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Alton Coal Development, LLC
Florida Extension Office
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05/03/2017

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

Subject: **2017 Temporary Diversion Ditch, Alton Coal Development, LLC, Coal Hollow Mine, Kane County, Utah, C/025/0005, Task ID #5414**

Dear Mr. Haddock,

Alton Coal Development, LLC (ACD) is submitting the following response to the deficiencies found in task ID. 5414. Changes to the text in Appendix 5-2 have been made to indicate that base dimensions of 0.0 ft (found in the Diversion Ditch Summary) indicates a triangular channel. Appendix 5-2 is consistent with the design on Drawing 5-34A. As for the deficiency addressing the soil stabilization plan. ACD will adhere to the approved MRP as follows:

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.

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 text 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

Alton Coal Development, LLC
Florida Extension Office
6602 Ilex Circle
Naples, Florida 34109
Phone (239) 825-2332

03/24/2017

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

Subject: **2017 Temporary Diversion Ditch, Alton Coal Development, LLC, Coal Hollow Mine, Kane County, Utah, C/025/0005**

Dear Mr. Haddock,

Alton Coal Development, LLC (ACD) is submitting this amendment to improve drainage control around the Pit 10 area and to minimize runoff that currently flows across reclaimed ground.

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 text 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

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

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	03/16/2017	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 17 day of March, 2017

Notary Public: Marty Nicholes, state of Utah.

My commission Expires: 9-11-2017
Commission Number: 670359
Address: 1670 E Millston Cir
City: Enoch State: UT Zip: 84721

} ss:

Notary Public
MARTY NICHOLES
Commission #670359
My Commission Expires
Sept 11, 2017
State of Utah

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

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.

Add	Replace	Remove	DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐	☒	☐	Chapter 5, TOC
☐	☒	☐	Chapter 5, Appendix 5-2
☐	☒	☐	Chapter 5, Drawing 5-3
☐	☒	☐	Chapter 5, Drawing 5-27
☐	☒	☐	Chapter 5, Drawing 5-34
☒	☐	☐	Chapter 5, Drawing 5-34A
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining
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Chapter 5

R645-301-500

Engineering

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APPENDIX 5-2

Sediment Impoundment and
Diversion Structure Analysis

By: Alton Coal Development, LLC
Chris McCourt, P.E.

Revised March 2017
Dan W. Guy

Coal Hollow Mine – Sedimentation Structure Sizing

Introduction

Protection of surface water quality at the Coal Hollow Mine is an important part of the mining process. By utilizing sedimentation structures for diversion and sediment impoundment, Alton Coal Development, LLC (ACD) will minimize the sediment that could potentially flow from active disturbance areas into drainages that are in and surrounding the proposed project area. Appropriate sizing of these structures is a necessary step toward ensuring that these controls function properly and serve the purpose of protecting the surrounding environment.

Therefore, ACD has completed a watershed analysis for appropriate sizing of four proposed sedimentation impoundments and four diversion ditches. This report will outline the methods used and results of this analysis.

Sediment Impoundments

Summary

The watersheds for the four proposed sedimentation impoundments have been evaluated mainly using the TR-55 method. This method of analysis was first issued by the Soil Conservation Service (SCS) in 1975. It has since been revised and updated numerous times. This method is applicable for evaluating small watersheds.

To assist with the calculations and mapping, Carlson 2007 Hydrology software has been utilized for this evaluation. A watershed analysis for this project includes: runoff flow paths, watershed boundaries, length and average grade for longest flow lines, runoff curve number classification, time of concentration and peak discharge. Information from this analysis was then used for sedimentation structure sizing. For the specifics associated with each of these parameters refer to the details section of this report.

The sedimentation structures were sized to impound the runoff associated with a 100-year frequency, 24-hour duration storm event. Using the Carlson rainfall map (assembled using TP-40 and TP-47 data), the rainfall intensity associated with this size of event for the Alton area is 3.1 inches. The following table summarizes the final results for each sedimentation structure:

Sedimentation Impoundment Capacities

Structure	Storage Required (ac/ft)	Design Storage* (ac/ft)	Percent above requirement	Additional Storage (ac/ft)
1	2.6	3.1	119	0.5
2	1.7	2.3	135	0.6
3	6.3	12.6	200	6.3
3 PM**	10.4	12.6	121	2.2
4	3.8	5.5	224	1.7
1B	0.5	0.8	160	0.3

*Design capacities include a minimum of 2 feet free board (spillway to top of embankment)
**Required pond size after completion of mining and addition of 103 acres for backfill material.

Two 4" HDPE drainage pipes have been installed from the underground mining sump to the inlet end of Pond 3. Only one pipe is used, with the second in place as a backup. The pipe is expected to carry up to 100 gpm or 0.22 cfs. A 6" decant pipe has been installed in Pond 3, which will allow controlled decanting of the water in the event of a continuous mine water discharge. The pond can be decanted to an elevation of 6808, which is 3 feet below the spillway. At this elevation, the pond can still contain approximately 4.98 ac. ft. of runoff, which is slightly greater than the 4.95 ac. ft. of runoff from a 10-year / 24-hour event of 2.39"; therefore, the pond will still meet the requirement of treating a 10-year / 24-hour runoff event.

Upon completion of the underground mining, the portals will be sealed and the pit will be backfilled. Since it is expected that there will be a deficit of backfill material for this final pit, borrow material will be extracted from a total area of approximately 66.1 acres encompassing the current long term spoil pile and the hillsides directly adjacent to pond 3 to the northeast and southwest. Removing these hillsides will result in additional disturbance (and watershed area) of 30.9 acres. Removal of the borrow material will also result in the re-establishment of pre-mining drainage paths that will increase the watershed for Sediment Pond 3 by an additional 72 acres of undisturbed ground located outside of the permit boundary, as shown on Drawings 5-19, 5-26 and 5-37. Runoff from the additional area of 102.9 acres for a Watershed 3 total of 387.9 acres will all flow to Pond 3. Calculations show that an additional 4.1 acre feet of runoff is expected from this area for the 100 year – 24 hour storm. Since the mining will be completed at this time, the additional capacity presently required for the possible mine water discharge will no longer be required; therefore, the additional 4.1 ac. ft. for the extra area has been added to the required 6.3 ac. ft. for Pond 3, resulting in a required size of 10.4 ac. ft. for the post-mining pond, as shown in the previous table "Sediment Impoundment Capacities". The runoff details and calculations for the additional 103 acre area is shown as "3 PM" in the following tables.

The enclosed maps and cross sections detail the design and location for each structure (Drawings 5-25 through 5-34). These drawings also show proposed spillways, diversion ditches and watersheds associated with each structure.

Details

Determining storage capacity requirements using the TR-55 method requires several steps. This section of the report will provide the details and assumptions associated with each step. These steps are: watershed boundaries/flow paths, runoff curve number classification, time of concentration, peak discharge and structure sizing.

- **Watershed Boundaries/Flow Paths**
  The watershed boundaries were determined by first identifying the runoff flow paths for the entire project area. This was completed by creating a three dimensional model of the surface topography. This model was then used to draw flow paths for all the watersheds. Based on these flow paths, boundaries for each watershed are easily determined based on flow direction in combination with proposed control structures (ponds, diversion ditches, etc..).

Using this process, the project area (in conjunction with diversion ditch locations and berms) was found to be separated into seven distinct watersheds. The natural separations of watersheds in this area are Lower Robinson Creek to the north and Sink Valley Wash at the south end. In addition to these natural separations, the proposed diversion ditches and berms also provide definite boundaries as shown on Drawings 5-26 and 5-27. The following summarizes the watersheds:

Sediment Impoundment Watersheds		
Watershed	**Area (acres)**	**Description**
1	27	North end of project area where facilities are proposed.
2	74	Borders south edge of Lower Robinson Creek.
3 3 PM	285 103	Main watershed through the center of permit area. Watershed expansion after completion of mining.
4	96	Southern most watershed bordered by Sink Valley Wash
*5	28	Isolated area between watersheds 3 and 4
*6	19	Area northwest of Lower Robinson Creek Reconstruction
7	5	Southwest end of facilities area, entrance/exit road

* These watersheds will have silt fence or other appropriate control measures installed.

- **Rainfall Amount and Runoff Curve Number Classification**
  First data required to begin estimating runoff for the watersheds is the rainfall amount and the runoff curve number classification. The rainfall amount is the precipitation associated with a 100 year frequency, 24 hour duration storm event. The runoff curve number classification is a classification of the soil and vegetation cover conditions for the watersheds.

  In order to estimate runoff from rainfall, the rainfall amount for a 100 year frequency, 24 hour duration storm event was determined using the Carlson rainfall map. This map was assembled by Carlson software based on TP-40 and TP-47 data. The resulting rainfall amount for the Alton area using this map is 3.1 inches.

  The runoff curve number was determined by matching the ground cover description and estimated hydrologic soil group for the project area to the descriptions available in Table 2-2d of TR-55. Based on visual observations of the project area and soils the following classifications were estimated:

  1. Cover Description: The cover description that best fits watersheds 2, 3 and 4 is "Sagebrush with grass understory". The hydrologic condition for this cover was estimated at "fair" which is defined as 30% to 70% ground cover. This estimation was based off the knowledge of current conditions and future disturbance/reclamation. Plans for this operation include sequenced disturbance combined with concurrent reclamation.

This will minimize the area that will be disturbed at any one time. This will be combined with a general vegetation coverage improvement within one to two growing seasons for reclamation compared to current conditions. In addition, a significant amount of runoff from the active mining area for this magnitude of storm event will be temporarily controlled within the active pit area and will not immediately report to the designed impoundments.

Watershed 1 and 7 have been classified differently since they includes the mine facilities area. This watershed is classified as "Gravel roads" since most the area will be stripped of vegetation and gravel spread for parking areas and roads. This results in a much higher runoff than the classification for the other three watersheds.

2. Hydrologic Soil Group: This classification was estimated to be Group C for the five watersheds evaluated, as outlined in Appendix A in TR-55. This classification is for soils having low infiltration rates thus producing high amounts of runoff. The soils in this classification typically have infiltration rates of 0.05 to 0.15 inches per hour.

The resulting curve number for watersheds 2, 3 and 4 is 63. Watershed 1 and 7 were assigned a curve number of 89. These classifications are intended to be conservative estimates (producing higher than expected runoff) to ensure that the sedimentation structures have more than sufficient storage capacity.

These classifications are used in the next step for determining the time of concentration.

- **Time of Concentration (T_c)**
  T_c is the time for runoff to travel from the furthest point in the watershed to the point that it meets the sedimentation structure. This figure is essential for calculating the peak flow which is used to determine the required size for the sedimentation structure. The SCS method for calculating T_c is used in this analysis. The following table summarizes the inputs for calculating the T_c along with the resulting outputs:

Time of Concentration (T_c)				
Watershed	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
1	89	1,087	6.8	0.16
2	63	5,670	3.8	1.7
3	63	7,095	3.5	2.2
3 PM	63	2,900	2.3	0.8
4	63	3,805	2.9	1.8
7	89	750	3.9	0.08

The T_c for each watershed is used to calculate the peak discharge which is the final step leading to the structure sizing.

- **Peak Discharge**
  The peak discharge for each watershed was calculated using the Graphical method. The inputs required for this method include: T_c, drainage area, 100 year 24 hour rainfall and the runoff curve number (CN). The following table outlines these inputs and the peak discharge:

Peak Discharge (*Inflow)					
Watershed	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Discharge (cfs)
1	89	0.16	3.1	27	74.7
2	63	1.7	3.1	74	9.9
3	63	2.2	3.1	285	31.8
3 PM	63	0.8	3.1	103	18.8
4	63	1.8	3.1	96	14.8
7	89	0.8	3.1	5	15.6

*The peak discharge from each watershed will also be the peak inflow to the sedimentation structures.

- **Sedimentation Impoundment Sizing**
  The method used for this step is again from the TR-55 program. A sedimentation structure is required for each one of the five watersheds analyzed. Therefore, a size has been evaluated for the five proposed structures. The inputs for this calculation are the following: drainage area, peak inflow, desired outflow, and runoff depth (Q). The desired outflow in this situation is zero since we do not intend any discharge from the structures. The spillways for these structures are proposed for emergency use only and are not intended for regular discharges. The following table summarizes these inputs and the required storage capacity for each watershed:

Sedimentation Impoundment Sizing				
Watershed	Drainage Area (ac)	Inflow (cfs)	Q (in)	Storage Required (ac/ft)
1	27	74.7	2.00	2.6
2	74	9.9	0.48	1.7
3	285	31.8	0.48	6.3
3 PM	103	18.8	0.48	4.1
4	96	14.8	0.48	3.8
1B	5	15.6	2.00	0.5

The enclosed maps show the proposed design and locations for each one these structures.

Conclusions

This analysis provides estimates of sufficient storage capacities for each watershed to impound water from a 100 year frequency, 24 hour duration storm event at the proposed Coal Hollow Mine. In addition to the required storage capacities, a minimum 15% additional storage capacity has been added to each structure design to account for sediment and any standing water that may occur. Spillways have also been included in the structure designs to provide a non-destructive route for discharge should these capacities ever be exceeded.

The one exception to the above is Pond 3. Although the pond size is 200% greater than required for the 100-year / 24-hour event, the pond may also receive water pumped from the underground mine. If a continuous discharge from the mine should occur, the pond is equipped with a decant which would allow for a static level 3' below the spillway. At this elevation, the pond would still have a retention capacity of 4.98 ac. ft., which is slightly greater than the 4.95 ac. ft. calculated runoff from a 10-year / 24 hour event.

Due to the isolated characteristics and the inability to effectively divert water from Watershed 5 and 6, the method of using silt fence or other appropriate control measures for sediment have been chosen and is included on the Drawing 5-26.

The structure designs established from this analysis will minimize impacts from sediment to the surrounding environment at the Coal Hollow Mine.

Diversion Ditches

Summary

The channel sizing for the four proposed diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 100 year, 24 hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The final mining on this site will occur in conjunction with the removal of the borrow area described above. This will be Pit B-1, as shown on Drawing 5-3. A temporary diversion ditch will be constructed prior to the mining of Pit B-1, to direct runoff to Pond 3 as shown on Drawings 5-3 and 5-27. Because this ditch has 2 very different slope segments, the design has been based on the upper, less steep section designated B-1T-U, and the lower, steeper section designate B-1T-L. The upper 960' section will carry the design flow at a non-erosive velocity; however, the lower 537' section will have a potentially erosive flow and will be protected from erosion with a 12" D50 rip-rap underlain by erosion control fabric. The upper section will be mined out as Pit B-1

reaches pit extents. The lower section will remain in place to continue to direct runoff from the mining area to Pond 3. It will be removed during the final borrow operation.

As indicated above, upon completion of mining, additional backfill material will be extracted from a borrow area which includes the hillsides to the northeast and southwest of sediment pond 3. As a result of the removal of the hillside to the northeast of the pond, the lower end of existing diversion ditch 4 will be realigned, as shown on Drawing 5-34. That realignment results in a slight decrease of watershed area draining to Ditch 4, from 169 acres to 164.2 acres. Since this is a decrease in area and potential runoff, the previously approved Ditch 4 calculations represent a "worst-case" scenario, and have not been changed for this submittal.

The following table summarizes the inputs and results for each diversion based on flows during a 100 year, 24 hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	17.4	0.6	7.2	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.1	19.8	0.6	5.4	0.3
B-1T-U	0.0	0.020	1.0	11.42	1.1	4.7	0.5
B-1T-L	0.0	0.020	4.8	**32.45	1.2	10.9	0.5

*All side slopes are 2h:1v
**Total flow from both watersheds.

Details

- **Watersheds**
  The first step used for evaluating the diversions was to determine the peak flow during a 100 year, 24 hour storm event for each diversion. In order to determine this variable, the TR-55 method of watershed analysis was again utilized. This requires determining the watershed boundaries associated with each diversion. The following table summarizes these watersheds:

Diversion Watersheds		
Ditch	**Area (acres)**	**Description**
1	158	Diverts water around project area
2	48	Diverts water along Robinson Creek to Pond 2
3	72	Diverts water around facilities area
4	169	Diverts water from project area into Pond 3
B-1T-U	6.1	Diverts water from Pit B-1 to Pond 3 (Flows to B-1T-L)
B-1T-L	11.3	Diverts water from Pit B-1 to Pond 3

- **Rainfall Amount and Runoff Curve Number Classification**
  The rainfall amount for a 100 year, 24 hour storm event was developed utilizing the same method as previously discussed in the impoundments section of this report. This number is 3.1 inches of precipitation.

  The runoff curve number classification for all four watersheds was estimated to be 63. This classification is consistent with the classification and logic used for the impoundment analysis.

- **Time of Concentration (T_c)**
  T_c is the time for runoff to travel from the furthest point in the watershed to the point that it meets the sedimentation structure. This figure is essential for calculating the peak flow which is used to determine the required size for the diversion ditch. The SCS method for calculating T_c is used in this analysis. The following table summarizes the inputs for calculating the T_c along with the resulting outputs:

Time of Concentration (T_c)				
Ditch	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
1	63	8,487	2.9	2.9
2	63	4,187	3.6	1.4
3	63	3,742	13.7	0.7
4	63	5,868	3.9	1.8
B-1T-U	89	960	1.0	0.1
B-1T-L	89	537	4.8	0.1

The T_c for each watershed is used to calculate the peak flow which is the final step leading to the diversion dimensions.

- **Peak Flow**
  The peak flow for each diversion was calculated using the Graphical method. The inputs required for this method include: T_c, drainage area, 100 year 24 hour rainfall and the runoff curve number (CN). The following table outlines these inputs and the peak flow:

Diversion Peak Flow					
Ditch	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Flow (cfs)
1	63	2.9	3.1	158	17.4
2	63	1.4	3.1	48	6.9
3	63	0.7	3.1	72	16.7
4	63	1.8	3.1	169	19.8
B-1T-U	89	0.1	3.1	6.1	11.42
B-1T-L	89	0.1	3.1	11.3	*32.45

*Total flow from upper (11.42 cfs) and lower (21.03 cfs)

- **Diversion Dimensions**
  The Manning's Equation (ME) equation was used to appropriately size the each diversion. Inputs into this equation are manning's coefficient, average diversion slope, peak flow and side slope angles. Outputs are the depth of flow, velocity and base dimension for applicable trapezoidal channel design. A base dimension of 0.0 ft. indicates a triangular channel. The following table summarizes the inputs and results:

Diversion Ditch Summary							
Ditch	**Base (ft)	*Manning n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	3.0	0.020	2.8	17.4	0.6	7.2	0.3
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	4.5	0.020	2.4	16.7	0.5	6.3	0.3
4	5.0	0.020	1.1	20.6	0.6	5.0	0.3
B-1T-U	0.0	0.020	1.0	11.42	1.1	4.7	0.5
B-1T-L	0.0	0.020	4.8	***32.45	1.2	10.9	0.5

*Manning n of 0.020 is for ordinary firm loam
**All side slopes are 2h:1v
***Total flow from upper and lower watersheds.

Temporary Diversion Ditches

Summary

Diverted drainage from the east and north sides above Pit 10 has previously flowed across reclaimed land to the west and into Diversion Ditch 4. In an effort to protect the reclaimed area and reduce the possibility of rilling and erosion, it is proposed to route the drainage along existing, established routes, as shown on Drawings 5-3 and 5-27. All of the runoff area is within the existing, approved Ditch 4 Watershed, as shown on Drawing 5-27. This entire watershed flows into Diversion Ditch 4 and finally into Sediment Pond 3, all of which are sized for the 100 year – 24 hour precipitation event. Since the proposed temporary diversion ditches herein described are entirely within this watershed and will only remain in place until Pit 10 is backfilled, their design is based on the 10 year – 6 hour precipitation event of 1.41", as required by law.

The proposed drainage routing is as follows: Ditch 4-A-U will intercept the undisturbed drainage from the west and northwest of Pit 10 and route it to the north and west to the existing haul road; Ditch 4-A-D will then carry the runoff from 4-A-U and contributing drainage to the haul road, across the haul road through existing culvert CR-1, then southward along the road to the point where it turns to the west; Ditch 4-A-R will then convey the drainage from 4-A-D and the contributing runoff from the reclaimed area to the west and into Diversion Ditch 4, as shown on Drawing 5-3. This proposed routing will eliminate concentrated flows across the reclaimed area and place those flows in existing ditches along the roads. It should be noted that the flow from Ditch 4-A-D to Culvert CR-1 has been evaluated and the culvert flow velocity was calculated at 4.21 fps. Although this velocity is considered non-erosive and additional protection is not considered necessary, it is proposed to install 6" D50 rip-rap over geotextile at both the inlet and outlet of that culvert. This same protection will also be placed at the outfall of Ditch 4-A-R into existing Ditch 4, as shown on Drawing 5-34A.

The following table summarizes the inputs and results for each temporary diversion based on flows during a 10 year- 6 hour storm event:

Temporary Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
4-A-U	0.0	0.020	1.4	0.16	0.21	1.82	0.3
4-A-D	0.0	0.020	2.9	3.23	0.58	5.10	0.3
4-A-R	0.0	0.020	1.2	3.53	0.69	3.70	0.3

*All side slopes are 2h:1v

Details

- **Watersheds**
  Since runoff to the Temporary Diversion Ditches comes from Undisturbed, Disturbed and Reclaimed Areas, each contributing watershed is calculated separately. The following table summarizes these watersheds:

Temporary Diversion Watersheds		
W. Shed	**Area (acres)**	**Description**
4-A-U	85.3	Runoff from Undisturbed Area to East of Pit 10
4-A-D	6.7	Runoff from Disturbed Area / Road North of Pit 10
4-A-R	19.9	Runoff from contributing Reclaimed Area

- **Rainfall Amount and Runoff Curve Number Classification**
  The rainfall amount for a 10 year - 6 hour storm event was developed utilizing the same method as previously discussed in this report. This number is 1.41 inches of precipitation.

  The runoff curve number classification of 63 was estimated for the undisturbed and reclaimed watersheds, and 89 for the disturbed area watershed. This is consistent with the numbers previously used in this report.

- **Watershed Parameters**
  The peak flow for each separate watershed and corresponding ditch was calculated using the OSM Storm 6.20 Computer Program. The parameters used are summarized below:

Watershed Parameters				
W. Shed	Curve Number	Flow Length (ft)	Average Slope (%)	T_c (hrs)
4-A-U	63	3,425	4.5	1.76
4-A-D	89	856	4.2	0.12
4-A-R	63	1,141	2.3	0.30

- **Peak Flow**
  The peak flow for each temporary diversion was calculated using the above parameters. The following table outlines these inputs and the peak flow:

Temporary Diversion Peak Flow					
Ditch	CN	Tc (hr)	Rainfall (in)	Drainage Area (ac)	Peak Flow (cfs)
4-A-U	63	1.76	1.41	85.26	0.16
4-A-D	89	0.12	1.41	6.65	3.23
4-A-R	63	0.30	1.41	19.90	0.14

- **Temporary Diversion Ditch Summary**
  The Manning's Equation (ME) equation was used to appropriately size each diversion. Inputs into this equation are manning's coefficient, average diversion slope, peak flow and side slope angles. Outputs are the depth of flow, velocity and base dimesion for a trapezoidal channel design. A base dimension of 0.0 ft. indicates a triangular channel. The following table summarizes the inputs and results:

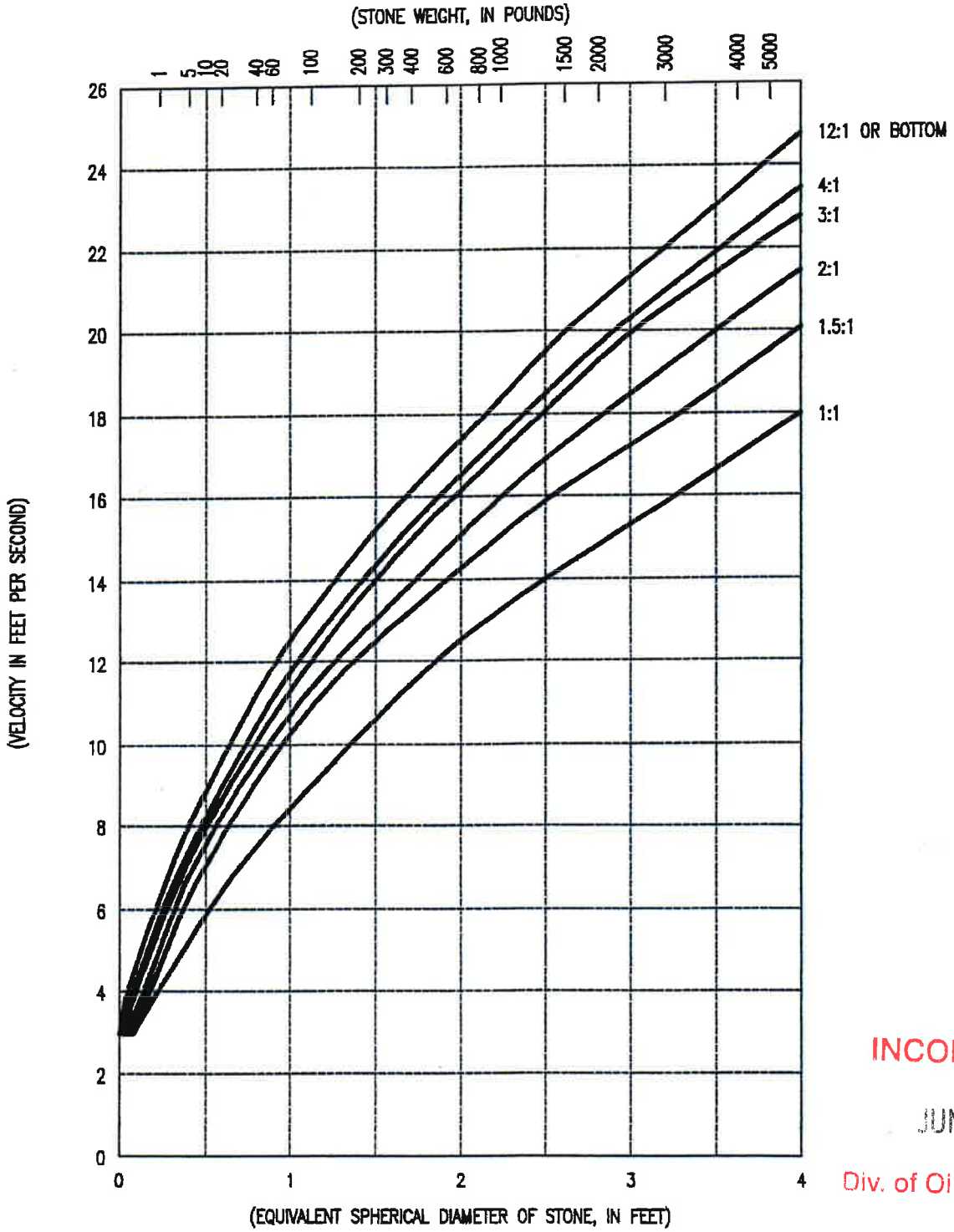
Temporary Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
4-A-U	0.0	0.020	1.4	0.16	0.21	1.82	0.3
4-A-D	0.0	0.020	2.9	3.23	0.58	5.10	0.3
4-A-R	0.0	0.020	1.2	3.53	0.69	3.70	0.3

*All side slopes are 2h:1v

Conclusions

These temporary diversions have been sized in manner that will transport the necessary flows and minimize erosion during a 10 year- 6 hour storm event. These diversions will prevent runoff from up gradient watersheds from entering the active mining areas and will also assist in directing water from disturbed areas to the sediment impoundments.

RIP-RAP CHART



SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

NOTE:

ADAPTED FROM REPORT OF SUBCOMMITTE ON SLOPE PROTECTION, AM. SOC. CIVIL ENGINEERS PROC. JUNE 1948. FOR STONE WEIGHING 165 LBS. PER CUBIC FEET.

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Figure 1

COUNTY RD 136

COUNTY RD INTERSECTION

TEMPORARY REROUTE COUNTY RD136

Range 6 West
Range 5 West

18
19
20
29
31
32

DIVERSION DITCH 3

Lower Robinson Creek

12" Culvert 17
ROADWAY
18" Culvert 13
18" Culvert 12
18" Culvert 1
18" Culvert 2
18" Culvert 3
18" Culvert 4
Pond 1
24 INCH DROP PIPE SPILLWAY
TOP OF RISER 6918'
BOTTOM OF RISER 6917'
24 INCH PIPE OUTLET 6915'
CULVERT 5 - 12"
Pond 1B
24 INCH DROP PIPE SPILLWAY
Straw Bale (Sediment Control)
COUNTY ROAD 136 CLOSURE POINT
24 INCH CULVERT OUTLET 6897'
24 INCH CULVERT INLET 6901'

Berm
Berm
Berm
Berm
Landown Yard

WATER TANKS

18" Culvert 7
36" Culvert 8
18" Culvert 6
96" Culvert 9
Outfall Diversion Ditch 2B
2B
2A
DIVERSION DITCH 2
24" Culvert 14
24" Culvert 10
24" Culvert 15
Pond 2
24" Culvert 11
24" Culvert 16

Air Monitor Site

Robinson Creek
Final plug to be removed by 2017

DIVERSION DITCH 4
(Configuration will change as mining progresses)

Primary Haulroad

Ditch 4-A-D
Removed as part of Primary Haul Road reclamation

Ditch 4-A-U
Removed after backfill of Pit 10

Robinson Creek
Temporary Diversion

DIVERSION DITCH 4 -
To be re-aligned following completion of UG mining and commencement of borrow.
(See Dwg. 5-25)

POND 3 ACCESS ROAD
(To be placed over subsoil as reclamation progresses, then re-aligned during final borrow)

5' X 10' 9" D50 APRON W/ EROSION CONTROL FABRIC

Pond 3

18" Culvert CR-1

(2) 4" HDPE PIPE BURIED

Weather Monitor Site

BURIED PIPE

SURFACE PIPE

Primary Haulroad

18" Culvert CR-2

Diversion Ditch 1

Ditch 4-A-R
Remains as edge-of-road ditch when Primary Haul Road transitions to Pond 3 access road.
Removed after backfill of Pit 10

Refer to Drawings 5-3B, 5-3C & 5-3D for Underground Facilities Details

Total Disturbed 372.5 acres

Ditch B-1T-L
Constructed Prior to Mining of Pit B-1, remains in place as Pit B-1 reaches pit extents, then mined out during final borrow.

Ditch B-1T-U
Constructed Prior to Mining of Pit B-1, then mined out as Pit B-1 reaches pit extents.

Install silt fence downgradient of Ditch B-1T-U.
Constructed Prior to Mining of Pit B-1, remains in place as Pit B-1 reaches pit extents, then mined out during final borrow.

18" Culvert CR-3

Pond 4

COUNTY ROAD 136
CLOSURE POINT

0 500 1000 1500

N

Township 39 South

CONTOUR INTERVAL = 2'

LEGEND:
- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- COAL RECOVERY LINE
- SECTION LINE
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER
- DIVERSION DITCHES
- BERM
- 2016 INT. DISTURBANCE
- 2016 BONDED DISTURBANCE
- CENTERLINE
- WATER LINE
- WATER TANK / WELL

DRAWN BY: C. McCOURT G. Grossman	CHECKED BY: CRM/WES
DRAWING: 5-3	DATE: 11/10/08
	SCALE: 1" = 500' on 24" X 36" paper
JOB NUMBER: 1400	SHEET

REVISIONS

DATE:	BY:
9/28/15	KN
1/31/16	KN
5/20/16	AC
8/01/16	AC
9/20/16	AC
3/3/17	AC
3/23/17	AC

FACILITIES & STRUCTURES

LAYOUT

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-3

JUN 07 2017
Div. of Oil, Gas & Mining

PROFESSIONAL ENGINEER
10230818
ANDREW R. CHRISTENSEN
6/2/17
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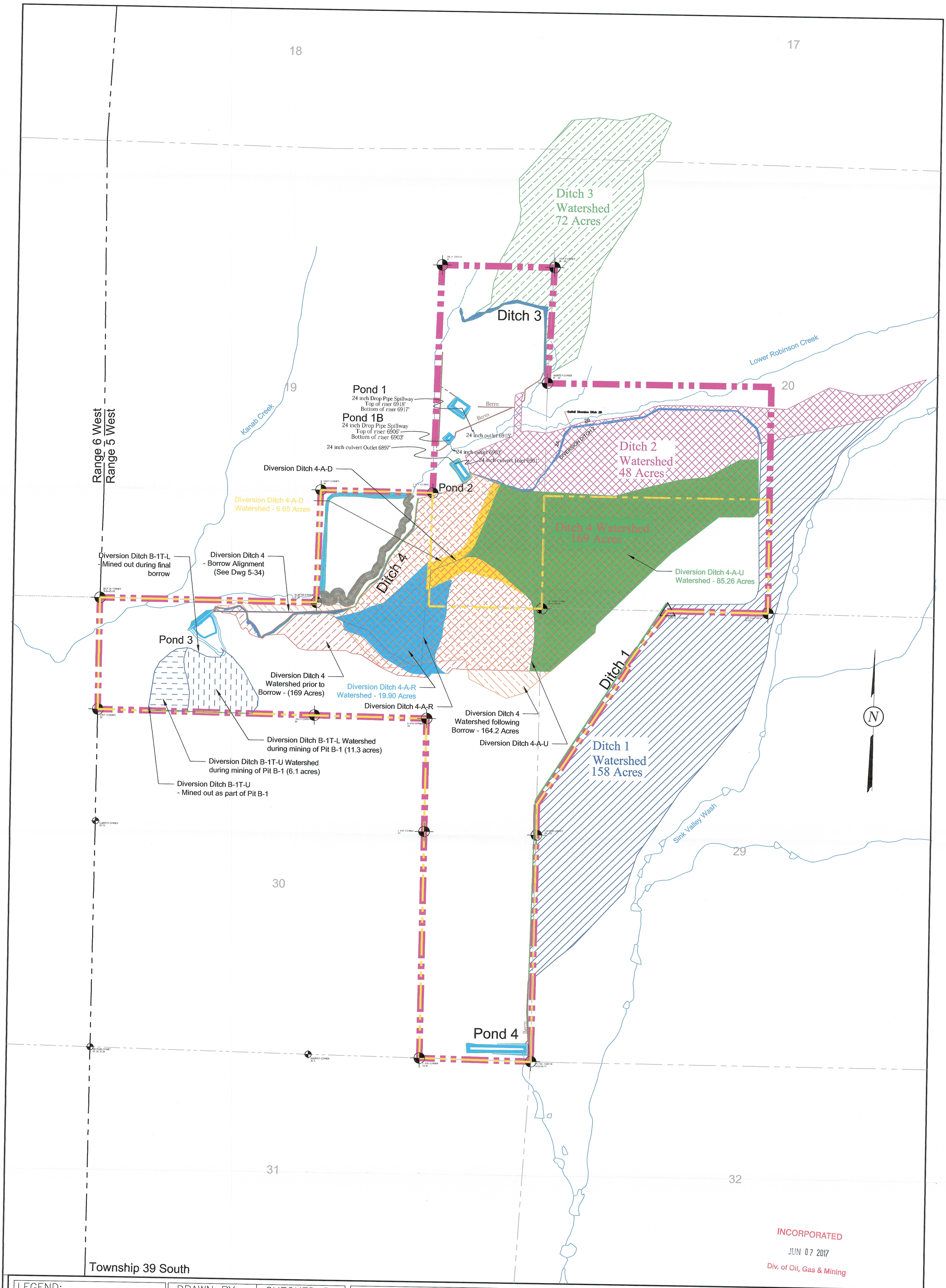

LEGEND:

- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- PROPOSED DIVERSION DITCHES
- EXISTING DRAINAGES
- PROPOSED SEDIMENT IMPOUNDMENT
- SECTION LINE
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER

DRAWN BY:	CHECKED BY:
C. McCOURT	GG
DRAWING: 5-27	DATE: 4/20/07
	SCALE: 1" = 500'
JOB NUMBER: 1400	SHEET

REVISIONS

DATE:	BY:
12/02/08	CRM
6/13/11	KN/JKSR
4/22/13	KN
8/13/13	KN
5/20/16	AC
9/19/16	AC
3/3/17	AC

DIVERSION DITCH WATERSHEDS

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-27

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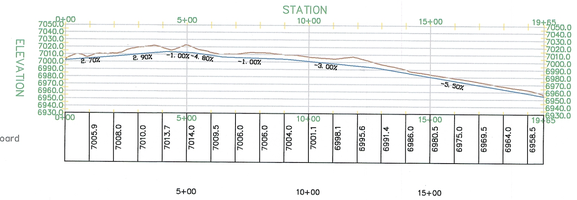
DITCH 3

TRAPEZOIDAL CHANNEL
EQUAL SIDE SLOPES

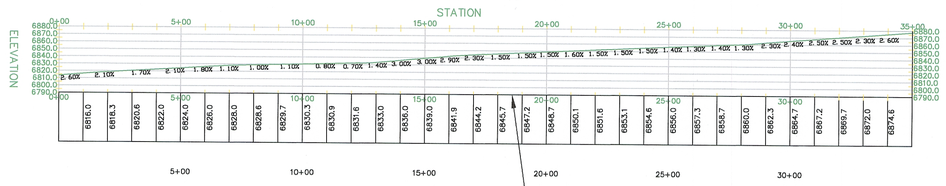
DITCH 4 & 4-BORROW

TRAPEZOIDAL CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: ORDINARY FIRM LOAM

PROFILE VIEW: DITCH 3
SCALE: 67
DATUM: 6930.00
VERTICAL SCALE 1" = 100'

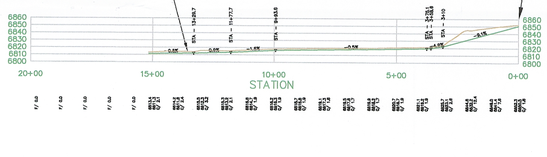


PROFILE VIEW: DITCH 4
SCALE: 67
DATUM: 6790.00
VERTICAL SCALE 1" = 100'



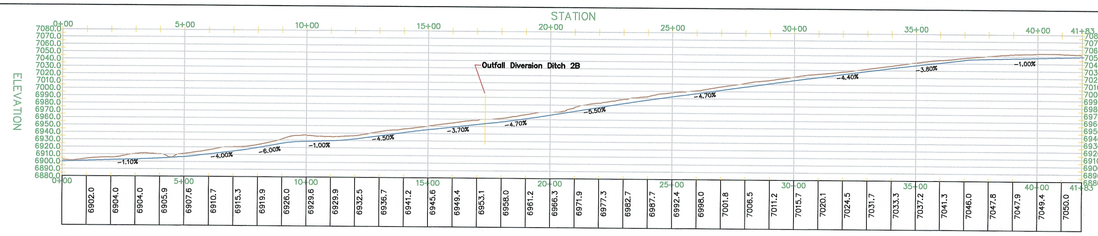
Ditch 4 Borrow Profile compared to final reclaim topography (see Dwg 5-37)

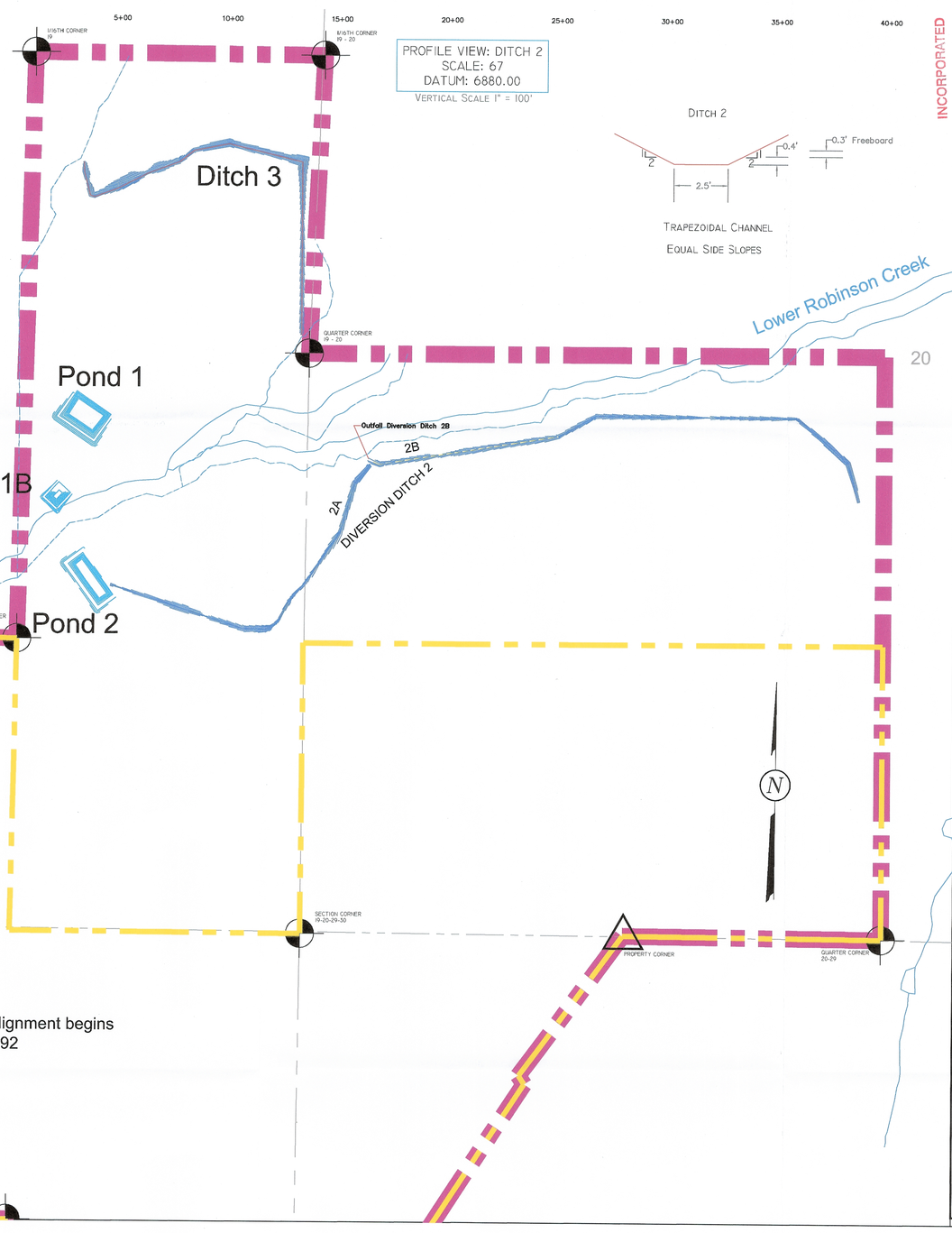
PROFILE VIEW: DITCH 4 BORROW
SCALE: 67
DATUM: 6800.00
VERTICAL SCALE 1" = 100'



Ditch 4 Borrow Alignment begins at Original Station 18+58.92

19





20

PROFILE VIEW: DITCH 2
SCALE: 67
DATUM: 6880.00
VERTICAL SCALE 1" = 100'

DITCH 2

TRAPEZOIDAL CHANNEL
EQUAL SIDE SLOPES

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PROFESSIONAL ENGINEER
10230018
CHRISTOPHER R. CHRISTENSEN
6/2/17
STATE OF UTAH

DIVERSION DITCH 2, 3 and 4 DETAILS

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-34

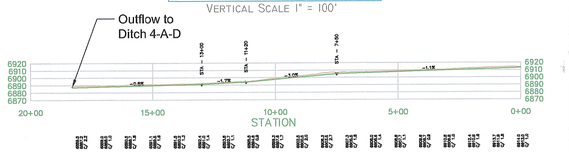
REVISIONS

DATE:	BY:
12/02/08	CRM
06/13/08	KN/JKSR
5/20/16	AC
9/20/16	AC
3/23/17	AC

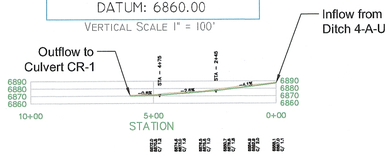
DRAWN BY:	CHECKED BY:
J. STANSFIELD	CRM/GG
DRAWING: 5-34	DATE: 4/20/07
	SCALE: 1" = 300'
JOB NUMBER: 1400	SHEET

LEGEND:
- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER
- DIVERSION DITCHES
- PROPOSED SEDIMENT IMPOUNDS

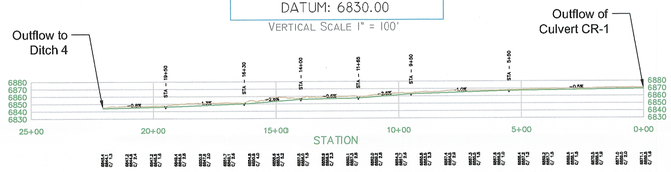
PROFILE VIEW: DITCH 4-A-U
SCALE: 67
DATUM: 6870.00
VERTICAL SCALE 1" = 100'



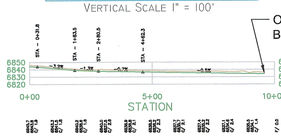
PROFILE VIEW: DITCH 4-A-D
SCALE: 67
DATUM: 6860.00
VERTICAL SCALE 1" = 100'



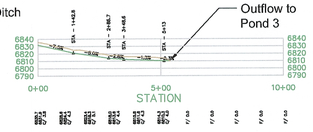
PROFILE VIEW: DITCH 4-A-R
SCALE: 67
DATUM: 6830.00
VERTICAL SCALE 1" = 100'



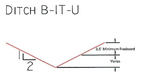
PROFILE VIEW: DITCH B-1T-U
SCALE: 67
DATUM: 6820.00
VERTICAL SCALE 1" = 100'



PROFILE VIEW: DITCH B-1T-L
SCALE: 67
DATUM: 6790.00
VERTICAL SCALE 1" = 100'

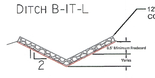


DITCH B-1T-U



TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: ORIDINARY FIRM LOAM

DITCH B-1T-L

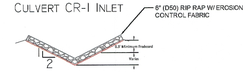


LINED TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: GEOTEXTILE & RIP RAP

DITCH 4-A-U

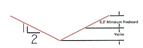
TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: ORIDINARY FIRM LOAM

CULVERT CR-1 INLET



LINED TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: GEOTEXTILE & RIP RAP

DITCH 4-A-D



TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: ORIDINARY FIRM LOAM

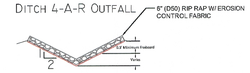
CULVERT CR-1 OUTLET

LINED TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: GEOTEXTILE & RIP RAP

DITCH 4-A-R

TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: ORIDINARY FIRM LOAM

DITCH 4-A-R OUTFALL



LINED TRIANGULAR CHANNEL
EQUAL SIDE SLOPES
CHANNEL LINING: GEOTEXTILE & RIP RAP

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Div. of Oil, Gas & Mining

PROFESSIONAL ENGINEER
JARED R. CHRISTENSEN
10230818
6/6/17
STATE OF UTAH

DIVERSION DITCH 4-A AND B-1T DETAILS

COAL HOLLOW PROJECT
ALTON, UTAH

DRAWING: 5-34A

REVISIONS									
BY:	xx								
DATE:	xx/xx/xx								

DRAWN BY:	CHECKED BY:
A. CHRISTENSEN	CRM/GG
DRAWING: 5-34A	DATE: 3/22/2017
	SCALE: 1" = 300'
JOB NUMBER: 1400	SHEET

LEGEND:
- PERMIT BOUNDARY
- PRIVATE COAL OWNERSHIP
- FOUND SECTION CORNER
- FOUND PROPERTY CORNER
- DIVERSION DITCHES
- PROPOSED SEDIMENT IMPOUNDS