0022

June 23, 2003

Gary E. Gray, Resident Agent
West Ridge Resources, Inc. / West Ridge Mine
P.O. Box 1077
Price, Utah 84501

RE: Findings for Highwall Reclamation Plan, West Ridge Resources, Inc., West Ridge Mine, C/007/041-DO00A-7, Outgoing File

Dear Mr. Gray:

This review highlights the deficiencies of your response to the Division Order. The Division can currently only approve the slope reclaimed to the angle of repose (or a lesser angle) (Appendix 5-10). If West Ridge Resources, Inc. would like to reclaim to a steeper angle, more information must be submitted as outlined in this review.

Please call me to set up a meeting by July 9, 2003 to discuss this review and how you would like to proceed. A copy of our technical analysis is enclosed for your information.

If you have any questions, please call Peter Hess at (435) 613-5622, or me at (801) 538-5268.

Sincerely,

/S/

Pamela Grubaugh-Littig
Permit Supervisor

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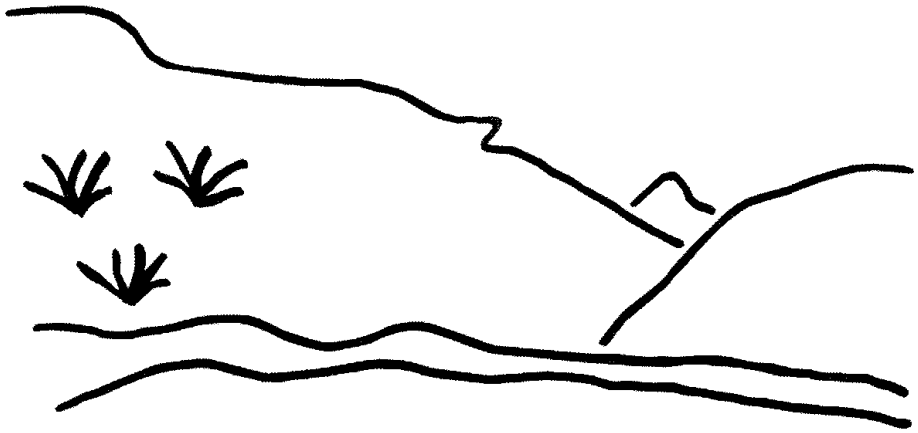
State of Utah



Utah Oil Gas and Mining

Coal Regulatory Program

West Ridge Mine
Response to Division Order
C/007/041-DO00A-7
Technical Analysis
June 17, 2003

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TECHNICAL ANALYSIS

The Division regulates the Surface Mining Control and Reclamation Act of 1977 (SMCRA). When mines submit a Permit Application Package or an amendment to their Mining and Reclamation Plan, the Division reviews the proposal for conformance to the R645-Coal Mining Rules. This Technical Analysis is such a review. Regardless of these analyses, the permittee must comply with the minimum regulatory requirements as established by SMCRA.

Readers of this document must be aware that the regulatory requirements are included by reference. A complete and current copy of these regulations and a copy of the Technical Analysis and Findings Review Guide can be found at http://ogm.utah.gov/coal

This Technical Analysis (TA) is written as part of the permit review process. It documents the Findings that the Division has made to date regarding the application for a permit and is the basis for permitting decisions with regard to the application. The TA is broken down into logical section headings which comprise the necessary components of an application. Each section is analyzed and specific findings are then provided which indicate whether or not the application is in compliance with the requirements.

Often the first technical review of an application finds that the application contains some deficiencies. The deficiencies are discussed in the body of the TA and are identified by a regulatory reference which describes the minimum requirements. In this Technical Analysis we have summarized the deficiencies at the beginning of the document to aid in responding to them. Once all of the deficiencies have been adequately addressed, the TA will be considered final for the permitting action.

It may be that not every topic or regulatory requirement is discussed in this version of the TA. Generally only those sections are analyzed that pertain to a particular permitting action. TA's may have been completed previously and the revised information has not altered the original findings. Those sections that are not discussed in this document are generally considered to be in compliance.

INTRODUCTION

Due to the implementation of a more extensively constructed highwall area at the West Ridge Mine portal area than what was approved by the original permit, the Division and the permittee have generated six deficiency documents/responses to what has become to be known as Appendix 5-9. Agapito and Associates, Inc. generated several slope stability analyses for the design, all of which have generated concerns within the Division. The latest response from the permittee proposed two plans; Appendix 5-9 proposes to reclaim the portal highwall at a 40-degree vertical angle. Appendix 5-10 proposes to reclaim the same area at a lesser angle. This gentler slope would require moving the toe of the reclaimed slope approximately forty feet to the northwest. As the original location of the right fork of the "C" Canyon drainage exists parallel with the toe of the highwall, the channel would also have to be moved forty feet to the northwest.

At the present time, the Division can only approve the slope reclaimed to the angle of repose or a lesser angle (Appendix 5-10). If the permittee wants to reclaim to a steeper angle, more information must be submitted.

The Division has outlined the information that must be submitted to make a determination that Appendix 5-9 (forty degree vertical angle slope) can be effectively implemented such that it will obtain the required 1.3 static safety factor. If that determination cannot be made, the Division will require the Permittee to reclaim the slope utilizing the design in Appendix 5-10. This technical analysis also requests that the permittee submit additional information, such as designs for the required channel relocation, to hopefully eliminate another review should the information submitted in response to DO00A-7 be found to be inadequate.

SUMMARY OF DEFICIENCIES

The Technical analysis of the proposed permit changes cannot be completed at this time. Additional information is requested of the permittee to address deficiencies in the proposal. A summary of deficiencies is provided below. Additional comments and concerns may also be found within the analysis and findings made in this Draft Technical Analysis. Upon finalization of this review, any 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 and 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

R645-301.742.300, Provide the above-cited corrections so the Maps 5-6B, and Maps 1 and 2 from Appendix 5-10 consistently reflect the same information. 30

R645-301-241, The plan should indicate the approximate area of the highwall reclamation site and the required topsoil volume to achieve a twelve to eighteen inch topsoil replacement depth..... 11

R645-301-242.120, Pocking and planting of trees as described in Appendix 5.9 will not likely be achieved due to the geogrid installation every 1.5 feet. A more realistic statement of pocking depth and tree planting should be described for Appendix 5.9..... 23

R645-301-541.400, The Permittee must either provide the Division charts of displacement versus shear stress that show a peak value. The Permittee may use another generally accepted method for determining the internal friction angle and the cohesive strength of the test material if desired..... 20

R645-301-542.200, The permittee must provide the Division with material specifications for the geogrid, the geosynthetic composite drain material and the geotextile filter fabric. The permittee must include discussions of the effective life of each of those materials as well as whether or not any of the designs stability requirements could be affected following the termination of each of the materials effective lives. 21

GENERAL CONTENTS

REPORTING OF TECHNICAL DATA

Regulatory Reference: 30 CFR 777.13; R645-301-130.

Analysis:

The Appendix 5-9 reclamation plan is based upon a report jointly produced by Agapito Associates, Inc. (AAI) and Mt. Nebo Scientific, entitled, "Stability Evaluation for the Proposed Reclaimed Slope at the Portal Excavation, West Ridge Mine, March 13, 2003, Revision No. 4." AAI was responsible for slope stability and geotechnical design.

AAI sampled the existing and proposed slope materials, designed a laboratory-testing program, analyzed the test results, and developed the geotechnical slope stability model and design. Appendix 5-9 has the stamp of a professional engineer, Francis S. Kendorski, Principal and Vice-President of Agapito Associates Inc.

Geotechnical soil analysis was conducted (January 2003) by Advanced Terra Testing, Inc., 833 Parfet Street, Lakewood, Colorado (303) 232-8308. The Advanced Terra Testing information is included as Appendix A of the AAI report.

The chemical characteristics of the topsoil and backfill (subsoil) material were evaluated by Colorado Analytical Laboratories, Inc., 240 South Main Street, Brighton, CO 80601 (303-659-2313) and are reported in Appendix A of Appendix 5-9.

Mt. Nebo Scientific supplied the revegetation and erosion control methods. The three consultants have been listed by names and addresses in Appendix 1-6.

The reclamation plan in Appendix 5-10 was produced by Mr. Dan Guy, Professional Engineer, of Blackhawk Engineering, Inc.

Findings:

The information meets the requirements for reporting of technical data.

ENVIRONMENTAL RESOURCE INFORMATION

Regulatory Reference: Pub. L 95-87 Sections 507(b), 508(a), and 516(b); 30 CFR 783., et. al.

SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.21; 30 CFR 817.22; 30 CFR 817.200(c); 30 CFR 823; R645-301-220; R645-301-411.

Analysis:

Soils in the vicinity of the highwall are listed on Map 2-2 as Midfork, very stony fine sandy loam, 10 – 50% slopes. Prior to disturbance, these soils were described in Appendix 2-2. Pit 14 was located in the immediate area of the highwall. In his January 15, 1997 Soil Resource Assessment, Mr. James Nyenhuis described the soils on the slopes of the highwall thusly:

It *(the Midfork map unit)* is located primarily along the more densely vegetated south slope (north-facing slope) of the right fork drainage. Present vegetation is mainly Douglas-fir and snowberry. The average annual precipitation is 16 to 20 inches, and the average freeze-free period is 60 to 80 days.

The M map unit is 75% Midfork, and 10% Rubbleland, 10% Commodore, and 5% Rock Outcrop. Midfork is deep to very deep, well drained. Effective rooting depth is 60 inches or more. Commodore is similar to Midfork but is shallow (<20 inches) to bedrock. Commodore was not sampled because it is a minor inclusion. Typically, the surface of Midfork is covered by an organic layer of twigs, leaves, and needles about 1.5 inches thick. The very dark grayish brown to brown "A" horizon is 5 – 7 inches thick and has gravelly to very stony fine sandy loam-to-loam texture. Total rock fragment content of the "A" horizon ranges from about 17 – 35% and can include about 10% gravel, 5 to 10% cobble or flagstone, and 2 – 15% stones and boulders.

The underlying subsoil layer is typically from about 7 to 18 inches in depth, and has very cobbly sandy loam-to-loam texture. Total rock fragment content of the subsoil ranges from about 7 to 40% and can include 5 to 15% gravel, 5 to 15% cobble or flagstone, and 1 to 15% stones and boulders. The substratum extends from the subsoil to a depth of 60 inches or more and has very gravelly to very stony sandy loam-to-loam texture. Total rock fragment content of the substratum ranges from about 35 to 40% and can include 10 to 15% gravel, 10 to 15% cobble or flagstone, and 10 to 20% stones or boulders. (Appendix 2-2, pp 14 - 15).

Soils from the highwall slope were salvaged to a depth of 18 inches. Mr. Nyenhuis indicated that below this depth, the rock fragment content exceeded 35 – 40% and 20% of that was large stones and boulders (Appendix 2-2, page 15).

Findings:

The information provided in the MRP adequately describes the pre-existing condition of the highwall.

OPERATION PLAN

TOPSOIL AND SUBSOIL

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

Analysis:

Topsoil Removal and rage

This submittal revises page 30 of Appendix 5-5 to indicate that there is no topsoil storage area in the left fork (ASCA Y has been eliminated). The area is dedicated to coal storage. Map 2-2, Mine site Order 1 Soil Survey has been revised accordingly. Sample site locations have been retained on Map 2-2. (The commitment to sample the soil of the operations pad over the next five years is described in the Annual Report year 2000.)

Revised Map 2-4, Topsoil Storage Area provides cross-sections and a profile of the topsoil stockpile, indicating that **7,613 cubic yards of soil are presently stored** in the topsoil storage area. In response to the deficiency written on October 10, 2002, Appendix 5-9 (page 3) indicates that the source of topsoil for the highwall reclamation will be from this topsoil stockpile. The highwall area is roughly triangular in shape, with a base of 300 ft and a height of 85 ft (page 3, App 5-9). The Division estimates the area of the reclaimed highwall site would therefore be no less than 12,750 sq ft or one third of an acre and would require approximately 500 cu yds of topsoil at a twelve-inch replacement depth.

Topsoil Substitutes and Supplements

Borrow area soils have been identified on page 2-14 of the MRP and in Appendix 2-4. Map 2-4 locates the borrow soils and provides reclamation contours for the borrow site. The plan does not directly indicate that these soils will be used for topsoil.

Findings:

The information supplied does not meet the requirements of Reclamation Plan, Backfilling and Grading. Prior to approval, the Permittee must provide the following:

R645-301-241, The plan should indicate the approximate area of the highwall reclamation site and the required topsoil volume to achieve a twelve to eighteen inch topsoil replacement depth.

RECLAMATION PLAN

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

On November 13, 2002, the Division completed a technical analysis for the highwall elimination plan for the West Ridge Mine. The Division found several deficiencies in the backfilling and grading plan. The Permittee responded to several deficiencies in the March 17, 2003 submittal. Others were either not addressed, or the responses were felt to be inadequate.

Section R645-301-553, Backfilling and Grading of the approved mining and reclamation plan (pg. 5-53), and Appendix 5-5 (section 4e, pg. 45) needs to be modified to reference that both Appendix 5-9 and Appendix 5-10 exist as options for reclaiming the portal highwall area. The text should also reference the Soils section of the MRP for a more detailed discussion of the approved experimental practice for topsoil storage with a discussion as to why the selected reclamation plan was chosen. This is necessary for a reader consulting the mining and reclamation plan at the time of reclamation so that the reviewer is aware that Appendix 5-10 exists and is a viable option.

The Division reviewed the submittal received on March 17, 2003 and found three issues in the backfilling and grading plan that need to be addressed before the Division can make a finding. The three issues are: 1) the angle of repose for the different soils that are associated with the reclaimed highwall slope must be determined. 2) The test results must either show peaks or the Permittee must use alternative methods to determine the soil properties. 3) The Permittee must conduct a rigorous testing program to show that the backfill material **will consistently meet or exceed the requirements of the material necessary to implement the design.**

Angle of Repose

The Permittee did not address the deficiencies relative to the angle of repose in the March 17, 2003 submittal. The Division required the Permittee to determine the angle of repose for the materials that would be associated with the reclaimed highwall. The basis for the request is the requirement of R645-301-553.130, which states…

> ***"R645-301-553.130, The Permittee must achieve a postmining slope that does not exceed either the angle-of-repose or such lesser slope as is necessary to achieve a minimum long-term static factor of 1.3*** *and prevent slides, except as provided in R645-301-553.530."*

In order for the requirements of R645-301-553.530 to be considered for compliance the highwall would have to be in either a previously mined or a continuously mined area. The highwall is post-SMCRA; therefore regulation R645-301-553.530 does not apply.

The Permittee did not give the Division the angle of repose. Instead, the Permittee addressed the angle of repose issue on page 4 as follows:

> *"West Ridge further proposes that the geogrid will reinforce and stabilize the surficial rooting zone. Geogrid reinforced slopes are typically constructed and fully vegetated at slope angles up to 70 degrees according to Tensar, a leading geogrid manufacturer, designer, and installer (Tensar 2003.) This approach should eliminate the need for determining the angle-of-repose of the uncompacted backfill material as requested by DOGM. West Ridge could not find an acceptable method for determination of angle of repose, based on a search of ASTM methods and contact with several soil laboratories."*

The Permittee did not state the angle of repose for any of the soil materials to be used. They did state that the mean slope angle of the undisturbed slopes in the area is approximately 32 degrees. In steep slope areas, (i.e., the West Ridge Mine location), the natural slope angle is usually at or near the angle of repose. The slope angle of the proposed reclaimed highwall is 40 degrees, which is 8 degrees steeper than the natural slope angle.

The Division is concerned that if the plan to reclaim the slope to a forty-degree vertical angle were approved, then the slope angle would be steeper than the angle of repose for the involved materials. The native slopes consist of consolidated material; the reclaimed slope area will consist of broken material that will be compacted by man made methods. The growth medium that will be spread to provide the vegetative cover will not be compacted. This material, as well as the backfill material must have angles of repose determined for them. If the angle of repose of the soils indicates that the material will remain stable on the forty-degree vertical angle slope, then a problem does not exist. If the soils will slump, the design is not acceptable.

The Division will not challenge the Permittee's statement that geogrid can reinforce or stabilize the soils. However, the use of geogrid does not allow the Division to ignore the requirements of R645-301-553.130. Therefore, the proposed design to reclaim the highwall does not meet the requirements of R645-301-553.130.

Post Peak Curve

The Division reviewed the slope stability study. The Division has concerns about the interpretation of the data from the material testing process. On page 9 of the March 17, 2003 submittal, the Permittee states the following:

> *"The results of the three-point direct shear test program indicate that the post-peak friction angle for the test material is 54 degrees and the cohesion is 1877 psf."*

The chart in Appendix A under Backfill that shows displacement versus shear stress **does not show a peak,** so the Division in unable to determine a value for the post peak angle. (Note: the chart for displacement versus shear strength is labeled topsoil instead of backfill).

Test Samples

The Permittee **used only one sample to determine the physical properties of the backfill material**. The values for those properties are felt to be unusually high; therefore the Division must require that additional tests be conducted such that a mean value for the friction angle and cohesion is determined. With this additional information, the Division will be able to determine whether or not the slope will meet the design requirements.

The test result for cohesion for the residual soil was determined to be 1,515 psf. A value of 42 degrees was determined for the internal angle of friction. (Note: the backfill material has 24% more cohesion and a 29% greater angle of friction than the residual soils.)

To verify that the backfill material can consistently meet or exceed the design requirements the Permittee must design a rigorous material testing procedure. **This should be done not only to obtain sufficient information to receive a Division approval for the design, but also to ensure that the approved design requirements are being met when the approved design is implemented.** The testing program must involve several samples from different areas.

Properties of Synthetic Materials

The permittee did not provide material specifications for the geogrid, the geosynthetic composite drain material or the geotextile filter fabric, all of which are considered critical aspects of the proposed design. This should include discussions of the effective life of each of those materials as well as whether or not any of the stability requirements of the design could be affected following the termination of each of the materials effective lives.

Backfilling and Grading On Steep Slopes

Analysis:

Two reclamation scenarios have been proposed: a 40 degree slope as described in Appendix 5-9 or an alternative of 31.2 to 33.6 degrees as described in Appendix 5-10. In either scenario, the backfill will be excavated from the warehouse and portal pad (page 3, App 5-9 and Section III of Appendix 5-10).

The backfill material has a USCS classification of GM (silty gravel with sand). The material is approximately 50% gravel, 25% sand, 25% fines, (App 5-9, App A, Physical Properties Tests Backfill). Table 2, Section 3.3 of Appendix 5-9 reports the backfill to have a plasticity index of 6.5, a saturated weight of 138 pcf, a moist cohesion of 1,877 psf and an internal angle of friction of 54 degree based upon the Advanced Terra Testing (2003) study. [**Note: These figures are significantly different than the information previously presented for the backfill. Appendix 5-9 Revisions No. 2 (received August 15, 2002) and No. 3 (Received January 15, 2002) report the backfill to have a plasticity index of 6.5, a saturated weight of 121.6 pcf, a moist cohesion of 771.7 psf and internal angle of friction of 38.4 degrees based upon the Advanced Terra Testing (2002) study.]

The stress/strain graph for the backfill material is shown in Appendix A of Appendix 5-9. (The graph is mistakenly labeled "Displacement vs. Shear Stress **Topsoil**," rather than "**Backfill**." However, the information on the graph correlates to that reported by the laboratory for the backfill. The graph indicates that there is no peak shear, but that the material is displaced steadily as force is increased.

A post-peak internal angle of friction (Phi) was derived from the point on the stress/strain curve representing the maximum stress applied during testing. By way of explanation of the term post-peak friction angle, Agapito Associates Inc indicates that the coarse-grained material chosen for the backfill "continued to gain strength after shearing had begun. This was probably because the larger particles in the material were rotating, causing the larger particles to act as keys and increase shearing resistance." AAI also states, "Post-peak shear strengths are typically used in slope evaluation because the conservative assumption is made that the material has already undergone peak shearing." (App5-9, Section 3.3.4, page 10).

Since the material rotates under confined conditions, this situation presents a question for reviewers. Will the material within the fill begin to rotate under strain and create movement in its unconfined placement on the slope?

The reported value of 54 degrees for Phi (Internal Friction Angle) describes a very strong material with high resistance to shearing. The very high Cohesion of 1,877 psf describes a material that one would suspect is very plastic. This material was described as non-plastic (App 5-9, Appendix A, Atterberg Limits tests Backfill). Consequently, the opinions of recognized geotechnical experts were sought by the Division on the Atterberg Limits, Mohr Colomb and Proctor Tests of the backfill material.

Dr. David J. Elton, P.E. of Civil Engineering Department at Auburn University had the following comments:

> *"54 degrees is possible, …the curves don't peak – I don't know why they refer to them as peak strengths…for NP fines, 2000 psf cohesion is very suspect…I don't understand their spreadsheet data reduction that lists phi for every displacement. How can they tell what phi is? You have to run at least two tests, and plot, etc. The data is consistent, anyway. I wonder if the data was reduced correctly."*

Tuncer B. Edil, Professor & Chair Geological Engineering Program and Professor of Civil & Environmental Engineering at the University of Wisconsin-Madison had the following comments:

> *"From your description I see no peak to speak of post-peak. You describe a near-linearly rising curve and use of end-point stresses in calculating strength. Is this being performed in a direct shear device? What is the maximum size of the gravel grains and the size of direct shear box? I find 54 degrees very high and suspect. Combined with that unusually high cohesion, this material becomes one of the strongest anywhere. The argument about post-peak being conservative etc is correct and fine but I am not sure that is what you have here. There may be a test artifact…."*

Laboratory information indicates that the backfill was sampled at five locations (App 5-9, App A). These samples were then composited for a direct shear test that was run at three applied stress levels. Given the extreme values reported by this single test and the deviation from the previous information known about the backfill, the Division requests that at least two more direct shear tests are run on the sample to provide an average value for the Mohr-Coulomb strength criteria for the material. This information is necessary regardless of which reclamation scenario is employed, since both Appendix 5-9 and Appendix 5-10 rely on the same geotechnical information for stability calculations.

Findings:

The information provided in the March 17, 2003 submittal is inadequate to meet the minimum General Backfilling and Grading requirements of the regulations. Before approval, the Permittee must provide the Division with the following in accordance with:

R645-302-214.200, In the Backfilling and Grading section of the mining and reclamation plan, the Permittee must indicate that both Appendix 5-9 and Appendix 5-10 exist as reclamation options.

R645-301-553.130, The Permittee must conduct tests to determine the angle of repose of all unconsolidated materials that will be part of the reclaimed highwall slope area.

R645-301-541.400, The Permittee must either provide the Division charts of displacement versus shear stress that show a peak value. The Permittee may use another generally accepted method for determining the internal friction angle and the cohesive strength of the test material if desired.

R645-301-553, The Permittee must provide the Division with a rigorous testing plan that will show whether all unconsolidated materials will or will not meet the design parameters for the reclaimed highwall.

R645-301-542.200, The permittee must provide the Division with material specifications for the geogrid, the geosynthetic composite drain material and the geotextile filter fabric. The permittee must include discussions of the effective life of each of those materials as well as whether or not any of the designs stability requirements could be affected following the termination of each of the materials effective lives.

The information supplied does not meet the requirements of Reclamation Plan, Backfilling and Grading of Steep Slopes. Prior to approval, the Permittee must provide the following:

R645-301-553.130, Regardless of the reclamation scenario chosen (appendix 5-9 or appendix 5-10), the application should include the results of multiple tests of the composited backfill samples for Mohr-Coulomb stress criteria to verify the extreme values reported.

TOPSOIL AND SUBSOIL

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

Analysis:

Redistribution

Two reclamation scenarios (Appendix 5-9 and 5-10) have been presented in this application. Regardless of which reclamation scenario is employed, the same topsoil and backfill will be used. The chemical characteristics of the topsoil and backfill (subsoil) material were evaluated by Colorado Analytical laboratories, Inc., 240 South Main Street, Brighton, CO 80601 (303-659-2313) and are reported in Appendix A of Appendix 5-9. A composite sample of the backfill was found to have sandy loam texture (56% sand, 30% silt, 14% clay); pH 7.8; EC = 6.84; 19.2% CaCO3; 24.3 %Saturation; K factor of 0.32 and SAR of 8.2. A composite sample of the topsoil was found to have a loam texture (44% sand, 36% silt, 20% clay); pH 7.8; EC = 0.68; 3.3% CaCO3; 37.7% saturation; K factor of 0.38 and SAR of 0.8 (by Division calculations SAR = 0.74). Selenium and boron levels were within the acceptable range.

The following information pertains to the redistribution of substitute topsoil under the scenario proposed in Appendix 5-9:

- The rooting zone backfill will be placed in 1.5 ft. lifts three feet wide adjacent to the compacted backfill lifts as the slope is constructed. A 1.5 ft lift of topsoil will be laid down one foot wide adjacent to the backfill as the slope is constructed (Section 6.0, pg 21).
- Geogrid (Tensar BX1100) will be in the fill at 1.5 ft depth intervals to add strength to the topsoil and uncompacted fill layers (Section 6.0, pg 22).
- The slope will be roughened to a depth of 12 – 18 inches (Section 4.1, page 13) or as described by the Division's 2001 publication, The Practical Guide to Reclamation (Section 6.0, page 22).
- Boulders will be placed on the slope with an excavator (Section 6.0, pg 22).
- An application of slow release 6-3-1 Biosol fertilizer at 1500 lbs/ac (Section 4.2, pg 14).

The scenario described above (Appendix 5-9) will not likely be implemented as described for the following reasons:

(1) Pocking as described in Appendix 5.9 cannot be achieved due to the geogrid installations every 1.5 feet.
(2) Use of the geogrid every 1.5 feet in depth will limit the depth of the planting hole for the 5-6 ft trees described in Section 6.0 page 22.

The soil redistribution plan for the reclamation described in Appendix 5-10 will be the same as that described for other cut slopes on the site (Section II, App 5-10). This reclamation sequence is described in Appendix 5-5, Part II and on Map 5-12 of the approved Mining and Reclamation Plan (MRP). Key reclamation tasks are summarized in Section 3 and detailed in Section 4 as follows:

4a) Remove Surface Structures
4b) Remove Pad Cap Layer
4c) Remove Excess Pad Fill
4d) Remove Remaining Pad Fill; Backfill All Cut Slopes
4e) Reclaim Portal Highwall
4f) Reapply Topsoil to Backfilled Cut Slopes
4g) Re-expose and Revitalize the Left-in-Place Topsoil
4f) Re-establish the Original Rubbleland Surface

The approved MRP indicates in Appendix 5-5 Section 4e that backfilling and grading of the highwall will not take place until the excess fill has been removed. The Permittee should re-evaluate the potential for excess fill under the two reclamation scenarios and revise the plan accordingly in Appendix 5-5 Section 4e.

The MRP describes the importation of fill material from the gravel pit and replacement of the fill to the gravel pit at final reclamation (Appendix 2-5 and Addendums). Map 5-11 Construction Sequence, illustrates the different stages of construction for the West Ridge Mine site. Step 7 shows completion of the pad level by hauling in imported fill from offsite, commercial gravel borrow areas. Step 8 shows a final cap layer of road base material placed over the imported fill surface. Apparently, the imported fill was not needed, because the Permittee has recently stated that imported bedding material was used around the culvert only, with the rest of the fill generated from the cuts and a surface layer applied from the gravel pit (Division communication with Mr. Gary Gray and Mr. Dave Shaver on April 29, 2003).

Findings:

The information supplied does not meet the requirements of Reclamation Plan, Topsoil/Subsoil. Prior to approval, the Permittee must provide the following:

R645-301-242.120, Pocking and planting of trees as described in Appendix 5.9 will not likely be achieved due to the geogrid installation every 1.5 feet. A more realistic statement of pocking depth and tree planting should be described for Appendix 5.9.

R645-301-553, The Permittee should re-evaluate the potential for excess fill under the two reclamation scenarios and revise the plan accordingly in Appendix 5-5 Section 4e and Appendix 2-5.

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:

Hydrologic Reclamation Plan

Appendix 5-10 is incomplete at this time, as it fails to include designs for a relocated channel for the right fork of the "C" Canyon drainage. Appendix 5-10, if approved, would reclaim the portal highwall area at a thirty-two degree vertical angle slope. This would move the toe of the reclaimed area approximately forty feet to the northwest, requiring moving the right fork drainage the same amount. Thus, approximately five hundred feet of channel will have to be reconstructed.

According to the State Engineer's Office (Price, Utah), the need to obtain a stream alteration permit is based on the vegetation that has been established in the riparian area of the channel down stream of the proposed relocation. If the area contains grasses, willows, cattails, and other flora related to areas that generally receive abundant quantities of slow moving flow, a stream alteration application/approval would be required.

At present, the MRP classifies the "C" Canyon drainage as ephemeral (See West Ridge MRP, Volume 3, Chapter 7, page 7-5, Section 724.200, Surface Water Information, Paragraph 2). However, the drainage covers an area that is larger than one square mile and by definition is considered intermittent. The Permittee needs to provide a discussion/demonstration that indicates the drainage is truly ephemeral and does not require a stream alteration permit. This can be accomplished by discussing flow records, flora (as outlined above), and photos of the channel that currently exist in the MRP.

The Permittee occasionally discharges mine water into this drainage through a UPDES permitted discharge point. Other than that, the only time the channel generally flows is in response to a thunderstorm or snowmelt within the contributing watersheds.

As part of the required designs necessary to make Appendix 5-10 a complete plan, with a potential for approval, the Permittee should evaluate the need to apply for and/or receive a stream alteration permit from the Utah State Engineers Office.

Diversions: Perennial and Intermittent Streams

To make Appendix 5-10 a viable alternative for reclamation, additional design information and clarification is necessary. In Section II of Appendix 5-10, the text indicates the channel will be relocated approximately 40-feet to the northwest. A review of the Map 5-6B Cross Sections indicates that the widest location is 40-feet, while the average displacement is approximately 22-ft.

The following channel design information is needed: 1) a profile of the proposed channel illustrating the gradient of both the original and proposed channels; 2) flow and velocity calculations of the stream channel based on the watershed; 3) designs and calculations of the proposed channel demonstrating it will adequately maintain a 100-year / 6-hour storm event; and 4) using available information, provide the slope, width-to-depth ratio, channel material type, and other characteristics to classify the general channel geometry.

Using the latest stream relocation technology available, the Division would prefer that the Permittee refrain from designing a standard riprap channel. The Division recommends utilizing natural stream restoration techniques with drop structures, energy dissipaters, the combination of toe-rock and vegetation, tree revetments, and possibly matting (pyramat) to construct the channel and stream banks. Maps 5-13 and 5-13E (photos 33 – 37) provide photographic illustrations of how the stream channel existed pre-mining. The combination of channel measurements from Map 5-6B and the photographs indicate the original channel ranged from approximately 15 to 35-feet wide, in a very rocky, alluvial/colluvial environment. Reconstruction of this type of channel, given the native material should be relatively simple to construct. This type of design would also tie-in well with the experimental practice study area, as well as the rest of the channel reconstruction in the disturbed area.

Findings:

Information in the proposal is not adequate to meet the requirements of the Reclamation Plan – Hydrologic Information section of the regulations. Prior to final approval, the applicant must supply the following information in accordance with:

R645-301-742.211, Provide the requested channel design information to demonstrate there will be no additional contributions of suspended solids and sediment to stream-flow outside the permit area.

R645-301-742.312, -742.314, -742.321, -742.322, -742.323, -742.324, Per the above-cited discussion, provide maps, cross sections, calculations, and designs for the proposed reclamation channel.

Appendix 5-10 is deficient in that it does not address the requirement to determine the need to obtain a stream alteration permit from the State Engineer's Office. Prior to approval, the Permittee must act in accordance with the following:

R645-301-742.320, Appendix 5-10 does not address the requirements for the need to obtain a stream alteration permit from the Utah State Engineers office.

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:

General Requirements

The permittee proposes to reclaim the highwall area to a 40-degree slope angle. The undisturbed slope above the highwall has a 32-degree slope angle. The Permittee plans to:

- Apply a geotextile material for stabilization.
- Apply compacted backfill.
- Apply growth media of three feet of uncompacted back fill and one foot of topsoil.
- Arrange boulders with 1/100 square foot irregular spacing.
- Scatter rocks less than 6" diameter on the surface.
- Roughen and gouge the surface in a random pattern. The dimensions for the gouges are 12-18" deep x 2-4' wide. A backhoe will prepare most of the gouges, however, staff with hand shovels will prepare gouges in particularly difficult areas.
- Apply Biosol 6-3-1 slow release fertilizer at a rate of 1500 pounds per acre.
- Hydroseed with the mulch: See Table 5 for rate and seed mixture.
- Apply bonded fiber mulch applied at a rate of 3500 pounds per acre.
- Plant containerized woody plants at a rate of 2500 plants per acre or one plant every 4.27 foot.
- Plant containerized Douglas fir (5-6') at a rate of 145 trees per acre with 1/300 square foot irregular spacing.
- Use diverter logs for erosion control, if needed.

To allow for proper root growth, the soil surface of three feet of backfill and one foot of topsoil will not receive compaction. The Division's experience has shown that steep slopes require extreme roughening to provide sites for seed germination and growth and erosion control. The information presented provides adequate detail for the degree and amount of roughness.

Boulders, smaller rocks, and diverter logs may provide microsites for plant growth. The Permittee mentions diverter logs are optional, but if used, the logs will come from nearby Lodge Pole pines (pg. 16). The Permittee may want to consult with the Division prior to removal of logs. The Division will consult with related agencies to determine the best measures for the Permittee to take to disturb the smallest practicable area (see R645-301-331).

Biosol fertilizer slowly releases the nitrogen, phosphate, and potassium over a period of two years (Patrick Collins, personal communications 4-17-03). The Permittee should realize that the release of fertilizers might not occur during plant growth, which would result in the leaching of fertilizer, especially nitrogen. Furthermore, fertilizers may not be the most limiting plant growth factor. Plants grow in proportion to the most limiting factor, which for West Ridge may be water.

The Division has concern that the plants may not grow maximally or survive in the backfill. The soil chemistry for the backfill shows that the EC is 6.84 and the SAR is 8.2. These numbers are considered "fair" according to the Division's soil guidelines. The Permittee, however, must be aware that there is a chance of marginal plant growth especially for the containerized plants. The Division recommends that the Permittee apply one foot of topsoil over the backfill and plant a few containerized plants of each listed species near the warehouse. The warehouse pad is located on top of the same backfill as the three-foot of backfill planned for the reclamation project. Planting "test" plants may provide valuable information as to whether the containerized plants will survive the high salinity concentrations of the backfill.

The Division is skeptical about revegetating slopes this steep. The Permittee provides three reclamation examples of sites with similar angles of repose:

1. Mesa Verde: vegetation cover approaching background.
2. Cottonwood fan portal with vegetation cover approaching 50%.
3. Third example: limited comparative information provided.

If the highwall slope were reduced, the roughened growing surface would provide greater stability and may support more vegetation coverage. Reducing the slope, however, may affect the experimental practice. The Permittee will need to modify the MRP if the experimental practice is affected.

Findings:

Information provided in the application is considered adequate to meet the minimum Revegetation requirements of the regulations.

STABILIZATION OF SURFACE AREAS

Regulatory Reference: 30 CFR Sec. 817.95; R645-301-244.

Analysis:

The approved MRP utilizes boulders (Appendix 5-5, Section 4e) and scarification 6 – 12 inches (Section R645-301-542.200, page 5-49) and extreme gouging with dimensions approximately 24" x 36" x 18" deep (Section R645-301-341, page 3-11). These measures will remain unchanged with the implementation of Appendix 5-10.

Figure 5 of the Agapito Associates report Revision No. 4 in Appendix 5-9 illustrates the additional stability components required for the 40-degree reclaimed slope. They include a geosynthetic composite drain, rock toe drain, geotextile filter fabric, and geogrid reinforced slope. The surface boulders and surface roughening to a depth of 12 – 18 inches will also be employed (Section 4.1, page 13).

Figure 6 of Appendix 5-9 describes the following additional measures for stability:

- Boulders (1 per 100 sq ft) will be used to add additional surface roughening and erosion protection (Fig 6, Appendix 5-9).
- The mix described in Table 5 of the AAI report will be hydro-seeded (Section 4.2, pg15).
- The seeded slope will be mulched at a rate of 3500 lbs/ac with a bonded fiber matrix such as EcoAegis or SoilGuard (Section 4.2, pg 14).
- Diverter logs may be used parallel to the contour (Section 4.2, pg 16).
- Containerized shrub and 5-6 ft. trees will be hand planted (Section 6.0, pg 22).

Findings:

The information provided meets the requirements of the regulations for applying the best technology available to stabilize surface areas.

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

A review of the resubmitted Map 5-6B (Mine Site Cross Sections) and Map 1 and Map 2 of Appendix 5-10 raised the following discrepancies:

1) On Map 5-6B, the location of the existing bypass culvert is different on stations 26+00 through 28+00 from the currently approved Map 5-6B in the MRP. There is no explanation as to why this is so.
2) On Map 1, the legend does not identify what the red-dashed line or coordinates represent. Looking at Map 2 the line appears to represent the bypass culvert; however, neither the lines nor map coordinates (Map 5-6) match either the approved Map 5-6B or the newly submitted Map 5-6B. Also on Map 1, the existing channel location does not correspond with the channel located on Map 5-6B.

Findings:

Information in the proposal is not adequate to meet the requirements of the Reclamation Plan – Maps, Plans, and Cross Sections of Reclamation Operations section of the regulations. Prior to final approval, the applicant must supply the following information in accordance with:

R645-301.742.300, Provide the above-cited corrections so the Maps 5-6B, and Maps 1 and 2 from Appendix 5-10 consistently reflect the same information.

REQUIREMENTS FOR PERMITS FOR SPECIAL CATEGORIES OF MINING

EXPERIMENTAL PRACTICES MINING

Regulatory Reference: 30 CFR Sec. 785.13; R645-302-210, -302-211, -302-212, -302-213, -302-214, -302-215, -302-216, -302-217, -302-218.

Analysis:

Appendix 2-6, West Ridge Mine Experimental Practice In-Place Topsoil Protection, details protecting topsoil resources in-place for (1) buried topsoil areas, and (2) buried RO/RL (rock outcrop/rubbleland) Travessilla Complex soil area. These two combined areas account for 16.75 acres of the total 29 acres of disturbed area.

(1) Buried Topsoil Areas

The West Ridge Resources topsoil protection protects in-place soil with a layer of geotextile fabric. The geotextile fabric provides a protective barrier between the existing soils and the imported fill materials used to construct the mine pads. By utilizing this procedure, soils were not only preserved in-place, but the existing stream channel geomorphology and original ground surface configuration were also preserved. Approximately 4.75 acres of the proposed 29-acre disturbed area were preserved using the geotextile fabric.

(2) Buried RO/RL Travessilla Complex Areas

The buried RO/RL Travessilla Complex mapping was also included in the Experimental Practices. As stated in the Order-III soil survey, the RO/RL Travessilla Complex unit contains 35% soils by volume (25% Travessilla plus 10% other soils) that supports a significant vegetation community. As stated in the plan, the RO/RL areas were not covered with geotextile, but instead, fill was placed directly over the existing ground surface which was marked with brightly colored marker flagging strips placed on 8-foot centers for the purpose of identifying the original surface during reclamation and excavation of the pad fills. Marker strips were used on approximately 12 of the 29 acres of the disturbed area.

Implementation of the 40-degree slope described in Appendix 5-9 would not affect the Experimental Practice, as the driving factor in the design was keeping the toe of the slope at the lower bench in to protect the In-Place Topsoil.

The Permittee was asked (Technical Analyses dated April 12 and November 26, 2002) to demonstrate to the Division that restoration of the highwall to a 40-degree slope and retention of the experimental practice would result in a site that was at least as environmentally sound as the alternative of eliminating a portion of the experimental practice and reducing the slope of the backfill.

A reclamation design for a 31.2 to 33.6 degree slope has been presented in Appendix 5-10. This slope would affect the experimental practice between cross sections 24+00 and 27+00 shown on Map 5-9. The area of buried topsoil to be affected would be 400 ft x 80 ft or approximately 0.74 acres. By Division calculations this represents 15.5% of the buried topsoil portion of the experimental practice and 0.04% of the entire experimental practice area that includes both buried salvageable topsoil and buried Rockoutcrop/Rubbleland Travessilla complex. There would be no additional disturbance to the south-facing slope of the right fork of C Canyon according to the cross sections shown in Map 2 of Appendix 10.

The Division is of the opinion that the successful revegetation of the site takes precedence over the experimental practice. If necessary to achieve a stable and revegetated site, the experimental practice area could be reduced in size. The significance of the alteration to the experimental practice was determined based upon the affect to the in-place topsoil, but no consideration was given to the affect on the buried RO/RL Travesilla Complex areas of the experimental practice. These areas comprise 12 acres, but are not indicated on Map 2-2.

Findings:

The Division is required to make a Finding whether the continued existence of the experimental practice is environmentally sound. The information provided is not adequate to make that finding and further information has been requested under the hydrology section of this Technical Analysis. In addition, prior to approval, the Permittee must provide the following in accordance with:

R645-302-218, (1) The acreage of Buried RO/RL Travessilla Complex Areas to be affected by the implementation of Appendix 5-10 should be indicated such that the Division may determine the significance of the alteration to the experimental practice.