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State of Utah  
DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF OIL, GAS AND MINING

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May 21, 2001

Chuck Semborski, Environmental Supervisor  
Energy West Mining Company  
P.O. Box 310  
Huntington, Utah 84528

Re: Revision to Reclamation Plan, Highwall Elimination, PacifiCorp, Deer Creek Mine,  
C/015/018-AM99C-3, Outgoing File

Dear Mr. Semborski:

The above-referenced amendment has been reviewed and there are deficiencies that must be adequately addressed prior to approval. A copy of our Technical Analysis is enclosed for your information. In order for us to continue to process your application, please respond to these deficiencies by June 21, 2001.

If you have any questions, please call me at (801) 538-5355 or Paul Baker at (801) 538-5261.

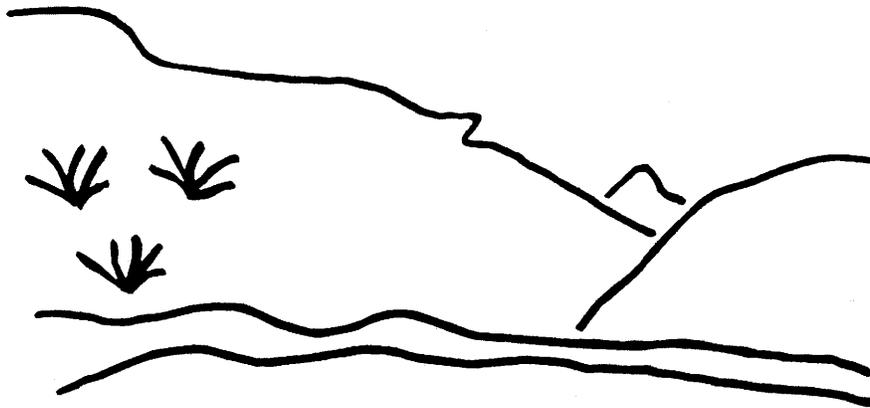
Sincerely,

A handwritten signature in black ink that reads "Daron R. Haddock".

Daron R. Haddock  
Permit Supervisor

sm  
Enclosure:  
cc: Price Field Office  
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# State of Utah



## Utah Oil Gas and Mining

### Coal Regulatory Program

Deer Creek Mine  
Revision of Reclamation Plan  
C/015/018-AM99C-3  
Technical Analysis  
May 18, 2001

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INTRODUCTION

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## TECHNICAL ANALYSIS

### INTRODUCTION

On March 22, 2001, the Division received a response to its November 6, 2000, technical analysis of the revised reclamation plan for the Deer Creek Mine. The chronology of this amendment is:

Initial Submittal	May 25, 1999
Division Response	July 7, 1999
PacifiCorp Response	December 6, 1999
Division Response	March 13, 2000
PacifiCorp Response	September 21, 2000
Division Response	November 6, 2000
PacifiCorp Response (This submittal)	March 22, 2001

Since 1996, the Division and the Office of Surface Mining, Reclamation and Enforcement have been evaluating highwall elimination plans, and the Deer Creek mining and reclamation plan is one of the last ones in the state not yet finalized. Most of the basic plans for highwall removal are adequate, but the application does not include a reclamation plan for the Ninth East North Meetinghouse portals.

In 1997, PacifiCorp responded to the Division's highwall survey and indicated there are no highwalls at the Ninth East North Meetinghouse portals. Whether or not this is correct, the plan needs to contain a reclamation plan for these portals. The application contains a commitment to incorporate this reclamation plan when the revised Deer Creek reclamation plan is conditionally approved; however, the Division considers this to be part of the reclamation plan for the entire mine and needs to have the reclamation plan for the Ninth East North Meetinghouse portals for review before approving the rest of the application.

The application contains other deficiencies that need to be resolved before it can be approved.

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**INTRODUCTION**

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**SUMMARY OF OUTSTANDING DEFICIENCIES**

**SUMMARY OF OUTSTANDING DEFICIENCIES**

The Technical Analysis regarding the proposed permit changes is not complete at this time, pending submittal of additional information by the permittee and further review by the Division, to address outstanding deficiencies in the proposal. A summary of those outstanding deficiencies is provided below. Additional comments, concerns and deficiencies may also be found within the analysis and findings made in this Draft Technical Analysis which have not been presented in this summary. Upon finalization of this review, any outstanding deficiencies will be evaluated for compliance with the regulatory requirements. Such deficiencies may be conditioned to the requirements of the permit issued by the Division, result in denial of the proposed permit changes, or may result in other executive or enforcement action as deemed necessary by the Division at that time to achieve compliance with the Utah Coal Regulatory Program.

Accordingly, the permittee must address those deficiencies as found within this Draft Technical Analysis and provide the following, prior to approval, in accordance with the requirements of:

***Regulations***

- R645-301-121.200**, On page 7-3, the application says the estimation of the K-factor was based on average percentages of sand, silt, and clay from the soil analyses in Appendix R645-301-200-D: This should be Appendix R645-301-200-C -----25
- R645-301-240**, Map DS-1782-D does not show soil being placed over all of the disturbed area, and the application needs to explain why this is the case or else provide for substitute topsoil cover over the entire disturbed area. -----21
- R645-301-542.00**, The applicant must submit backfilling and grading maps for the 9<sup>th</sup> East North Meetinghouse Portals areas before the Division can approve the reclamation plan -----32
- R645-301-542.200 and R645-301-521.110**, The applicant must give the Division a reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals. The reclamation plan must also include the location of all pre law sites surrounding the 9<sup>th</sup> East North Meetinghouse Portals. -----17
- R645-301-542.200**, The applicant must give the Division detailed topographic maps and cross sections for the 9<sup>th</sup> East North Meetinghouse Portals. The drawings must show the location of the highwalls (if they exist) and other features that show that the site meets the AOC requirements-----13

**SUMMARY OF OUTSTANDING DEFICIENCIES**

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- R645-301-551**, The applicant must give the Division portal closure plans for North Fork Meetinghouse Canyon. -----19
- R645-301-553.100 and R645-301-121.200**, The cross sections for Section A-A' and Section B-B' on drawing DS1784D do not match the contour lines on drawing DS1782D. The applicant must determine which drawing is correct and make the necessary correction. See the *Deer Creek* subsection in this analysis for more details. -----13
- R645-301-742.312**, The applicant states in the cover letter that they will perform sieve analyses or similar analyses in conjunction with the construction of the bioengineered channels. The applicant also says more detailed information has been added to the Bioengineered Channels Section to help the reader better understand the construction process; the additional information and the commitment to sieve analysis could not be found in the Hydrology Section -----25
- R645-301-830.130**, The applicant did not include a detailed reclamation cost estimate in the amendment. The applicant informed the Division that the reclamation cost estimate would not be submitted until the reclamation plan was approved. The Division agreed to that procedure. Prior to final approval the applicant must submit a detailed reclamation cost estimate -----33

OPERATION PLAN

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## OPERATION PLAN

### TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

#### Analysis:

##### Topsoil Substitutes and Supplements

###### *Exploration/Sampling Program - Substitute Topsoil*

The Deer Creek Mine was developed prior to enactment of the Surface Mining Control and Reclamation Act (SMRCA), and topsoil was not salvaged or stockpiled during construction and mine development activities. The applicant intends to use construction fills within the disturbance area as substitute topsoil. Much of this material is from the terraced area on the south side of Deer Creek Canyon.

The application contains limited information about the substitute soils that would be used for reclamation. Eighteen samples were taken from the terraces from which much of the fill originated, and these were analyzed for the parameters in the Division's soils guidelines. Results are in Appendix R645-301-200B. Although these samples were not taken from the fill itself, they should give a general idea of the chemical and physical characteristics of the fill. No samples showed any limiting chemical characteristics, but textures of most samples were fairly high in clay.

In the fill itself, core samples were taken from seven locations and from various depths at each location. These locations are shown on Drawing DS-1810-D. The samples were taken for the purpose of doing stability analyses, so the locations were not necessarily the same as those from which the applicant proposes to gather substitute topsoil. Two samples were taken in the refuse piles, three near some of the highwalls, and two from the fan portal area at the upper end of the disturbed area.

The results of these analyses are in Appendix R645-301-200-C. Samples 1, 2, 3, 4, and 5 had either high sodium adsorption ratio (SAR) or high electrical conductivity (EC) values. Generally, the highest SAR and EC values were in the upper few feet, and, according to verbal information from the applicant's representative, this may be because of salt applications to keep the roads free of ice. High pH readings were found in samples 3 and 6. The upper layers of material near one of the portals had high selenium values. The only site where all samples in the profile met all the Division's criteria for acceptable soils was 2A near the fan.

In addition to these samples taken in 2000, several other samples were taken in 1980 and 1983. These samples were of fill, coal refuse, and slag. Results of analyses on these samples are in the existing mining and reclamation plan, Chapter 4, Tables I and II. With a few exceptions, these samples do not show problems with the physical or chemical characteristics of the fill, but the samples were not analyzed for all the parameters in the Division's *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines*. The Division recognizes that the 1980 thru 1983 operational sampling took place prior to implementation of the 1988 guidelines for topsoil and overburden. However, reclamation standards for soil and overburden are now rated using the 1988 guidelines. Therefore, since sampling did not follow the current 1988 Division guidelines for topsoil and overburden, information in the plan is incomplete and does not show that the fill or refuse materials in Deer Creek and Elk canyons are suitable for achieving the revegetation standards. Further sampling using current guidelines needs to be performed before a determination can be made concerning substitute soil and refuse suitability.

Most of the samples from 1980 and 1983 show few or no problem with EC or SAR values; however, two samples from the parking lot fill slope had EC values of 9.0 (assumed to be  $\text{mmhos} \cdot \text{cm}^{-1}$ ). This could be a result of using salt as discussed above, and the problem may have grown progressively worse to where some of these soils may now be unusable.

In the current mining and reclamation plan and in the application, there are no results of testing soils that would be used in reclamation according to current guidelines. For this reason, the applicant commits in this application to conduct a soils sampling program during in June through October of 2001 and 2002. The areas to be sampled will be at accessible sites between 3+00 and 31+00 as shown on map DS-1810-D. Testing will be done according to the Division's soils guidelines. The timetable commitment is acceptable, and it is important that the applicant and the Division ensure soil samples are actually taken and analyzed and that the mining and reclamation plan is amended accordingly.

In the reclamation section of the existing mining and reclamation plan are the headings "Interim Vegetation Establishment" and "Fill Slopes." This section discusses interim revegetation efforts on fill slopes at the equipment yard and run of mine conveyor. The plan says the interim vegetation plan will provide the basis for developing final revegetation plan by testing revegetation techniques and plant species. Another purpose for this interim revegetation plan is to develop the fill material as a substitute for topsoil by establishing a root system in the top layers along with organic material buildup and an environment suitable for microorganism colonization.

Commitment 7 in the maintenance and monitoring section of the interim revegetation section of the plan says the soil materials on the fill slopes will be sampled at five year intervals. Because development of these soils is part of the reclamation plan, results of these analyses need to be included in the application. The sampling program to which the applicant commits in the application needs to specifically include the interim revegetation areas where soil was being

OPERATION PLAN

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developed for final reclamation. This commitment is already in the plan, but the applicant needs to fulfill its commitment.

*Exploration/Sampling Program - Refuse Piles*

Appendix R645-301-200-C contains analyses of two core samples from the refuse piles, one from Deer Creek Canyon and one from Elk Canyon. The analyses of the Deer Creek Canyon refuse, site 1 on Drawing DS-1810-D, show high salt levels in the upper part of the profile similar to the soil samples gathered elsewhere. This could be because the sample site was near two storage docks where salt may have been used. Since only two samples were taken, they may not be representative of the entire refuse pile. Further sampling of the refuse in Deer Creek Canyon might show other portions of the refuse pile do not have the high salt levels found at site 1. The refuse in Elk Canyon, site 6, does not have the high salt concentrations, but it does have high pH values (9.0) in the upper layers. No acid forming potential was identified in these samples.

Within Chapter 3 of the current mining and reclamation plan, page 3-65, Table 7, Deer Creek Mine - Waste Rock Analysis, several problems are identified associated with materials taken from roof and floor materials. Data is incomplete since no determinations were made for selenium or for acid base potential. One of the samples had a paste pH value of 5.87 which indicates there could be acid forming potential. One Blind Canyon floor sample apparently had a very high SAR value which indicates that although some areas may meet the Division's criteria, there are probably isolated problem areas.

The Division lacks confidence in the data in Table 7 because some of the SAR values do not correlate with the reported calcium, magnesium, and sodium values. Either some of the SAR values were calculated incorrectly or the sodium, calcium, and magnesium values were not reported correctly.

Tables I and II in Chapter 4 also show some chemical analyses of coal waste with one sample of slag. The slag sample had a very high pH (10.9), but otherwise, no problems were found in the refuse or slag samples. However, the applicant did not test these samples for several parameters listed in the Division's soils guidelines.

The Division cannot make a determination of waste acceptability because of errors in the data, incomplete data, and because several samples show unacceptable salt, SAR, and pH levels. Errors exist within some of the data in the current plan, and some analyses are incomplete and do not follow the Division's soils guidelines. Furthermore, unacceptable criteria are identified for Blind Canyon floor samples for SAR and pH, and poor criteria are met on Blind Canyon split samples for SAR and on Hiawatha floor samples for pH. Therefore, since data errors exist, data is incomplete, and roof and floor analyses identify toxicity, the Division cannot make a determination of waste acceptability.

There is some evidence not all of the refuse is toxic to plants. This is discussed further in the reclamation plan section of this analysis.

The applicant commits in the application to sample refuse on the same schedule as substitute topsoil and includes some details of this sampling plan. Sampling will be done in 2001 and/or 2002. Sample points will be placed randomly in the refuse areas, and samples will be taken at three-foot depth intervals to a point four feet below the grade of the proposed final surface configuration. This general commitment is acceptable, but until the Division has this information, it must be assumed that the refuse must be covered with at least four feet of the best available non-toxic and non-acid forming material.

All soil and refuse sampling should be coordinated with the Division. Although this is not a regulatory requirement, the applicant should be able to avoid having to resample if a Division soil scientist is present when the samples are being taken. In addition, the application does not specify how many samples would be taken, and this can be coordinated in the field at the time of sampling.

**Findings:**

Information provided in the application is adequate to meet the requirements of this section of the regulations. The applicant should coordinate its soil and refuse sampling program so Division representatives can be present when these samples are being taken. This is not a regulatory requirement, but it is a good way to avoid questions about the data or having to resample.

RECLAMATION PLAN

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## RECLAMATION PLAN

### POSTMINING LAND USES

Regulatory Reference: 30 CFR Sec. 784.15, 784.200, 785.16, 817.133; R645-301-412, -301-413, -301-414, -302-270, -302-271, -302-272, -302-273, -302-274, -302-275.

#### Analysis:

According to Section 412 of the application, the postmining land uses will be grazing and wildlife habitat, and these are the same as the premining land uses. Both the Forest Service and Bureau of Land Management have indicated no foreseeable changes to this use, and the area is zoned by the county for grazing, mining, and recreation.

#### Findings:

Information provided in the proposal is considered adequate to meet the requirements of this section of the regulations.

### APPROXIMATE ORIGINAL CONTOUR RESTORATION

Regulatory Reference: 30 CFR Sec. 784.15, 785.16, 817.102, 817.107, 817.133; R645-301-234, -301-270, -301-271, -301-412, -301-413, -301-512, -301-531, -301-533, -301-553, -301-536, -301-542, -301-731, -301-732, -301-733, -301-764.

#### Analysis:

The requirements for restoring a site to the approximate original contour (AOC) are couched in the backfilling and grading regulations. The only regulation that specially mentions AOC requirements is R645-301-553.110 that states the following:

Achieve the approximate original contour (AOC), except as provided in R645-301-553.500 through R645-301-553.540 (previously mined areas (PMA's), continuously mined areas (CMA's) and areas subject to the AOC provisions), R645-301-553.600 through R645-301-553.612 (PMA's and CMA's), R645-302-270 (non-mountaintop removal on steep slopes), R645-302-220 (mountaintop removal mining), R645-301-553.700 (thin overburden) and R645-301-553.800 (thick overburden);

Since some of the highwalls at the Deer Creek site are CMA's the applicant can leave highwall remnants when allowed under R645-301-553.600 through R645-301-553.612. Thus the applicant can leave some highwalls remnants and still meet the AOC requirements at the Deer Creek Mine site.

The Division's technical memo Tech-002 gives additional AOC guidelines. Those guidelines were also used to evaluate the Deer Creek Mine for AOC compliance.

Except as specifically exempted, all disturbed areas shall be returned to the approximate original contour. The final surface configuration shall closely resemble the general surface configuration of the land prior to mining. To evaluate compliance with this requirement, the term "surface configuration" must be clarified. Surface configuration refers to the premining and postmining topography of the mine site and surrounding area.

The term AOC does not mean that the land is restored to the original contours. Elevation of the premining and postmining site plays a minor role if any in evaluating AOC.

The main question that the Division answers when evaluating AOC is whether the postmining topography, excluding elevation, closely resemble the premining configuration. The Division evaluates premining and postmining topography on slope length and angle, and whether restoring the site to the original contours would violate other rules.

In some cases the applicant cannot restore the site to the premining contours without violating other regulations, such as slope stability and erosion. Many of the natural slopes in the area are at the angle of repose. When a slope is at its angle of repose, the safety factor is 1.0 or slightly greater. The minimum safety factor for reclaimed slopes is 1.3. If all slopes were returned to the premining conditions, the safety factor requirement could not be met.

When the natural slope has a safety factor less than 1.3, the applicant usual opts to reduce the slope angle by either extending the toe or decreasing the height. Extending the slope's toe may block the drainage which violates other regulations. If the applicant decreases the slope height then a cut slope will be left.

The Deer Creek mine consists of four separate surface facilities. This technical analysis addresses how each of those facilities will be reclaimed.

#### *Deer Creek*

The final contour map for the main Deer Creek site is Drawing DS1782D, D1mmm n near Creek Mine Disturbed Area Final Reclamation Contour Map, and the reclamation cross sections are on Drawing DS1783D and DS1784D. The reclamation contour maps show the locations of the highwall remnants, the location of the cross sections, the refuse piles, drainage systems and the cut and fill quantities. The cross section maps show the locations of the Blind Canyon coal seam and the concrete and asphalt disposal areas.

RECLAMATION PLAN

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The cross sections are not always perpendicular to the contours. Thus, the cross sections show slopes that are less steep than the maximum slope angle. This is important to remember when evaluating highwall reclamation.

The main Deer Creek facilities area is considered a pre-law site because it was constructed before May 3, 1978. Because the site is pre-law, the applicant only has to eliminate highwalls to the extent practical. On page 5-12 the applicant explains why highwall remnants will remain as follows:

1. Highwall remnants are proposed at the Deer Creek Mine since sufficient fill material does not exist to completely eliminate these areas. The areas are outlined on maps DS-1782-D, 1 of 1 and DS-1783-D 1 of 2, 2 of 2. The Deer Creek Mine is considered a continuously mine area (CMA). Development of the portals began before the passage of SMCRA and therefore, no spoil material was ever salvaged. Since it is impossible to completely eliminate the highwall areas, the idea is to blend these areas into the natural surroundings of the canyon to become compatible with the approved post mining land use.
2. The portion of the highwalls remaining consist of near vertical fluvial channel sand escarpments associated with the Blackhawk formation (refer to Volume 8, Geologic Section). The fill material below these areas is combination of crushed concrete and underground development wastes. Stability of these areas are presented below. A conceptual highwall elimination plan for the Deer Creek is presented in Appendix R645-301-500-D. Cut and fill estimates agree with the highwall elimination plan.

The main reasons why the Division allows highwall remnants to remain are (1) slope stability problems and (2) lack of fill material. Many highwalls in Utah are located in steep canyons. If mine operators were to completely backfill the highwalls in some steep canyons, the results would be either the slope is too steep to achieve the 1.3 safety factor or the backfill would interfere with the drainage plans. The Division reviewed the cross sections and found that the applicant could eliminate the highwall remnants by placing more fill. The additional fill could be placed without decreasing the safety factor below 1.3 or interfering with the drainage plan. See Appendix R645-301-500-E for the slope stability study. Therefore, slope stability concerns are not the reason that the Division would allow highwall remnants to remain.

The Division reviewed the cut and fill calculations. The applicant does not have enough fill material on the site to totally eliminate the highwalls and have the reclaimed topographies blend into the surrounding topography. The applicant could place more fill against the highwall to reduce or eliminate the highwall remnants. If the applicant did eliminate the highwalls, they would not have enough fill to grade the rest the site so that it blended into the surrounding topography. If the applicant placed most of the fill along the highwalls then the valley floor

would have to be flat. The surrounding topography is V-shaped valleys, not valleys with steep slopes and a flat bottom.

The valley walls consist mostly of soil overlying bedrock. If the applicant were to get more fill on site, their only option would be to use bedrock.

The highwalls are usually at the base of natural cliffs. If the applicant placed more fill along the highwalls they would not eliminate the safety hazards associated with cliffs or restore the area to the natural topography.

The surrounding area contains natural cliffs. The highwall remnants at the cliff bases will blend into the surrounding topography.

The Division has determined the applicant has met the minimum requirements of R645-301-553.600. The applicant cannot reclaim all the highwalls because they do not have access to enough reasonably available fill material.

On Drawing DS1784D the applicant shows the cross sections for Section A-A' and Section B-B' and the location of the sections is shown on Drawing DS1782D. Section A-A' and Section B-B' are for the spoil storage area.

The cross section for Section B-B' shows that two terraces will be left after reclamation. The terrace at elevation 7415 feet is 20 feet wide and the terrace at elevation 7375 feet is 40 feet wide. However, the contour lines on drawing DS1782 are no further apart than 10 feet. According to drawing DS1782D the terraces could be no wider than 10 feet. Similar terraces are also shown on Section A-A'. The applicant must clarify the inconsistency between the cross sections and the topographic maps regarding the terraces on the spoil storage area after reclamation.

The cross sections show that the slopes flatten out at an elevation of 7370'; however, the contour map shows that the slopes flatten out at an elevation of 7350'.

Terraces do not blend into the surrounding topography. Therefore, the Division will not allow terraces to be part of the postmining topography unless the applicant can show that the terraces are needed.

#### *Rilda Canyon*

The reclamation plans for Rilda Canyon are shown on drawing CE-10884-EM. Rilda Canyon Final Reclamation of Surface Facilities and Access Road and the cross sections on drawing CE-10891-EM (sheet 1 and sheet 2) Rilda Canyon Access Road/Facilities Cross Sections. The cross sections show that the area will be restored to a configuration similar to the original topography. The main difference is some slopes will be less steep because the applicant

RECLAMATION PLAN

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needs to place excess material along the slopes.

The application shows the location of the highwalls both the topographic map and cross sections. The cross sections show the highwall (portal face up) boundaries. During reclamation, the highwalls will be completely covered.

The slope angles are no steeper than 2H:1V, which the Division considers stable under most circumstances. The application does not address slope stability at the Rilda Canyon site.

*9<sup>th</sup> East Grimes Wash Portals*

The Grimes Wash portal area has been reclaimed. The as built drawings were approved on February 14, 2001 and are located in Appendix 14 of Volume 3 of the MRP. The plans show that the highwalls have been reclaimed. Most of the highwalls were constructed in vertical out crops. Therefore, the extent of the highwall was limited to the approximate portal dimensions.

*9<sup>th</sup> East North Meetinghouse Portals*

The applicant did not include a reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals. The applicant stated in Appendix R645-301-500-B that the plan would be added when it became available. Before the Division can approve the reclamation plan the applicant must submit a detailed reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals area. The plan must contain enough information for the Division to determine that the site will be restored to the approximate original contours, adequate highwall elimination (assuming highwalls exist), and slope stability.

**Findings:**

Information provided in the proposed amendment is not adequate to meet the requirements of this section of the regulations. Prior to approval, the applicant must provide the following in accordance with:

**R645-301-553.100 and R645-301-121.200,** The cross sections for Section A-A' and Section B-B' on drawing DS1784D do not match the contour lines on drawing DS1782D. The applicant must determine which drawing is correct and make the necessary correction. See the *Deer Creek* subsection in this analysis for more details.

**R645-301-542.200,** The applicant must give the Division detailed topographic maps and cross sections for the 9<sup>th</sup> East North Meetinghouse Portals. The drawings must show the location of the highwalls (if they exist) and other features that show that the site meets the AOC requirements

## BACKFILLING AND GRADING

Regulatory Reference: 30 CFR Sec. 785.15, 817.102, 817.107; R645-301-234, -301-537, -301-552, -301-553, -302-230, -302-231, -302-232, -302-233.

### Analysis:

#### General

##### *Deer Creek Site*

The general backfilling and grading requirements are that the site be restored to the approximate original contours; the elimination of all highwalls, spoil piles and depressions; have stable slopes; minimize erosion and water pollution both on and off the site; and support the approved postmining land use.

The Deer Creek site meets the general requirements for being reclaimed to the approximate original contour requirements. The general requirements are that the site blend into the surrounding area, the reclaimed drainages complement the natural drainages and highwalls are eliminated. Because the Deer Creek site is pre-law, the Division will allow some highwall remnants to remain.

The main facilities are in steep canyons and were constructed before the enactment of SMCRA. The steep slopes and pre law development combine to prevent the applicant from restoring the site to the original configuration. However, the reclamation plan shows that the site will have a topography similar to the surrounding areas. See the final reclamation contour map and cross sections drawings (see drawings DS1782D, DS1783D and DS1784D for details). The restored channels will be in the bottom of the canyons and will complement the existing drainages.

The portals in the main Deer Creek facilities area were constructed before the enactment of SMCRA, May 3, 1978. Because the portals are pre SMCRA, the applicant does not have to completely eliminate the highwalls to comply with the AOC requirements.

The main problem the applicant has with highwall elimination is lack of fill material. On drawing DS1782D, Deer Creek Mine Disturbed Area Final Reclamation Contour Map, the application shows the cut and fill quantities. The application shows that 175,918 cubic yards of cut material are available and 156,279 cubic yards of fill material are needed. The permittee is faced with a shortage of fill material. Since soil volume calculations are at best accurate to within 10% and the difference between the cut material (material to be moved) to the fill material (material to be placed during reclamation) is 12%, the Division considers the cut and fill quantities to balance.

RECLAMATION PLAN

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The cross sections that show the cut slopes are shown on drawings DS1883D and DS1784D. The highwall at station 18+00 is at the base of a cliff. The applicant could place more fill against the highwall to eliminate it but would gain almost nothing. The steep cliff above the highwall is more of a safety hazard than the highwall itself. During reclamation the contractor could feather the restored slope with the natural slope so that the transition zone would appear almost natural.

The highwall located along stations 21+00 to 23+00 are also at the base of a steep natural cliff. The applicant could place more fill at the top of the highwall to eliminate it. However, the applicant would gain little because the natural cliff is more of a safety hazard than the highwall.

The highwalls will be reclaimed with 2H:1V slopes as shown in Appendix R645-301-500D. The cross sections for the reclaimed highwall on drawings DS1883D and DS1784D have slopes less than 20°. The reason for the gentler slope is that the cross sections are not perpendicular to the strike (maximum steepness) of the slope.

The safety factors for the reclaimed highwall slopes are greater than 1.3. The applicant could increase the slope angle and eliminate more highwall remnants. If the applicant were to increase the fill used to eliminate the highwalls then they would have to decrease the fill in other areas. A lack of fill in other areas could prevent the site from blending into the surrounding areas. R645-301-553.600 allows the applicant to leave pre SMCRA highwall remnants if they do not have enough fill material. The Division has reviewed the backfilling and grading plan and determined that the applicant does not have enough material on the site to eliminate the pre-SMCRA highwalls.

On drawing DS1783D, Deer Creek Mine Deer Creek Canyon Final Reclamation Cross Sections, the application shows the location of the concrete storage areas. Concrete will be used as fill material because of a lack of on site material.

*Rilda Canyon*

The breakouts at Rilda Canyon are post SMCRA. The reclamation contour map for Rilda Canyon is Map 4-1A Deer Creek Mine - Rilda Canyon Final Reclamation of Surface Facilities and Access Road (Drawing # CE-10884-EM) and the cross sections are shown on Map 4-4A Deer Creek Mine Rilda Canyon Access Road/Facilities Cross Sections (Drawing # CE-10891-EM). The reclamation plan calls for the complete elimination of all highwall in Rilda Canyon. The highwall remnants are shown on the cross section.

The applicant did not address slope stability at Rilda Canyon. The reclaimed slopes will have slopes of 3H:1V. In other areas, slopes with angles of 2H:1V have safety factors greater than 2. Based on other safety factor studies in the area, the Division considers the slopes to be stable.

*9<sup>th</sup> East Grimes Wash Portals*

The portal site was originally disturbed by coal mining activities dating back prior to 1920. Evidence of the early mining activities can be seen by the remnants of two partially open portals, a coal handling area south of the portals and evidence of a wooden coal chute above the Wilberg Mine fan. The applicant reclaimed the area, and the Division approved the as-built drawings on February 14, 2001. See Appendix XIV of Volume 3 of the MRP for more details.

*9<sup>th</sup> East North Meetinghouse Portals*

The applicant did not include a reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals. The application says in Appendix R645-301-500-B that the plan would be added when it became available. Before the Division approves the reclamation plan, the applicant must submit a detailed reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals area. The plan must contain enough information for the Division to determine that the site will be restored to the approximate original contours with adequate highwall elimination and slope stability.

*Variance From the Approximate Original Contour Requirements*

The applicant did not request a variance from the approximate original contour requirements for any disturbed areas at the Deer Creek Mine.

*Spoil and Underground Development Waste*

The applicant conducted slope stability studies for the two refuse piles. The study for the refuse pile in Elk Canyon shows the reclaimed site will have a safety factor of 1.58. The study in Deer Creek shows the refuse pile will have a safety factor of 2.3. The Division reviewed the slope stability studies done by RB&C Engineering and considered them adequate to show that the reclaimed refuse piles will meet the minimum safety factor requirements.

R645-301-553.252 requires the applicant to cover all refuse piles with 4 feet of material unless the Division approve a lesser amount. On page 5-13 the application says the results from chemical and physical analysis for the refuse are in given in Appendix R645-301-200A. However, Appendix R645-301-200A was not included in the submittal. The applicant committed to include the information when it became available.

On page 5-9, the application explains the reclamation of the refuse pile in Deer Creek as follows:

1. Suitable substitute soil as determined by the soil sampling/exploration program or barrow pit will be separated and stored in the area of the dismantled truck loadout and storage area (Area #2, see DS-1796-D in

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Appendix R645-301-500A). This soil will be used in areas where lesser quality soils exist and/or used as cover over the slope of the refuse pile in Deer Creek Canyon.

2. The material storage yard will be excavated and used as fill along the parameter of the material storage yard and portal area. The outslope of the refuse will also be excavated and used as fill in these areas. This will create a slope of less than 2:1.

The other sites were breakout portals and there was no refuse associated with those site.

*Exposed Coal Seams*

The application shows the location of the Blind Canyon coal seam in drawings DS1783D and DS1784D. Rider seams may occur in the area. However, the Division will only require the applicant to backfill coal seams that were uncovered due to mining activities. The lack of available fill material is the major reason that the Division will not require that all rider seams be backfilled.

*Cut-and-Fill Terraces*

The applicant does not plan to use any cut-and-fill terraces.

*Previously Mined Areas*

The Division made the finding that the applicant cannot eliminate all the highwall remnants at the Deer Creek mine due to lack of fill material. See the approximate original contour section of this TA for details.

**Findings:**

Information provided in the proposed amendment is not adequate to meet the requirement of this section of the regulations. Prior to approval, the applicant must provide the following in accordance with:

**R645-301-542.200 and R645-301-521.110,** The applicant must give the Division a reclamation plan for the 9<sup>th</sup> East North Meetinghouse Portals. The reclamation plan must also include the location of all pre law sites surrounding the 9<sup>th</sup> East North Meetinghouse Portals.

## MINE OPENINGS

Regulatory Reference: 30 CFR Sec. 817.13, 817.14, 817.15; R645-301-513, -301-529, -301-551, -301-631, -301-748, -301-765, -301-748.

### Analysis:

The Deer Creek Mine has a total of 16 portals and 1 exhaust shaft. The applicant backfilled and sealed 7 portals, 4 of the sealed portals are in Deer Creek Canyon the other 3 are in Grimes Wash.

The general portal closure plan is shown on Figure 5-1. A block seal will be placed in the portal 25 feet from the entrance and then backfilled. The general portal sealing and backfilling plan is adequate for all portals in the Deer Creek site except the intake portal.

#### *Deer Creek Intake Portals and Belt Portal*

All portals except for the Deer Creek Canyon intake and belt portals are located up dip from the mined out entries. Because the portals are located up dip the applicant believes that hydraulic seals are not needed.

The Deer Creek intake and belt are located down dip from the coal seams. The applicant does not want to place a hydrologic seal in the portal because the surrounding rock is fractured and water would seep around the seal. The applicant will place pipes behind the seal and let the water flow through the pipe into the stream channel.

#### *Rilda Canyon*

The application states that the concrete portal liners with the two portals will be demolished and removed from the permit area for disposal at the Deer Creek Waste Rock Site. The portals will be sealed and backfilled as depicted in Figure 1, page 4-3. Backfill material will be obtained from the facility pad. The applicant's proposal is consistent with the standard portal sealing procedures.

#### *9<sup>th</sup> East Breakouts Grimes Wash Canyon*

The 9<sup>th</sup> East Grimes Wash portals were developed in June 1977. The portals were used for intake ventilation from 1977 until 1990 when they were permanently sealed.

The portal site was originally disturbed by coal mining activities dating back prior to 1920. Evidence of the early mining activities can be seen by the remnants of 2 partially open portals, a coal handling area south of the portals and evidence of a wooden coal chute above the Wilberg Mine fan. On February 14, 2001 the Division approved the as-built drawings for the

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reclamation work at the 9<sup>th</sup> East Grimes Wash portals. At that time the Division found the reclamation work met the minimum backfilling and grading requirements. -

*9<sup>th</sup> East North Meetinghouse Portals*

The applicant says Appendix R645-301-500-B, which contains information about the portal closure plan, will be amended when the information becomes available.

On February 14, 2001 the Division approved the as-built drawings for the reclamation work at the 9<sup>th</sup> East Grimes Wash portals. At that time the Division found the reclamation work met the minimum backfilling and grading requirements.

**Findings:**

Information provided in the proposed amendment is not adequate to meet the requirements of this section. Prior to approval, the applicant must provide the following in accordance with:

**R645-301-551**, The applicant must give the Division portal closure plans for North Fork Meetinghouse Canyon.

**TOPSOIL AND SUBSOIL**

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

**Analysis:**

**Soil Redistribution**

Reclamation will involve three disturbed areas: Deer Creek Canyon, Deer Canyon, and Elk Canyon. According to the backfilling and grading plan in Section R645-301-553 of the application, reclamation will begin at the uppermost parts of the disturbed areas and will proceed down the canyons. Various stages of the process will be occurring simultaneously. Substitute topsoil will be excavated from the existing undisturbed drainage corridor. The material will be taken from between stations 9+00 and 15+00 and between 24+00 and 30+00 as shown on map DS-1782-D. It is estimated 58,891.08 cubic yards of material is available which gives an average cover depth of 27 inches over the area this map shows receiving soil.

Map DS-1782-D does not show soil being placed over all of the disturbed area, and the application does not discuss why this is the case. According to verbal information from the applicant's representative, this is because in-place substitute topsoil will be used in some areas. The application needs to make this clear.

The estimates of the amount of soil available must be considered strictly estimates at this point and cannot be finalized until results are received from the sampling program. Having 27 inches of substitute topsoil over nontoxic spoil and refuse would be acceptable, but the Division is unsure how widespread the problems are that have been identified in the spoil and refuse. Therefore, the Division accepts the plan as presented, but the applicant must understand there is a chance modifications will be needed.

### **Soil Nutrients and Amendments**

The biology chapter of the application says fertilizer will be applied at the rate of 40 pounds per acre of ammonium nitrate and 35 pounds per acre of triple superphosphate. The Division encourages operators to use minimal amounts of fertilizer, and these quantities are relatively low.

In addition to the fertilizer, the applicant commits to apply one ton per acre of certified noxious weed free hay, and the hay and fertilizer will be incorporated into the soil in the gouging process. This should help to increase the amount of organic matter and the fertility and structure of the substitute topsoil.

### **Soil Stabilization**

Once soil has been distributed, the soiled surface will be roughened by deep gouging (pocking) using a trackhoe to create depressions approximately 3 feet diameter x 1.5 feet deep. The application says these depressions will be developed throughout the reclaimed area and will influence moisture retention and greatly reduce sediment loss. Deep gouging creates depressions across the surface which increases water harvesting and helps reduce surface erosion. In addition, rock litter consisting of various sized rocks and boulders will be randomly placed on the slopes and/or nested into the soil to help control slope slippage.

After seeding, the application says certified noxious weed free straw mulch will be applied at a rate of 2000 pounds per acre followed by application of 500 lbs/ac of tackifier on slopes greater than 20% to anchor the straw mulch and stabilize the soil. This mulching technique has worked very well at similar nearby mine sites.

Rills and gullies which develop to a depth of nine inches or greater in areas that have been re-graded and topsoiled and which either; (1) disrupt the approved post-mining land use or the reestablishment of the vegetative cover, or (2) cause or contribute to the violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized. The topsoil will be replaced and the areas will be reseeded.

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**Refuse Pile Reclamation**

Refuse that is cut during grading will be used as fill along cut banks and highwalls. Any acid-forming or toxic materials will be covered with four feet of non-acid and/or nontoxic material. The sampling program included in the application will determine whether some of the refuse is suitable as subsoil.

If the applicant can adequately identify and isolate those areas of the refuse where toxicity problems are located, it may be possible to use part of the refuse as a subsoil substitute. Refuse with unacceptable chemical or physical characteristics would need to be segregated and buried under at least four feet of non-toxic, non-acid forming, and noncombustible material as the applicant has committed to do.

The Division anticipates that not all of the refuse will be toxic or acid-forming. Sampling of vegetation established on portions of the refuse pile for interim erosion control indicates the refuse can, at least in some areas, support vegetation. In 1998, vegetation cover on the refuse pile was measured by the applicant's consultant as 40.5%, and in 1999, vegetation cover on the pinyon-juniper reference area was roughly estimated as about 40%. While this seems to indicate the refuse can, by itself, support adequate vegetation, there is no vegetation established on the area of the refuse pile where the high salt concentrations were found near the surface.

**Findings:**

Information provided in the proposal is not adequate to meet the requirements of this section of the regulations. Prior to final approval, the applicant must provide the following in accordance with:

**R645-301-240**, Map DS-1782-D does not show soil being placed over all of the disturbed area, and the application needs to explain why this is the case or else provide for substitute topsoil cover over the entire disturbed area.

**ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES**

Regulatory Reference: 30 CFR Sec. 701.5, 784.24, 817.150, 817.151; R645-100-200, -301-513, -301-521, -301-527, -301-534, -301-537, -301-732.

**Analysis:**

The applicant plans to reclaim all roads at the Deer Creek mine site. They also plan to reclaim the access road for the C1 and C2 belt line. The road reclamation plan is as follows:

The remainder of the Deer Creek mine road to the Emery County road (asphalt and base) will be excavated and transported to the waste rock site for disposal. Excavation will extend approximately 410 feet past station 0+00, to the point where the county road terminates. Approximately 25,042 cubic yards of material will be cut and 21,301 cubic yards of fill will be moved in this area. A 100 foot diameter turnaround (unpaved) will be constructed at the end of the Emery County road so that vehicular traffic can exit the area properly.

The plan meets the minimum requirements of R645-301-542.600 because (1) the road will be removed because it is not needed for the postmining land use, (2) the road bed will be reseeded according to the approved reclamation plan and (3) the asphalt rubble will be disposed at the waste rock site.

#### **Findings:**

The applicant met the minimum requirements of this section.

## **HYDROLOGIC INFORMATION**

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

#### **Analysis:**

##### **Water quality standards and effluent limitations**

The operator has provided a water monitoring plan in Appendix A. The plan contains a commitment on page 177 that discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water-quality laws and regulations and with effluent limitations for coal mining promulgated by the EPA and set forth in 400CFR Part 434. UPDES information is in Appendix B, Volume 9.

In Table 7-1, the operator has provided the values for the parameters used in RUSLE to estimate annual sediment contributions to Deer Creek from reclaimed watersheds. A 3.5" computer disc with the information used to determine sediment loss for the seven disturbed areas shown on Drawing DS-1795-D (Appendix R645-301-700-C) is included in Appendix 700-C.

The R-factor was determined using the data in the CITY database within RUSLE for the nearby Hiawatha area. Hiawatha is #44399 in the applicant's data base, found on the 3.5" disc.

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It states on page 7-3 that the estimation of the K-factor was based on average percentages of sand, silt, and clay from the soil analyses in Appendix R645-301-200-D (should be C). No data were available for percent rock-cover, so the average percent rock-cover at the recently reclaimed Cottonwood Fan Portal area (1999 Vegetation Report, p. 243) was used. The estimated K-factor used in the calculations was 0.225.

In determining the C-factor for the RUSLE calculations for the disturbed areas, maximum roughness was used because of the planned pocking, and entries for other ground covers such as rock fragments and vegetative residue were used conservatively because no data have been established.

The hillslope lengths and gradients used in determining the LS-factor for input to RUSLE are shown on Drawing DS-1795-D in Appendix R645-301-700-C (page 7-3).

The P-factor calculations in RUSLE yield not only the conservation planning value of the system (the P-factor itself), but also the sediment delivery ratio (SDR). Both values are calculated in RUSLE and shown in the RUSLE Spreadsheet Table. The P value in the table should be used for conservation planning, while the SDR (Sediment Delivery Ratio) should be used to estimate off-slope impact. When  $R * K * LS * C$  are multiplied by P, the result is the A value (estimated soil loss) in the RUSLE Spreadsheet Table, while multiplying  $R * K * LS * C$  by SDR gives an estimate of the sediment yield (SY). Table 7-1 tabulates the input and results of calculating A

$$R * K * LS * C * P = A \text{ (estimated soil loss—page 7-2)}$$

$$R * K * LS * C * SDR = SY \text{ (estimated sediment yield)}$$

### Diversions

Two ephemeral draws in Elk Canyon have been included in the channel design (DS-1780D) and final reclamation contour map (DS-1782D). Small ephemeral draws between the Terrace Enhancement Project area and Deer Creek may collect and convey water. The drainage areas of these small draws are not significant enough to require designed channels, but these are areas with the potential for gully formation. **NOTE:** the reference stations on DS1780D are measured along the channel length and do not correspond with the cross-section locations on DS1782D.

On page 104 of Volume 9, Deer Creek is described as an ephemeral stream based on observations by the operator; however, because the stream drains an area of more than one square mile, it is an intermittent stream by the definition in the Coal Mining Rules. Considered separately from the Deer Creek drainage, Deer and Elk are each an ephemeral drainage.

Design capacity for permanent, intermittent stream-channel diversions needs to be at least equal to the unmodified channel upstream and downstream from the diversion and able to safely pass a 100-year, 6-hour event. Small-scale cross sections of the unmodified channel immediately upstream and downstream of the site are on Drawing DS-1783-D, along with design cross sections for the reclaimed channels. Based on the NOAA Precipitation Frequency Atlas, 2.4 inches is the value for the 100-year, 6-hour storm event. Flows that would result from such a storm event were determined for Deer Creek Canyon, Deer Canyon, and Elk Canyon using STORM. Calculated watershed hydrographs are in Appendix 700-A, and results are summarized in Table 7-2. Five storm hydrographs were constructed: three for each of the drainages, one for routing Deer Canyon into Deer Creek Canyon, and one for routing all three drainages together. The designed drainage channel characteristics are summarized in Table 7-3 and channel design results are in Appendix 700-D.

Designs for channel transitions between the upstream and downstream natural channel to the reclaimed channels are shown on Figure 7-1A. Soft bioengineering methods for channel reclamation are described in on page 7-13 and designs are included in Figure 7-2A. These are to be used on three reaches where slopes are less than 5%. Dick Rol of the Division's AML section reviewed these plans and the following evaluation is based on his comments.

1. The design for using root wads in the transition areas looks acceptable. Having log ends pointing downstream is acceptable, but it is imperative that the operator plant enough sedges and willows behind the logs.
2. The value of placing anything in the middle of the channel is questionable. Placing wattles in the middle of the stream is a practice with which Dick is not familiar. Wattles are mainly intended for streambank protection, not for trying to establish islands. Using them to establish islands might work in some situations, but this doesn't appear to be a good place; nevertheless, it might be worth trying with one or two as an experimental practice.
3. Rocks in the middle of the channel will impede the flow and tend to create scour points that could become nick points.
4. The base material for the channel is a concern. Sieve analysis is not discussed, and probably cannot be known until the channel is actually excavated. The operator needs to commit to do sieve analyses during reclamation to help determine a stable final channel design.
5. A riprap channel with lots of vegetation on the sides would be a reasonable design option.

In response to Dick's comments, the applicant has stated a commitment to perform sieve analyses or similar analyses. The applicant also responded that Dick's comments were

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appreciated but that based on their evaluation, the stream channel as designed would be stable. The placement of logs, boulder clusters, willow wattles, etc. will direct flow towards the center of the channel in a meandering fashion. Willow wattles and U- or V-shaped weirs will provide flow dissipation to slow velocities and promote sedimentation. The applicant states more detailed information has been added to the Bioengineered Channels Section to help the reader better understand the construction process, but the additional information and the commitment to do sieve analyses could not be found in the Hydrology Section.

Designs for the channel transitions between the upstream and downstream natural channel and the reclaimed channel are on Drawing 7-1A in Appendix 700-B, and designs for energy dissipation basins are on Figure 7-3A. Locations for these structures are shown on Drawing DS-1780-D. **NOTE:** the reference stations on DS1780D are measured along the channel length and do not correspond with the cross-section locations on DS1782D.

The operator adjusted the channel location to minimize the potential for destabilizing the cut slope across from the Mine Office and Bath House. This area was predisposed to failure in 1992 when a tension crack was developed due to ponding water along the diversion ditch.

The operator provided riprap and granular filter material designs for the riprapped reclamation channels. Riprap gradation calculations are in Appendix 700-E. Calculations and assumptions that were used to determine Manning's 'n' for the riprap channel have been included on page 11 in the proposed reclamation plan.

Maps are certified. Hydraulic analysis, calculations, designs and drawings in the Hydrology Section are certified by John Christensen, Licensed Professional Engineer.

**Findings:**

The plan does not meet minimum regulatory requirements for this section. The applicant must provide the following in accordance with:

**R645-301-121.200**, On page 7-3, the application says the estimation of the K-factor was based on average percentages of sand, silt, and clay from the soil analyses in Appendix R645-301-200-D: This should be Appendix R645-301-200-C

**R645-301-742.312**, The applicant states in the cover letter that they will perform sieve analyses or similar analyses in conjunction with the construction of the bioengineered channels. The applicant also says more detailed information has been added to the Bioengineered Channels Section to help the reader better understand the construction process; the additional information and the commitment to sieve analysis could not be found in the Hydrology Section

## REVEGETATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

### Analysis:

#### Timing

Table 3-1 shows the timing of various steps in reclamation, and Table 3-2 is a schedule of monitoring activities. Except for soil sampling, the reclamation timetable does not show months in which the activities would occur, but a note below the table discusses the timing of seeding and planting more specifically. Soil salvage and replacement activities would be done during backfilling and grading operations. Advantageously, seeding will occur in the fall, but if recontouring is completed in the spring on the upper portions of the disturbed area, seeding will follow. Seeding will occur as contemporaneously as practical with grading operations, and tree and shrub plantings will occur in early spring.

The seeding and planting schedule is acceptable, but the applicant should attempt to seed as much of the area as possible in the fall. Grading cannot usually begin in the spring until the ground has dried to some degree, and by this time, seeding would be very risky.

Although spring is recognized as a good time to plant seedlings, other operators have had good success planting containerized stock in the fall, particularly at mid- or higher elevation sites that are likely to have some snow cover for much of the winter. Snow cover reduces frost heaving.

The application is not required to have a revegetation monitoring schedule, but the schedule in the application should be adequate for showing revegetation success for bond release.

#### **Mulching and other soil stabilizing practices.**

The section of this review addressing the reclamation plan for soils and subsoils discusses soil preparation techniques.

#### *Seed and planting mixes*

The applicant has revised the three seed mixes in the mining and reclamation plan and has followed Division recommendations. Many of the species have been tried at interim revegetation sites at the mine, and the recommendations were partly based on the successes at

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those sites. Every species in the mixtures is native to the area, and the mixtures are diverse and should lead to vegetation stands that comply with the revegetation performance standards. Drawing DS-1797-D shows which seed/planting mixes will be planted in which areas of the mine. The riparian seed mixture will be applied to the area within 20 feet either side of the channels. The conifer seed mixture will be applied to north-facing slopes, and the pinyon-juniper seed mixture will be applied on south-facing slopes.

The applicant is required by R645-301-358.400 to enhance where practicable, restore, or replace, wetlands and riparian vegetation along rivers and streams and bordering ponds and lakes. Since these areas are considered habitat of unusually high value, the applicant needs to use the best technology currently available to achieve these goals. Deer Creek above and below the mine supports a riparian community that needs to be restored as far as possible. The seed and planting mix contains many of the species assumed to have been in the riparian area before disturbance as shown in Table 6, page 2-156, of the current mining and reclamation plan. Many of the species in the seed and planting mix are upland species, but there are other species in the mix that would grow strictly in areas with enhanced moisture availability.

In Section R645-301-342, the application says channel design will incorporate soft bioengineering in slope areas of less than 5% along the Deer and Elk Creek drainages. Instead of riprap, alternative instream controls, such as wing deflectors, boulder clusters, and U- or V-shaped weirs, will be used. Locations where these techniques will be used are shown on Drawing DS-1780-D, and specific designs are in Figures 7-1A and 7-2A.

In the November 6, 2000, technical analysis, the Division made recommendations and requirements for changing the stream restoration designs. These included planting sedge and grass plugs and additional willows behind logs and root wads to prevent erosion and scouring, changing the locations of the willow wattles, and doing a sieve analysis on the channel base material. In its response letter, the applicant explained the reasons for the stream channel design, and the letter said a commitment to do a sieve analysis on the base material was included in the application. The letter also said the application included other additional design information, but it appears this information was not included. The hydrologic information section of this analysis contains further discussion of this issue and also contains a deficiency.

*Seeding and mulching methods*

Seed will be applied with a hurricane spreader or using a hydroseeder. If a hydroseeder is used, a small amount of wood fiber mulch will be added to mark the coverage area during application. These are standard seeding methods and are acceptable.

After seeding, certified noxious weed free straw mulch will be applied at a rate of 2000 pounds per acre followed by application of 500 pounds per acre of tackifier to anchor the straw mulch and stabilize the soil. This mulching technique has worked very well at similar nearby mine sites. The applicant should not use an asphalt-based tackifier.

Two of the seed mixes include some combination of containerized plants, cuttings, rooted cuttings, bare root plants, and poles. In the riparian areas, 25% of each of these would be planted during each of the first four years. This allows some sedimentation and development of suitable planting sites to occur before all the seedlings are planted. In the Division's experience, there are not always enough places to plant along a restored stream during the first year after reclamation.

The Division has recently become aware of difficulties that can accompany planting rooted cuttings. The roots tend to break off easily, and for this reason, they need to be handled very carefully. If proper care is taken, however, they can work very well.

The concept of planting the transplants in stages was suggested by the Division, but the applicant needs to be aware it would lead to a longer extended responsibility period. Regulation R645-301-357.311 allows planting trees or shrubs at a rate of up to a cumulative total of 20% of the required stocking rate through 40% of the extended responsibility period without restarting the extended responsibility period. The success standard for woody plants in the riparian area is 3412 per acre; therefore, up to a total of 682 trees or shrubs per acre could be planted during the first four years after the initial planting without affecting the extended responsibility period. According to the application, however, about 1014 per acre would be planted each of the first four years for a total of about 3042. This, of course, is much greater than 682.

#### *Maintenance and monitoring*

The application does not discuss irrigation, so it is assumed the reclaimed area will not be irrigated. Rodent control measures will be implemented as necessary. Weed control will not be done unless it is necessary, but all noxious weeds will be eradicated if they become established on the site. The Division does not anticipate that irrigation or pest control will be needed except for noxious weeds. The husbandry practices in R645-301-357 allow control of noxious weeds through the entire extended liability period without affecting the length of this period.

The application says the annual monitoring will include inspection for rills and gullies. If present, they will be filled and the soil reseeded. Rill and gully repair will follow the requirements of rules R645-301-357.360 through R645-301-357.365.

#### **Standards for success**

The plan contains information about three reference areas that will be used as revegetation success standards. It appears from the data and comparisons in the plan that these reference areas are acceptable.

The application discusses ways of measuring vegetation cover, productivity, and the density of woody plants. It also mentions the statistical tests that will be used, and these methods are acceptable.

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The application says revegetation for tree and shrub species will be considered successful when the tree and shrub counts in the reclaimed areas are similar at the time of bond release to the counts in the reference areas. Standards attained at the time of bond release will be approved by the Division and the Division of Wildlife Resources.

The Revised Universal Soil Loss Equation (RUSLE) will be used to model sediment loss from disturbed and reclaimed areas, and sedimentation will be monitored above and below the mine. While there are problems with every method developed for measuring erosion, those discussed in the application are acceptable.

At the time of bond release or when the extended period for successful revegetation has passed, one or a combination of the similarity indexes in Appendix B of the Division's "Vegetation Information Guidelines" will be used to compare life forms and/or species present in the reclaimed and reference areas. Similarity will be considered successful when the index value is at least 70% of the reference area.

The methods and standard proposed are acceptable. The application leaves open the possibility of doing similarity tests on life forms and/or species. Since reclaimed and reference areas do not always have exactly the same species, it is best to leave the option open to do the test either way. The applicant and the Division should also do a qualitative analysis of the vegetation data. The Division has found in comparing diversity between reclaimed and reference areas that diversity and similarity indexes are useful but that they do not always take enough factors into account. It is impossible with many of these indexes to use a statistical test, so if the standard is not met, there is no alternative but to say the site does not meet bond release criteria.

Seasonality of established plant species is an important issue at some mines, but most or all of the species encountered in the vegetation sampling at Deer Creek were cool season species. These are generally much easier to establish than warm season species, so seasonality should not be a concern. To achieve revegetation success, essentially all of the species in the reclaimed area should be cool season.

The other requirements in R645-301-353 would be very difficult to measure quantitatively, so a qualitative analysis at the time the applicant is seeking bond release is most appropriate.

### **Field Trials**

The application includes no specific proposal for field trials, but field trials could be needed depending on the results of sampling refuse and substitute soils.

The mining and reclamation plan and the application lack adequate soils and refuse data for the Division to determine conclusively that revegetation is feasible using the proposed

reclamation plan. The application includes a plan for sampling soils and refuse, but without that information, it is not known how well vegetation will grow.

It is vital that there be adequate suitable soils for revegetation. The applicant anticipates having 27 inches of soil over subsoil and refuse with at least four feet of material over any toxic or acid-forming spoil or refuse. This should be adequate if this much material is actually available. Most perennial species in Utah have relatively deep roots so they can extract water from increasing depths as the summer progresses. If root growth is inhibited by poor chemical or physical characteristics or if the soil has low water holding capacity, vegetative cover, production, diversity, and erosion control will all suffer.

### **Fish and Wildlife Habitat**

The seed mixtures in the application are acceptable for providing proper habitat conditions for wildlife.

Re-establishment of the riparian areas is an important aspect of reclamation because all riparian areas are considered critical wildlife habitat. The reclamation plan presented in the application is designed to restore as many wildlife values as possible to the riparian area. As discussed in the hydrologic information section of this review, however, there are some problems with the stream reclamation plan that need to be resolved.

No other enhancement measures are discussed in this section of the application, but the application says rocks and boulders would be placed on the surface. This enhancement method has been used successfully at other mines to create habitat for birds and small mammals.

The application discusses possible water discharge from the portal after reclamation. In the July 7, 1999, technical analysis, the Division required a program to study the effects of the discharge on macroinvertebrate populations in Deer Creek and Huntington Creek. The cover letter for the response to this technical analysis says the applicant believes there is no justification to perform a macroinvertebrate study before or after reclamation.

Volume 9A of the current mining and reclamation plan contains a report from the Ecosystem Research Institute about the water quality and macroinvertebrate studies done in Deer and Huntington Creeks in 1990, 1991, 1992, and 1994. The report concludes the water discharge from the Deer Creek mine had no measurable effects on the macroinvertebrate populations of Huntington Creek. However, it did affect Deer Creek.

Water from the mine had a pH of near 7, but as CO<sub>2</sub> was lost from the water, the pH increased to about 8.5 and calcium carbonate precipitated. The report estimates that 250,000 kg of calcium carbonate was deposited as limestone in Deer Creek over a three year period. It concludes that this rate of precipitation would "seal the stream bottom and thus prevent accrual of stream water into the adjacent riparian community." It also says this precipitation would

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decrease the amount of macroinvertebrate colonization in Deer Creek. This could be through alteration of the substrate or direct effects on the macroinvertebrates as observed in the stonefly study.

The Division contacted the Division of Wildlife Resources about this issue, and they are primarily concerned about any effects on Huntington Creek rather than Deer Creek. They do not feel the effects on Deer Creek are of enough significance to warrant further monitoring of the macroinvertebrate populations. Therefore, while there have been and probably will continue to be effects on the macroinvertebrate populations of Deer Creek, these are not significant enough to require further monitoring.

After the mine is reclaimed, there will, presumably, continue to be some discharge from the mine and calcium carbonate precipitation; however, most should occur near the disturbed area with less happening farther down the canyon. The report in the plan discusses the sealing effect the calcium carbonate had on the streambed and that it decreased infiltration into the soil. This could continue to occur after reclamation, but the area most likely to be affected would be the reclaimed area. As the report in the plan says, there were, unexpectedly, no effects of the water discharge on the riparian vegetation. The increased water should have had some effects on the vegetation composition and cover, but limestone precipitation apparently sealed the stream bottom to the point there were no measurable effects. When the mine water discharge is eliminated or greatly reduced, the effects of sealing the creek bottom will remain, so the amount of water available to riparian vegetation could be decreased compared to premining levels.

**Findings:**

Information provided in the revegetation section of the application is adequate to meet the requirements of this section of the regulations. However, before the Division can make a finding that reclamation is feasible, it needs complete soils and refuse information. The applicant has committed to gather this information, but the data is not yet in the application or the approved mining and reclamation plan.

## MAPS, PLANS, AND CROSS SECTIONS OF RECLAMATION OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-323, -301-512, -301-521, -301-542, -301-632, -301-731.

### Analysis:

#### Reclamation backfilling and grading maps

##### *Deer Creek Canyon*

The main facilities for the mine are located in Deer Creek Drainage, Deer Drainage and Elk Canyon Drainage. Drawing DS1782D, Deer Creek Mine Disturbed Area Final Reclamation Contour Map show the reclamation contours for those areas. The map scale is 1" = 100', which is adequate for the Division to verify mass balance calculations. The map has been certified by a professional engineer and shows the highwall remnants. The map does not have the disturbed area boundaries labeled.

The cross sections are shown on Drawing DS1783D and DS1784D, Deer Creek Mine, Deer Creek Canyon Final Reclamation Cross Sections. The cross section are at a scale of 1" = 80', which is different than the base map. The applicant does not want to change the scale of the map for fear of losing details. While the Division recommends that the scales of the base maps and cross sections be the same no action will be taken at this time.

##### *Rilda Canyon*

The backfilling map for Rilda Canyon is drawing CE-10884-EM. The map shows the reclaimed contours for the site and the riprap. The map scale is 1" = 100'.

The cross sections are on drawing CE-10891-EM and do not show the location of the portals, highwalls or disturbed area boundaries. The cross section scale is 1" = 20' which is not equal to the base map scale. The Division's staff prefers to have the scales of the maps and cross sections the same when practical.

##### *9<sup>th</sup> East Grimes Wash Portals*

The application does not include backfilling and grading maps for the 9<sup>th</sup> East North Meetinghouse Portals. The application needs to include as-built drawing for the area.

##### *9<sup>th</sup> East North Meetinghouse Portals*

The applicant did not include backfilling and grading maps for the 9<sup>th</sup> East North Meetinghouse Portals. The application does say in Appendix R645-301-301-500-B that the

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reclamation plan for the area would be updated when it became available. The backfilling and grading plans must be approved by the Division before the reclamation plan can be approved.

**Reclamation facilities maps**

*Deer Creek Canyon*

The main facilities for the mine are located in Deer Creek Drainage, Deer Drainage and Elk Canyon Drainage. Drawing DS1782D, Deer Creek Mine Disturbed Area Final Reclamation Contour Map show the reclamation contours for those areas. The cross sections are shown on Drawing DS1783D and DS1784D, Deer Creek Mine, Deer Creek Canyon Final Reclamation Cross Sections. The maps and cross sections show the rip rapped drainages and energy dissipaters. No other reclamation facilities are shown.

*Rilda Canyon*

Drawing CE-10884-EM shows the location of the reclamation facilities for Rilda Canyon. Those facilities consist of riprapped channels.

*9<sup>th</sup> East Grimes Wash Portals*

The applicant gave the Division as-built drawings for the 9<sup>th</sup> East Grimes Wash Portal area in a separate amendment that was approved on February 12, 2001.

*9<sup>th</sup> East North Meetinghouse Portals*

The applicant needs to give the Division drawings for the 9<sup>th</sup> East North Meetinghouse Portal area. The drawings must show any facilities that will be left after reclamation.

**Final surface configuration maps**

The backfilling and grading maps show the final surface configuration.

**Findings:**

Information provided in the proposed amendment is not adequate to meet the requirements of this section. Prior to approval, the applicant must provide the following in accordance with:

**R645-301-542.00**, The applicant must submit backfilling and grading maps for the 9<sup>th</sup> East North Meetinghouse Portals areas before the Division can approve the reclamation plan

## **BONDING AND INSURANCE REQUIREMENTS**

Regulatory Reference: 30 CFR Sec. 800; R645-301-800, et seq.

### **Analysis:**

#### **Determination of bond amount**

The application does not include a revised reclamation cost estimate in the amendment. The applicant informed the Division that a cost estimate would not be included until the reclamation plan was approved. The Division agreed with the concept since the reclamation bond estimate must be based on the approved plan.

### **Findings:**

Information provided in the proposed amendment is not adequate to meet the requirements of this section. Prior to approval, the applicant must provide the following in accordance with:

**R645-301-830.130,** The applicant did not include a detailed reclamation cost estimate in the amendment. The applicant informed the Division that the reclamation cost estimate would not be submitted until the reclamation plan was approved. The Division agreed to that procedure. Prior to final approval the applicant must submit a detailed reclamation cost estimate