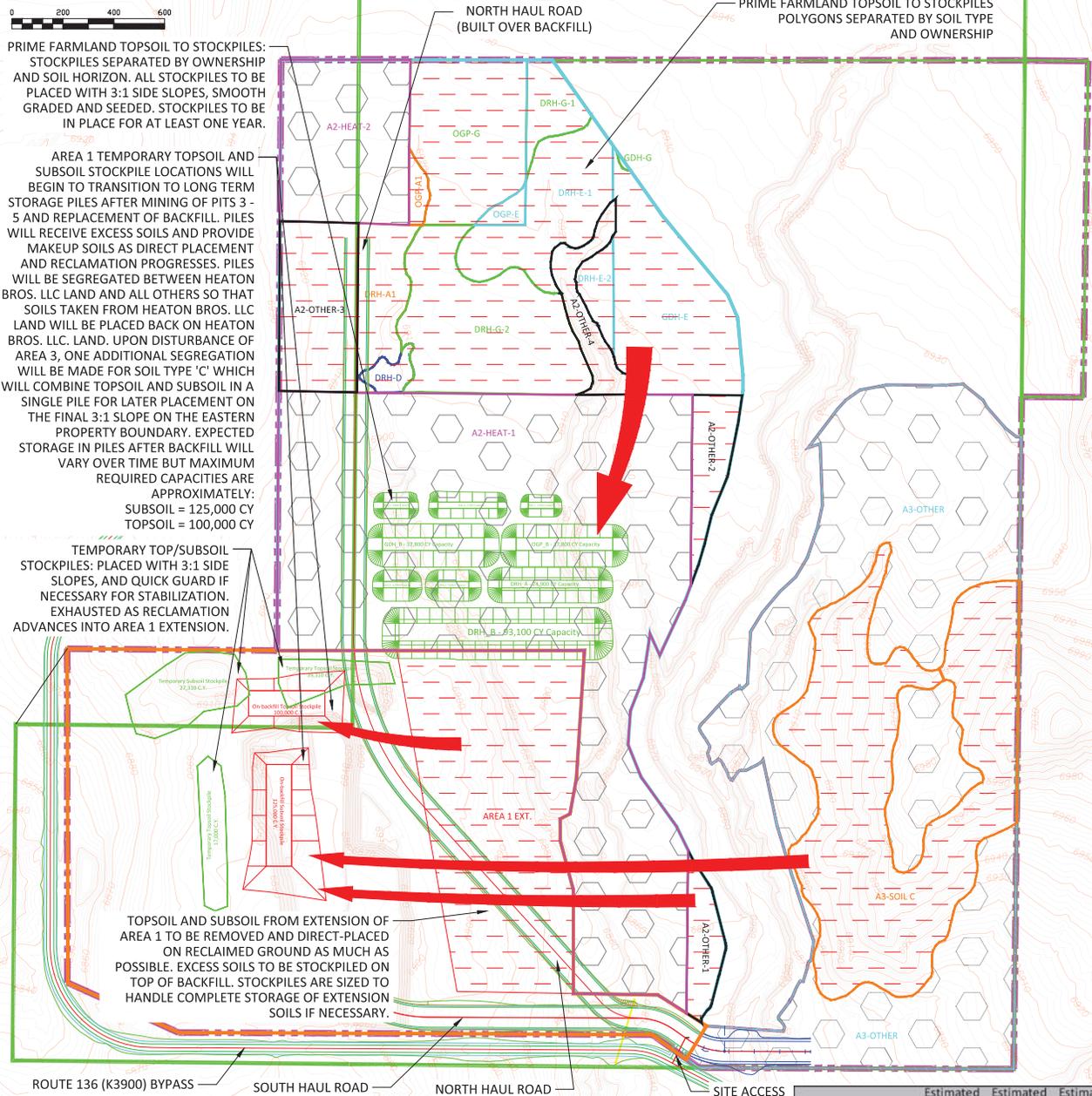
Polygon	Area (sq. ft)	Area (Acres)	Topsoil Salvage Depth (ft)*	Subsoil Salvage Depth (ft)*	Topsoil Salvage Volume (CY)	Subsoil Salvage Volume (CY)	Movement Designation
A1-Extension (Heaton Soils)	777,984	17.86	1.08	2.73	31,119	78,663	Heaton Piles
A2-HEAT-1	2,111,728	48.48	1.03	2.88	80,167	225,512	Direct Haul
A2-HEAT-2	325,574	7.47	1.15	2.61	13,867	31,452	Direct Haul
A2-OTHER-1	68,089	1.56	1.55	2.45	3,909	6,178	Other Piles
A2-OTHER-2	83,480	1.92	1.08	2.92	3,350	9,018	Other Piles
A2-OTHER-3	205,461	4.72	1.14	2.61	8,688	19,849	Other Piles
A2-OTHER-4	79,152	1.82	0.97	3.03	2,834	8,892	Other Piles
A3-SOIL C	916,106	21.03	0.50	1.00	16,965	33,930	'C' Pile
A3-OTHER	1,576,899	36.20	0.94	1.96	54,997	114,374	Direct Haul

North Private Lease Areas 1, 2 & 3 Soil Movement Quantities

Soil Destination	Topsoil Storage/Haul Volume (CY)	Subsoil Salvage/Haul Volume (CY)
Area 1 - Stockpiles Req'd Volume	31,119	78,663
Area 2 - HEAT Direct Haul Volume	94,034	256,964
Area 2 - OTHER Stockpiles Req'd Volume	18,780	43,937
Area 3 - 'C' Stockpile Req'd Volume^	50,895	
Area 3 - OTHER Direct Haul Volume	54,997	114,374

* Topsoil and Subsoil combined as discussed in MRP Chapter 2

* Weighted average salvage depth from soil types composite within Area/Ownership polygons - See Dwg 2-3



PRIME FARMLAND TOPSOIL TO STOCKPILES: STOCKPILES SEPARATED BY OWNERSHIP AND SOIL HORIZON. ALL STOCKPILES TO BE PLACED WITH 3:1 SIDE SLOPES, SMOOTH GRADED AND SEEDED. STOCKPILES TO BE IN PLACE FOR AT LEAST ONE YEAR.

AREA 1 TEMPORARY TOPSOIL AND SUBSOIL STOCKPILE LOCATIONS WILL BEGIN TO TRANSITION TO LONG TERM STORAGE PILES AFTER MINING OF PITS 3 - 5 AND REPLACEMENT OF BACKFILL. PILES WILL RECEIVE EXCESS SOILS AND PROVIDE MAKEUP SOILS AS DIRECT PLACEMENT AND RECLAMATION PROGRESSES. PILES WILL BE SEGREGATED BETWEEN HEATON BROS. LLC LAND AND ALL OTHERS SO THAT SOILS TAKEN FROM HEATON BROS. LLC LAND WILL BE PLACED BACK ON HEATON BROS. LLC. LAND. UPON DISTURBANCE OF AREA 3, ONE ADDITIONAL SEGREGATION WILL BE MADE FOR SOIL TYPE 'C' WHICH WILL COMBINE TOPSOIL AND SUBSOIL IN A SINGLE PILE FOR LATER PLACEMENT ON THE FINAL 3:1 SLOPE ON THE EASTERN PROPERTY BOUNDARY. EXPECTED STORAGE IN PILES AFTER BACKFILL WILL VARY OVER TIME BUT MAXIMUM REQUIRED CAPACITIES ARE APPROXIMATELY:
SUBSOIL = 125,000 CY
TOPSOIL = 100,000 CY

TEMPORARY TOP/SUBSOIL STOCKPILES: PLACED WITH 3:1 SIDE SLOPES, AND QUICK GUARD IF NECESSARY FOR STABILIZATION. EXHAUSTED AS RECLAMATION ADVANCES INTO AREA 1 EXTENSION.

TOPSOIL AND SUBSOIL FROM EXTENSION OF AREA 1 TO BE REMOVED AND DIRECT-PLACED ON RECLAIMED GROUND AS MUCH AS POSSIBLE. EXCESS SOILS TO BE STOCKPILED ON TOP OF BACKFILL. STOCKPILES ARE SIZED TO HANDLE COMPLETE STORAGE OF EXTENSION SOILS IF NECESSARY.

Contour Interval = 2'

	Permit Area 1 Disturbance	= 69.8 Acres		Top/Subsoil Direct Placed for Reclaim
	Permit Area 2 Disturbance	= 97.8 Acres		Top/Subsoil placed in Stockpile
	Permit Area 3 Disturbance	= 57.2 Acres		
	Total Disturbance	= 224.8 Acres		
	Undisturbed Area	= 70.8 Acres		
	Total Lease Area	= 295.6 Acres		

Owner	Prime Farmland Area	Estimated A Horizon Salvage Quantity ¹	Estimated B Horizon Salvage Quantity ¹	Estimated C Horizon Salvage Quantity ¹
	acres	yds ³	yds ³	yds ³
DRH	17.9	17,700	88,889	6,840
GDH	7.2	5,798	36,666	3,852
OGP	6.9	7,265	34,027	2,055
Total	31.9	30,762	159,582	12,747

1. Estimated salvage volumes based on estimated horizon salvage depths listed in Table 13, Volume 11, Order 2 Soil Survey for the North Private Lease Expansion of the Coal Hollow Mine.

LEGEND:

	PERMIT BOUNDARY
	PRIVATE COAL OWNERSHIP
	SECTION LINE
	FOUND SECTION CORNER
	FOUND PROPERTY CORNER

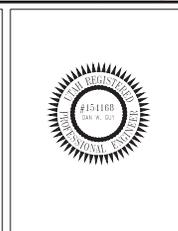
DRAWN BY:	CHECKED BY:
A. CHRISTENSEN	DWG
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2-4	4/10/15
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0001	

REVISIONS	
DATE:	BY:
9/7/16	AC
10/3/16	AC
10/19/16	AC
11/23/16	AC
12/14/16	AC
2/2/17	AC
5/4/17	AC

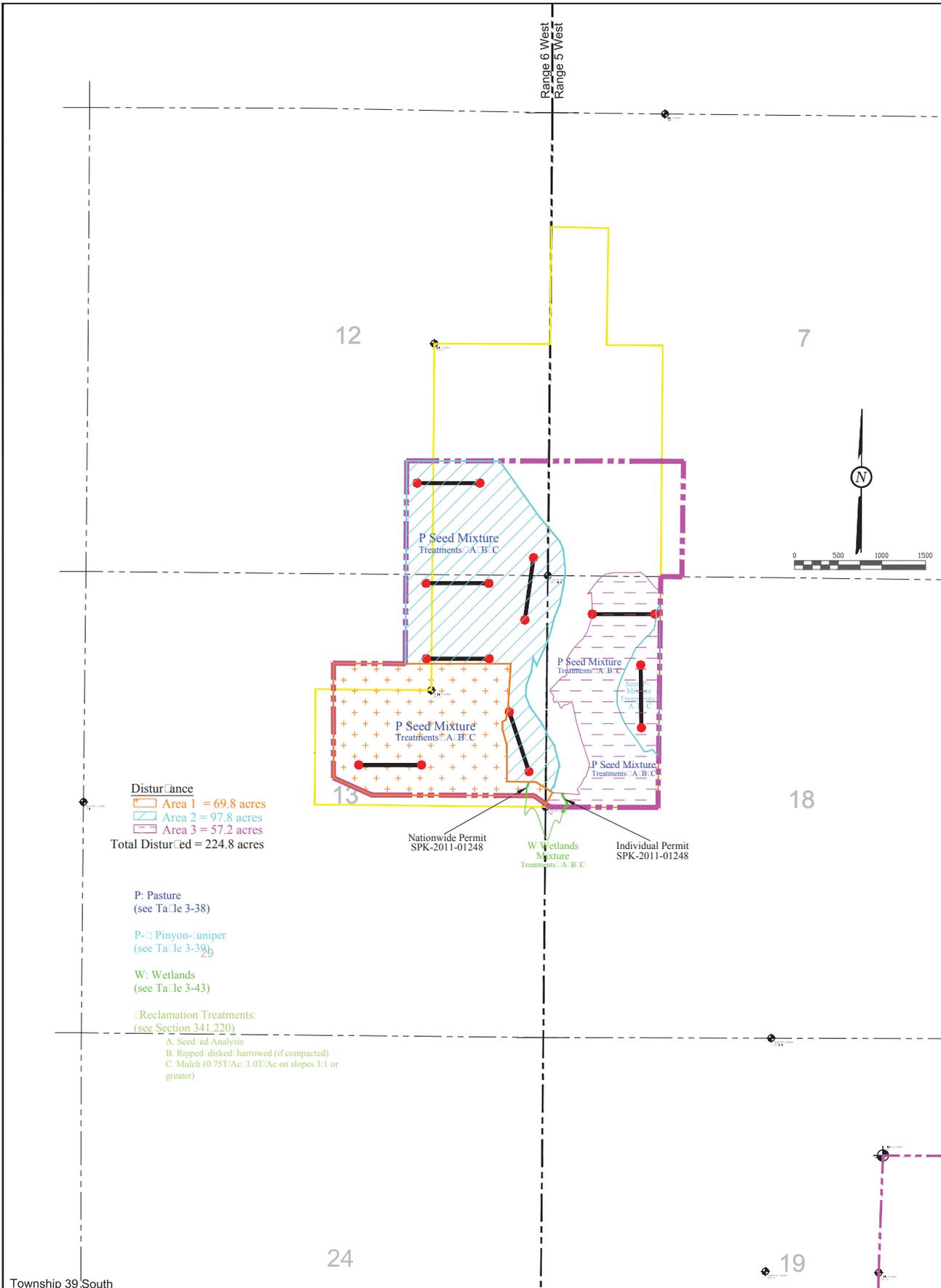
TOPSOIL HANDLING PLAN

NORTH COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 2-4



463 North 100 West, Suite 1
Cedar City, Utah 84721
Phone (435)867-5331
Fax (435)867-1192



Disturbance
 Area 1 = 69.8 acres
 Area 2 = 97.8 acres
 Area 3 = 57.2 acres
Total Disturbed = 224.8 acres

P: Pasture
 (see Table 3-38)

P-P Pinyon-juniper
 (see Table 3-39)

W: Wetlands
 (see Table 3-43)

Reclamation Treatments:
 (see Section 341.220)

A. Seeded Analysis
 B. Ripped/disked/harrowed (if compacted)
 C. Mulch (0.75T/Ac:1.0T/Ac on slopes 3:1 or greater)

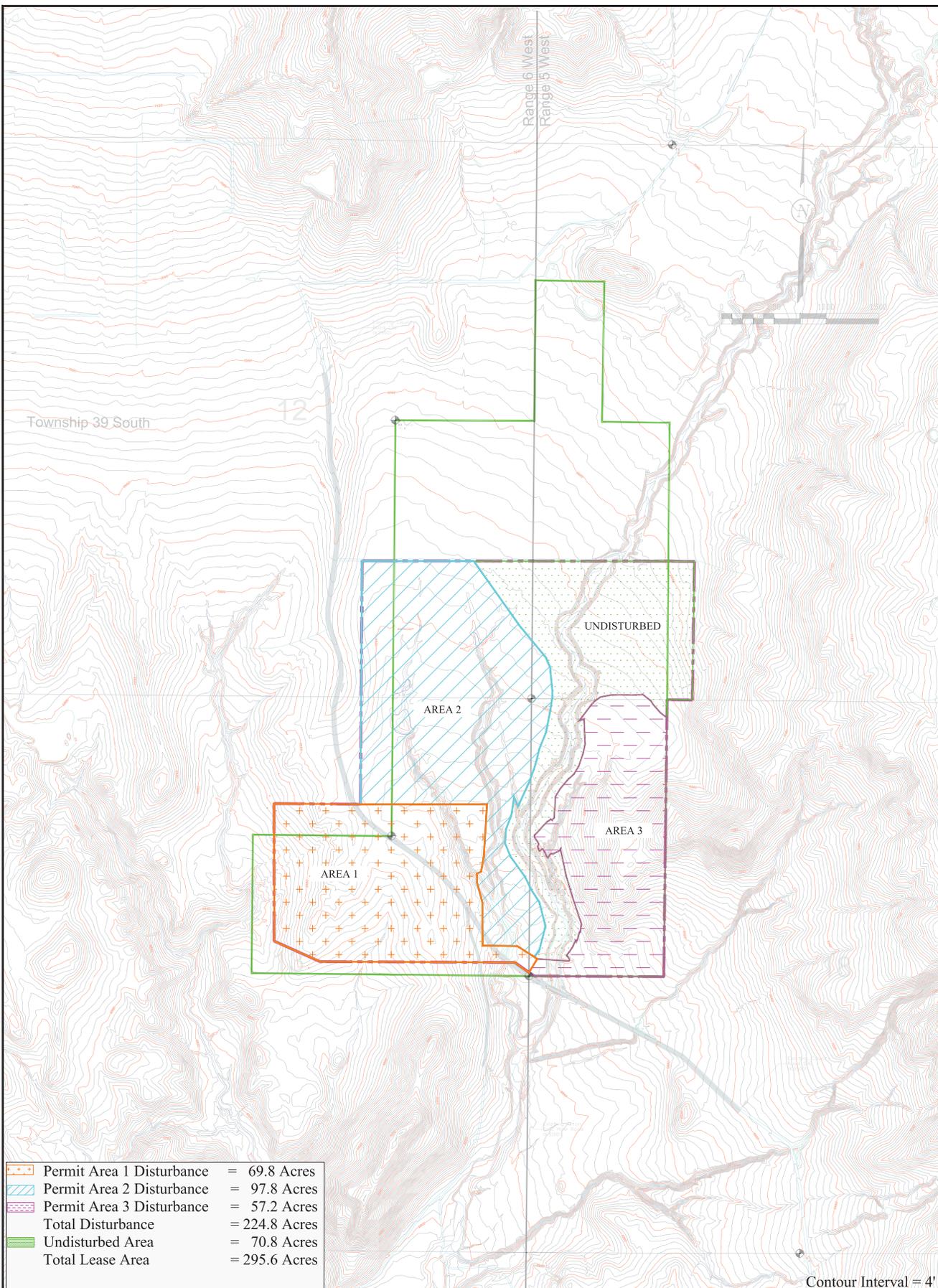
Nationwide Permit SPK-2011-01248

W Wetlands Mixture Treatments: A, B, C

Individual Permit SPK-2011-01248

Township 39 South

LEGEND: PERMIT BOUNDARY PRIVATE COAL OWNERSHIP SECTION LINE FOUND SECTION CORNER FOUND PROPERTY CORNER	DRAWN BY: K. NICHOLS	CHECKED BY: AC	REVISIONS		RECLAMATION TREATMENTS, MONITORING & SAMPLE LOCATIONS NORTH COAL HOLLOW PROJECT ALTON, UTAH DRAWING: 11		 63 North 1 West, Suite 1 Cedar Bluff, Utah 84201 Phone 35-867-5331 Fax 35-867-1192
	DRAWING: 3-11	DATE: 8/8/14	DATE: BY: 10/15/15 [] N 12/2/16 [] N 04/20/17 [] N	SCALE: 1" = 500'			
JOB NUMBER: 0001	SHEET						



	Permit Area 1 Disturbance	= 69.8 Acres
	Permit Area 2 Disturbance	= 97.8 Acres
	Permit Area 3 Disturbance	= 57.2 Acres
	Total Disturbance	= 224.8 Acres
	Undisturbed Area	= 70.8 Acres
	Total Lease Area	= 295.6 Acres

Contour Interval = 4'

LEGEND: PERMIT BOUNDARY PRIVATE COAL OWNERSHIP SECTION LINE FOUND SECTION CORNER FOUND PROPERTY CORNER	DRAWN BY: K. NICHOLAS	CHECKED BY: DWG	REVISIONS <table border="1"> <thead> <tr> <th>DATE:</th> <th>BY:</th> </tr> </thead> <tbody> <tr> <td>12/15/15</td> <td>AC</td> </tr> <tr> <td>1/8/16</td> <td>AC</td> </tr> <tr> <td>8/15/16</td> <td>AC</td> </tr> <tr> <td>9/7/16</td> <td>AC</td> </tr> <tr> <td>10/3/16</td> <td>AC</td> </tr> <tr> <td>2/2/17</td> <td>AC</td> </tr> <tr> <td>5/4/17</td> <td>AC</td> </tr> </tbody> </table>	DATE:	BY:	12/15/15	AC	1/8/16	AC	8/15/16	AC	9/7/16	AC	10/3/16	AC	2/2/17	AC	5/4/17	AC	DISTURBANCE SEQUENCE NORTH COAL HOLLOW PROJECT ALTON, UTAH DRAWING: 5-46		 463 North 100 West, Suite 1 Cedar City, Utah 84721 Phone (435)867-5331 Fax (435)867-1192
	DATE:	BY:																				
12/15/15	AC																					
1/8/16	AC																					
8/15/16	AC																					
9/7/16	AC																					
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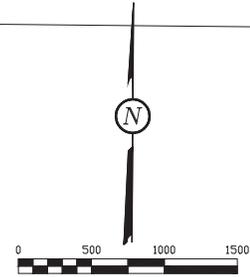
Note:

- Pit boundaries represent extent of extracted coal, See Dwg. 5-57 for surface pit boundaries.
- Sequence colors represent Quarters of years as noted below.

- 1/1/2016 - 1/1/2016
- 1/1/2016 - 4/1/2016
- 4/1/2016 - 7/1/2016
- 7/1/2016 - 10/1/2016
- 10/1/2016 - 1/1/2017
- 1/1/2017 - 4/1/2017
- 4/1/2017 - 7/1/2017
- 7/1/2017 - 10/1/2017
- 10/1/2017 - 1/1/2018
- 1/1/2018 - 4/1/2018
- 4/1/2018 - 7/1/2018
- 7/1/2018 - 10/1/2018
- 10/1/2018 - 1/1/2019
- 1/1/2019 - 4/1/2019
- 4/1/2019 - 7/1/2019
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- 10/1/2019 - 1/1/2020
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- 4/1/2020 - 7/1/2020
- 7/1/2020 - 10/1/2020
- 10/1/2020 - 1/1/2021
- 1/1/2021 - 4/1/2021
- 4/1/2021 - 7/1/2021
- 7/1/2021 - 10/1/2021
- 10/1/2021 - 1/1/2022
- 1/1/2022 - 4/1/2022
- 4/1/2022 - 7/1/2022

Township 39 South

Range 6 West
Range 5 West



Coal Sequence Summary by Year:

Year 1:		
Open Pit*	=	585,300 Tons
Highwall**	=	0 Tons
Total		585,300 Tons

Year 2:		
Open Pit	=	787,000 Tons
Highwall	=	69,800 Tons
Total		856,800 Tons

Year 3:		
Open Pit	=	442,300 Tons
Highwall	=	157,300 Tons
Total		599,600 Tons

Year 4:		
Open Pit	=	528,600 Tons
Highwall	=	206,600 Tons
Total		735,200 Tons

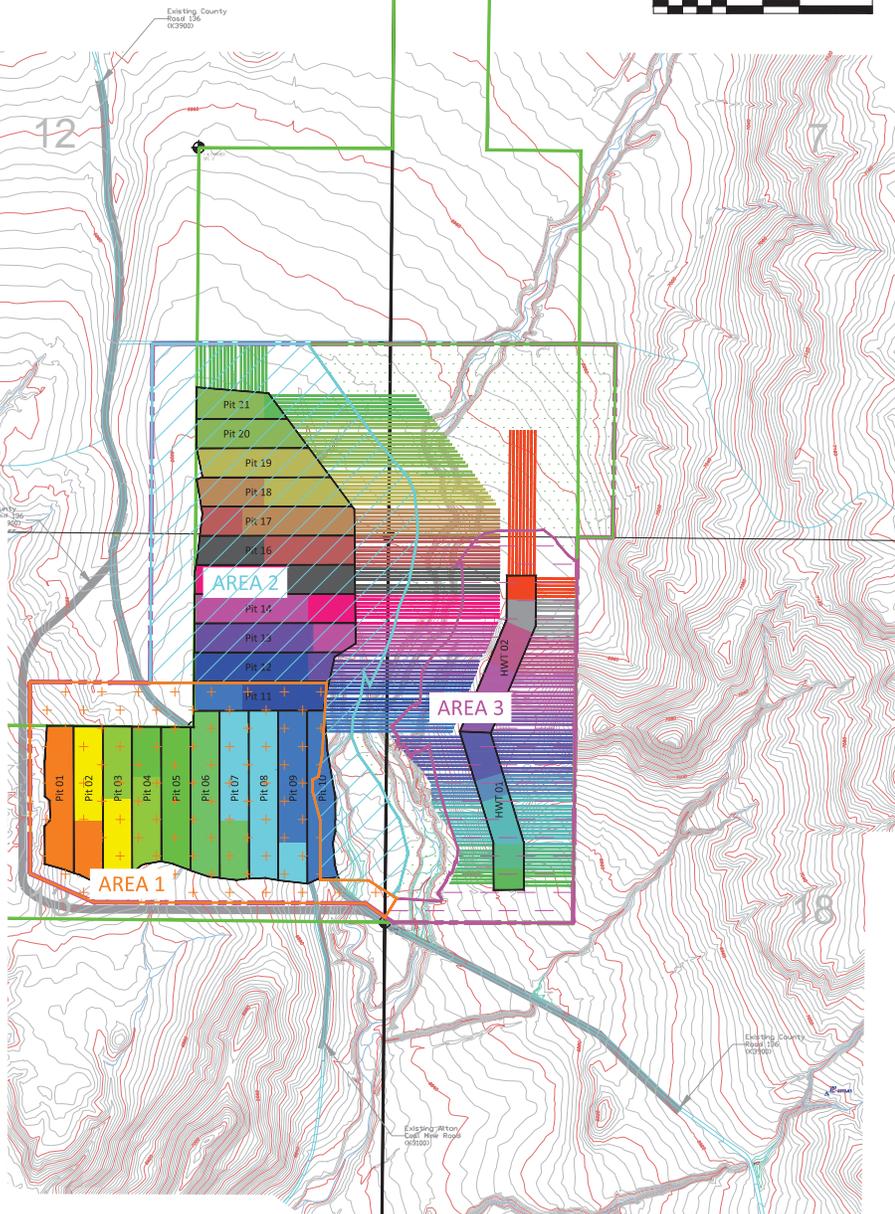
Year 5:		
Open Pit	=	111,800 Tons
Highwall	=	168,800 Tons
Total		280,600 Tons

Year 6:		
Open Pit	=	121,500 Tons
Highwall	=	115,100 Tons
Total		236,600 Tons

Year 7:		
Open Pit	=	39,700 Tons
Highwall	=	68,100 Tons
Total		107,800 Tons

North Area Total = 3,401,900 Tons

*All tons are at 95% recovery
** All Tons are at 35% recovery



Contour Interval = 4'

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

DRAWN BY:	CHECKED BY:
A. CHRISTENSEN	DWG
DRAWING:	DATE:
5-53	4/10/15
	SCALE:
	1" = 400'
JOB NUMBER:	SHEET
0001	

REVISIONS	
DATE:	BY:
12/15/15	AC
1/8/16	AC
8/15/16	AC
9/7/16	AC
10/3/16	AC
2/2/17	AC
5/4/17	AC

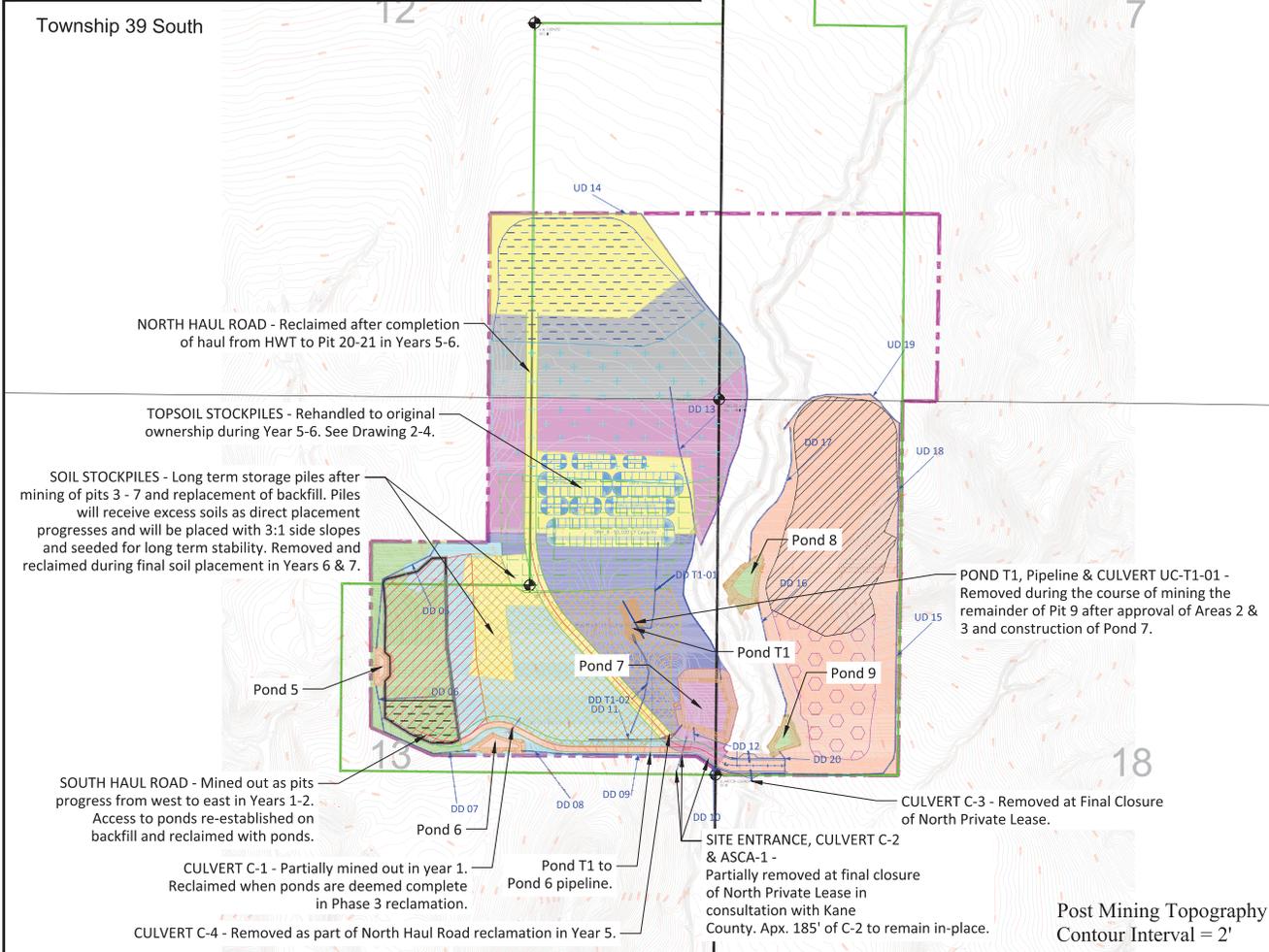
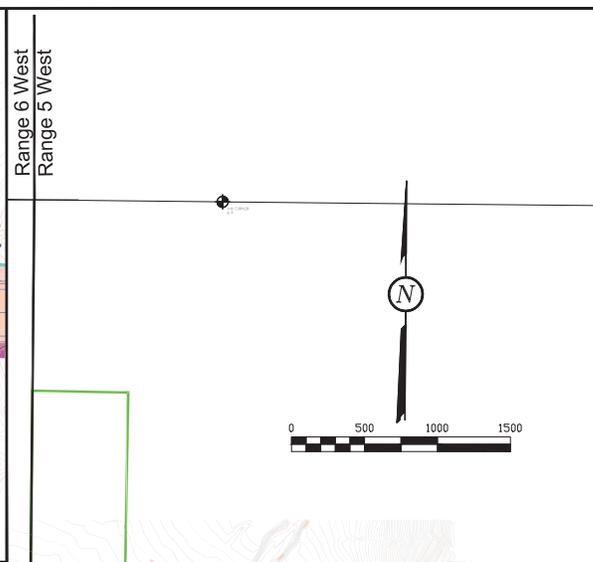
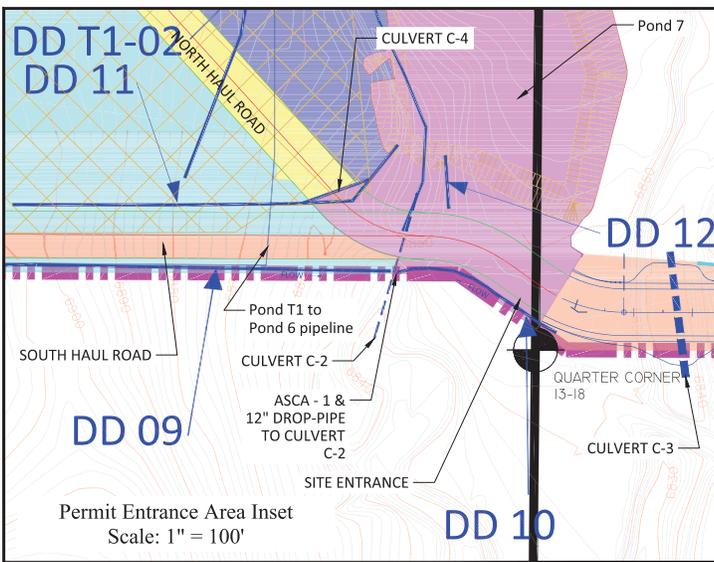
COAL REMOVAL SEQUENCE

NORTH COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-53



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Cedar City, Utah 84721
Phone (435)867-5331
Fax (435)867-1192



Phase 1 Reclamation:

	Year 1 Reclaim = 17.9 Acres
	Year 2 Reclaim = 34.7 Acres
	Year 3 Reclaim = 24.1 Acres
	Year 4 Reclaim = 39.3 Acres
	Year 5 Reclaim = 24.3 Acres
	Year 6 Reclaim = 11.6 Acres
	Year 7 Reclaim = 26.4 Acres
	Year 8 Reclaim = 00.0 Acres
	Year 9 Reclaim = 00.0 Acres
Total Ph. 1 Reclamation = 178.4 Acres	

Phase 2/Surface Mulch & Seeding:

	Year 1 Seeding = 16.2 Acres
	Year 2 Seeding = 25.0 Acres
	Year 3 Seeding = 22.3 Acres
	Year 4 Seeding = 22.2 Acres
	Year 5 Seeding = 23.8 Acres
	Year 6 Seeding = 49.3 Acres
	Year 7 Seeding = 57.8 Acres
	Year 8 Seeding = 5.8 Acres
	Year 9 Seeding = 2.5 Acres
Total Ph. 2 Reclamation = 224.9 Acres	

Phase 3 Reclamation to be completed and released within the 10 year timeframe from Phase 1. **Ponds, culverts and ditches (except Area 1 extension)** to be assessed and reclaimed as Phase 3 nears completion. Area 1-A structures will be removed as mining advances.

Contour Interval = 2'

LEGEND:

- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- SECTION LINE
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER

DRAWN BY:	A. CHRISTENSEN
CHECKED BY:	DWG
DRAWING:	5-76B
DATE:	10/12/15
SCALE:	1" = 400'
JOB NUMBER:	0001
SHEET:	

REVISIONS	
DATE:	BY:
12/15/15	AC
1/8/16	AC
8/15/16	AC
9/7/16	AC
10/3/16	AC
3/31/16	AC
5/4/17	AC

FACILITIES RECLAMATION SEQUENCE

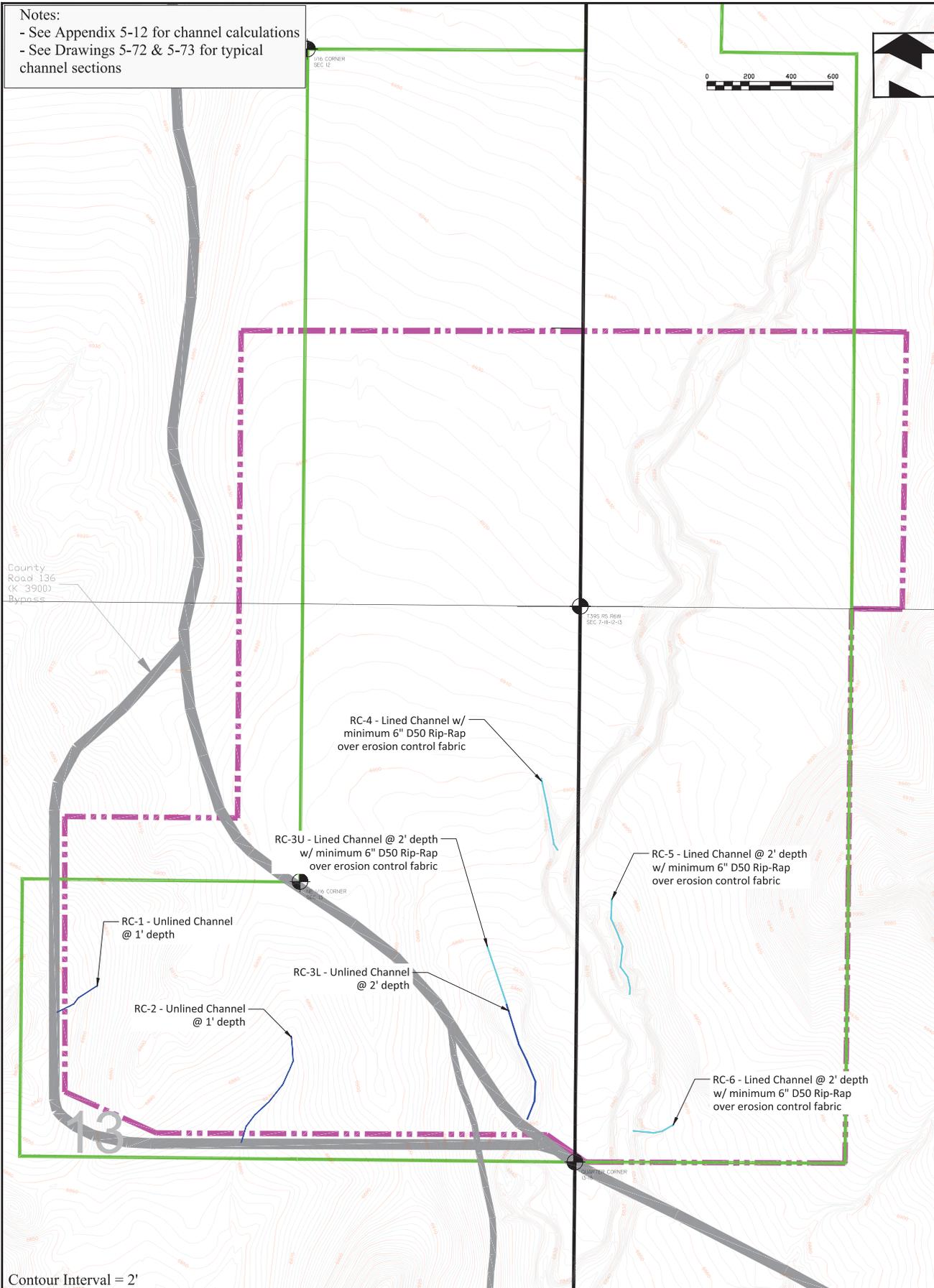
NORTH COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-76B



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Notes:
 - See Appendix 5-12 for channel calculations
 - See Drawings 5-72 & 5-73 for typical channel sections



Contour Interval = 2'

LEGEND:

- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- SECTION LINE
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER
- RECLAIMED CHANNEL

DRAWN BY:
A. CHRISTENSEN

CHECKED BY:
DWG

DRAWING:
5-79

JOB NUMBER:
0001

DATE:
12/15/15

SCALE:
1" = 200'

SHEET

REVISIONS	
DATE:	BY:
1/8/16	AC
8/15/16	AC
9/7/16	AC
10/3/16	AC
2/2/17	AC
5/4/17	AC

POST MINING SURFACE HYDROLOGY

NORTH COAL HOLLOW PROJECT
 ALTON, UTAH

DRAWING: 5-79



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Table 3-38: Revegetation Seed Mixture for the Pasture Lands at the Coal Hollow Project

(Final determination to be made by landowners)	Rate* (# PLS/Ac)	Seeds/ft2
SHRUBS		
FORBS **		
<i>Achillea millefolium var. occidentalis</i>	0.04	2.55
<i>Astragalus cicer</i>	1.5	4.22
<i>Hedysarum boreale</i>	1	0.77
<i>Linum perenne</i>	1	6.39
<i>Medicago sativa</i>	1	5.21
GRASSES		
<i>Bromus inermis</i>	1	2.45
<i>Dactylis glomerata</i>	0.2	0.00
<i>Pascopyrum smithii</i>	1.5	4.34
<i>Elymus lanceolatus ssp. lanceolatus</i>	1.5	5.27
<i>Psathyrostachys juncea</i>	1	0.00
<i>Thinopyrum intermedium</i>	2	0.00
<i>Phleum pretense</i>	0.2	0.00
<i>Poa pratensis</i>	0.1	5.00
Sterile Triticale - Quick Guard	10.00	4.59
TOTALS	22.04	40.78

* Based on drill seeding methods. The number reflects the pounds of pure live seed (PLS) per acre. 10

*** Seeds used may be based on commercial availability. Other forb species that would be beneficial for sage-grouse enhancement include: *Achillea millefolium*, *Agoseris glauca*, *Crepis acuminata*, *Gayophytum* spp., *Lomatium* spp., *Tragopogon dubius*, *Trifolium* spp.

Revegetation success standards and postmining land uses at the Coal Hollow Mine, Utah

COAL HOLLOW LEASE

RECLAIMED AREA	TOTAL LIVING COVER	WOODY SPECIES DENSITY	PRODUCTION
Sagebrush/Grass ⁽⁶⁵⁾	Sagebrush/Grass Reference Area	10% of the total value in the Sagebrush/Grass Reference Area ⁽¹⁾	Sagebrush/Grass Reference Area
Pasture Land ⁽⁷⁾	64.50% ⁽⁶⁴⁾	No woody species density standard	1,100 lbs/ac ⁽⁸⁷⁾
Pinyon-Juniper ⁽⁶⁵⁾	49.75% ⁽⁴⁾ <u>Sagebrush/Grass Reference Area</u>	10% of the total value in the Pinyon-Juniper <u>Sagebrush/Grass Reference Area</u> ⁽¹⁾	700 lbs/ac ⁽⁹⁾ <u>Sagebrush/Grass Reference Area</u>
Meadow ⁽⁶⁵⁾	Meadow Reference Area	10% of the total value in the Meadow Reference Area ⁽¹⁾	Meadow Reference Area
Oak Brush ⁽⁶⁵⁾	Oak Brush Reference Area	10% of the total value in the Oak Brush Reference Area ⁽¹⁾	Oak Brush Reference Area
Meadow (Dry) ⁽⁶⁵⁾	Meadow (Dry) Reference Area	10% of the total value in the Meadow (Dry) Reference Area ⁽¹⁾	Meadow (Dry) Reference Area

NORTH PRIVATE LEASE

Pasture Land ⁽⁷⁶⁾	64.50% ⁽⁶⁴⁾	No woody species density standard	1,100 lbs/ac ⁽⁸⁷⁾
Sagebrush Drainage ⁽⁷⁶⁾ Sagebrush within the incised channels west of Kanab Creek channel (i.e. Sample Site: V-07)	Sagebrush Drainage Reference Area (Sample Site: V-03)	10% of the total value Sagebrush Drainage Reference Area ⁽¹⁾ (Sample Site: V-03)	Sagebrush Drainage Reference Area (Sample Site: V-03)
Wetlands ⁽⁷⁾	U.S. Army COE standards	U.S. Army COE standards	U.S. Army COE standards

(1) Can include shrubs and subshrubs. Rabbitbrush (*Chrysothamnus nauseosus*) cannot account for more than 10% of the total density.

(2) Recommended index: Diversity for Forbs: MacArthur=s Diversity Index for forbs.

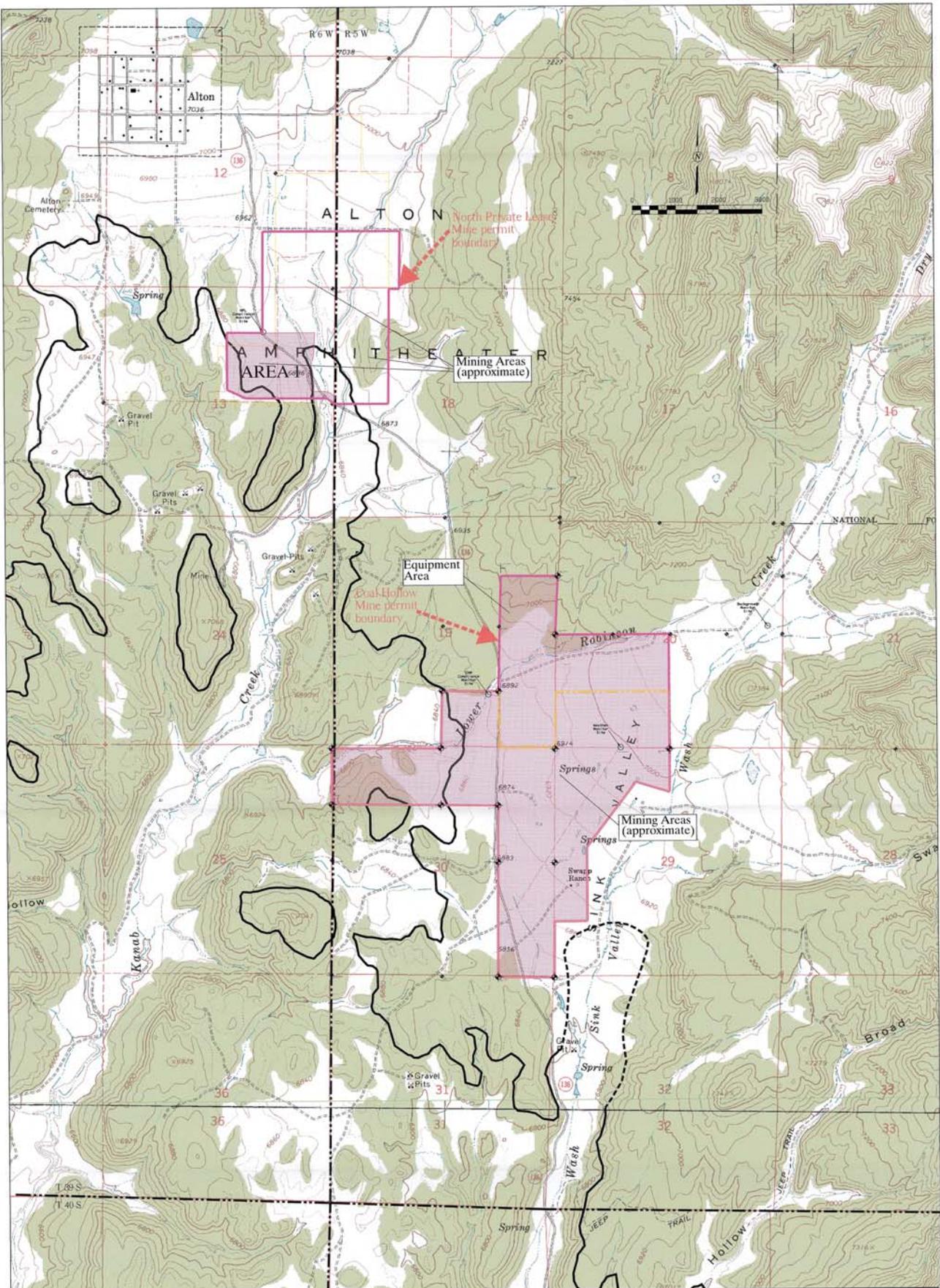
(3) Recommended index: Diversity for Grasses: MacArthur=s Diversity Index for grasses.

⁽⁶⁴⁾ This is the average total living cover measured for all Pasture Lands sampled (see Appendix 3-4 and Volume 12 for Pasture Land cover data).

⁽⁶⁵⁾ Postmining land use is primarily domestic grazing with limited wildlife use.

⁽⁷⁶⁾ Postmining Land use is domestic grazing.

⁽⁸⁷⁾ Refer to Volume 12, Table 43 for production information.



LEGEND:

	PERMIT AREA
	PRIVATE COAL
	COAL LINE BOUNDARY
	COUNTY ROAD

DRAWN BY: N. BUTKOVICH	CHECKED BY: APC
DRAWING: 1-1	DATE: 8/16/04
JOB NUMBER: 1400	SCALE: 1" = 1000'
	SHEET

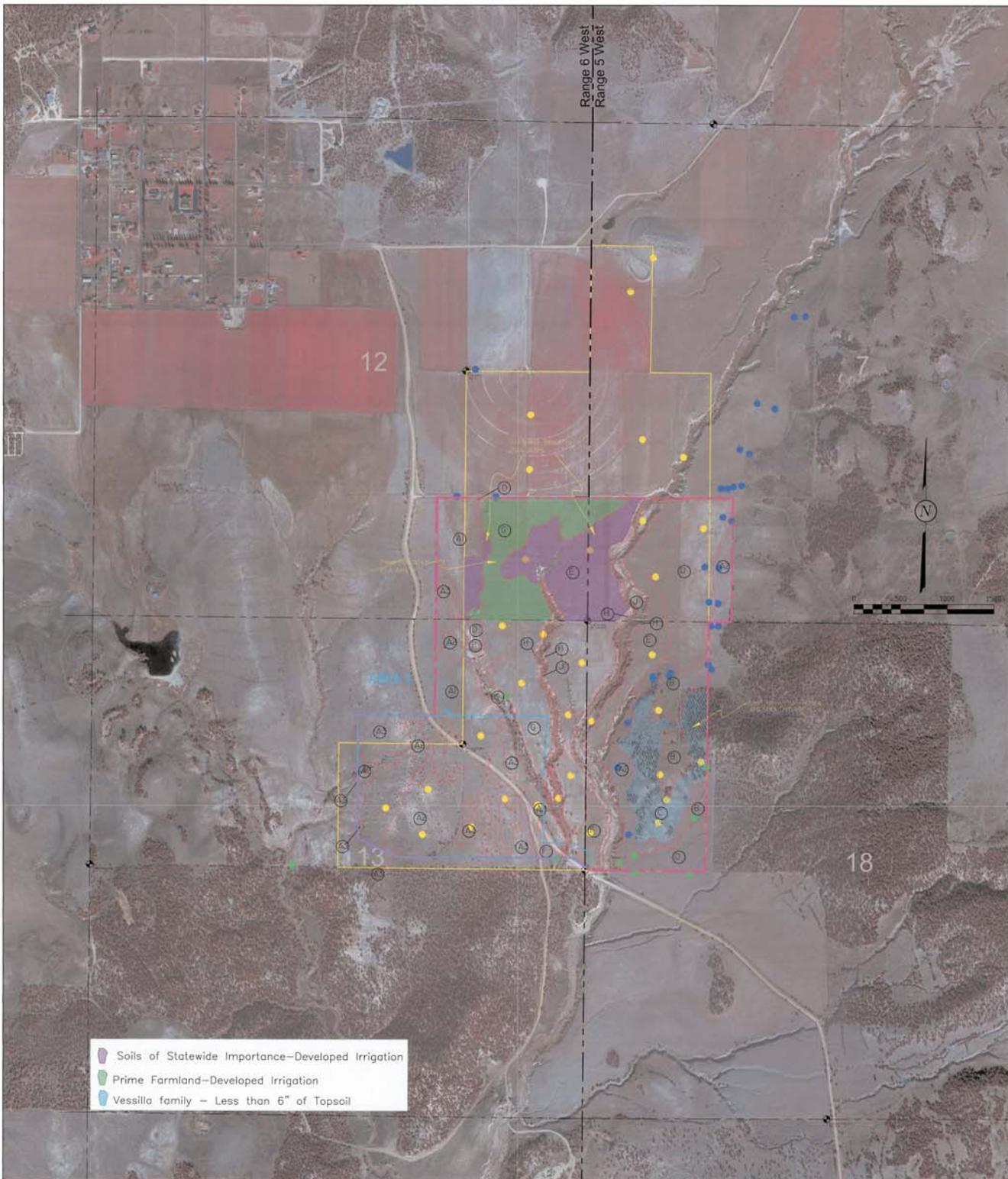
REVISIONS	
DATE:	BY:
8/25/08	CRM
10/18/13	KN
8/7/14	KN
8/23/16	KN
9/29/16	KN

PERMIT AREA	
COAL HOLLOW PROJECT ALTON, UTAH	
DRAWING: 1-1	

INCORPORATED
DEC 21 2016
Oil, Gas & Mining

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Cedar City, Utah 84721
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Fax (435)867-1192

RECEIVED
DEC 21 2016
CITY OF CEDAR CITY, UTAH



■ Soils of Statewide Importance-Developed Irrigation
■ Prime Farmland-Developed Irrigation
■ Vessilla family - Less than 6" of Topsoil

MAP UNIT	MAP UNIT NAME	ESTIMATED SALVAGE DEPTHS NON PRIME FARMLAND (1)			ESTIMATED SALVAGE DEPTHS PRIME FARMLAND, IF IRRIGATED			(1) ESTIMATED SALVAGE DEPTHS ARE WEIGHTED AVERAGES BASED ON MAP UNIT COMPONENTS AND PERCENTAGE OF EACH COMPONENT IN THE MAP UNIT. VARIATIONS OF SALVAGE DEPTH OCCUR WITHIN EACH MAP UNIT AND SHOULD BE MONITORED DURING SALVAGE OPERATIONS.
		TOPSOIL DEPTH	SUBSOIL DEPTH	TOTAL SALVAGE	A HORIZON DEPTH	B HORIZON DEPTH	C HORIZON DEPTH	
A1	SIDESHOW FAMILY, 0 TO 4 PERCENT SLOPE	14	31	46	8	35	4	(2) GOOD/FAIR SUBSOIL IS BASED ON THE SOIL MEETING THE GOOD AND FAIR SUITABILITY CRITERIA FOR ALL PARAMETERS EXCEPT CLAY TEXTURES IN GUIDELINES FOR MANAGEMENT OF TOPSOIL AND OVERBURDEN (UTAH DOGM, 2005).
A2	SIDESHOW - TEROMOTE FAMILIES, 4 TO 8 PERCENT SLOPES	13	32	46	8	36	1	
A3	SIDESHOW FAMILY, 8 TO 18 PERCENT SLOPES	14	31	46	8	34	4	
B	FLUGLE - BRIMLEY FAMILIES, 8 TO 15 PERCENT SLOPE	17	25	42	10	32	0	
C	QUEZCAN FAMILY - VESSILLA FAMILIES, 20 TO 45 PERCENT SLOPES	6	12	18				
D	WIMMER - TEROMOTE - BOBKNOLL, 2 TO 8 PERCENT SLOPES	14	31	46	8	36	0	
E	ATATL - CCC FAMILIES, 0 TO 4 PERCENT SLOPES	13	35	48	6	38	4	
F	BOXCANYON FAMILY, 0 TO 4 PERCENT SLOPES	19	29	48	8	40	0	
G	AAA FAMILY, 0 TO 5 PERCENT SLOPES	11	37	48	8	37	2	
H	BBB - ATLATL FAMILY, 8 TO 25 PERCENT SLOPES	12	36	48				
J	SIDESLIDE - DDD FAMILIES, 4 TO 12 PERCENT SLOPES	7	41	48				
K	BBB FAMILY, 15 TO 75 PERCENT SLOPES	12	36	48				
P	POND							

INCORPORATED DEC 21 2016

LEGEND: PERMIT BOUNDARY PRIVATE COAL OWNERSHIP SECTION LINE FOUND SECTION CORNER UT 1942 2002 Natchez 2002 2002 & 2004 Topo 400	DRAWN BY: K. NICHOLAS	CHECKED BY: B. LONG	REVISIONS		SOIL SURVEY MAP NORTH COAL HOLLOW PROJECT ALTON, UTAH DRAWING: 2-3	RECEIVED JAN 8 2017 DIV. OF OIL, GAS & MINING	 463 North 100 West, Suite 1 Cedar City, Utah 84721 Phone (435)867-5331 Fax (435)867-1192
	DRAWING: 2-3	DATE: 7/30/14	DATE: 03/12/15 10/03/15 12/16/15	BY: KN KN KN			
JOB NUMBER: 0001		SHEET					