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

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July 20, 1995

Paige B. Beville, Manager
Environmental, Health & Safety
Mountain Coal Company
ARCO Coal Company
555 17th Street, Room 2170
Denver, Colorado 80202

Re: Approval of Reclamation Plans, Mountain Coal Company, Gordon Creek 2, 7, & 8 Mines, ACT/007/016, Folder #3, Carbon County, Utah

Dear Ms. Beville:

The Division has completed the Technical Analysis and Findings for your reclamation plans for the Gordon Creek 2, 7, & 8 Mines. A copy is enclosed for your records. As you are aware this has been a lengthy process which has included involvement of technical staff from your office, from OSM, and from the Division. We have concluded that the plans you have proposed will satisfy the regulatory requirements and are acceptable for use in reclaiming this area. There is one noted deficiency that still must be addressed. Mountain Coal must provide a copy of the comments made by the legal owner of record of the reclaimed land surface concerning the proposed postmining land use. We have no record of any comments from Robert & Linda Jewkes. Once these comments have been received your plans can be considered approved with the following two conditions.

1) During the growing season, a determination will need to be made as to whether or not a pre-disturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

2) Backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

We appreciate the work you have done to finalize these reclamation plans. We encourage you to proceed with the reclamation of this mine site as quickly as possible. Please don't hesitate to call if you have any questions.

Sincerely,

Lowell P. Braxton
Associate Director - Mining

Enclosure
cc: D. Haddock
P. Grubaugh-Littig
J. Helfrich
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TECHNICAL ANALYSIS AND FINDINGS
RECLAMATION PLAN

MOUNTAIN COAL COMPANY
GORDON CREEK #2, #7, #8 MINES
ACT/007/016

July 20, 1995

SUMMARY OF PERMIT CONDITIONS

As determined in the analysis and findings of this Technical Analysis, approval of the plan is subject to the following Permit Conditions. The applicant is subject to compliance with the following Permit Conditions and must commit to comply with the requirements of these conditions as referenced in the approved Permit.

Accordingly, as a condition of this permit, the permittee must do the following, in accordance with the requirements of:

R645-301-412.200

The permittee must provide a copy of the comments concerning the proposed postmining land use by the legal or equitable owner of record (Robert F. & Linda M. Jewkes) of the surface of the land following reclamation. In lieu of comments, the permittee may provide evidence that the surface land owner has been given ample opportunity to comment.

R645-301-321.100

During the growing season, a determination will need to be made as to whether or not a predisturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

R645-301-553

Backfilling and Grading, backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

RECLAMATION PLAN

GENERAL REQUIREMENTS

Regulatory Reference: PL 95-87 Sec. 515 and 516; 30 CFR Sec. 784.13, 784.14, 784.15, 784.16, 784.17, 784.18, 784.19, 784.20, 784.21, 784.22, 784.23, 784.24, 784.25, 784.26; R645-301-231, -301-233, -301-322, -301-323, -301-331, -301-333, -301-341, -301-342, -301-411, -301-412, -301-422, -301-512, -301-513, -301-521, -301-522, -301-525, -301-526, -301-527, -301-528, -301-529, -301-531, -301-533, -301-534, -301-536, -301-537, -301-542, -301-623, -301-624, -301-625, -301-626, -301-631, -301-632, -301-731, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-732, -301-733, -301-746, -301-764, -301-830.

Analysis:

See individual sections.

POSTMINING LAND USES

Regulatory Reference: R645-301-412, 301-413

Analysis:

Coal mining has been a land use in this area since the early 1900s. Some of the larger mines to be opened in the area were Sweets in 1925 and Consumers and National in 1928 (page 5-19). The Swisher No. 1 Mine lies immediately adjacent to the disturbed area and was reclaimed by the Utah Abandoned Mine Lands program.

The stated postmining land use is the same as the premining land use of wildlife habitat (page 3-8) and the intent of the reclamation designs is to restore the site to a condition compatible with the premining land use. Private landowners presently manage the lands surrounding the mine site for limited livestock forage. There are no range improvements in the area (page 4-53).

Appendix 3-10 contains a copy of a letter from Mountain Coal Company to the landowners, informing them of the anticipated postmining land use and proposed

reclamation. Two of the landowners, James and Mark Jacob, signed and returned the letter, thus acknowledging and agreeing to the land use. However, Robert F. and Linda M. Jewkes, who are the landowners of the #7 and #8 Mine areas, do not want the site returned to the premining land use and approximate original contour. The Jewkeses want the road to remain.

The Sweets Canyon Water Fill Area, also known as "Sweets Pond," will not be reclaimed. The pond is located on private land and the land owner has requested that the pond remain for private use (Page 3-32 and Appendix 3-5). The landowner has committed to leave the fence surrounding the pond in place in order to keep livestock out of the pond and riparian area. The pond constitutes a utility improvement for the area, supports a fish population, and provides for wildlife habitat.

Findings:

Comments regarding the postmining land use have not been received from all landowners. Accordingly the following permit condition is required:

R645-301-412.200

The permittee must provide a copy of the comments concerning the proposed postmining land use by the legal or equitable owner of record (Robert F. & Linda M. Jewkes) of the surface of the land following reclamation. In lieu of comments, the permittee may provide evidence that the surface land owner has been given ample opportunity to comment.

PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

Regulatory Reference: R645-301-333, 301-342, 301-358

Analysis:

The permittee will employ the following measures to enhance the suitability of the site for wildlife habitat:

1. A small native rock holding basin will be constructed for wildlife watering near the No. 8 Mine seep.

2. A fence will prevent livestock grazing of the revegetated area for the entire bond liability period.

3. The seeps in the No. 7 area will flow across the surface of the backfill and will thus be accessible to wildlife.

4. The plant species to be used in revegetation have been selected for their value as wildlife forage and cover.

5. Drainage and seep areas will be enhanced by the addition of both seeded and transplanted riparian species.

6. Sweets Pond will remain for the intended postmining land use of wildlife habitat. The pond will be fenced to exclude livestock. The pond currently supports fish and occasional beaver.

Findings

The plan fulfills the requirements of this section.

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 No. 2 area and the Old Fan Portal area were both built prior to SMCRA and thus do not come under the requirement of restoration to approximate original contour (AOC) *per se*. Only the No. 7 and No. 8 areas come under the requirements of restoration to approximate original contour and both of these areas will be restored to approximate original contour, as required by R645-301-553.110. For a more general discussion, see also **Backfilling and Grading** below.

<u>No. 2 Area</u>

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in August of 1992. Based on samples taken from the site, the #2 Mine area estimates soils values at 120 pcf dry density, 5.75 psi (828 psf) cohesion, and an internal friction angle of 23.8 degrees. Due to the steep and narrow canyon configuration in which the surface facilities exist, slope stability is a critical factor in determination of the extent to which highwalls and cutslopes can be backfilled. The #2 Mine

area was evaluated for factors of safety of 1.3 and 1.5. The minimum requirements for long-term stability as required under the regulations dictate a minimum factor of safety of 1.3. Slope charts, under saturated conditions, were used in the proposal to determine maximum embankment heights for varying slope angles under saturated conditions. For this area, Agapito determined the following slope geometry parameters for a stability safety factor of 1.3 (see page 4 of Appendix 3-8).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	933	250
20	343	125
25	197	92
30	126	73
35	90	63

The natural channels that must be reestablished through the No. 2 area limit the width of the base of the fill. Therefore, the slope of 20° and base width of 343 feet were used in the design of the fill. These geometric parameters allow for a maximum slope height of approximately 125 feet, which will at the same time allow for the backfilling of most of the cut slopes *and* the attainment of the required stability (page 3-35).

The No. 2 area was disturbed prior to SMCRA. For such a site, both the R645- rules and the Federal regulations require *both* that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable. The designed backfills of the highwalls and cut slopes of the No. 2 area fulfill both of these requirements. Given the amount of material available and the space constraints imposed by the reestablished natural channels, it would not be possible to completely backfill the cut slopes. The final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration and would thus require more material than the original quantity. The designed backfills use all the reasonably available spoil that is necessary to achieve a stable configuration *and* they eliminate as much of the cut slope as possible, even though the upper part of the cut slope will not be eliminated.

No. 7 Area

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The #7 Mine area samples yielded 120 pcf dry density, 3.5 psi (504 psf) cohesion, and an internal friction angle of 21 degrees. As indicated in the analysis, the #7 Mine area was evaluated for factors of safety of 1.25 and 1.5. For this area, Agapito determined the following slope geometry parameters for a stability safety factor of 1.5 (see page 3 of Appendix 3-7).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	291	78
20	124	45
25	77	36
30	50	29
35	36	25

A safety factor of 1.5, rather than 1.3, was used for this area for a couple of reasons. First, the area contains two seeps and a small fault and the highwall below the MSHA safety bench has a history of natural instability. And since the planned earthwork will make it impossible to reach and repair this site in the event that it requires maintenance, the slightly higher safety factor will provide a greater margin of safety. Second, the MSHA safety bench in this area, which marks the upper extent of the highwall, is approximately 40 feet high and thus forms a good place into which to key the crest of the fill. The planned backfill will be approximately 45 feet high and will thus cover the safety bench while leaving the upper 60 feet of the faceup as it is. Backfilling the highwall to attain the lower safety factor of 1.3 would result in the elimination of only about 19 additional feet of the cutslope (see page 3 of Appendix 3-7). The natural channel that must be reestablished through this area limits the width of the base of the fill. So again, as in the No. 2 area, the slope of 20° was used in the design of the fill. This allows a maximum base width of 124 feet and a maximum slope height of 45 feet (page 3-39).

Given the amount of material available and the space constraint imposed by the reestablished natural channel, it would not be possible to completely backfill the portal faceup above the highwall and still achieve a stable configuration. As in the No. 2 area, the final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration, would require more material than the original quantity, and would interfere with the

reestablished natural channel. The designed backfill eliminates as much of the cut slope above the highwall as possible, as required by R645-301-553.110, and at the same time achieves a stable configuration, as required by R645-301-553.130. The designed backfill is, in fact, the only possible configuration that will fulfill the requirements of these two regulations in the No. 7 area.

R645-301-553.100 requires that disturbed areas be backfilled and grade to 1) achieve the approximate original contour, 2) eliminate all highwalls, spoil piles, and depressions, 3) achieve a stable postmining slope which has a stability safety factor of at least 1.3, 4) minimize erosion and water pollution both on and off the site, and 5) support the postmining land use. Furthermore, R645-100-200 defines approximate original contour as "that [final] surface configuration achieved by backfilling and grading of the mined areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain with all highwalls, spoil piles, and coal refuse piles having a design approved under the R645- rules and prepared for abandonment." Thus, the concept of approximate original contour involves not only the original geometry of an area, but the stability, hydrology, and suitability to the postmining land use of that area as well. The planned final configuration of the No. 7 area meets all of the parameters of approximate original contour, as the following discussion will demonstrate.

The stability of the final surface configuration has already been discussed at some length. Indeed, it has been shown that the planned final surface configuration is really the only one possible given the space constraints imposed by the natural drainage channel, the amount of fill material available, and the stability characteristics of that material, including density, cohesion, and internal friction angle (page 3-39).

R645-301-553.140 requires that the postmining configuration minimize water pollution both on and off the site. The planned configuration will best fulfill this requirement for several reasons. First, the stable configuration achieved using the stability safety factor of 1.5 will prevent slides and minimize erosion. Second, the designed slope of approximately 2.7h:1v will best promote successful revegetation by providing a stable seed bed. Third, the lower fill height will allow for the channeling of water from a seep above the fill over the surface of the fill, which will prevent the seep from saturating and destabilizing the fill. And fourth, the planned configuration is the only possible configuration which will meet all the requirements of approximate original contour without interfering with the reestablishment of the natural drainage channel (pages 3-39 to 3-41).

The planned configuration will also closely resemble the general surface configuration that existed prior to mining and will mimic the visual attributes of the surrounding area. The surrounding area is steep and contains many cliffs and ledges. The remaining 60 feet of

faceup above the fill will resemble these cliffs and ledges and the fill at its base will closely resemble the talus slopes which underlie those cliffs and ledges (page 3-40).

The planned configuration will be entirely compatible with the postmining land use of grazing and wildlife habitat. Grazing area and wildlife habitat will merely be displaced, but not eliminated, by the remaining faceup. And the emphasis given in designing the fill to stability, good vegetation, and preservation of good water quality will enhance the value of this area as livestock land and wildlife habitat (page 3-41).

No. 8 Area

This area, which lies opposite the No. 7 area and on a much gentler slope, will be completely backfilled and restored to approximate original contour (page 3-42).

Old Fan Portal Area

This area contains a partially reclaimed highwall and cut slope. The area was abandoned in 1984 and is, therefore, subject to the reclamation requirements of both SMCRA and the R645- rules.

The same stability and slope geometry parameters that were used in the reclamation design of the No. 2 area were used to design the reclaimed slopes in this area. As with the No. 2 Area, these slope parameters achieve a factor of safety for the reclaimed slopes of at least 1.3 (see page 4 of Appendix 3-8).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	933	250
20	343	125
25	197	92
30	126	73
35	90	63

For such a site, both the R645- rules and the Federal regulations require that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable.

Again, as with the No. 2 area, the Old Fan Portal area was initially disturbed prior to SMCRA. For such a site, both the R645- rules and the Federal regulations require *both* that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable. The designed backfills of the highwalls and cut slopes of the Old Fan Portal area fulfill both of these requirements. Given the amount of material available and the space constraints imposed by the presence of the county road, it would not be possible to completely backfill the cut slopes. The final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration and would thus require more material than the original quantity. Such a fill would also extend for some distance down slope from the present fill toe and would cover the county road and interfere with the reestablished main channel. The designed backfills use all the reasonably available spoil that is necessary to achieve a stable configuration *and* they eliminate as much of the cut slope as possible, even though the upper part of the cut slope between cross sections #10 and #11 will not be eliminated (pages 3-36 to 3-37).

Public Comments and Comments from Other Agencies

On May 15, 1995, the Division received comments regarding the regrading plan in a letter from the Western Regional Coordinating Center of the Office of Surface Mining. These comments were in the form of an analysis of the regrading plan and followed a brief site visit made by OSM representative Gene Hay in April of 1995.

The OSM analysis concentrated particularly on the restoration of the site to approximate original contour (AOC). The analysis used the data provided by the permittee, but made different assumptions regarding the conditions of the fill material. The analysis concluded that the highwalls and cutslopes at this site could be completely backfilled with no risk of slope instability using material available on the site. The Division made a full assessment of the analysis, but still found the plan for incomplete elimination of the highwalls and cutslopes to be the best for this site.

The OSM analysis appears to be based on 2 overlying ideas. The first is that it is highly unlikely that backfill material at this site will become saturated with water and that, therefore, backfill design should be based on an assumption of less-than-full saturation. The second is that there is a large quantity of surplus spoil available at this site for backfilling.

Regarding the first, the OSM analysis assumed a fill saturation level of ⅓ the fill height, as opposed to the assumption of total saturation made by the permittee. The OSM letter stated: "Due to the amount of time moisture remains in the [No. 7] area, it is a more realistic design standard to assume that only the bottom one third of the fill material will be

saturated." The OSM letter did not state the provenance of the ⅓ figure, but even so, the Division is convinced that the assumption of total saturation is much more realistic for this area, particularly as a worst-case condition. The rock in this area is fractured and thus provides numerous routes by which water can saturate the fill from behind. In addition, the fill will be placed and compacted against a rock face and the rock/fill interface will also provide a route whereby water can saturate the fill from behind. This problem is compounded by the fact that the rock face provides an impermeable or partly permeable water barrier and can thus allow the buildup of hydrostatic pressure behind the fill. The Division has observed the phenomenon of fill saturation by way of the rock/fill interface, with the resulting lateral displacement of saturated fill material, at several reclaimed sites in this area, even where the fill and the parent material are similar. The potential for saturation of the fill is high during the Spring thaw and is especially high in years of high snowfall or during periods of unusually heavy rain.

The necessity of long-term stability dictates that any fill in this area be designed assuming events and conditions which might be unusual, but nevertheless likely, over a long period of time and which might, therefore, jeopardize the stability of the fill. To require, on the basis of an assumption of less-than-complete saturation, that the highwalls and cutslopes at this site be completely backfilled, would deprive the backfill designs of a prudent and necessary cautiousness. All of these considerations are discussed in a May 22, 1995 letter which the permittee's consultant, Agapito Associates, Inc. wrote, at the permittee's request, to further explain the assumption of full fill saturation used in the stability analysis. Agapito's reasoning, as expressed in this letter, reflects the Division's reasoning in approving the stability analysis of the fills based on the assumption of full saturation.

In light of all this, the Division agrees with the OSM that the factor of safety for the slope design should be reduced to 1.3 for the #7 Mine area, especially in regard to saturated slopes. Typically, engineering practices allow for a long term static factor of safety of 1.3 under normal conditions and a factor of safety of 1.1 for saturated conditions. However, regulatory requirements do not allow for factors of safety of less than 1.3. As further explained below, the Division also considers slope evaluation under saturated conditions as a valid precaution in design of these slopes for long-term stability.

Through modeling and analysis, it was found by the Division that saturated conditions dramatically affect the slope angle and height allowable in comparison to unsaturated conditions where cohesion can be developed. OSM analysis varied the extent to which the fill areas were saturated and theorized that a significant change in the slope could be obtained under certain circumstances. Under certain conditions, the Division agrees that such slopes could be achieved. However, modeling and analysis also indicated that only small changes in the phreatic line (saturation elevation and gradient) would drastically affect these

assumptions. The conjecture made by OSM as to where saturation occurs within these fills cannot be reasonably assured on a long-term basis. In the event that saturation occurs in and through a critical failure surface, factors of safety were found to drop from 1.3 under dry conditions to less than 1 (failure) under saturation.

As an example of the problems associated with the saturation level, a cross section taken from the plan and indicated on the drawings as Section 3 was used to show how saturation can affect slope stability. The soil parameters used in the analysis are taken from the plan and are shown in the sample data labeled as Gordon Creek #7 Portal Area, Saturation limited to top of MSHA bench. This example shows a slope from the top of the cutslope above the portal area projected at the least slope possible, to where it encroaches on the stream channel. The slope shown is a approximately 2:1 slope. Dry, the embankment exceeds a 1.3 FS. The graphic section provided with the example, with a phreatic line projecting from the MSHA bench to the toe of the fill indicates a FS of 1.2. A second graphic, with the slope fully saturated, indicates a FS of .69, resulting in slope failure. Refer to data and figures found in Appendix I to the this technical analysis.

While technically feasible, the use of underdrains, and rock buttressing of the slopes could be utilized to increase the slope angle of these fills, such practices are usually reserved for critical or high-risk construction sites. Extensive engineering and design requirements are necessary to build such structures and costs associated with construction are very high. Rock and underdrain material needed to construct such features would have to be brought in or developed elsewhere within the permitted area, thus further increasing the disturbed area. Such structures also require some degree of monitoring and maintenance in order to assure their proper function. Due to the remoteness of the site and the low hazards associated with the area, underdrains and rock toe buttresses of these slope is not warranted.

The Division agrees that due to varying climate and soils conditions within the Gordon Creek Area, that long-term static factors of safety should be evaluated under saturated conditions. Inaccessibility of the site following reclamation and the inability to maintain the site with major following revegetation warrant a conservative approach in stability design.

Terracing, benching and surface diversions are indicated in the rules and also mentioned by OSM as possible alternatives to alleviate problems with slope stability and saturation of fills. Known seeps within the fill areas are identified in the plan and have been developed in a manner that will endeavor to bring and keep these seep areas on the surface of the fills to reduce saturation. Benching and terracing of the slopes is not proposed in the plan. Because of the tight constraints within the canyon, development of benches in the fills would increase the lateral or base requirements for the fills in order to effectively decrease slopes and increase stability. Diversions along the tops of the slopes are considered

impractical for several reasons. Because of the steep natural slopes above the fill areas, construction of diversion would further increase the disturbed areas and potentially decrease the stability of the natural slopes above the disturbed areas. Placement of diversions in the fill at the top of the slopes is also considered impractical due to the steepness of these backfilled areas. Differential settling between the fill and the adjacent natural materials can often cause cracks or voids in the fill material at the interface which if diversions were to be place in these areas could inadvertently divert water directly into and behind the filled areas. These diversions as well as diversions associated with the use of terraces also would require a higher degree of maintenance on the site. Diversions, benches and terraces, although allowed in the regulations, are considered impractical based on site conditions.

These limitations do however restrict the amount of backfill material that can be placed along some of the cutslopes and above the highwalls within the mine site. In addition to the analysis performed for the fill areas, the cutslopes and cutslope areas above the highwalls were also evaluated by the operator for stability. These areas were found to have significantly higher factors of safety than the 1.3 minimum regulatory requirement. These high factors of safety are attributable to the high amount of bedrock in these cutslopes.

Although complete elimination of highwalls and cutslopes by backfilling those areas is the preferred alternative during reclamation, such practices cannot be achieved throughout the Gordon Creek Mine site due to factor of safety limitations, soils conditions and the geometry of the cutslopes in relationship to the natural slopes above the cuts and the establishment of permanent drainage channels below the cutslopes.

Regarding the second idea upon which the OSM analysis is based--that there is a large surplus of spoil available for backfilling the cutslopes and highwalls--this is simply not true and the OSM analysis acknowledges that fact. There is indeed, as the OSM analysis states, a large quantity of spoil in the original stream channel both adjacent to the No. 7 area and below sediment pond #7A. But all of this material came from the construction of the No. 2, No. 7, No. 8, and Old Fan Portal faceups. None has been hauled in or added as a result of mining. If all of this material were placed back in the cuts and compacted perfectly (speaking as if this were possible), without regard to stability, it would just fill the cuts and restore the area to its original configuration. Mine development wastes and spoils resulting from underground mining operations generally result in volumes of materials greater than the volumes originally excavated during mining operations. Use of all of these materials in backfilling and grading to achieve AOC is more desirable than the development of additional disturbed areas above or adjacent to highwalls for disposal. No historic maps of sufficient detail are available to show the pre-mining surface configuration for the entire mine site. Consequently, a detailed accounting of the location and extent of these materials is not available for evaluation.

OSM considers in their analysis that additional spoil is (or should be) reasonably available within the Gordon Creek Mine site. The Division agrees that, due to swell factors resultant from excavation of the mine facilities and that none of the materials excavated during mine development were removed from the area, that the volume of material currently placed as fill within the mine facilities is greater that the volume of the cuts that were concurrently developed during mine development. However, due to the limitations dictated by the factor of safety and site geometry, such fill material cannot effectively be used to eliminate all cut areas and cutslopes. Further discussion of this subject is found under the Backfilling and Grading Section of this TA.

The proposal put forth by the OSM analysis is to completely backfill the cutslopes and highwalls, which would require huge quantities of surplus spoil. Page 1 of the OSM analysis states: ". . . . the amount of spoil needed to eliminate the [No. 2] highwall will increase the fill volume for Portal No. 2 by about 64% (from 75,378 to 123,620 cubic yards)." Then page 5 states: "At the most, the combination [of the permittee's plan and the OSM proposal for the No. 7 area] will require the company to move an additional 24,930 compacted cubic yards." And then, having established that the OSM proposal would require large quantities of additional spoil, page 4 of the analysis states: "If [the spoil material beneath and below the 7A pond is] not needed to reclaim the No. 2 portal, it could be used to backfill the No. 7 portal." The last of these 3 comments illustrates that, even according to OSM's own analysis, there is no surfeit of fill material with which to completely backfill the cutslopes and highwalls. The OSM proposal would require all the spoil available plus a great deal more.

The additional quantities of spoil which would be needed to implement the OSM proposal are enormous. The additional 64% needed in the No. 2 area would constitute an increase of 48,242 cubic yards. The additional quantity of 24,930 cubic yards which the OSM proposal would require for the No. 7 area is half again larger than the present total for the No. 7 and No. 8 areas combined. This site is located in a narrow canyon with steep walls on both sides and an intermittent stream channel in the bottom. The additional fill material required by the OSM analysis simply isn't there.

Findings:

The plan fulfills the requirements of this section.

The Division's goal in reclaiming this site is the same as OSM's: to formulate a plan for restoring the site to AOC which both complies with the applicable Federal and state regulations and is also stable and environmentally sound over the long term. In assessing the proposed reclamation plan, the Division has worked with the permittee and has been sensible of OSM's concerns, as expressed in its May 15 letter to the Division. The Division

maintains that the plan for incomplete backfilling of the cutslopes and highwalls is the best plan for this site on all counts.

First, the highwall backfills, as designed, will be stable over the long term. This long-term stability is the result of a great deal of caution having been built into the plan. The assumption of full saturation in the stability analyses and the safety factor of 1.5 used in the No. 7 area are part of this caution. While this caution may seem excessive, it is sound in the context of a worst-case design philosophy and is thus certainly sound in designing for long-term stability. The cutslopes in the No. 2, the Old Fan Portal areas, and above the No. 7 highwall will not be completely eliminated, but given the limited quantity of spoil material and the space limitations of the canyon, their complete elimination is not possible in any event. And changing the saturation assumption in order to increase the fill height would only serve to remove a prudent caution from the plan and would gain only a few additional feet on the respective cutslope and highwalls. The OSM analysis suggests that the backfill material be terraced or that diversions be cut into its face to break up the long continuous slopes and thus prevent saturation of the fill and enhance its surface and mass stability. But diversions require maintenance and are thus not suited to long-term reclamation and they are a liability to surface stability as well. And there is neither space nor spoil enough for actual terraces.

Second, the stability of the backfills will make for quick and effective revegetation. This revegetation, of course, will enhance the surface stability of the fills and prevent damage from erosion. The long continuous slopes proposed by the OSM analysis would increase the risk of erosion damage and surface instability and would thus not be conducive to revegetation. Again, while higher and steeper fill slopes would eliminate more of the highwalls and cutslopes, their deleterious effect on revegetation would negate whatever benefit might be gained from the elimination of a very few more feet of the highwalls and cutslope.

Third, and related to the second, the stability of the backfills due to the lesser slopes will result in a reduced sediment production potential for the entire site. Erosion damage and sediment production will be decreased and the resulting contribution of sediment to surface waters off the site will be decreased. And again, while higher and steeper slopes would eliminate more of the highwalls and cutslopes, their increased potential for erosion and sediment production would negate any benefit which might result from the very small additional highwall and cutslope reduction.

And finally, the remaining portions of the No. 2 and the No. 7 cutslope will be similar in structural composition to the preexisting cliffs in the surrounding area and will be compatible with the visual attributes of the area. The and cutslope remnants are composed of the same rock which forms natural cliffs and outcrops in many of the canyons in the Gordon Creek area and are thus identical in structural composition to those natural features. And the

existence of these natural cliffs and outcrops elsewhere in the surrounding area assures that the cutslope remnants will blend into the surrounding topography and be visually compatible with the scenery of the surrounding area.

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:

The first reclamation operation following the final closure of the mining operation was the sealing of the portals. The No. 2 mine was sealed permanently in October of 1985 and the No. 7 and 8 mines were sealed in December of 1990. Each portal was first sealed by placing a block seal 25 to 50 feet inby the portal. The portal structure was then removed and the area outby the seal was completely backfilled to prevent access to the seal and to minimize roof breaking. Exposed coal seams in the portal areas were also covered.

The 2, 7 & 8 mines are considered dry mines, i.e., the mines themselves do not produce enough water to supply the needs of the mining operation. Most of the workings are downdip from the portals. The only area updip from the portal is the area northwest of the No. 2 west portals through the 70-acre lease modification. No water was encountered during the mining of this area. Because of the dryness of the mines and the locations of the portals relative to the dip of the seam, the seals will not impound water and so no hydrologic seals were used.

Shortly after final cessation of operations and portal sealing, all surface structures were removed. Metal, wood, pipe, and other such structural material was hauled away and either sold for scrap or disposed of in a municipal landfill. All concrete, including foundations, floors, and structural supports, was broken up and buried at the toe of the portal faceups.

Reclamation of the minesite will occur in two phases. During the first phase, the entire site will be reclaimed and the natural drainage channels reestablished and reconfigured from the No. 8 area down to the lower end of the No. 2 mine area. The present sediment ponds will be eliminated and a new 3-cell sediment pond will be constructed at the lower end of the site adjacent to the present main entrance gate. The new 3-cell pond will receive runoff from the entire site. All disturbed *and* undisturbed drainage will flow into the pond.

Once vegetation is reestablished and the sediment contribution to the pond is within acceptable limits, the second phase of the reclamation process will be carried out. The 3-cell sediment pond will first be removed and the area reclaimed. The reclaimed main drainage channel will then be extended to intersect the undisturbed channel below the site.

Sweets Pond will not be reclaimed. It is located on private land and the landowner has requested that the pond be left in place for private use. The permittee will turn the pond over to the landowner when reclamation is complete. The pond is designed for long-term stability and is a utility improvement as well as a source of water for wildlife.

All cutslopes along pad and road areas will be reduced as much as possible while maintaining the required minimum stability safety factor of 1.3. This will be accomplished by recovering downslope material with a backhoe and placing it against the cutslope faces with a bulldozer. The fill material will be compacted with a sheepsfoot compactor to improve stability. Temporary erosion controls, such as straw bales and silt fences, will be placed below these backfilled areas to prevent sediment from leaving the site and entering the natural drainage. The Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. determined the limiting dimensions of the fills in the respective areas by a detailed stability analysis. This analysis is discussed and its results are shown in the discussion which follows.

Since different parts of the site were originally disturbed at different times and under different regulatory requirements, the site has been divided, for the purposes of the backfilling and grading plan, into 4 different areas: the No. 2 area, the No. 7 area, the No. 8 area, and the Old Fan Portal area.

No. 2 Area

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The slope geometry parameters for this area were discussed in the Approximate Original Contour section above.

In 1993, the permittee performed a stability investigation of the cut slope above the portals in the No. 7 area, which is very similar to, but higher than, the cut slopes in the No. 2 area. This stability investigation, the results of which are found in Appendix 3-1, revealed that the No. 7 cut slope has a stability safety factor of 2.62. Since the No. 2 cut slopes are lower than those in the No. 7 area, and since the No. 2 cut slopes will be at least partially backfilled, which will further increase their stability, then the No. 2 cut slopes can be expected to achieve a stability safety factor *at least* equal to the value 2.62 achieved by the

No. 7 cut slope. And this, combined with the fact that the No. 2 cut slopes have been stable throughout the more than 30 years of their existence, demonstrates that the No 2 cut slope remnants fulfill the stability requirement of R645-301-553.523.

There are two seeps which daylight in the cutslope of the No. 2 area: one near the lower end of the No. 7 road and one above the office/shop area. Water from these seeps will flow over the surface of the fill in rip rap channels.

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the No. 2 area which are shown on Plates 3-8B and 3-8C depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7A and are of insufficient resolution to adequately show the extent to which the cut slopes of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 4 surveyed cross sections of the No. 2 area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 4 cross sections are designated #6, #7, #8, and #9. Their locations are shown on Plate 3-7A while the cross sections themselves are found on Plate 3-14. These additional cross sections are adequate to further define the present and final surface configuration of the No. 2 area.

No. 7 Area

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The slope geometry parameters for this area were discussed in the Approximate Original Contour section above.

Natural conditions within this canyon would typically place slopes at angles with factors of safety at or near a FS of 1 to 1.1. Development of backfilled slopes to a factor of safety of 1.3 requires a reduction in the natural slopes which existed prior to mining and a significantly greater amount of material than would be available from mine development waste and fill. If such fill materials were readily available, it would have to be placed within the bottom of the canyon and would elevate the drainage areas, reducing the gradient in these fill areas, and over-steepening the gradient down stream of the fills. Such practices would not be conducive to re-establishment of the natural drainage patterns within the canyon. Development of borrow areas for additional fill materials would further increase the disturbed area.

Surface contours within the site were revised by the Division to determine to what extent additional material may be available, within the currently disturbed area, to minimize or further reduce the extent and the height of the cutslopes associated with backfilling and grading. The Division found that material within the site is sufficient to further backfill the #7 Mine portal area to the extent that would be allowed by reducing the factor of safety from 1.5 to 1.3. The revised contours were used only to roughly approximate changes to the entire facilities that would occur. These revised contours, developed approximately 42,000 additional cubic yards of material which could be used for fill within the cutslope areas. Of this, approximately 14,000 cubic yards were used in the #7 Mine portal area with the remainder of the material used in and around the #2 Mine portal area. This material was derived from the gentle slopes adjacent to and to the southeast of the #2 Mine portal area. EarthVision volumetric mass balance calculations from revision of the surface contours are as found in the Volumetrics Report attached to this TA in Appendix I. These calculations only consider the movement of material in comparison to the final reclamation contours proposed by the operator and as such do not relate to the mass balance calculations in the plan used in design earthwork from the mine operation stage to final reclamation. Revision of the proposed surface contours was accomplished by the Division only to determine whether or not additional material could be utilized from within the currently disturbed area.

Placement of this additional material along the cutslopes within the site did not eliminate any significant amount of cutslope areas as delineated on the maps in the proposal. The additional fill material did help to reduce the vertical extent of some of these cutslopes. The cutslopes above the #7 Mine portal area were reduced from approximately 85 feet to 45 feet vertically, but due to factor of safety limitations, could not be completely eliminated. The cutslopes above the #2 portal area were also reduced by 10-15 feet but slopes were constrained by the main drainage channel located in the bottom of the canyon.

Variations in the soils characteristics in consideration of the placement of backfill material should also be noted. Analysis of the soils for the #7 Mine area and the #2 Mine area are different enough so as to affect the degree to which slopes can be developed and the extent to which cutslopes can be reduced. During field construction, the operator should be aware that the identification and location of materials which have the best characteristics for constructing slopes in critical areas may have a marked effect on the final slopes that can be attained during reclamation. Should higher quality materials be encountered during earthmoving activities, field amendments to the plan could enhance the final reclamation configuration.

In 1993, the permittee performed a stability investigation of the cut slopes above the portals and the road in the No. 7 area. This stability investigation, the results of which are found in Appendix 3-1, revealed that the No. 7 portal cut slope has a stability safety factor of 2.62 and that the cut slopes above the road have a stability safety factor of 4.01. Since the

No. 7 highwall below the MSHA safety bench, which has had a history of natural instability, will be completely eliminated by backfilling, and since the No. 7 road cut slopes will be at least partially backfilled, which will further increase their stability, the No. 7 cut slopes can be expected to be stable. And this, combined with the fact that the No. 7 cut slopes have been stable throughout their 15-year existence, demonstrates that the No. 7 cut slope remnants fulfill the stability requirement of R645-301-553.130.

R645-301-553.100 requires that disturbed areas be backfilled and graded to 1) achieve the approximate original contour, 2) eliminate all highwalls, spoil piles, and depressions, 3) achieve a stable postmining slope which has a stability safety factor of at least 1.3, 4) minimize erosion and water pollution both on and off the site, and 5) support the postmining land use. Furthermore, R645-100-200 defines approximate original contour as "that [final] surface configuration achieved by backfilling and grading of the mined areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain with all highwalls, spoil piles, and coal refuse piles having a design approved under the R645- rules and prepared for abandonment." Thus, the concept of approximate original contour involves not only the original geometry of an area, but the stability, hydrology, and suitability to the postmining land use of that area as well. The planned final configuration of the No. 7 area meets all of the parameters of approximate original contour, as the following discussion will demonstrate.

The stability of the final surface configuration has already been discussed at some length. Indeed, it has been shown that the planned final surface configuration is really the only one possible given the space constraints imposed by the natural drainage channel, the amount of fill material available, and the stability characteristics of that material, including density, cohesion, and internal friction angle (page 3-39).

R645-301-553.140 requires that the postmining configuration minimize water pollution both on and off the site. The planned configuration will best fulfill this requirement for several reasons. First, the stable configuration achieved using the stability safety factor of at least 1.3 will prevent slides and minimize erosion. Second, the designed slope of approximately 2.7h:1v will best promote successful revegetation by providing a stable seed bed. Third, the lower fill height will allow for the channeling of water from a seep above the fill over the surface of the fill, which will prevent the seep from saturating and destabilizing the fill. And fourth, the planned configuration is the only possible configuration which will meet all the requirements of approximate original contour without interfering with the reestablishment of the natural drainage channel (pages 3-39 to 3-41).

The planned configuration will also closely resemble the general surface configuration that existed prior to mining and will mimic the visual attributes of the surrounding area. The

surrounding area is steep and contains many cliffs and ledges. The remaining 60 feet of faceup above the fill will resemble these cliffs and ledges and the fill at its base will closely resemble the talus slopes which underlie those cliffs and ledges (page 3-40).

The planned configuration will be entirely compatible with the postmining land use of grazing and wildlife habitat. Grazing area and wildlife habitat will merely be displaced, but not eliminated, by the remaining faceup. And the emphasis given in designing the fill to stability, good vegetation, and preservation of good water quality will enhance the value of this area as livestock land and wildlife habitat (page 3-41).

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the No. 7 area which are shown on Plates 3-8A and 3-8B depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7A and are of insufficient resolution to adequately show the extent to which the cut slope and highwall of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 3 surveyed cross sections of the No. 7 area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 3 cross sections are designated #1, #2, and #3. Their locations are shown on Plate 3-7A while the cross sections themselves are found on Plate 3-13. These additional cross sections are adequate to further define the present and final surface configuration of the No. 7 area.

Although the incorporation of cutslopes into the reclamation design does have advantages as noted above, there are also adverse effects. Most important, is the consideration that due to the steepness of the cut slopes, their existence may pose a safety hazard to people, livestock and wildlife who encounter them. Because of the location of these cutslopes, the hazards associated with them are considered minimal. Steep natural slopes occur above these areas which limit access to the cutslopes. All access to the cutslope areas is below the cutslopes and no roads or trails are found immediately above these areas. Natural terrain in the area can be found as steep or steeper than the cutslope areas such that the natural hazards are at least equal or greater to the hazards associated with the cutslopes.

Another adverse effect is the visual and esthetic impact from the retained cutslopes. The visual impact is that the cutslopes will remain visible following revegetation and will be most visible from the bottom of the canyon where the site is accessible. However, the cutslopes are not visible from other vistas or viewing areas which would be generally accessible to the public or within view of any residences. The cutslopes will also appear similar to scarps which are found throughout the region resulting from natural land surface failures. Accordingly, while the visual impact from the cutslopes is adverse, it is not

considered as significant or limiting in regard to the post mining land use or as having any impact outside of the permit area.

As part of the backfilling and grading evaluation of the site, the Division considered the elimination or the reduction of cutslopes within the site. The visual effects regarding the placement of additional materials to reduce the vertical extent of cutslopes is not significant in comparison to the final surface configuration as proposed by the operator. To compare the difference, 3-D models looking at the #2 Mine area and the #7 Mine area were developed. Figure 1 shows the #2 Portal area as proposed in the plan while Figure 2 show the site following the relocation of the additional materials. Similarly, Figures 3 and 4, are shown for the #7 Portal area. Unfortunately, digital data was not made available to compare the pre-mining surface configuration or the operational surface configuration to the final reclaimed surface configuration.

No. 8 Area

This area, which lies opposite the No. 7 area and on a much gentler slope, will be completely backfilled and restored to approximate original contour (page 3-42).

There is a seep in the road cut just below the No. 8 mine pad. This seep has been controlled by two gravel drains. The first, which is approximately 36 inches deep by 12 inches thick by 24 inches wide, crosses the road and discharges into a small concrete retention basin in an otherwise undisturbed area. The second is approximately 24 inches wide by 18 inches deep and parallels the road to where it discharges into the main undisturbed culvert.

Both gravel drains will be left in place and covered with additional fill material. The second gravel drain will be supplemented with an additional 24-inch-square section of gravel along the road ditch. This will be covered with roofing paper before it is covered with fill material. The resulting enlarged drain will empty into the restored natural drainage channel between the No. 8 and No. 7 areas (page 3-40a).

Old Fan Portal Area

Backfilling and Grading of this area is discussed in the section on Approximate Original Contour above.

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the

Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the Old Fan Portal area which are shown on Plates 3-8D and 3-8E depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7B and are of insufficient resolution to adequately show the extent to which the cut slope and highwall of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 4 surveyed cross sections of the Old Fan Portal area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 4 cross sections are designated #9, #10, #11, and #12. Their locations are shown on Plate 3-7B while the cross sections themselves are found on Plates 3-14 and 3-15. These additional cross sections are adequate to further define the present and final surface configuration of the Old Fan Portal area.

Findings:

Although OSM and Division disagree in part, to some of the assumptions used in the design and the development of the reclamation plan for the Gordon Creek 2, 7 & 8 Mines, the plan was found to meet the minimum regulatory requirements with respect to highwall elimination, backfilling and grading, and meeting AOC requirements. Additional materials potentially can be placed to reduce the vertical extent of cutslopes within the existing disturbed area. However, such considerations are not significant to warrant re-design and re-evaluation of the reclamation plan as proposed.

Backfilling in the #7 Mine portal area should be increased by reducing the factor of safety from 1.5 to 1.3. Evaluation of other areas, including the #2 Mine portal area are already proposed with a 1.3 factor of safety. Accordingly, the following permit condition is required:

> **R645-301-553,** Backfilling and Grading, backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

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 first reclamation operation following the final closure of the mining operation was the sealing of the portals. The No. 2 mine was sealed permanently in October of 1985 and the No. 7 and 8 mines were sealed in December of 1990. Each portal was first sealed by placing a block seal 25 to 50 feet in by the portal. The portal structure was then removed and the area out by the seal was completely backfilled to prevent access to the seal and to minimize roofbreaking. Exposed coal seams in the portal areas were also covered.

Findings:

The plan fulfills the requirements of this section.

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-232, -301-233, -301-234, -301-242, -301-243.

Analysis:

Prelaw (i.e. P.L.95-87) disturbance at this site is approximately 10.82 acres and comprises the No.2 Mine operation yard and access road (approximately 9.18 acres) and the Old Fan Portal (approximately 1.64 acres). Topsoil was not separately salvaged from these prelaw disturbed areas prior to their disturbance.

The permittee plans to use material from the No. 2 Mine fill and the No.2 Mine access road fill as substitute topsoil (Page 3-14). Laboratory analyses characterizing the proposed substitute topsoil material are found in Appendix 8-1.

The permittee has committed to sample the regraded surface of the No.2 Mine to determine fertilizer requirements (page 3-15).

Topsoil and subsoil from the No.7 Mine area were salvaged from all disturbed areas

except those areas which were excessively rocky, where topsoil was of limited depth, or where the steepness of the terrain posed a safety hazard to machinery. Topsoil from the No. 7 Mine (3684 cubic yards) is stored adjacent to the No. 2 Mine operations area and subsoil from the No. 7 Mine (8000 cubic yards) is stored adjacent to the No. 7 Mine operational area. This topsoil and subsoil material will be evenly distributed along the contour (page 3-43) to a depth of twelve inches subsequent to backfilling and grading (Table 8-5A).

Topsoil which was salvaged from the No. 8 Mine (2514 cubic yards) disturbance is stored on top of the subsoil pile adjacent to the No.7 Mine operations area. Subsequent to the completion of backfilling and grading, this topsoil material will also be evenly distributed along the contour to a depth of twelve inches (Table 8-5A).

Interim reclamation of the Old Fan Portal area was done in 1984. The existing fill was used as topsoil since no topsoil had been salvaged initially. Vegetation has been established on the regraded spoils. The permittee proposes additional regrading in the Old Fan Portal area.

The permittee proposes that the surface material on slopes steeper than 70 percent (areas depicted on Plate 3-7A, 3-7B, and 3-7C) be left in place and used as substitute topsoil (page 3-17). To demonstrate its suitability as substitute topsoil material, this surface material will be sampled in May and June and analyzed as described in Section 3.5.5.1. Sample site locations are shown on Plate 3-1.

In order to alleviate compaction, all regraded soil will be deep ripped to a depth of 18-inches (page 3-33 & 47). Plant growth medium will be gouged and roughened in order to maximize its surface roughness and thus enhance its revegetation capability. This will be accomplished by using a large backhoe bucket to create 2'-3' diameter, irregularly-placed depressions (page 8-32).

Prior to reexcavation, the topsoil and subsoil stockpiles will be analyzed for nitrogen, phosphorus and potassium (page 3-50). An appropriate fertilizer will then be formulated based on that analysis.

Findings:

The plan fulfills the requirements of this section.

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 Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. determined the limiting dimensions of the fills in the respective areas by a detailed stability analysis. All cutslopes along road areas will be reduced as much as possible while maintaining the required minimum stability safety factor of 1.3. This will be accomplished by recovering downslope material with a backhoe and placing and compacting it against the cutslope faces with a bulldozer. Temporary erosion controls, such as straw bales and silt fences, will be placed below these backfilled areas to prevent sediment from leaving the site and entering the natural drainage.

Findings:

The plan fulfills the 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:

Acid and toxic-forming materials

The permittee has committed to the removal and relocation of contaminated material from the No. 2, 7 & 8 Mine yard fills. This includes removal of material contaminated with oil and grease, material which is more than 50 percent coal, and acid- and toxic-forming material as defined by the Utah Coal Mining Regulations and qualified by the Division's Guidelines for Topsoil and Overburden, Table 2. These contaminated materials will be identified during backfilling and grading based on visual observation, combustibility analysis and the sampling outline on pages 3-50 & 3-51. The contaminated materials will then be completely removed from their original location and buried onsite with four feet of non-

combustible, nonacid- and nontoxic-forming material.

Exposed coal seams will be covered with a minimum of four feet of noncombustible material. Some small rider seams will not be covered in areas where the fill configuration required to cover them would be unstable (See also **Backfilling and Grading** above). The coal seams will be covered with three feet of "rock material" and one foot of topsoil and/or suitable substitute topsoil (page 3-34).

Findings:

The plan fulfills the requirements of this section.

Sedimentation Ponds R645-301-742.220 thru 742.225.2

Analysis:

The hydrologic portion of the reclamation plan calls for a new 3-celled sedimentation pond to be constructed at the downstream end of the disturbed area. The Operator has provided for maintenance of the temporary sediment pond during the reclamation phase (page 7-40). It will be reclaimed and the original channel restored when bond release requirements are met for sediment control and vegetation (page 7-40). Per the requirements of R645-301-880-320 and R645-301-732-210 and Phase II bond release criteria, the following structures will be affected (Sweet's Canyon Pond and the temporary sediment pond) and as such, a Division of Water Rights permit, a Division of Dam Safety permit and a maintenance agreement for these structures have been supplied. The Operator has stated how he will comply with the requirements for permanent maintenance including sediment removal if required for the reconstructed sediment pond on page 7-40 of the plan. Sediment levels are shown as being determined by direct measurement at the sediment marker, as shown on Plate 7-14 and will be cleaned-out when the sediment reaches the cleanout level of 7748.5'. The pond will be inspected quarterly and on an annual basis as required.

The Sweet's Canyon Pond will remain and be maintained by the landowner as stated in the September 28, 1994 letters found in Appendix 3-5 to Beaver Creek Coal Company from Agnes K. Pierce. A Slope Stability Analysis for the Sweet's Canyon Pond is found in Appendix 3-4 demonstrating a slope stability of 2.35 for saturated conditions. Water Rights Lease and Sale Agreement allocated to the Sweet's Canyon Pond was entered into on the 7th of April, 1993 and is found in Appendix 3-9.

The following forms and applications have been approved for the following impoundments to be retained or used during reclamation.

Sweet's Pond

1) Form 69 filed with the Division of Water Rights is found in appendix 7-4.
2) A transfer of Water Rights to the Sweet's Pond from Gordon Creek is found in appendix 3-9 but a change application for the point of use needs to be filed by the owner for the water rights to be valid.
3) A clarification of the use and responsibility for maintenance of the pond now that Mr. E.E. Pierce is deceased is found in appendix 3-5.

Temporary Sediment Pond

1) Sediment clean-out levels will be marked with a sediment marker in the pond.
2) Clean-out of the pond will occur at the 60 % sediment storage level (7748.5').
3) Form 69 for the temporary 3-celled structure is found in appendix 7-4. An approval letter, dated February 7, 1995, is also found in Appendix 7-4.
4) The pond will be decanted using a portable pump to the maximum sediment storage level elevation when necessary. (page 4-2).

Findings:

The permittee meets the requirements of the rules regarding the sediment ponds and permanent impoundments.

Diversions R645-301-742.300 et.al. and R645-301-742.400 thru 743

Analysis

The plan provides for reclamation of the Right and Left Forks of Bryner Canyon using the 100-year 6-hour storm event in accordance with R645-301-742.323. Permanent channels for the ephemeral drainages were designed using the 10-year 6-hour event in accordance with R645-301-742.333. The main channel and the Right Fork of Bryner Canyon were considered intermittent and all others considered ephemeral. The watershed boundaries used to determine precipitation runoff from undisturbed areas within Bryner Canyon are shown on Plate 7-5A. The locations of all channels showing riprap sizes and slopes are shown on Plate 3-7A, 3-7B, and 3-7C. All design information for the plan regarding the applicable calculations and methodologies is found in Appendix 7-1.

The plan provides for the restoration of the Right Fork of Bryner Canyon to restore premining characteristics of the original stream channel where it meets the old pad fill. Ponding, in what is considered a natural depression that appeared to be caused by the

presence of the pad and failure to reestablish original grade for the channel, has been eliminated.

Reclamation of the mine site will be completed in a single phase, with the exception of the removal of the new sediment ponds. The first step will be to build the new three celled pond in the Bryner Canyon drainage below the mine site. (See Plates 3-7B and 7-14). The minesite will be reclaimed starting from the top down, with No. 8 first, followed by No. 7, No.2 Access Road, and finally, the Old Fan Portal Area. The natural drainage will be restored down to the undisturbed drainage below the No. 2 Mine, as shown on Plate 3-7A. At this point the No.2 pond and 7A pond will be removed and all drainage above the new 2/7/8 Sediment Ponds will flow into the ponds.

There are several diversions of miscellaneous spring flow which drains across reclaimed slopes (springs located at the 2,7, and 8 mine areas). Provisions are discussed on page 7-33 regarding the use of riprap and filter blankets for the appropriate areas and a french drain for the No. 8 Mine road cut seep.

Findings:

The permittee has supplied the necessary information regarding the restoration of the natural drainages in the area of the No.2,7, and 8 Mine sites

1. The Permittee has filed the necessary Stream Alteration Permit for the reclaimed stream channel with the Division of Water Rights and as such a positive finding can be made pending approval by the Division of Water Rights.

Sediment Control Measures R645-301-742

Analysis

The Permittee has provided details on mulching rates, hydromulch application rates, tackifier amounts and types, and erosion control matting. Commitments to maintain the site from an erosion standpoint have been made in the permit in Section 7.2.8.5 (page 7-58), Maintenance Plan For Erosion. A design summary of the one BTCA area associated with the Old Fan Portal Area is found in Appendix 7-5 and designated as such on Plate 3-2.

There will be a lot of earth moving taking place adjacent to presently undisturbed drainages and it will be considered prudent sediment control to prevent the migration of earth disturbance into those presently undisturbed drainages. The contractor should be made aware

of this potential and instructed in regards to using care when operating adjacent to these areas.

Findings:

The Permittee meets the requirements of the rules regarding erosion control and control of sediment from the reclaimed areas.

Water Quality Monitoring R645-301-723 and 742.100,200,300

Analysis

The Permittee has proposed a plan which monitors 6 stations for the parameters shown in Table 7-18. The sampling program provides information on seasonal flow and water quality on intermittent and ephemeral streams that have potential to be affected by mine discharge and surface disturbance. Discussion of surface water monitoring locations, type, frequency and flow device may be found in Table 7-17. A map of monitoring locations is provided on Plate 7-2. Analyses will be for parameters listed in Table 7-18. The Post Mining Water Monitoring plan is described on 7-67 of the permit.

Findings:

The Permittee meets the requirements of the regulations regarding water monitoring.

REVEGETATION

Regulatory Reference: R645-301-244, 301-353, 301-355, 301-356

Analysis:

General requirements

The revegetation portion of the plan is found on pages 3-52 thru 3-65. The revegetation seed mixture is specified on page 3-54 and 3-55. The mixture contains grasses, forbs, and shrubs which are known to be palatable to big game animals. Cicer milkvetch and alfalfa are the only non-native species in the mixture. Cicer milkvetch has been included both because it is a legume and also because it is palatable to big game animals. Alfalfa is desirable for its quick establishment and nitrogen-fixing capabilities. Alfalfa usually does not

persist on these sites for more than a few years. Five other native forb species are included in the mixture.

In addition to the five shrub species which will be seeded, the riparian areas will also be transplanted with containerized stock of Salix, Elderberry, Serviceberry and Chokecherry (page 3-55). Seeps and springs will be planted at 25-foot intervals and the main drainages will be planted at 50-foot intervals on each side. An augmented seed mixture which includes additional grass and forb species will be applied to the riparian areas.

All seeding will be done by either hydroseeding or hand broadcasting and will be followed by light raking (page 3-53). Past interim seeding efforts have shown this procedure to be effective for this area. The permittee has committed to limit the amount of time the seed is in the hydroseeder to no more than 30 minutes.

The plan commits to leaving the site in a roughened state (page 8-32). By using a large backhoe bucket to redistribute the topsoil, depressions 2 feet to 3 feet in diameter will be left. The surface material in areas which are not backfilled and which will not receive topsoil will be amended with straw or hay at a rate of 1500 pounds per acre. Where feasible, the straw or hay will be incorporated into the soil with a trackhoe. In less accessible areas, the straw or hay will be incorporated by punching and gouging the soil (page 3-51). Hand roughening will consist of surface loosening of the soil to a depth of 4 to 6 inches with hand tools.

Timing

The plan commits to begin seeding no earlier than September 1 (page 3-54) and to complete the seeding in the fall of the year. This is the time of year normally accepted for seeding with this particular seed mixture and for this area. The revegetation schedule is outlined on page 3-57. Preliminary work such as seed ordering and soil sampling will begin, respectively, in May and June. Recontouring will begin in July with final mulching occurring in October.

Mulching and other soil stabilizing practices

A wood fiber hydromulch will be applied, at the rate of 2000 lbs per acre (3-56), to all seeded areas with slopes less than 2h:1v and to all nontopsoiled areas with slopes greater than 2h:1v (page 3-58). Hydromulching has been shown, in interim revegetation on this site, to be effective in controlling erosion and stabilizing the soil surface on slopes less than 2h:1v.

On slopes steeper than 70 percent where topsoil and/or subsoil is not applied, alfalfa mulch will be placed on the surface at the rate of 1500 lbs per acre. In areas which can be reached by a trackhoe, surface gouging will be performed to create surface roughness and incorporate mulch. In steep areas which cannot be reached by a backhoe, hand tools will be used to roughen the soil surface and incorporate the mulch.

Standards for success

The postmining land use is wildlife habitat. Therefore, the requirements of R645-301-356.230 must be met. Success of vegetation will be determined on the basis of shrub stocking and vegetative ground cover. The plan does not specify a shrub standard. The Division, DWR and the permittee have agreed, as shown by a 10/31/94 letter from Bill Bates of DWR (page 3-58), that a minimum shrub stocking standard of 2000 shrubs per acre will be the success standard to be achieved by this site. The permittee's commitment to this success standard is found on page 3-61 of the plan.

The stated success standard for cover and diversity is to be that of the Mountain Grassland community (page 3-58). The Mountain Grassland (also referred to as Mountain Brush/Grass Community) reference area is located above the No. 2 Mine and identified on Plate 9-1. The data for this reference area were collected in July of 1981. The most frequent species in the reference area during the 1981 inventory were Salina Wildrye and Indian Ricegrass. Based on an ocular estimate, total vegetative cover was 20 percent. In 1993 the Mountain Grassland reference was again sampled and the vegetative cover was estimated to be 43 percent (Appendix 9-2). Salina Wildrye and Broom Snakeweed were the most frequently encountered plants. Because of the large differences in percent cover values, some doubt exists that the same areas were sampled. However, approval of the reference area is based on the 1993 sampling. If subsequent sampling indicates that the 1981 sampling is more representative of the actual cover value, then the use of the Mountain Grassland reference area as a standard for the entire site will have to be reevaluated.

The proposed 2/7/8 Sediment Pond is to be constructed in an area which is not included in the current approved disturbed area. However, the area was previously disturbed by the construction of the adjacent Carbon County road and by the operation of the abandoned Swisher No. 1 Mine. The plan commits to revegetate this area to meet the success standard of the Mountain Grassland reference area. A determination will have to be made during the growing season, prior to disturbance, as to whether or not a vegetation inventory of this area is necessary.

Findings:

The plan fulfills the requirements of this section. However, as a condition of this

permit, the permittee must commit to do the following, in accordance with the requirements of:

R645-301-321.100

During the growing season, a determination will need to be made as to whether or not a predisturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

STABILIZATION OF SURFACE AREAS

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

Analysis:

See **Revegetation** and **Backfilling and Grading** above.

Findings:

The plan fulfills the requirements of this section.

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:

See also **Backfilling and Grading** above.

Affected area boundary maps.

Plates 3-7A, 3-7B, and 3-7C accurately and adequately show the disturbed area boundaries for the No. 2, No. 7, No. 8, and Old Fan Portal areas. Approximately 1.5 acres will be added to the disturbed area with the construction of the new sediment ponds and this added area is shown on Plates 3-7B and 3-7C. Since this area constitutes less than 15% of the total present disturbed area, its addition to the disturbed area does not constitute a significant revision of the permit, but only an amendment.

Bonded area map.

Plates 3-7A, 3-7B, and 3-7C accurately and adequately show the bonded area boundaries for the No. 2, No. 7, No. 8, and Old Fan Portal areas. Plate 3-1A shows Sweets Pond, which will not be reclaimed, and its associated bonded area. For this site, the bonded area is identical to the disturbed area and comprises approximately 17.2 acres. Approximately 1.5 acres will be added to the disturbed area with the construction of the new sediment ponds and this added area is shown on Plates 3-7B and 3-7C.

Reclamation backfilling and grading maps.

Plates 3-7A, 3-7B, and 3-7C show the backfilling and grading which will be done at this site. In addition, Plates 3-8A, 3-8B, 3-8C, 3-8D, and 3-8E contain cross sections, taken from topographic maps, which depict the present surface configuration and the anticipated reclaimed surface configuration.

Reclamation facilities maps.

The only reclamation facilities which will remain will be the new sediment ponds, which will be reclaimed at the end of the Phase II reclamation period. These ponds are shown on Plates 3-7B and 3-7C.

Final surface configuration maps.

Plates 3-7A, 3-7B, and 3-7C show the anticipated final surface configuration. In addition, Plates 3-8A, 3-8B, 3-8C, 3-8D, and 3-8E contain cross sections, taken from topographic maps, which depict the present surface configuration and the anticipated final surface configuration.

Reclamation surface and subsurface manmade features maps.

There are no buildings within 1000 feet of this site and no electrical transmission lines or pipelines passing over or under the site.

Plates 3-7A, 3-7B, 3-7C, and 3-1A show the anticipated final surface configuration. These maps show the location and extent of the fence which will be erected around the site to keep livestock from destroying the developing vegetation. Plates 3-7B and 3-7C show the Carbon County access road in relation to the rest of the site and Plate 3-1A shows Sweets Pond and its surrounding area.

Reclamation treatments maps.

The only reclamation treatment facilities which will remain will be the new sediment ponds, which will be reclaimed at the end of the Phase II reclamation period. These ponds are shown on Plates 3-7B and 3-7C.

All facilities which will be used to protect and enhance fish and wildlife related environmental values are shown on Plates 3-7A, 3-7B, and 3-7C. These include a small native rock holding basin for wildlife watering near the No. 8 Mine seep, the fence which will prevent livestock grazing of the revegetated area for the entire bond liability period, and the seeps in the No. 7 area which will flow across the surface of the backfill and thus be accessible to wildlife.

Findings:

The plan fulfills the requirements of this section.

BONDING AND INSURANCE REQUIREMENTS

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

Analysis:

Form of bond. (Reclamation Agreement)

A surety bond in the amount of $641,443 is held with the United Pacific Insurance Company.

Determination of bond amount.

The total cost of reclaiming this site was estimated to be approximately $327,826, in 1983 dollars. The costs of sealing and backfilling the portals and of removing and disposing of the surface facilities were left out of the calculation of this sum since all of this work was done in 1991, while at the same time the cost of reclaiming the Old Fan Portal area was added in. This estimated cost was escalated through 1988, when the No. 8 Mine started operation, at which time the reclamation costs associated with the No. 8 area were added in, to make up a total of $394,074, in 1988 dollars. This amount was then escalated through 1999 in order to get an estimate of the required bond amount through the end of the present permit term. The required amount turns out to be $505,643, in 1999 dollars. Since the reclamation bond is in the amount of $641,443, this site is more than adequately bonded

through 1999. The following table summarizes the foregoing discussion.

YEAR	ESCALATION FACTOR*	RECLAMATION COST	REMARKS
1983	----	$327,826	#2 and #7 Mines Only
1984	0.92	$330,842	#2 and #7 Mines Only
1985	2.90	$340,436	#2 and #7 Mines Only
1986	2.10	$347,586	#2 and #7 Mines Only
1987	1.95	$354,364	#2 and #7 Mines Only
1988	1.81	$360,777 + $33,297 = $394,074	#8 Mine Added to #2 and #7 Mines
1989	1.77	$401,050	#2, #7 & #8 Mines
1990	0.77	$404,138	#2, #7 & #8 Mines
1991	1.27	$409,270	#2, #7 & #8 Mines
1992	2.21	$418,315	#2, #7 & #8 Mines
1993	2.61	$429,233	#2, #7 & #8 Mines
1994	3.21	$443,012	#2, #7 & #8 Mines
1995	2.68	$454,884	#2, #7 & #8 Mines
1996	2.68	$467,075	#2, #7 & #8 Mines
1997	2.68	$479,593	#2, #7 & #8 Mines
1998	2.68	$492,446	#2, #7 & #8 Mines
1999	2.68	$505,643	#2, #7 & #8 Mines

*Escalation factors are taken from Means©

Terms and conditions for liability insurance.

Liability insurance policy ISL G1 519134-A is held with the Insurance Company of North America through the agency of the CIGNA Insurance Company. The effective term of this policy goes from January 1, 1993 through January 1, 1996. The combined coverage

for bodily injury and property damage is $500,000 for each occurrence and $500,000 aggregate. The certificate of insurance which the Division holds states that, in the event that the policy is cancelled for any reason by the permittee, the insurance agency, CIGNA, will give the Division written notification within 45 days.

Findings:

The plan fulfills the requirements of this section.

APPENDIX I

to
Gordon Creek 2, 7 & 8 Mine
Reclamation Plan TA

Technical Exhibits, Calculations, and Supporting Data

GEOSYSTEM SLOPE STABILITY PROGRAM
SB-SLOPE

PROJECT DATA:
Project: Gordon Creek #7 Portal Area
Location: Saturation limited to top of MSHA bench.
Filename: 278S Description: Gordon Creek 278 Section 3

ANALYSIS DATA:

Point No.	Coordinates X	Coordinates Y
1	157.0	8310.0
2	171.0	8300.0
3	181.0	8290.0
4	249.0	8208.0
5	280.0	8178.0
6	288.0	8177.0
7	316.0	8146.0
8	350.0	8141.0
9	480.0	8147.0
10	489.0	8145.0
11	491.0	8143.0
12	500.0	8143.0
13	550.0	8170.0

Line No.	Left Point	Right Point	Soil No.	Phreatic Line
1	1	2	1	N
2	2	3	1	N
3	3	4	1	N
4	4	5	1	N
5	5	6	1	N
6	6	7	1	N
7	7	8	1	N
8	8	9	1	N
9	9	10	1	N
10	10	11	1	N
11	11	12	1	N
12	12	13	1	N
13	2	9	2	N
14	5	9	2	Y

Soil No.	Density pcf	Cohesion psf	Phi Deg
1	155.0	2000	35.0
2	120.0	504	21.0

SB-SLOPE

Simplified Bishop Slope Stability Analysis

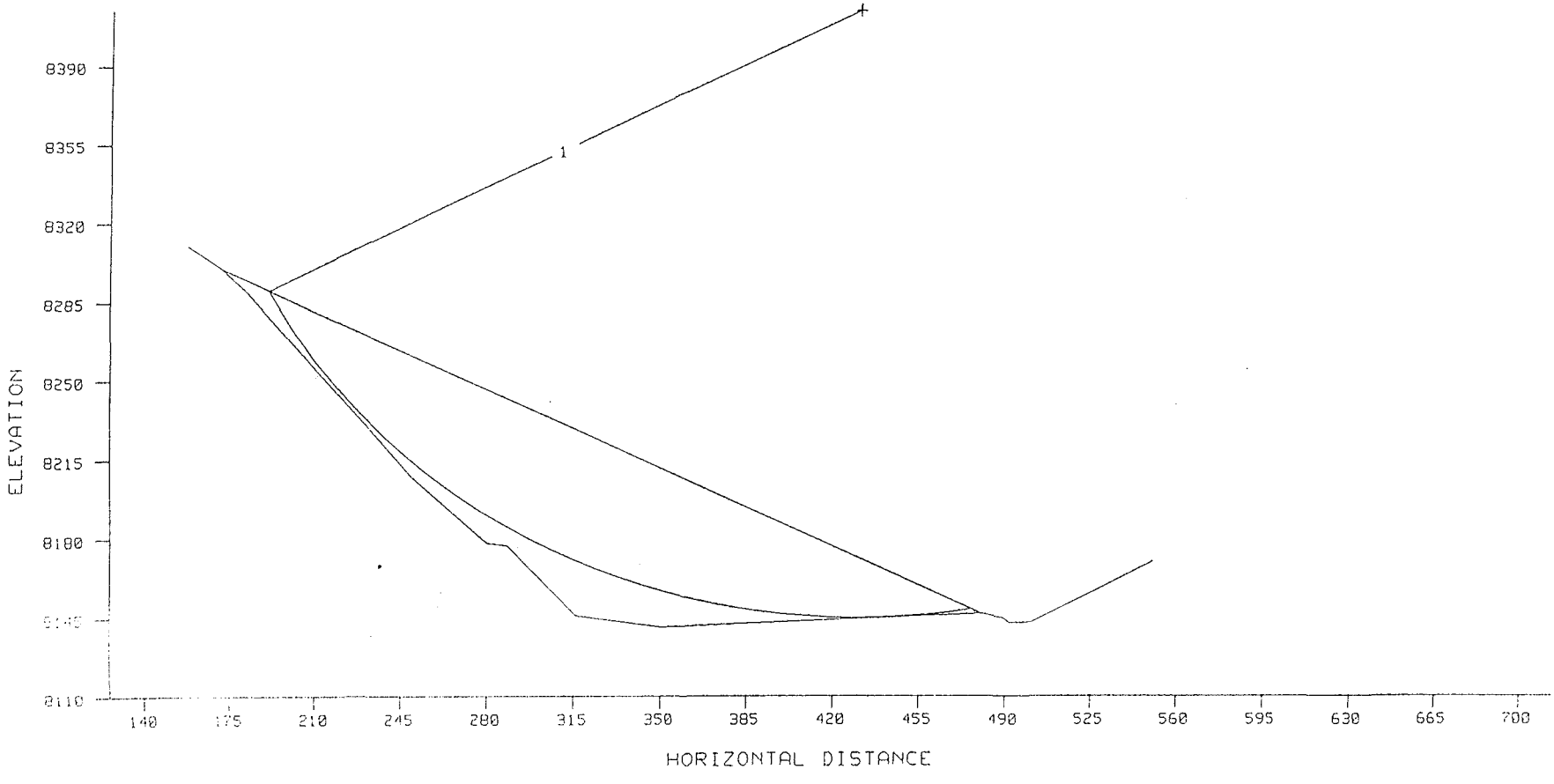
PROJECT: Gordon Creek #7 Portal Area

LOCATION: Saturation limited to top of MSHA bench.

FILE: 278S

COMPLETE SLOPE CROSS SECTION SHOWN

CIRCLE	X	Y	RADIUS	FS
1	430.0	8415.0	270.0	1.20



OSMRE - TIPS

SB-SLOPE

Simplified Bishop Slope Stability Analysis

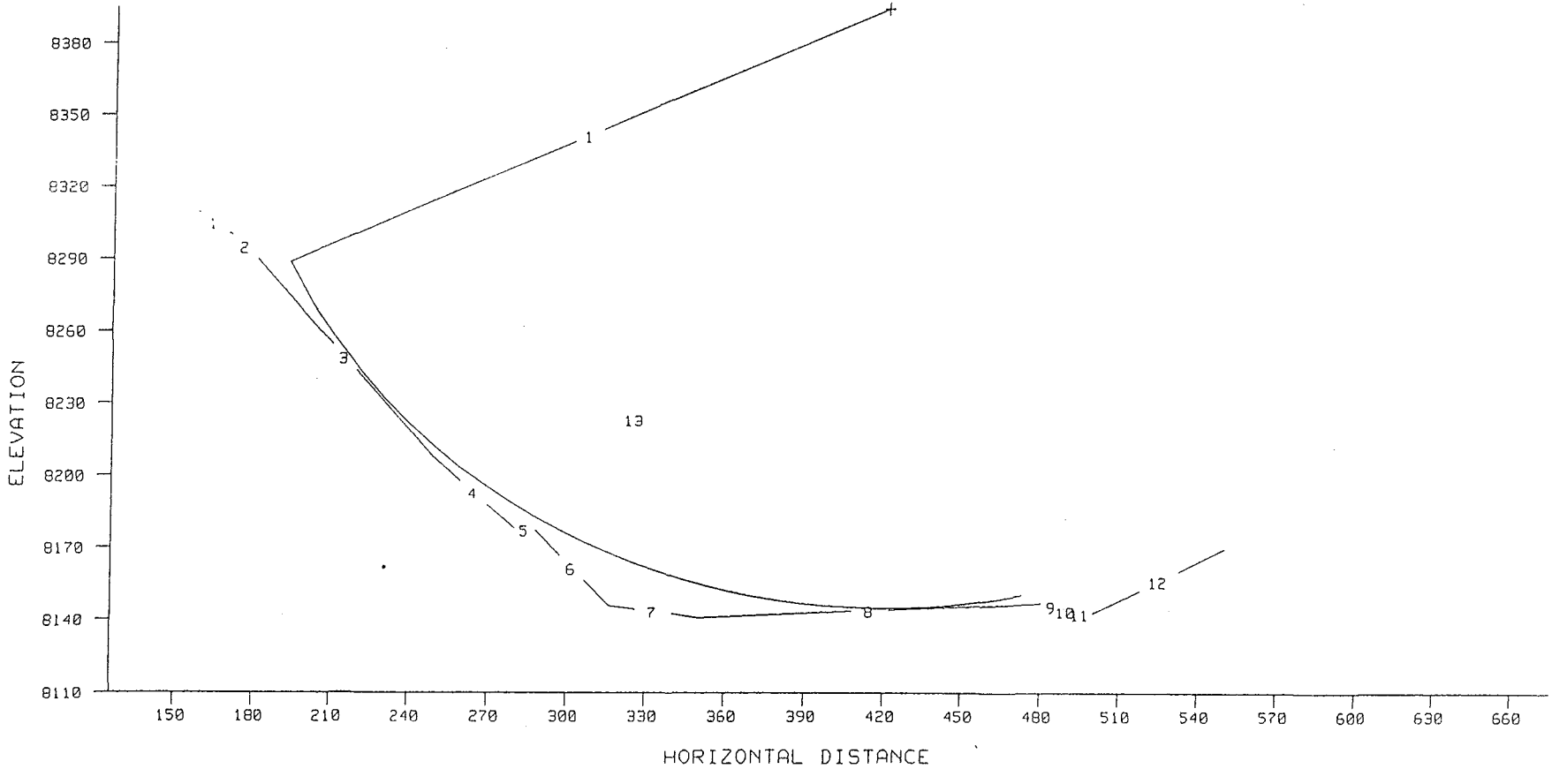
PROJECT: Gordon Creek #7 Portal Area

LOCATION: Section 3

FILE: 278S

COMPLETE SLOPE CROSS SECTION SHOWN

CIRCLE	X	Y	RADIUS	FS
1	420.0	8395.0	250.0	0.69



OSMRE - TIPS

VOLUMETRICS REPORT

Run by: rharden
Version: 2.0
Date: 06/07/95
Report file: t1.2vrpt

Polygon file: cutfill.vply
Zone definintion: Operational
Deposition operation: base.2grd
Unconformity operation: revised.2grd
Unconformity operation: base.2grd
Primary field: Polygon ID
Sorting method: Polygon order
Input units: feet square by feet
Volumetrics conversion factor: .037037037313
Output units: Cubic yards
Global minimum thickness: 0.0

---------- Zone name: cut ----------

Minimum z: none
Maximum z: none
Minimum thickness: 1
Yield factor: 1.0

---------- Zone name: fill ----------

Minimum z: none
Maximum z: none
Minimum thickness: 1
Yield factor: 1.0

Volumetrics Report

Zone name: cut

Polygon ID / Polygon Class	Polygon Area	Volume	Positive Area
Cutfill			
	1,901,825.6875	42,205.8104	148,064.882682
Subtotal for Cutfill	1,901,825.6875	42,205.8104	148,064.882682
Total for cut	1,901,825.6875	42,205.8104	148,064.882682

Zone name: fill

Polygon ID / Polygon Class	Polygon Area	Volume	Positive Area
Cutfill			
	1,901,825.6875	41,966.0424	186,808.363121
Subtotal for Cutfill	1,901,825.6875	41,966.0424	186,808.363121
Total for fill	1,901,825.6875	41,966.0424	186,808.363121

Figure [illegible] Portal Area as Proposed, Looking West

Figure 2 - #2 Portal Area as Revised, Looking West

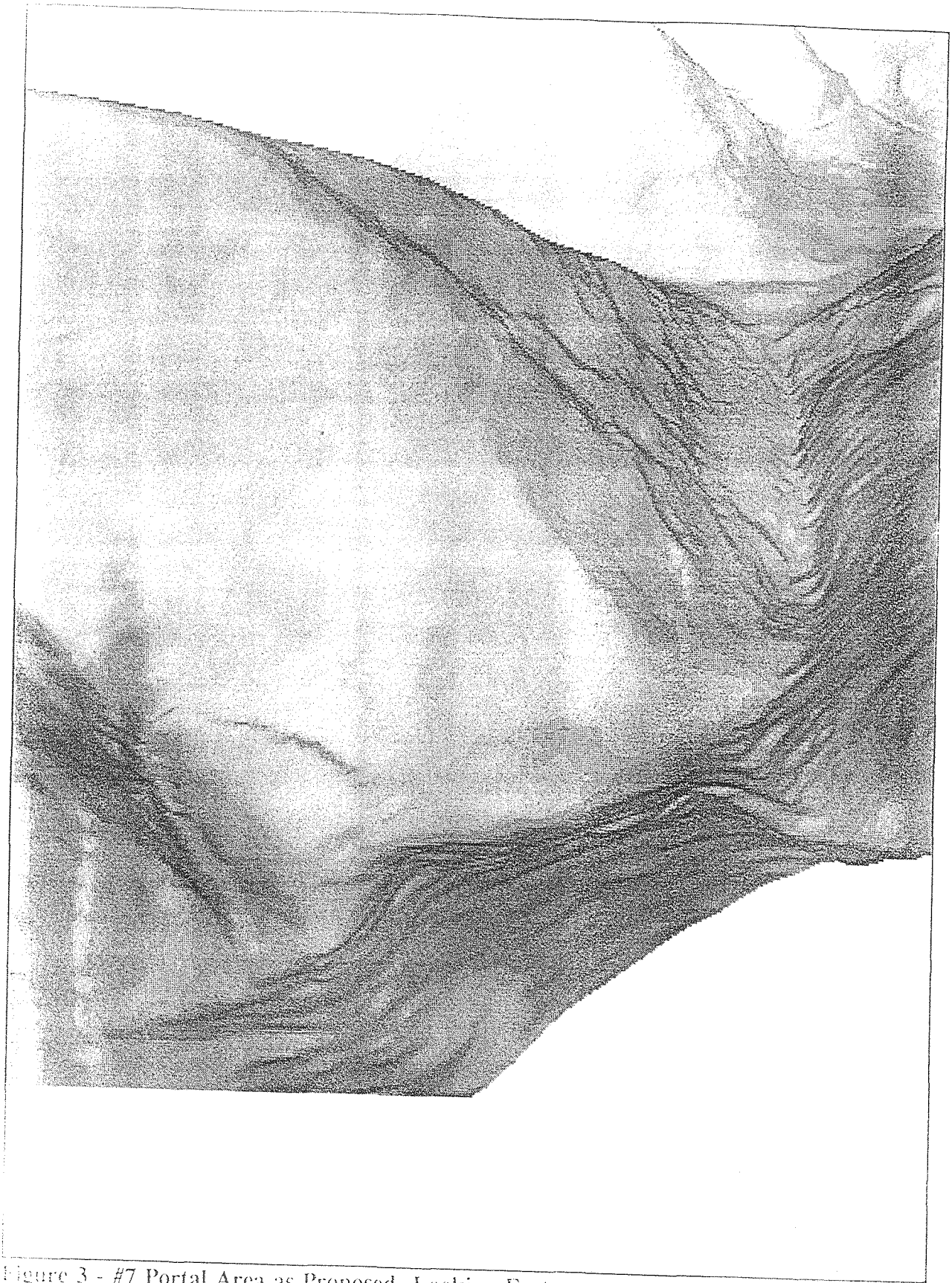


Figure 3 - #7 Portal Area as Proposed, Looking East

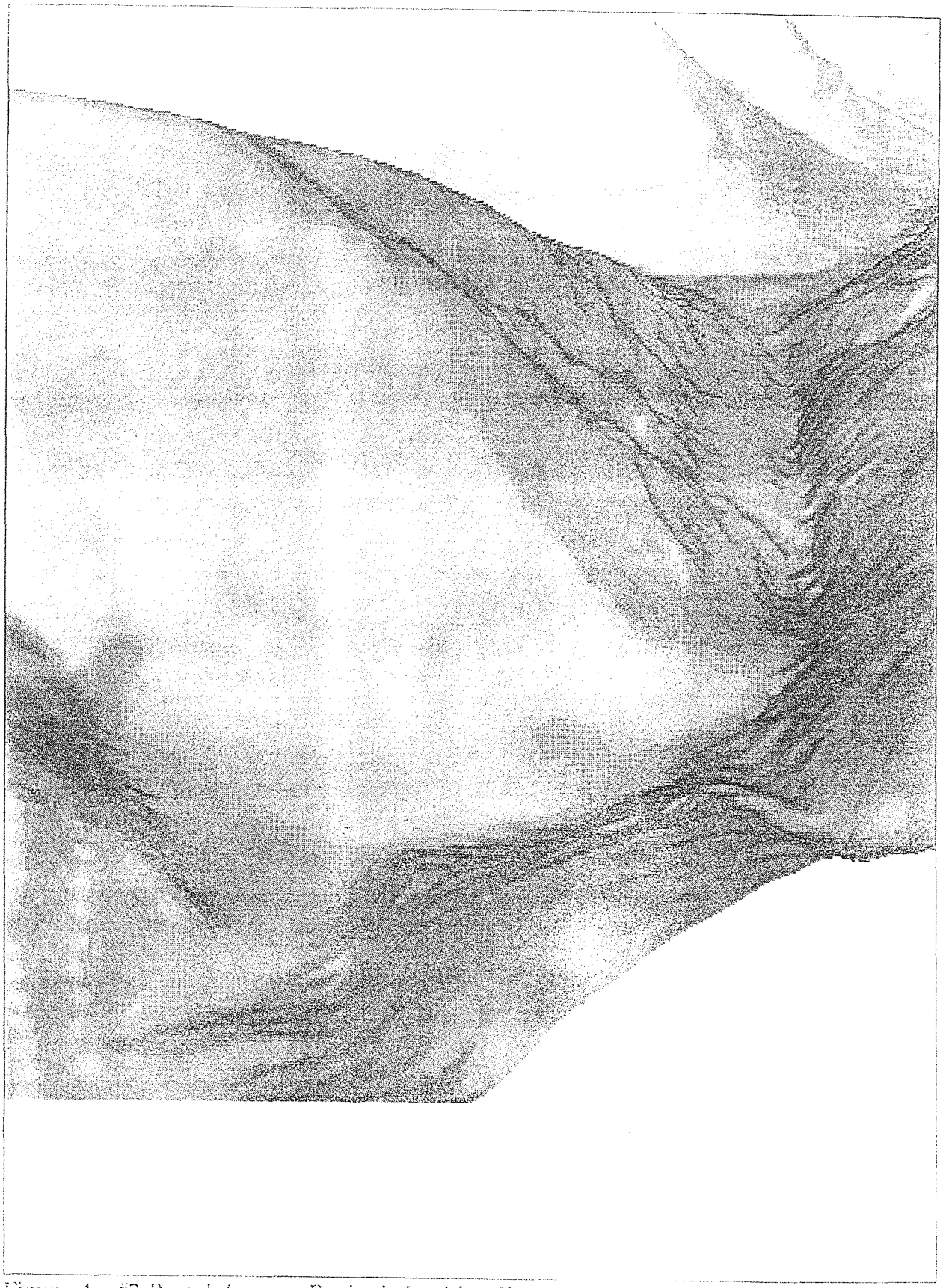


Figure 4 - #7 Portal Area as Revised, Looking East

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

Michael O. Leavitt
Governor

Ted Stewart
Executive Director

James W. Carter
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340
801-359-3940 (Fax)
801-538-5319 (TDD)

July 20, 1995

Paige B. Beville, Manager
Environmental, Health & Safety
Mountain Coal Company
ARCO Coal Company
555 17th Street, Room 2170
Denver, Colorado 80202

Re: Approval of Reclamation Plans, Mountain Coal Company, Gordon Creek 2, 7, & 8 Mines, ACT/007/016, Folder #3, Carbon County, Utah

Dear Ms. Beville:

The Division has completed the Technical Analysis and Findings for your reclamation plans for the Gordon Creek 2, 7, & 8 Mines. A copy is enclosed for your records. As you are aware this has been a lengthy process which has included involvement of technical staff from your office, from OSM, and from the Division. We have concluded that the plans you have proposed will satisfy the regulatory requirements and are acceptable for use in reclaiming this area. There is one noted deficiency that still must be addressed. Mountain Coal must provide a copy of the comments made by the legal owner of record of the reclaimed land surface concerning the proposed postmining land use. We have no record of any comments from Robert & Linda Jewkes. Once these comments have been received your plans can be considered approved with the following two conditions.

1) During the growing season, a determination will need to be made as to whether or not a pre-disturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

2) Backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

We appreciate the work you have done to finalize these reclamation plans. We encourage you to proceed with the reclamation of this mine site as quickly as possible. Please don't hesitate to call if you have any questions.

Sincerely,

Lowell P. Braxton
Associate Director - Mining

Enclosure
cc: D. Haddock
P. Grubaugh-Littig
J. Helfrich
S. White
J. Kelley
R. Harden
H. Sauer
FINTACOV.278

TECHNICAL ANALYSIS AND FINDINGS
RECLAMATION PLAN

MOUNTAIN COAL COMPANY
GORDON CREEK #2, #7, #8 MINES
ACT/007/016

July 20, 1995

SUMMARY OF PERMIT CONDITIONS

As determined in the analysis and findings of this Technical Analysis, approval of the plan is subject to the following Permit Conditions. The applicant is subject to compliance with the following Permit Conditions and must commit to comply with the requirements of these conditions as referenced in the approved Permit.

Accordingly, as a condition of this permit, the permittee must do the following, in accordance with the requirements of:

R645-301-412.200

The permittee must provide a copy of the comments concerning the proposed postmining land use by the legal or equitable owner of record (Robert F. & Linda M. Jewkes) of the surface of the land following reclamation. In lieu of comments, the permittee may provide evidence that the surface land owner has been given ample opportunity to comment.

R645-301-321.100

During the growing season, a determination will need to be made as to whether or not a predisturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

R645-301-553

Backfilling and Grading, backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

RECLAMATION PLAN

GENERAL REQUIREMENTS

Regulatory Reference: PL 95-87 Sec. 515 and 516; 30 CFR Sec. 784.13, 784.14, 784.15, 784.16, 784.17, 784.18, 784.19, 784.20, 784.21, 784.22, 784.23, 784.24, 784.25, 784.26; R645-301-231, -301-233, -301-322, -301-323, -301-331, -301-333, -301-341, -301-342, -301-411, -301-412, -301-422, -301-512, -301-513, -301-521, -301-522, -301-525, -301-526, -301-527, -301-528, -301-529, -301-531, -301-533, -301-534, -301-536, -301-537, -301-542, -301-623, -301-624, -301-625, -301-626, -301-631, -301-632, -301-731, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-732, -301-733, -301-746, -301-764, -301-830.

Analysis:

See individual sections.

POSTMINING LAND USES

Regulatory Reference: R645-301-412, 301-413

Analysis:

Coal mining has been a land use in this area since the early 1900s. Some of the larger mines to be opened in the area were Sweets in 1925 and Consumers and National in 1928 (page 5-19). The Swisher No. 1 Mine lies immediately adjacent to the disturbed area and was reclaimed by the Utah Abandoned Mine Lands program.

The stated postmining land use is the same as the premining land use of wildlife habitat (page 3-8) and the intent of the reclamation designs is to restore the site to a condition compatible with the premining land use. Private landowners presently manage the lands surrounding the mine site for limited livestock forage. There are no range improvements in the area (page 4-53).

Appendix 3-10 contains a copy of a letter from Mountain Coal Company to the landowners, informing them of the anticipated postmining land use and proposed

reclamation. Two of the landowners, James and Mark Jacob, signed and returned the letter, thus acknowledging and agreeing to the land use. However, Robert F. and Linda M. Jewkes, who are the landowners of the #7 and #8 Mine areas, do not want the site returned to the premining land use and approximate original contour. The Jewkeses want the road to remain.

The Sweets Canyon Water Fill Area, also known as "Sweets Pond," will not be reclaimed. The pond is located on private land and the land owner has requested that the pond remain for private use (Page 3-32 and Appendix 3-5). The landowner has committed to leave the fence surrounding the pond in place in order to keep livestock out of the pond and riparian area. The pond constitutes a utility improvement for the area, supports a fish population, and provides for wildlife habitat.

Findings:

Comments regarding the postmining land use have not been received from all landowners. Accordingly the following permit condition is required:

R645-301-412.200

The permittee must provide a copy of the comments concerning the proposed postmining land use by the legal or equitable owner of record (Robert F. & Linda M. Jewkes) of the surface of the land following reclamation. In lieu of comments, the permittee may provide evidence that the surface land owner has been given ample opportunity to comment.

PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

Regulatory Reference: R645-301-333, 301-342, 301-358

Analysis:

The permittee will employ the following measures to enhance the suitability of the site for wildlife habitat:

1. A small native rock holding basin will be constructed for wildlife watering near the No. 8 Mine seep.

2. A fence will prevent livestock grazing of the revegetated area for the entire bond liability period.

3. The seeps in the No. 7 area will flow across the surface of the backfill and will thus be accessible to wildlife.

4. The plant species to be used in revegetation have been selected for their value as wildlife forage and cover.

5. Drainage and seep areas will be enhanced by the addition of both seeded and transplanted riparian species.

6. Sweets Pond will remain for the intended postmining land use of wildlife habitat. The pond will be fenced to exclude livestock. The pond currently supports fish and occasional beaver.

Findings

The plan fulfills the requirements of this section.

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 No. 2 area and the Old Fan Portal area were both built prior to SMCRA and thus do not come under the requirement of restoration to approximate original contour (AOC) *per se*. Only the No. 7 and No. 8 areas come under the requirements of restoration to approximate original contour and both of these areas will be restored to approximate original contour, as required by R645-301-553.110. For a more general discussion, see also **Backfilling and Grading** below.

<u>No. 2 Area</u>

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in August of 1992. Based on samples taken from the site, the #2 Mine area estimates soils values at 120 pcf dry density, 5.75 psi (828 psf) cohesion, and an internal friction angle of 23.8 degrees. Due to the steep and narrow canyon configuration in which the surface facilities exist, slope stability is a critical factor in determination of the extent to which highwalls and cutslopes can be backfilled. The #2 Mine

area was evaluated for factors of safety of 1.3 and 1.5. The minimum requirements for long-term stability as required under the regulations dictate a minimum factor of safety of 1.3. Slope charts, under saturated conditions, were used in the proposal to determine maximum embankment heights for varying slope angles under saturated conditions. For this area, Agapito determined the following slope geometry parameters for a stability safety factor of 1.3 (see page 4 of Appendix 3-8).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	933	250
20	343	125
25	197	92
30	126	73
35	90	63

The natural channels that must be reestablished through the No. 2 area limit the width of the base of the fill. Therefore, the slope of 20° and base width of 343 feet were used in the design of the fill. These geometric parameters allow for a maximum slope height of approximately 125 feet, which will at the same time allow for the backfilling of most of the cut slopes *and* the attainment of the required stability (page 3-35).

The No. 2 area was disturbed prior to SMCRA. For such a site, both the R645- rules and the Federal regulations require *both* that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable. The designed backfills of the highwalls and cut slopes of the No. 2 area fulfill both of these requirements. Given the amount of material available and the space constraints imposed by the reestablished natural channels, it would not be possible to completely backfill the cut slopes. The final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration and would thus require more material than the original quantity. The designed backfills use all the reasonably available spoil that is necessary to achieve a stable configuration *and* they eliminate as much of the cut slope as possible, even though the upper part of the cut slope will not be eliminated.

<u>No. 7 Area</u>

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The #7 Mine area samples yielded 120 pcf dry density, 3.5 psi (504 psf) cohesion, and an internal friction angle of 21 degrees. As indicated in the analysis, the #7 Mine area was evaluated for factors of safety of 1.25 and 1.5. For this area, Agapito determined the following slope geometry parameters for a stability safety factor of 1.5 (see page 3 of Appendix 3-7).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	291	78
20	124	45
25	77	36
30	50	29
35	36	25

A safety factor of 1.5, rather than 1.3, was used for this area for a couple of reasons. First, the area contains two seeps and a small fault and the highwall below the MSHA safety bench has a history of natural instability. And since the planned earthwork will make it impossible to reach and repair this site in the event that it requires maintenance, the slightly higher safety factor will provide a greater margin of safety. Second, the MSHA safety bench in this area, which marks the upper extent of the highwall, is approximately 40 feet high and thus forms a good place into which to key the crest of the fill. The planned backfill will be approximately 45 feet high and will thus cover the safety bench while leaving the upper 60 feet of the faceup as it is. Backfilling the highwall to attain the lower safety factor of 1.3 would result in the elimination of only about 19 additional feet of the cutslope (see page 3 of Appendix 3-7). The natural channel that must be reestablished through this area limits the width of the base of the fill. So again, as in the No. 2 area, the slope of 20° was used in the design of the fill. This allows a maximum base width of 124 feet and a maximum slope height of 45 feet (page 3-39).

Given the amount of material available and the space constraint imposed by the reestablished natural channel, it would not be possible to completely backfill the portal faceup above the highwall and still achieve a stable configuration. As in the No. 2 area, the final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration, would require more material than the original quantity, and would interfere with the

reestablished natural channel. The designed backfill eliminates as much of the cut slope above the highwall as possible, as required by R645-301-553.110, and at the same time achieves a stable configuration, as required by R645-301-553.130. The designed backfill is, in fact, the only possible configuration that will fulfill the requirements of these two regulations in the No. 7 area.

R645-301-553.100 requires that disturbed areas be backfilled and grade to 1) achieve the approximate original contour, 2) eliminate all highwalls, spoil piles, and depressions, 3) achieve a stable postmining slope which has a stability safety factor of at least 1.3, 4) minimize erosion and water pollution both on and off the site, and 5) support the postmining land use. Furthermore, R645-100-200 defines approximate original contour as "that [final] surface configuration achieved by backfilling and grading of the mined areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain with all highwalls, spoil piles, and coal refuse piles having a design approved under the R645- rules and prepared for abandonment." Thus, the concept of approximate original contour involves not only the original geometry of an area, but the stability, hydrology, and suitability to the postmining land use of that area as well. The planned final configuration of the No. 7 area meets all of the parameters of approximate original contour, as the following discussion will demonstrate.

The stability of the final surface configuration has already been discussed at some length. Indeed, it has been shown that the planned final surface configuration is really the only one possible given the space constraints imposed by the natural drainage channel, the amount of fill material available, and the stability characteristics of that material, including density, cohesion, and internal friction angle (page 3-39).

R645-301-553.140 requires that the postmining configuration minimize water pollution both on and off the site. The planned configuration will best fulfill this requirement for several reasons. First, the stable configuration achieved using the stability safety factor of 1.5 will prevent slides and minimize erosion. Second, the designed slope of approximately 2.7h:1v will best promote successful revegetation by providing a stable seed bed. Third, the lower fill height will allow for the channeling of water from a seep above the fill over the surface of the fill, which will prevent the seep from saturating and destabilizing the fill. And fourth, the planned configuration is the only possible configuration which will meet all the requirements of approximate original contour without interfering with the reestablishment of the natural drainage channel (pages 3-39 to 3-41).

The planned configuration will also closely resemble the general surface configuration that existed prior to mining and will mimic the visual attributes of the surrounding area. The surrounding area is steep and contains many cliffs and ledges. The remaining 60 feet of

faceup above the fill will resemble these cliffs and ledges and the fill at its base will closely resemble the talus slopes which underlie those cliffs and ledges (page 3-40).

The planned configuration will be entirely compatible with the postmining land use of grazing and wildlife habitat. Grazing area and wildlife habitat will merely be displaced, but not eliminated, by the remaining faceup. And the emphasis given in designing the fill to stability, good vegetation, and preservation of good water quality will enhance the value of this area as livestock land and wildlife habitat (page 3-41).

No. 8 Area

This area, which lies opposite the No. 7 area and on a much gentler slope, will be completely backfilled and restored to approximate original contour (page 3-42).

Old Fan Portal Area

This area contains a partially reclaimed highwall and cut slope. The area was abandoned in 1984 and is, therefore, subject to the reclamation requirements of both SMCRA and the R645- rules.

The same stability and slope geometry parameters that were used in the reclamation design of the No. 2 area were used to design the reclaimed slopes in this area. As with the No. 2 Area, these slope parameters achieve a factor of safety for the reclaimed slopes of at least 1.3 (see page 4 of Appendix 3-8).

Slope Angle (degrees)	Width of Base (feet)	Maximum Height (feet)
15	933	250
20	343	125
25	197	92
30	126	73
35	90	63

For such a site, both the R645- rules and the Federal regulations require that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable.

Again, as with the No. 2 area, the Old Fan Portal area was initially disturbed prior to SMCRA. For such a site, both the R645- rules and the Federal regulations require *both* that "all reasonably available spoil" be used in backfilling the highwall *and* that the backfill be stable. The designed backfills of the highwalls and cut slopes of the Old Fan Portal area fulfill both of these requirements. Given the amount of material available and the space constraints imposed by the presence of the county road, it would not be possible to completely backfill the cut slopes. The final reclaimed slope must be less than the original slope because the fill material is now unconsolidated. To completely backfill the cut slopes with a fill of a lesser slope than the original would create a fill with a larger cross-sectional area than the original configuration and would thus require more material than the original quantity. Such a fill would also extend for some distance down slope from the present fill toe and would cover the county road and interfere with the reestablished main channel. The designed backfills use all the reasonably available spoil that is necessary to achieve a stable configuration *and* they eliminate as much of the cut slope as possible, even though the upper part of the cut slope between cross sections #10 and #11 will not be eliminated (pages 3-36 to 3-37).

Public Comments and Comments from Other Agencies

On May 15, 1995, the Division received comments regarding the regrading plan in a letter from the Western Regional Coordinating Center of the Office of Surface Mining. These comments were in the form of an analysis of the regrading plan and followed a brief site visit made by OSM representative Gene Hay in April of 1995.

The OSM analysis concentrated particularly on the restoration of the site to approximate original contour (AOC). The analysis used the data provided by the permittee, but made different assumptions regarding the conditions of the fill material. The analysis concluded that the highwalls and cutslopes at this site could be completely backfilled with no risk of slope instability using material available on the site. The Division made a full assessment of the analysis, but still found the plan for incomplete elimination of the highwalls and cutslopes to be the best for this site.

The OSM analysis appears to be based on 2 overlying ideas. The first is that it is highly unlikely that backfill material at this site will become saturated with water and that, therefore, backfill design should be based on an assumption of less-than-full saturation. The second is that there is a large quantity of surplus spoil available at this site for backfilling.

Regarding the first, the OSM analysis assumed a fill saturation level of ⅓ the fill height, as opposed to the assumption of total saturation made by the permittee. The OSM letter stated: "Due to the amount of time moisture remains in the [No. 7] area, it is a more realistic design standard to assume that only the bottom one third of the fill material will be

saturated." The OSM letter did not state the provenance of the ⅓ figure, but even so, the Division is convinced that the assumption of total saturation is much more realistic for this area, particularly as a worst-case condition. The rock in this area is fractured and thus provides numerous routes by which water can saturate the fill from behind. In addition, the fill will be placed and compacted against a rock face and the rock/fill interface will also provide a route whereby water can saturate the fill from behind. This problem is compounded by the fact that the rock face provides an impermeable or partly permeable water barrier and can thus allow the buildup of hydrostatic pressure behind the fill. The Division has observed the phenomenon of fill saturation by way of the rock/fill interface, with the resulting lateral displacement of saturated fill material, at several reclaimed sites in this area, even where the fill and the parent material are similar. The potential for saturation of the fill is high during the Spring thaw and is especially high in years of high snowfall or during periods of unusually heavy rain.

The necessity of long-term stability dictates that any fill in this area be designed assuming events and conditions which might be unusual, but nevertheless likely, over a long period of time and which might, therefore, jeopardize the stability of the fill. To require, on the basis of an assumption of less-than-complete saturation, that the highwalls and cutslopes at this site be completely backfilled, would deprive the backfill designs of a prudent and necessary cautiousness. All of these considerations are discussed in a May 22, 1995 letter which the permittee's consultant, Agapito Associates, Inc. wrote, at the permittee's request, to further explain the assumption of full fill saturation used in the stability analysis. Agapito's reasoning, as expressed in this letter, reflects the Division's reasoning in approving the stability analysis of the fills based on the assumption of full saturation.

In light of all this, the Division agrees with the OSM that the factor of safety for the slope design should be reduced to 1.3 for the #7 Mine area, especially in regard to saturated slopes. Typically, engineering practices allow for a long term static factor of safety of 1.3 under normal conditions and a factor of safety of 1.1 for saturated conditions. However, regulatory requirements do not allow for factors of safety of less than 1.3. As further explained below, the Division also considers slope evaluation under saturated conditions as a valid precaution in design of these slopes for long-term stability.

Through modeling and analysis, it was found by the Division that saturated conditions dramatically affect the slope angle and height allowable in comparison to unsaturated conditions where cohesion can be developed. OSM analysis varied the extent to which the fill areas were saturated and theorized that a significant change in the slope could be obtained under certain circumstances. Under certain conditions, the Division agrees that such slopes could be achieved. However, modeling and analysis also indicated that only small changes in the phreatic line (saturation elevation and gradient) would drastically affect these

assumptions. The conjecture made by OSM as to where saturation occurs within these fills cannot be reasonably assured on a long-term basis. In the event that saturation occurs in and through a critical failure surface, factors of safety were found to drop from 1.3 under dry conditions to less than 1 (failure) under saturation.

As an example of the problems associated with the saturation level, a cross section taken from the plan and indicated on the drawings as Section 3 was used to show how saturation can affect slope stability. The soil parameters used in the analysis are taken from the plan and are shown in the sample data labeled as Gordon Creek #7 Portal Area, Saturation limited to top of MSHA bench. This example shows a slope from the top of the cutslope above the portal area projected at the least slope possible, to where it encroaches on the stream channel. The slope shown is a approximately 2:1 slope. Dry, the embankment exceeds a 1.3 FS. The graphic section provided with the example, with a phreatic line projecting from the MSHA bench to the toe of the fill indicates a FS of 1.2. A second graphic, with the slope fully saturated, indicates a FS of .69, resulting in slope failure. Refer to data and figures found in Appendix I to the this technical analysis.

While technically feasible, the use of underdrains, and rock buttressing of the slopes could be utilized to increase the slope angle of these fills, such practices are usually reserved for critical or high-risk construction sites. Extensive engineering and design requirements are necessary to build such structures and costs associated with construction are very high. Rock and underdrain material needed to construct such features would have to be brought in or developed elsewhere within the permitted area, thus further increasing the disturbed area. Such structures also require some degree of monitoring and maintenance in order to assure their proper function. Due to the remoteness of the site and the low hazards associated with the area, underdrains and rock toe buttresses of these slope is not warranted.

The Division agrees that due to varying climate and soils conditions within the Gordon Creek Area, that long-term static factors of safety should be evaluated under saturated conditions. Inaccessibility of the site following reclamation and the inability to maintain the site with major following revegetation warrant a conservative approach in stability design.

Terracing, benching and surface diversions are indicated in the rules and also mentioned by OSM as possible alternatives to alleviate problems with slope stability and saturation of fills. Known seeps within the fill areas are identified in the plan and have been developed in a manner that will endeavor to bring and keep these seep areas on the surface of the fills to reduce saturation. Benching and terracing of the slopes is not proposed in the plan. Because of the tight constraints within the canyon, development of benches in the fills would increase the lateral or base requirements for the fills in order to effectively decrease slopes and increase stability. Diversions along the tops of the slopes are considered

impractical for several reasons. Because of the steep natural slopes above the fill areas, construction of diversion would further increase the disturbed areas and potentially decrease the stability of the natural slopes above the disturbed areas. Placement of diversions in the fill at the top of the slopes is also considered impractical due to the steepness of these backfilled areas. Differential settling between the fill and the adjacent natural materials can often cause cracks or voids in the fill material at the interface which if diversions were to be place in these areas could inadvertently divert water directly into and behind the filled areas. These diversions as well as diversions associated with the use of terraces also would require a higher degree of maintenance on the site. Diversions, benches and terraces, although allowed in the regulations, are considered impractical based on site conditions.

These limitations do however restrict the amount of backfill material that can be placed along some of the cutslopes and above the highwalls within the mine site. In addition to the analysis performed for the fill areas, the cutslopes and cutslope areas above the highwalls were also evaluated by the operator for stability. These areas were found to have significantly higher factors of safety than the 1.3 minimum regulatory requirement. These high factors of safety are attributable to the high amount of bedrock in these cutslopes.

Although complete elimination of highwalls and cutslopes by backfilling those areas is the preferred alternative during reclamation, such practices cannot be achieved throughout the Gordon Creek Mine site due to factor of safety limitations, soils conditions and the geometry of the cutslopes in relationship to the natural slopes above the cuts and the establishment of permanent drainage channels below the cutslopes.

Regarding the second idea upon which the OSM analysis is based--that there is a large surplus of spoil available for backfilling the cutslopes and highwalls--this is simply not true and the OSM analysis acknowledges that fact. There is indeed, as the OSM analysis states, a large quantity of spoil in the original stream channel both adjacent to the No. 7 area and below sediment pond #7A. But all of this material came from the construction of the No. 2, No. 7, No. 8, and Old Fan Portal faceups. None has been hauled in or added as a result of mining. If all of this material were placed back in the cuts and compacted perfectly (speaking as if this were possible), without regard to stability, it would just fill the cuts and restore the area to its original configuration. Mine development wastes and spoils resulting from underground mining operations generally result in volumes of materials greater than the volumes originally excavated during mining operations. Use of all of these materials in backfilling and grading to achieve AOC is more desirable than the development of additional disturbed areas above or adjacent to highwalls for disposal. No historic maps of sufficient detail are available to show the pre-mining surface configuration for the entire mine site. Consequently, a detailed accounting of the location and extent of these materials is not available for evaluation.

OSM considers in their analysis that additional spoil is (or should be) reasonably available within the Gordon Creek Mine site. The Division agrees that, due to swell factors resultant from excavation of the mine facilities and that none of the materials excavated during mine development were removed from the area, that the volume of material currently placed as fill within the mine facilities is greater that the volume of the cuts that were concurrently developed during mine development. However, due to the limitations dictated by the factor of safety and site geometry, such fill material cannot effectively be used to eliminate all cut areas and cutslopes. Further discussion of this subject is found under the Backfilling and Grading Section of this TA.

The proposal put forth by the OSM analysis is to completely backfill the cutslopes and highwalls, which would require huge quantities of surplus spoil. Page 1 of the OSM analysis states: ". . . . the amount of spoil needed to eliminate the [No. 2] highwall will increase the fill volume for Portal No. 2 by about 64% (from 75,378 to 123,620 cubic yards)." Then page 5 states: "At the most, the combination [of the permittee's plan and the OSM proposal for the No. 7 area] will require the company to move an additional 24,930 compacted cubic yards." And then, having established that the OSM proposal would require large quantities of additional spoil, page 4 of the analysis states: "If [the spoil material beneath and below the 7A pond is] not needed to reclaim the No. 2 portal, it could be used to backfill the No. 7 portal." The last of these 3 comments illustrates that, even according to OSM's own analysis, there is no surfeit of fill material with which to completely backfill the cutslopes and highwalls. The OSM proposal would require all the spoil available plus a great deal more.

The additional quantities of spoil which would be needed to implement the OSM proposal are enormous. The additional 64% needed in the No. 2 area would constitute an increase of 48,242 cubic yards. The additional quantity of 24,930 cubic yards which the OSM proposal would require for the No. 7 area is half again larger than the present total for the No. 7 and No. 8 areas combined. This site is located in a narrow canyon with steep walls on both sides and an intermittent stream channel in the bottom. The additional fill material required by the OSM analysis simply isn't there.

Findings:

The plan fulfills the requirements of this section.

The Division's goal in reclaiming this site is the same as OSM's: to formulate a plan for restoring the site to AOC which both complies with the applicable Federal and state regulations and is also stable and environmentally sound over the long term. In assessing the proposed reclamation plan, the Division has worked with the permittee and has been sensible of OSM's concerns, as expressed in its May 15 letter to the Division. The Division

maintains that the plan for incomplete backfilling of the cutslopes and highwalls is the best plan for this site on all counts.

First, the highwall backfills, as designed, will be stable over the long term. This long-term stability is the result of a great deal of caution having been built into the plan. The assumption of full saturation in the stability analyses and the safety factor of 1.5 used in the No. 7 area are part of this caution. While this caution may seem excessive, it is sound in the context of a worst-case design philosophy and is thus certainly sound in designing for long-term stability. The cutslopes in the No. 2, the Old Fan Portal areas, and above the No. 7 highwall will not be completely eliminated, but given the limited quantity of spoil material and the space limitations of the canyon, their complete elimination is not possible in any event. And changing the saturation assumption in order to increase the fill height would only serve to remove a prudent caution from the plan and would gain only a few additional feet on the respective cutslope and highwalls. The OSM analysis suggests that the backfill material be terraced or that diversions be cut into its face to break up the long continuous slopes and thus prevent saturation of the fill and enhance its surface and mass stability. But diversions require maintenance and are thus not suited to long-term reclamation and they are a liability to surface stability as well. And there is neither space nor spoil enough for actual terraces.

Second, the stability of the backfills will make for quick and effective revegetation. This revegetation, of course, will enhance the surface stability of the fills and prevent damage from erosion. The long continuous slopes proposed by the OSM analysis would increase the risk of erosion damage and surface instability and would thus not be conducive to revegetation. Again, while higher and steeper fill slopes would eliminate more of the highwalls and cutslopes, their deleterious effect on revegetation would negate whatever benefit might be gained from the elimination of a very few more feet of the highwalls and cutslope.

Third, and related to the second, the stability of the backfills due to the lesser slopes will result in a reduced sediment production potential for the entire site. Erosion damage and sediment production will be decreased and the resulting contribution of sediment to surface waters off the site will be decreased. And again, while higher and steeper slopes would eliminate more of the highwalls and cutslopes, their increased potential for erosion and sediment production would negate any benefit which might result from the very small additional highwall and cutslope reduction.

And finally, the remaining portions of the No. 2 and the No. 7 cutslope will be similar in structural composition to the preexisting cliffs in the surrounding area and will be compatible with the visual attributes of the area. The and cutslope remnants are composed of the same rock which forms natural cliffs and outcrops in many of the canyons in the Gordon Creek area and are thus identical in structural composition to those natural features. And the

existence of these natural cliffs and outcrops elsewhere in the surrounding area assures that the cutslope remnants will blend into the surrounding topography and be visually compatible with the scenery of the surrounding area.

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:

The first reclamation operation following the final closure of the mining operation was the sealing of the portals. The No. 2 mine was sealed permanently in October of 1985 and the No. 7 and 8 mines were sealed in December of 1990. Each portal was first sealed by placing a block seal 25 to 50 feet inby the portal. The portal structure was then removed and the area outby the seal was completely backfilled to prevent access to the seal and to minimize roof breaking. Exposed coal seams in the portal areas were also covered.

The 2, 7 & 8 mines are considered dry mines, i.e., the mines themselves do not produce enough water to supply the needs of the mining operation. Most of the workings are downdip from the portals. The only area updip from the portal is the area northwest of the No. 2 west portals through the 70-acre lease modification. No water was encountered during the mining of this area. Because of the dryness of the mines and the locations of the portals relative to the dip of the seam, the seals will not impound water and so no hydrologic seals were used.

Shortly after final cessation of operations and portal sealing, all surface structures were removed. Metal, wood, pipe, and other such structural material was hauled away and either sold for scrap or disposed of in a municipal landfill. All concrete, including foundations, floors, and structural supports, was broken up and buried at the toe of the portal faceups.

Reclamation of the minesite will occur in two phases. During the first phase, the entire site will be reclaimed and the natural drainage channels reestablished and reconfigured from the No. 8 area down to the lower end of the No. 2 mine area. The present sediment ponds will be eliminated and a new 3-cell sediment pond will be constructed at the lower end of the site adjacent to the present main entrance gate. The new 3-cell pond will receive runoff from the entire site. All disturbed *and* undisturbed drainage will flow into the pond.

Once vegetation is reestablished and the sediment contribution to the pond is within acceptable limits, the second phase of the reclamation process will be carried out. The 3-cell sediment pond will first be removed and the area reclaimed. The reclaimed main drainage channel will then be extended to intersect the undisturbed channel below the site.

Sweets Pond will not be reclaimed. It is located on private land and the landowner has requested that the pond be left in place for private use. The permittee will turn the pond over to the landowner when reclamation is complete. The pond is designed for long-term stability and is a utility improvement as well as a source of water for wildlife.

All cutslopes along pad and road areas will be reduced as much as possible while maintaining the required minimum stability safety factor of 1.3. This will be accomplished by recovering downslope material with a backhoe and placing it against the cutslope faces with a bulldozer. The fill material will be compacted with a sheepsfoot compactor to improve stability. Temporary erosion controls, such as straw bales and silt fences, will be placed below these backfilled areas to prevent sediment from leaving the site and entering the natural drainage. The Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. determined the limiting dimensions of the fills in the respective areas by a detailed stability analysis. This analysis is discussed and its results are shown in the discussion which follows.

Since different parts of the site were originally disturbed at different times and under different regulatory requirements, the site has been divided, for the purposes of the backfilling and grading plan, into 4 different areas: the No. 2 area, the No. 7 area, the No. 8 area, and the Old Fan Portal area.

No. 2 Area

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The slope geometry parameters for this area were discussed in the Approximate Original Contour section above.

In 1993, the permittee performed a stability investigation of the cut slope above the portals in the No. 7 area, which is very similar to, but higher than, the cut slopes in the No. 2 area. This stability investigation, the results of which are found in Appendix 3-1, revealed that the No. 7 cut slope has a stability safety factor of 2.62. Since the No. 2 cut slopes are lower than those in the No. 7 area, and since the No. 2 cut slopes will be at least partially backfilled, which will further increase their stability, then the No. 2 cut slopes can be expected to achieve a stability safety factor *at least* equal to the value 2.62 achieved by the

No. 7 cut slope. And this, combined with the fact that the No. 2 cut slopes have been stable throughout the more than 30 years of their existence, demonstrates that the No 2 cut slope remnants fulfill the stability requirement of R645-301-553.523.

There are two seeps which daylight in the cutslope of the No. 2 area: one near the lower end of the No. 7 road and one above the office/shop area. Water from these seeps will flow over the surface of the fill in rip rap channels.

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the No. 2 area which are shown on Plates 3-8B and 3-8C depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7A and are of insufficient resolution to adequately show the extent to which the cut slopes of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 4 surveyed cross sections of the No. 2 area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 4 cross sections are designated #6, #7, #8, and #9. Their locations are shown on Plate 3-7A while the cross sections themselves are found on Plate 3-14. These additional cross sections are adequate to further define the present and final surface configuration of the No. 2 area.

No. 7 Area

A stability analysis of this area was done by the Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. in April of 1992. The slope geometry parameters for this area were discussed in the Approximate Original Contour section above.

Natural conditions within this canyon would typically place slopes at angles with factors of safety at or near a FS of 1 to 1.1. Development of backfilled slopes to a factor of safety of 1.3 requires a reduction in the natural slopes which existed prior to mining and a significantly greater amount of material than would be available from mine development waste and fill. If such fill materials were readily available, it would have to be placed within the bottom of the canyon and would elevate the drainage areas, reducing the gradient in these fill areas, and over-steepening the gradient down stream of the fills. Such practices would not be conducive to re-establishment of the natural drainage patterns within the canyon. Development of borrow areas for additional fill materials would further increase the disturbed area.

Surface contours within the site were revised by the Division to determine to what extent additional material may be available, within the currently disturbed area, to minimize or further reduce the extent and the height of the cutslopes associated with backfilling and grading. The Division found that material within the site is sufficient to further backfill the #7 Mine portal area to the extent that would be allowed by reducing the factor of safety from 1.5 to 1.3. The revised contours were used only to roughly approximate changes to the entire facilities that would occur. These revised contours, developed approximately 42,000 additional cubic yards of material which could be used for fill within the cutslope areas. Of this, approximately 14,000 cubic yards were used in the #7 Mine portal area with the remainder of the material used in and around the #2 Mine portal area. This material was derived from the gentle slopes adjacent to and to the southeast of the #2 Mine portal area. EarthVision volumetric mass balance calculations from revision of the surface contours are as found in the Volumetrics Report attached to this TA in Appendix I. These calculations only consider the movement of material in comparison to the final reclamation contours proposed by the operator and as such do not relate to the mass balance calculations in the plan used in design earthwork from the mine operation stage to final reclamation. Revision of the proposed surface contours was accomplished by the Division only to determine whether or not additional material could be utilized from within the currently disturbed area.

Placement of this additional material along the cutslopes within the site did not eliminate any significant amount of cutslope areas as delineated on the maps in the proposal. The additional fill material did help to reduce the vertical extent of some of these cutslopes. The cutslopes above the #7 Mine portal area were reduced from approximately 85 feet to 45 feet vertically, but due to factor of safety limitations, could not be completely eliminated. The cutslopes above the #2 portal area were also reduced by 10-15 feet but slopes were constrained by the main drainage channel located in the bottom of the canyon.

Variations in the soils characteristics in consideration of the placement of backfill material should also be noted. Analysis of the soils for the #7 Mine area and the #2 Mine area are different enough so as to affect the degree to which slopes can be developed and the extent to which cutslopes can be reduced. During field construction, the operator should be aware that the identification and location of materials which have the best characteristics for constructing slopes in critical areas may have a marked effect on the final slopes that can be attained during reclamation. Should higher quality materials be encountered during earthmoving activities, field amendments to the plan could enhance the final reclamation configuration.

In 1993, the permittee performed a stability investigation of the cut slopes above the portals and the road in the No. 7 area. This stability investigation, the results of which are found in Appendix 3-1, revealed that the No. 7 portal cut slope has a stability safety factor of 2.62 and that the cut slopes above the road have a stability safety factor of 4.01. Since the

No. 7 highwall below the MSHA safety bench, which has had a history of natural instability, will be completely eliminated by backfilling, and since the No. 7 road cut slopes will be at least partially backfilled, which will further increase their stability, the No. 7 cut slopes can be expected to be stable. And this, combined with the fact that the No. 7 cut slopes have been stable throughout their 15-year existence, demonstrates that the No. 7 cut slope remnants fulfill the stability requirement of R645-301-553.130.

R645-301-553.100 requires that disturbed areas be backfilled and graded to 1) achieve the approximate original contour, 2) eliminate all highwalls, spoil piles, and depressions, 3) achieve a stable postmining slope which has a stability safety factor of at least 1.3, 4) minimize erosion and water pollution both on and off the site, and 5) support the postmining land use. Furthermore, R645-100-200 defines approximate original contour as "that [final] surface configuration achieved by backfilling and grading of the mined areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain with all highwalls, spoil piles, and coal refuse piles having a design approved under the R645- rules and prepared for abandonment." Thus, the concept of approximate original contour involves not only the original geometry of an area, but the stability, hydrology, and suitability to the postmining land use of that area as well. The planned final configuration of the No. 7 area meets all of the parameters of approximate original contour, as the following discussion will demonstrate.

The stability of the final surface configuration has already been discussed at some length. Indeed, it has been shown that the planned final surface configuration is really the only one possible given the space constraints imposed by the natural drainage channel, the amount of fill material available, and the stability characteristics of that material, including density, cohesion, and internal friction angle (page 3-39).

R645-301-553.140 requires that the postmining configuration minimize water pollution both on and off the site. The planned configuration will best fulfill this requirement for several reasons. First, the stable configuration achieved using the stability safety factor of at least 1.3 will prevent slides and minimize erosion. Second, the designed slope of approximately 2.7h:1v will best promote successful revegetation by providing a stable seed bed. Third, the lower fill height will allow for the channeling of water from a seep above the fill over the surface of the fill, which will prevent the seep from saturating and destabilizing the fill. And fourth, the planned configuration is the only possible configuration which will meet all the requirements of approximate original contour without interfering with the reestablishment of the natural drainage channel (pages 3-39 to 3-41).

The planned configuration will also closely resemble the general surface configuration that existed prior to mining and will mimic the visual attributes of the surrounding area. The

surrounding area is steep and contains many cliffs and ledges. The remaining 60 feet of faceup above the fill will resemble these cliffs and ledges and the fill at its base will closely resemble the talus slopes which underlie those cliffs and ledges (page 3-40).

The planned configuration will be entirely compatible with the postmining land use of grazing and wildlife habitat. Grazing area and wildlife habitat will merely be displaced, but not eliminated, by the remaining faceup. And the emphasis given in designing the fill to stability, good vegetation, and preservation of good water quality will enhance the value of this area as livestock land and wildlife habitat (page 3-41).

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the No. 7 area which are shown on Plates 3-8A and 3-8B depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7A and are of insufficient resolution to adequately show the extent to which the cut slope and highwall of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 3 surveyed cross sections of the No. 7 area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 3 cross sections are designated #1, #2, and #3. Their locations are shown on Plate 3-7A while the cross sections themselves are found on Plate 3-13. These additional cross sections are adequate to further define the present and final surface configuration of the No. 7 area.

Although the incorporation of cutslopes into the reclamation design does have advantages as noted above, there are also adverse effects. Most important, is the consideration that due to the steepness of the cut slopes, their existence may pose a safety hazard to people, livestock and wildlife who encounter them. Because of the location of these cutslopes, the hazards associated with them are considered minimal. Steep natural slopes occur above these areas which limit access to the cutslopes. All access to the cutslope areas is below the cutslopes and no roads or trails are found immediately above these areas. Natural terrain in the area can be found as steep or steeper than the cutslope areas such that the natural hazards are at least equal or greater to the hazards associated with the cutslopes.

Another adverse effect is the visual and esthetic impact from the retained cutslopes. The visual impact is that the cutslopes will remain visible following revegetation and will be most visible from the bottom of the canyon where the site is accessible. However, the cutslopes are not visible from other vistas or viewing areas which would be generally accessible to the public or within view of any residences. The cutslopes will also appear similar to scarps which are found throughout the region resulting from natural land surface failures. Accordingly, while the visual impact from the cutslopes is adverse, it is not

considered as significant or limiting in regard to the post mining land use or as having any impact outside of the permit area.

As part of the backfilling and grading evaluation of the site, the Division considered the elimination or the reduction of cutslopes within the site. The visual effects regarding the placement of additional materials to reduce the vertical extent of cutslopes is not significant in comparison to the final surface configuration as proposed by the operator. To compare the difference, 3-D models looking at the #2 Mine area and the #7 Mine area were developed. Figure 1 shows the #2 Portal area as proposed in the plan while Figure 2 show the site following the relocation of the additional materials. Similarly, Figures 3 and 4, are shown for the #7 Portal area. Unfortunately, digital data was not made available to compare the pre-mining surface configuration or the operational surface configuration to the final reclaimed surface configuration.

No. 8 Area

This area, which lies opposite the No. 7 area and on a much gentler slope, will be completely backfilled and restored to approximate original contour (page 3-42).

There is a seep in the road cut just below the No. 8 mine pad. This seep has been controlled by two gravel drains. The first, which is approximately 36 inches deep by 12 inches thick by 24 inches wide, crosses the road and discharges into a small concrete retention basin in an otherwise undisturbed area. The second is approximately 24 inches wide by 18 inches deep and parallels the road to where it discharges into the main undisturbed culvert.

Both gravel drains will be left in place and covered with additional fill material. The second gravel drain will be supplemented with an additional 24-inch-square section of gravel along the road ditch. This will be covered with roofing paper before it is covered with fill material. The resulting enlarged drain will empty into the restored natural drainage channel between the No. 8 and No. 7 areas (page 3-40a).

Old Fan Portal Area

Backfilling and Grading of this area is discussed in the section on Approximate Original Contour above.

R645-301-542.300 and R645-301-542.310 require that the reclamation plan include " . . . final surface configuration maps with cross sections (at intervals specified by the

Division) that indicate: . . . [t]he final surface configuration to be achieved for the affected areas." The cross sections of the Old Fan Portal area which are shown on Plates 3-8D and 3-8E depict the final surface configuration. These cross sections were taken directly from the contours of Plate 3-7B and are of insufficient resolution to adequately show the extent to which the cut slope and highwall of the area will be backfilled. Therefore, in 1995, at the Division's request, the permittee submitted 4 surveyed cross sections of the Old Fan Portal area and superimposed upon these cross sections profiles of the anticipated final surface configuration. These 4 cross sections are designated #9, #10, #11, and #12. Their locations are shown on Plate 3-7B while the cross sections themselves are found on Plates 3-14 and 3-15. These additional cross sections are adequate to further define the present and final surface configuration of the Old Fan Portal area.

Findings:

Although OSM and Division disagree in part, to some of the assumptions used in the design and the development of the reclamation plan for the Gordon Creek 2, 7 & 8 Mines, the plan was found to meet the minimum regulatory requirements with respect to highwall elimination, backfilling and grading, and meeting AOC requirements. Additional materials potentially can be placed to reduce the vertical extent of cutslopes within the existing disturbed area. However, such considerations are not significant to warrant re-design and re-evaluation of the reclamation plan as proposed.

Backfilling in the #7 Mine portal area should be increased by reducing the factor of safety from 1.5 to 1.3. Evaluation of other areas, including the #2 Mine portal area are already proposed with a 1.3 factor of safety. Accordingly, the following permit condition is required:

R645-301-553, Backfilling and Grading, backfilled slopes in the #7 Mine portal area shall be backfilled to the extent possible while maintaining a factor of safety of 1.3. The operator shall determine, based on site conditions, where additional materials may be developed and placed as fill to further reduce or eliminate cut slopes associated with the reclamation plan. Slope measurements and stability analysis based on site conditions during construction shall be provided in conjunction with certified as-built reports or plans demonstrating stability and that backfilling of cutslopes to the extent possible during reclamation activities has been accomplished.

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 first reclamation operation following the final closure of the mining operation was the sealing of the portals. The No. 2 mine was sealed permanently in October of 1985 and the No. 7 and 8 mines were sealed in December of 1990. Each portal was first sealed by placing a block seal 25 to 50 feet in by the portal. The portal structure was then removed and the area out by the seal was completely backfilled to prevent access to the seal and to minimize roofbreaking. Exposed coal seams in the portal areas were also covered.

Findings:

The plan fulfills the requirements of this section.

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-232, -301-233, -301-234, -301-242, -301-243.

Analysis:

Prelaw (i.e. P.L.95-87) disturbance at this site is approximately 10.82 acres and comprises the No.2 Mine operation yard and access road (approximately 9.18 acres) and the Old Fan Portal (approximately 1.64 acres). Topsoil was not separately salvaged from these prelaw disturbed areas prior to their disturbance.

The permittee plans to use material from the No. 2 Mine fill and the No.2 Mine access road fill as substitute topsoil (Page 3-14). Laboratory analyses characterizing the proposed substitute topsoil material are found in Appendix 8-1.

The permittee has committed to sample the regraded surface of the No.2 Mine to determine fertilizer requirements (page 3-15).

Topsoil and subsoil from the No.7 Mine area were salvaged from all disturbed areas

except those areas which were excessively rocky, where topsoil was of limited depth, or where the steepness of the terrain posed a safety hazard to machinery. Topsoil from the No. 7 Mine (3684 cubic yards) is stored adjacent to the No. 2 Mine operations area and subsoil from the No. 7 Mine (8000 cubic yards) is stored adjacent to the No. 7 Mine operational area. This topsoil and subsoil material will be evenly distributed along the contour (page 3-43) to a depth of twelve inches subsequent to backfilling and grading (Table 8-5A).

Topsoil which was salvaged from the No. 8 Mine (2514 cubic yards) disturbance is stored on top of the subsoil pile adjacent to the No.7 Mine operations area. Subsequent to the completion of backfilling and grading, this topsoil material will also be evenly distributed along the contour to a depth of twelve inches (Table 8-5A).

Interim reclamation of the Old Fan Portal area was done in 1984. The existing fill was used as topsoil since no topsoil had been salvaged initially. Vegetation has been established on the regraded spoils. The permittee proposes additional regrading in the Old Fan Portal area.

The permittee proposes that the surface material on slopes steeper than 70 percent (areas depicted on Plate 3-7A, 3-7B, and 3-7C) be left in place and used as substitute topsoil (page 3-17). To demonstrate its suitability as substitute topsoil material, this surface material will be sampled in May and June and analyzed as described in Section 3.5.5.1. Sample site locations are shown on Plate 3-1.

In order to alleviate compaction, all regraded soil will be deep ripped to a depth of 18-inches (page 3-33 & 47). Plant growth medium will be gouged and roughened in order to maximize its surface roughness and thus enhance its revegetation capability. This will be accomplished by using a large backhoe bucket to create 2'-3' diameter, irregularly-placed depressions (page 8-32).

Prior to reexcavation, the topsoil and subsoil stockpiles will be analyzed for nitrogen, phosphorus and potassium (page 3-50). An appropriate fertilizer will then be formulated based on that analysis.

Findings:

The plan fulfills the requirements of this section.

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 Grand Junction consulting firm of J.F.T. Agapito & Associates, Inc. determined the limiting dimensions of the fills in the respective areas by a detailed stability analysis. All cutslopes along road areas will be reduced as much as possible while maintaining the required minimum stability safety factor of 1.3. This will be accomplished by recovering downslope material with a backhoe and placing and compacting it against the cutslope faces with a bulldozer. Temporary erosion controls, such as straw bales and silt fences, will be placed below these backfilled areas to prevent sediment from leaving the site and entering the natural drainage.

Findings:

The plan fulfills the 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:

Acid and toxic-forming materials

The permittee has committed to the removal and relocation of contaminated material from the No. 2, 7 & 8 Mine yard fills. This includes removal of material contaminated with oil and grease, material which is more than 50 percent coal, and acid- and toxic-forming material as defined by the Utah Coal Mining Regulations and qualified by the Division's Guidelines for Topsoil and Overburden, Table 2. These contaminated materials will be identified during backfilling and grading based on visual observation, combustibility analysis and the sampling outline on pages 3-50 & 3-51. The contaminated materials will then be completely removed from their original location and buried onsite with four feet of non-

combustible, nonacid- and nontoxic-forming material.

Exposed coal seams will be covered with a minimum of four feet of noncombustible material. Some small rider seams will not be covered in areas where the fill configuration required to cover them would be unstable (See also **Backfilling and Grading** above). The coal seams will be covered with three feet of "rock material" and one foot of topsoil and/or suitable substitute topsoil (page 3-34).

Findings:

The plan fulfills the requirements of this section.

Sedimentation Ponds R645-301-742.220 thru 742.225.2

Analysis:

The hydrologic portion of the reclamation plan calls for a new 3-celled sedimentation pond to be constructed at the downstream end of the disturbed area. The Operator has provided for maintenance of the temporary sediment pond during the reclamation phase (page 7-40). It will be reclaimed and the original channel restored when bond release requirements are met for sediment control and vegetation (page 7-40). Per the requirements of R645-301-880-320 and R645-301-732-210 and Phase II bond release criteria, the following structures will be affected (Sweet's Canyon Pond and the temporary sediment pond) and as such, a Division of Water Rights permit, a Division of Dam Safety permit and a maintenance agreement for these structures have been supplied. The Operator has stated how he will comply with the requirements for permanent maintenance including sediment removal if required for the reconstructed sediment pond on page 7-40 of the plan. Sediment levels are shown as being determined by direct measurement at the sediment marker, as shown on Plate 7-14 and will be cleaned-out when the sediment reaches the cleanout level of 7748.5'. The pond will be inspected quarterly and on an annual basis as required.

The Sweet's Canyon Pond will remain and be maintained by the landowner as stated in the September 28, 1994 letters found in Appendix 3-5 to Beaver Creek Coal Company from Agnes K. Pierce. A Slope Stability Analysis for the Sweet's Canyon Pond is found in Appendix 3-4 demonstrating a slope stability of 2.35 for saturated conditions. Water Rights Lease and Sale Agreement allocated to the Sweet's Canyon Pond was entered into on the 7th of April, 1993 and is found in Appendix 3-9.

The following forms and applications have been approved for the following impoundments to be retained or used during reclamation.

Sweet's Pond

1) Form 69 filed with the Division of Water Rights is found in appendix 7-4.
2) A transfer of Water Rights to the Sweet's Pond from Gordon Creek is found in appendix 3-9 but a change application for the point of use needs to be filed by the owner for the water rights to be valid.
3) A clarification of the use and responsibility for maintenance of the pond now that Mr. E.E. Pierce is deceased is found in appendix 3-5.

Temporary Sediment Pond

1) Sediment clean-out levels will be marked with a sediment marker in the pond.
2) Clean-out of the pond will occur at the 60 % sediment storage level (7748.5').
3) Form 69 for the temporary 3-celled structure is found in appendix 7-4. An approval letter, dated February 7, 1995, is also found in Appendix 7-4.
4) The pond will be decanted using a portable pump to the maximum sediment storage level elevation when necessary. (page 4-2).

Findings:

The permittee meets the requirements of the rules regarding the sediment ponds and permanent impoundments.

Diversions R645-301-742.300 et.al. and R645-301-742.400 thru 743

Analysis

The plan provides for reclamation of the Right and Left Forks of Bryner Canyon using the 100-year 6-hour storm event in accordance with R645-301-742.323. Permanent channels for the ephemeral drainages were designed using the 10-year 6-hour event in accordance with R645-301-742.333. The main channel and the Right Fork of Bryner Canyon were considered intermittent and all others considered ephemeral. The watershed boundaries used to determine precipitation runoff from undisturbed areas within Bryner Canyon are shown on Plate 7-5A. The locations of all channels showing riprap sizes and slopes are shown on Plate 3-7A, 3-7B, and 3-7C. All design information for the plan regarding the applicable calculations and methodologies is found in Appendix 7-1.

The plan provides for the restoration of the Right Fork of Bryner Canyon to restore premining characteristics of the original stream channel where it meets the old pad fill. Ponding, in what is considered a natural depression that appeared to be caused by the

presence of the pad and failure to reestablish original grade for the channel, has been eliminated.

Reclamation of the mine site will be completed in a single phase, with the exception of the removal of the new sediment ponds. The first step will be to build the new three celled pond in the Bryner Canyon drainage below the mine site. (See Plates 3-7B and 7-14). The minesite will be reclaimed starting from the top down, with No. 8 first, followed by No. 7, No.2 Access Road, and finally, the Old Fan Portal Area. The natural drainage will be restored down to the undisturbed drainage below the No. 2 Mine, as shown on Plate 3-7A. At this point the No.2 pond and 7A pond will be removed and all drainage above the new 2/7/8 Sediment Ponds will flow into the ponds.

There are several diversions of miscellaneous spring flow which drains across reclaimed slopes (springs located at the 2,7, and 8 mine areas). Provisions are discussed on page 7-33 regarding the use of riprap and filter blankets for the appropriate areas and a french drain for the No. 8 Mine road cut seep.

Findings:

The permittee has supplied the necessary information regarding the restoration of the natural drainages in the area of the No.2,7, and 8 Mine sites

1. The Permittee has filed the necessary Stream Alteration Permit for the reclaimed stream channel with the Division of Water Rights and as such a positive finding can be made pending approval by the Division of Water Rights.

Sediment Control Measures R645-301-742

Analysis

The Permittee has provided details on mulching rates, hydromulch application rates, tackifier amounts and types, and erosion control matting. Commitments to maintain the site from an erosion standpoint have been made in the permit in Section 7.2.8.5 (page 7-58), Maintenance Plan For Erosion. A design summary of the one BTCA area associated with the Old Fan Portal Area is found in Appendix 7-5 and designated as such on Plate 3-2.

There will be a lot of earth moving taking place adjacent to presently undisturbed drainages and it will be considered prudent sediment control to prevent the migration of earth disturbance into those presently undisturbed drainages. The contractor should be made aware

of this potential and instructed in regards to using care when operating adjacent to these areas.

Findings:

The Permittee meets the requirements of the rules regarding erosion control and control of sediment from the reclaimed areas.

Water Quality Monitoring R645-301-723 and 742.100,200,300

Analysis

The Permittee has proposed a plan which monitors 6 stations for the parameters shown in Table 7-18. The sampling program provides information on seasonal flow and water quality on intermittent and ephemeral streams that have potential to be affected by mine discharge and surface disturbance. Discussion of surface water monitoring locations, type, frequency and flow device may be found in Table 7-17. A map of monitoring locations is provided on Plate 7-2. Analyses will be for parameters listed in Table 7-18. The Post Mining Water Monitoring plan is described on 7-67 of the permit.

Findings:

The Permittee meets the requirements of the regulations regarding water monitoring.

REVEGETATION

Regulatory Reference: R645-301-244, 301-353, 301-355, 301-356

Analysis:

General requirements

The revegetation portion of the plan is found on pages 3-52 thru 3-65. The revegetation seed mixture is specified on page 3-54 and 3-55. The mixture contains grasses, forbs, and shrubs which are known to be palatable to big game animals. Cicer milkvetch and alfalfa are the only non-native species in the mixture. Cicer milkvetch has been included both because it is a legume and also because it is palatable to big game animals. Alfalfa is desirable for its quick establishment and nitrogen-fixing capabilities. Alfalfa usually does not

persist on these sites for more than a few years. Five other native forb species are included in the mixture.

In addition to the five shrub species which will be seeded, the riparian areas will also be transplanted with containerized stock of Salix, Elderberry, Serviceberry and Chokecherry (page 3-55). Seeps and springs will be planted at 25-foot intervals and the main drainages will be planted at 50-foot intervals on each side. An augmented seed mixture which includes additional grass and forb species will be applied to the riparian areas.

All seeding will be done by either hydroseeding or hand broadcasting and will be followed by light raking (page 3-53). Past interim seeding efforts have shown this procedure to be effective for this area. The permittee has committed to limit the amount of time the seed is in the hydroseeder to no more than 30 minutes.

The plan commits to leaving the site in a roughened state (page 8-32). By using a large backhoe bucket to redistribute the topsoil, depressions 2 feet to 3 feet in diameter will be left. The surface material in areas which are not backfilled and which will not receive topsoil will be amended with straw or hay at a rate of 1500 pounds per acre. Where feasible, the straw or hay will be incorporated into the soil with a trackhoe. In less accessible areas, the straw or hay will be incorporated by punching and gouging the soil (page 3-51). Hand roughening will consist of surface loosening of the soil to a depth of 4 to 6 inches with hand tools.

Timing

The plan commits to begin seeding no earlier than September 1 (page 3-54) and to complete the seeding in the fall of the year. This is the time of year normally accepted for seeding with this particular seed mixture and for this area. The revegetation schedule is outlined on page 3-57. Preliminary work such as seed ordering and soil sampling will begin, respectively, in May and June. Recontouring will begin in July with final mulching occurring in October.

Mulching and other soil stabilizing practices

A wood fiber hydromulch will be applied, at the rate of 2000 lbs per acre (3-56), to all seeded areas with slopes less than 2h:1v and to all nontopsoiled areas with slopes greater than 2h:1v (page 3-58). Hydromulching has been shown, in interim revegetation on this site, to be effective in controlling erosion and stabilizing the soil surface on slopes less than 2h:1v.

On slopes steeper than 70 percent where topsoil and/or subsoil is not applied, alfalfa mulch will be placed on the surface at the rate of 1500 lbs per acre. In areas which can be reached by a trackhoe, surface gouging will be performed to create surface roughness and incorporate mulch. In steep areas which cannot be reached by a backhoe, hand tools will be used to roughen the soil surface and incorporate the mulch.

Standards for success

The postmining land use is wildlife habitat. Therefore, the requirements of R645-301-356.230 must be met. Success of vegetation will be determined on the basis of shrub stocking and vegetative ground cover. The plan does not specify a shrub standard. The Division, DWR and the permittee have agreed, as shown by a 10/31/94 letter from Bill Bates of DWR (page 3-58), that a minimum shrub stocking standard of 2000 shrubs per acre will be the success standard to be achieved by this site. The permittee's commitment to this success standard is found on page 3-61 of the plan.

The stated success standard for cover and diversity is to be that of the Mountain Grassland community (page 3-58). The Mountain Grassland (also referred to as Mountain Brush/Grass Community) reference area is located above the No. 2 Mine and identified on Plate 9-1. The data for this reference area were collected in July of 1981. The most frequent species in the reference area during the 1981 inventory were Salina Wildrye and Indian Ricegrass. Based on an ocular estimate, total vegetative cover was 20 percent. In 1993 the Mountain Grassland reference was again sampled and the vegetative cover was estimated to be 43 percent (Appendix 9-2). Salina Wildrye and Broom Snakeweed were the most frequently encountered plants. Because of the large differences in percent cover values, some doubt exists that the same areas were sampled. However, approval of the reference area is based on the 1993 sampling. If subsequent sampling indicates that the 1981 sampling is more representative of the actual cover value, then the use of the Mountain Grassland reference area as a standard for the entire site will have to be reevaluated.

The proposed 2/7/8 Sediment Pond is to be constructed in an area which is not included in the current approved disturbed area. However, the area was previously disturbed by the construction of the adjacent Carbon County road and by the operation of the abandoned Swisher No. 1 Mine. The plan commits to revegetate this area to meet the success standard of the Mountain Grassland reference area. A determination will have to be made during the growing season, prior to disturbance, as to whether or not a vegetation inventory of this area is necessary.

Findings:

The plan fulfills the requirements of this section. However, as a condition of this

permit, the permittee must commit to do the following, in accordance with the requirements of:

R645-301-321.100

During the growing season, a determination will need to be made as to whether or not a predisturbance vegetation inventory of the proposed 2/7/8 Sediment Pond is necessary.

STABILIZATION OF SURFACE AREAS

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

Analysis:

See **Revegetation** and **Backfilling and Grading** above.

Findings:

The plan fulfills the requirements of this section.

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:

See also **Backfilling and Grading** above.

Affected area boundary maps.

Plates 3-7A, 3-7B, and 3-7C accurately and adequately show the disturbed area boundaries for the No. 2, No. 7, No. 8, and Old Fan Portal areas. Approximately 1.5 acres will be added to the disturbed area with the construction of the new sediment ponds and this added area is shown on Plates 3-7B and 3-7C. Since this area constitutes less than 15% of the total present disturbed area, its addition to the disturbed area does not constitute a significant revision of the permit, but only an amendment.

Bonded area map.

Plates 3-7A, 3-7B, and 3-7C accurately and adequately show the bonded area boundaries for the No. 2, No. 7, No. 8, and Old Fan Portal areas. Plate 3-1A shows Sweets Pond, which will not be reclaimed, and its associated bonded area. For this site, the bonded area is identical to the disturbed area and comprises approximately 17.2 acres. Approximately 1.5 acres will be added to the disturbed area with the construction of the new sediment ponds and this added area is shown on Plates 3-7B and 3-7C.

Reclamation backfilling and grading maps.

Plates 3-7A, 3-7B, and 3-7C show the backfilling and grading which will be done at this site. In addition, Plates 3-8A, 3-8B, 3-8C, 3-8D, and 3-8E contain cross sections, taken from topographic maps, which depict the present surface configuration and the anticipated reclaimed surface configuration.

Reclamation facilities maps.

The only reclamation facilities which will remain will be the new sediment ponds, which will be reclaimed at the end of the Phase II reclamation period. These ponds are shown on Plates 3-7B and 3-7C.

Final surface configuration maps.

Plates 3-7A, 3-7B, and 3-7C show the anticipated final surface configuration. In addition, Plates 3-8A, 3-8B, 3-8C, 3-8D, and 3-8E contain cross sections, taken from topographic maps, which depict the present surface configuration and the anticipated final surface configuration.

Reclamation surface and subsurface manmade features maps.

There are no buildings within 1000 feet of this site and no electrical transmission lines or pipelines passing over or under the site.

Plates 3-7A, 3-7B, 3-7C, and 3-1A show the anticipated final surface configuration. These maps show the location and extent of the fence which will be erected around the site to keep livestock from destroying the developing vegetation. Plates 3-7B and 3-7C show the Carbon County access road in relation to the rest of the site and Plate 3-1A shows Sweets Pond and its surrounding area.

Reclamation treatments maps.

The only reclamation treatment facilities which will remain will be the new sediment ponds, which will be reclaimed at the end of the Phase II reclamation period. These ponds are shown on Plates 3-7B and 3-7C.

All facilities which will be used to protect and enhance fish and wildlife related environmental values are shown on Plates 3-7A, 3-7B, and 3-7C. These include a small native rock holding basin for wildlife watering near the No. 8 Mine seep, the fence which will prevent livestock grazing of the revegetated area for the entire bond liability period, and the seeps in the No. 7 area which will flow across the surface of the backfill and thus be accessible to wildlife.

Findings:

The plan fulfills the requirements of this section.

BONDING AND INSURANCE REQUIREMENTS

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

Analysis:

Form of bond. (Reclamation Agreement)

A surety bond in the amount of $641,443 is held with the United Pacific Insurance Company.

Determination of bond amount.

The total cost of reclaiming this site was estimated to be approximately $327,826, in 1983 dollars. The costs of sealing and backfilling the portals and of removing and disposing of the surface facilities were left out of the calculation of this sum since all of this work was done in 1991, while at the same time the cost of reclaiming the Old Fan Portal area was added in. This estimated cost was escalated through 1988, when the No. 8 Mine started operation, at which time the reclamation costs associated with the No. 8 area were added in, to make up a total of $394,074, in 1988 dollars. This amount was then escalated through 1999 in order to get an estimate of the required bond amount through the end of the present permit term. The required amount turns out to be $505,643, in 1999 dollars. Since the reclamation bond is in the amount of $641,443, this site is more than adequately bonded

through 1999. The following table summarizes the foregoing discussion.

YEAR	ESCALATION FACTOR*	RECLAMATION COST	REMARKS
1983	----	$327,826	#2 and #7 Mines Only
1984	0.92	$330,842	#2 and #7 Mines Only
1985	2.90	$340,436	#2 and #7 Mines Only
1986	2.10	$347,586	#2 and #7 Mines Only
1987	1.95	$354,364	#2 and #7 Mines Only
1988	1.81	$360,777 + $33,297 = $394,074	#8 Mine Added to #2 and #7 Mines
1989	1.77	$401,050	#2, #7 & #8 Mines
1990	0.77	$404,138	#2, #7 & #8 Mines
1991	1.27	$409,270	#2, #7 & #8 Mines
1992	2.21	$418,315	#2, #7 & #8 Mines
1993	2.61	$429,233	#2, #7 & #8 Mines
1994	3.21	$443,012	#2, #7 & #8 Mines
1995	2.68	$454,884	#2, #7 & #8 Mines
1996	2.68	$467,075	#2, #7 & #8 Mines
1997	2.68	$479,593	#2, #7 & #8 Mines
1998	2.68	$492,446	#2, #7 & #8 Mines
1999	2.68	$505,643	#2, #7 & #8 Mines

*Escalation factors are taken from Means©

Terms and conditions for liability insurance.

Liability insurance policy ISL G1 519134-A is held with the Insurance Company of North America through the agency of the CIGNA Insurance Company. The effective term of this policy goes from January 1, 1993 through January 1, 1996. The combined coverage

for bodily injury and property damage is $500,000 for each occurrence and $500,000 aggregate. The certificate of insurance which the Division holds states that, in the event that the policy is cancelled for any reason by the permittee, the insurance agency, CIGNA, will give the Division written notification within 45 days.

Findings:

The plan fulfills the requirements of this section.

APPENDIX I

to
Gordon Creek 2, 7 & 8 Mine
Reclamation Plan TA

Technical Exhibits, Calculations, and Supporting Data

GEOSYSTEM SLOPE STABILITY PROGRAM
SB-SLOPE

PROJECT DATA:
Project: Gordon Creek #7 Portal Area
Location: Saturation limited to top of MSHA bench.
Filename: 278S Description: Gordon Creek 278 Section 3

ANALYSIS DATA:

Point No.	Coordinates X	Y
1	157.0	8310.0
2	171.0	8300.0
3	181.0	8290.0
4	249.0	8208.0
5	280.0	8178.0
6	288.0	8177.0
7	316.0	8146.0
8	350.0	8141.0
9	480.0	8147.0
10	489.0	8145.0
11	491.0	8143.0
12	500.0	8143.0
13	550.0	8170.0

Line No.	Left Point	Right Point	Soil No.	Phreatic Line
1	1	2	1	N
2	2	3	1	N
3	3	4	1	N
4	4	5	1	N
5	5	6	1	N
6	6	7	1	N
7	7	8	1	N
8	8	9	1	N
9	9	10	1	N
10	10	11	1	N
11	11	12	1	N
12	12	13	1	N
13	2	9	2	N
14	5	9	2	Y

Soil No.	Density pcf	Cohesion psf	Phi Deg
1	155.0	2000	35.0
2	120.0	504	21.0

SB-SLOPE

Simplified Bishop Slope Stability Analysis

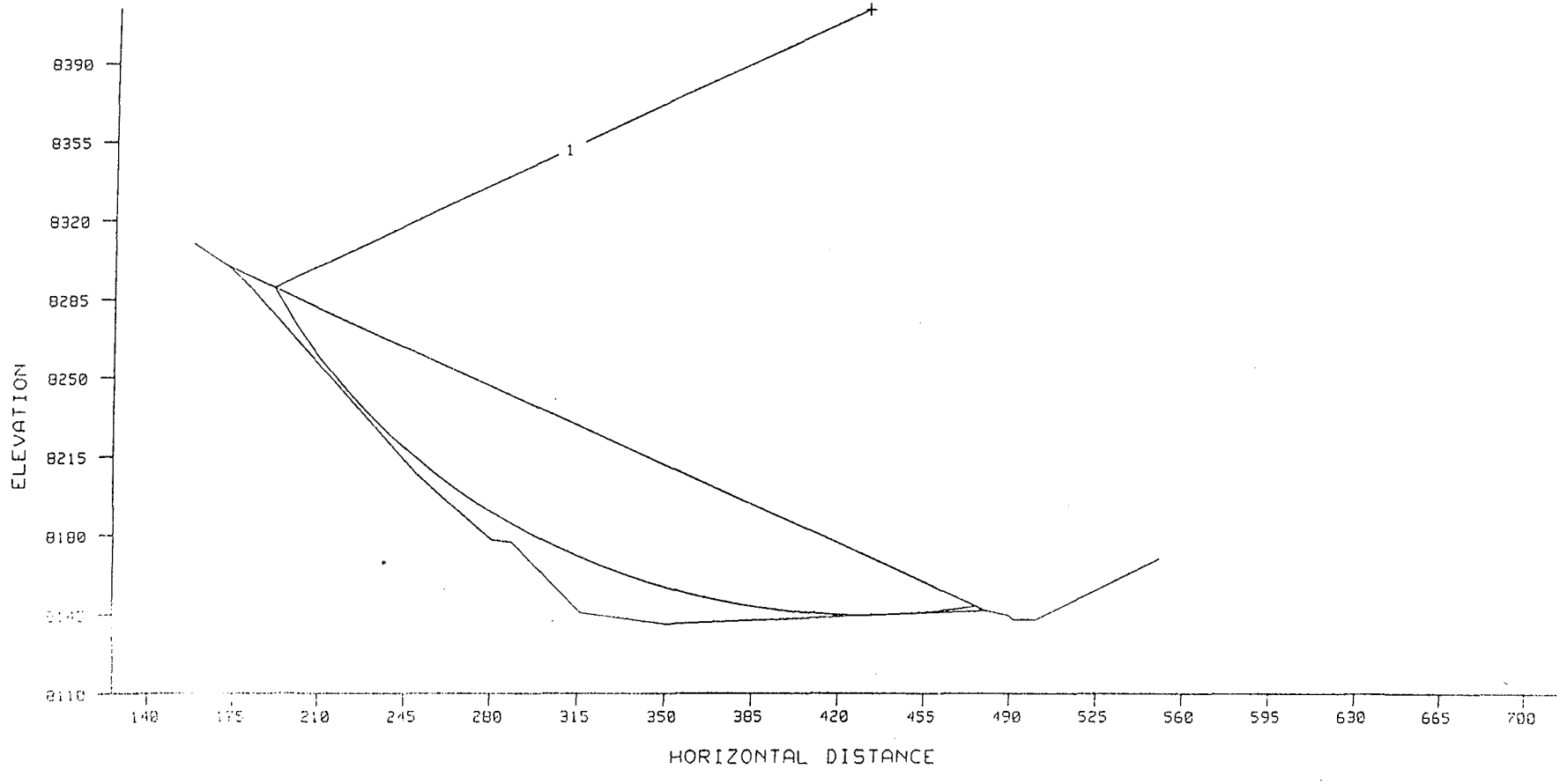
PROJECT: Gordon Creek #7 Portal Area

LOCATION: Saturation limited to top of MSHA bench.

FILE: 278S

COMPLETE SLOPE CROSS SECTION SHOWN

CIRCLE	X	Y	RADIUS	FS
1	430.0	8415.0	270.0	1.20



OSMRE - TIPS

SB-SLOPE

Simplified Bishop Slope Stability Analysis

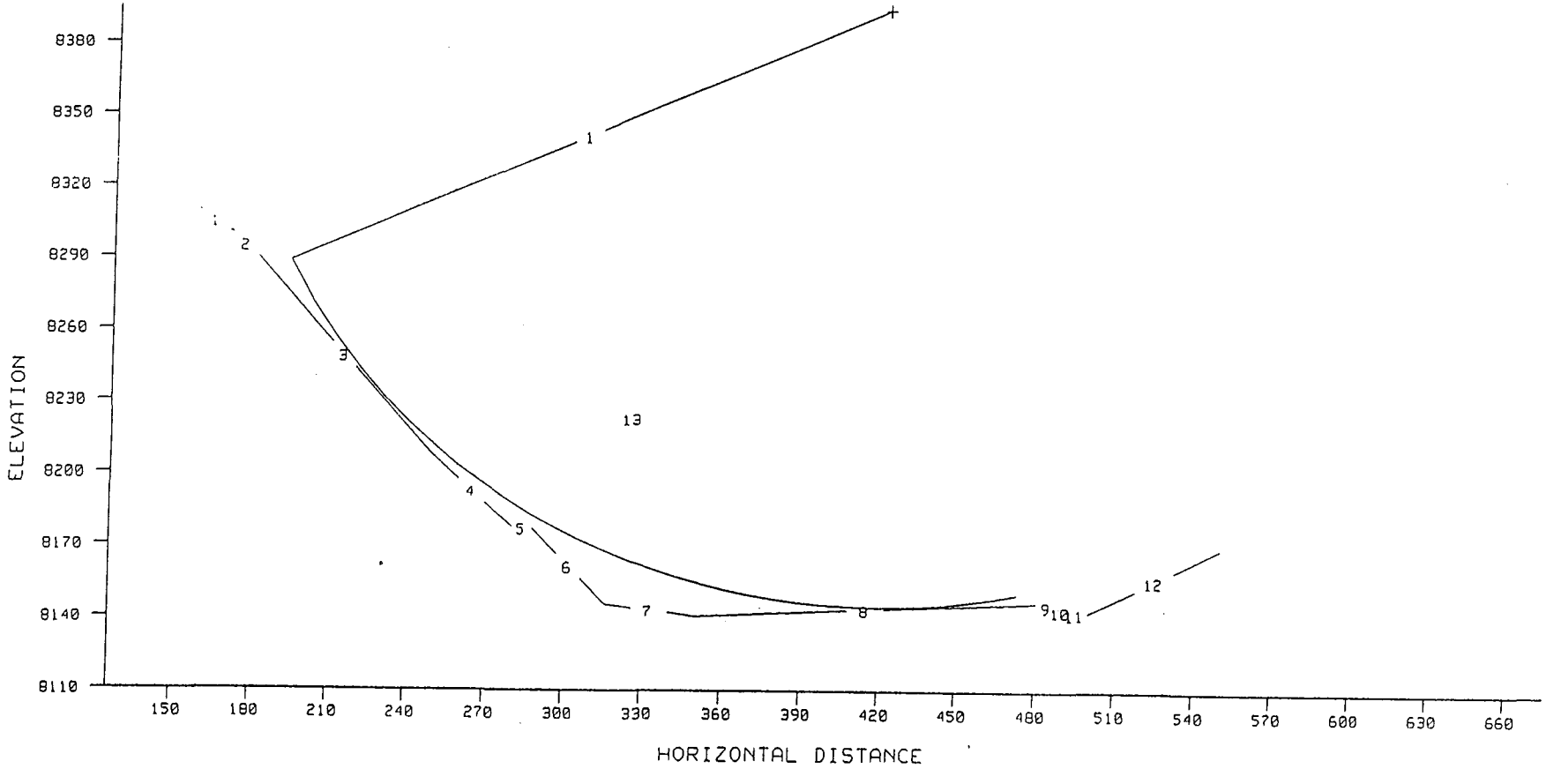
PROJECT: Gordon Creek #7 Portal Area

LOCATION: Section 3

FILE: 278S

COMPLETE SLOPE CROSS SECTION SHOWN

CIRCLE	X	Y	RADIUS	FS
1	420.0	8395.0	250.0	0.69



VOLUMETRICS REPORT

Run by: rharden
Version: 2.0
Date: 06/07/95
Report file: t1.2vrpt

Polygon file: cutfill.vply
Zone definintion: Operational
Deposition operation: base.2grd
Unconformity operation: revised.2grd
Unconformity operation: base.2grd
Primary field: Polygon ID
Sorting method: Polygon order
Input units: feet square by feet
Volumetrics conversion factor: .037037037313
Output units: Cubic yards
Global minimum thickness: 0.0

---------- Zone name: cut ----------

Minimum z: none
Maximum z: none
Minimum thickness: 1
Yield factor: 1.0

---------- Zone name: fill ----------

Minimum z: none
Maximum z: none
Minimum thickness: 1
Yield factor: 1.0

Volumetrics Report

Zone name: cut

Polygon ID / Polygon Class	Polygon Area	Volume	Positive Area
Cutfill	1,901,825.6875	42,205.8104	148,064.882682
Subtotal for Cutfill	1,901,825.6875	42,205.8104	148,064.882682
Total for cut	1,901,825.6875	42,205.8104	148,064.882682

Zone name: fill

Polygon ID / Polygon Class	Polygon Area	Volume	Positive Area
Cutfill	1,901,825.6875	41,966.0424	186,[illegible].363121
Subtotal for Cutfill	1,901,825.6875	41,966.0424	186,[illegible].363121
Total for fill	1,901,825.6875	41,966.0424	186,[illegible].363121

Figure 1 Portal Area as Proposed, Looking West

Figure 2 – #2 Portal Area as Revised, Looking West

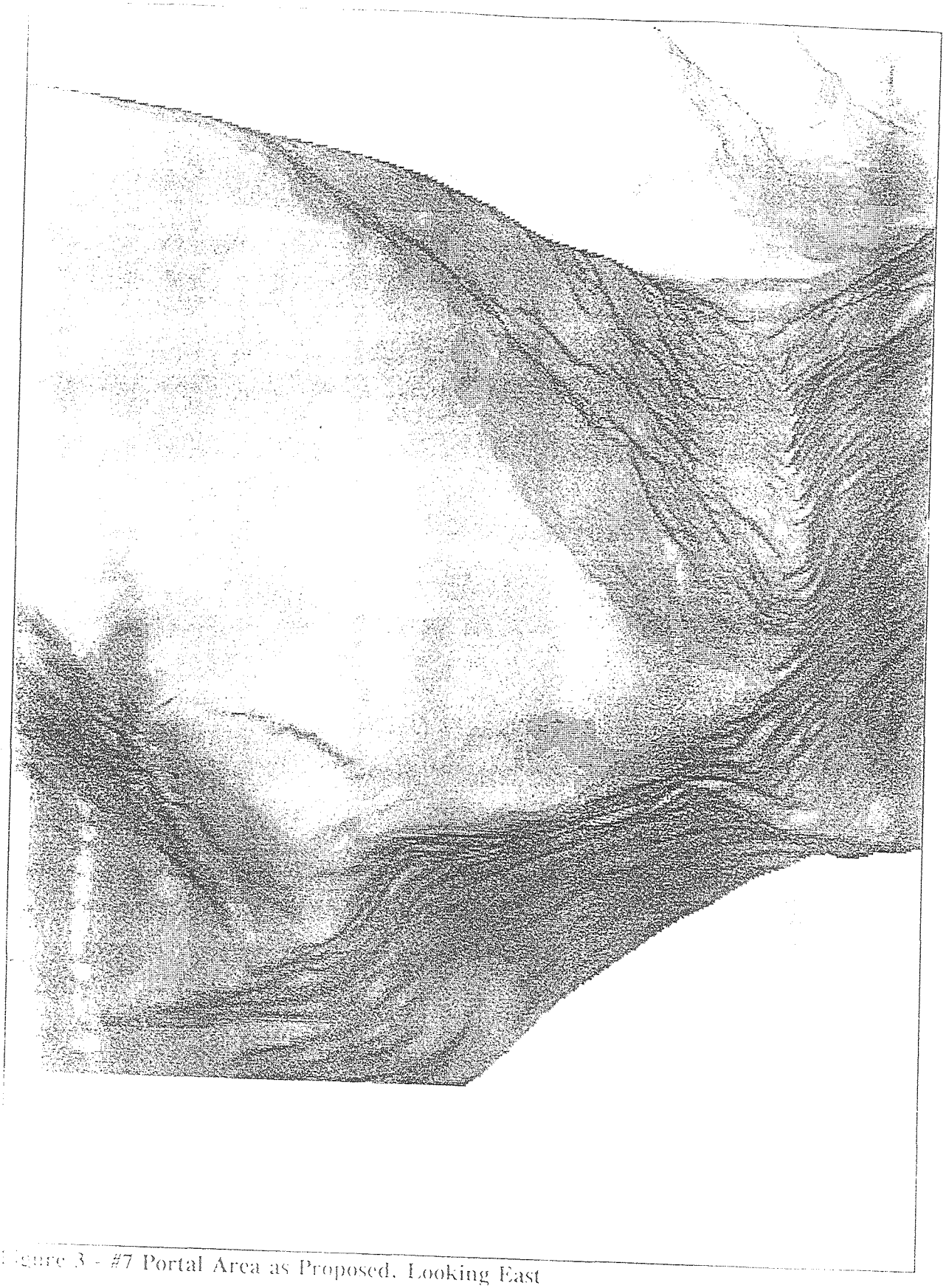


Figure 3 - #7 Portal Area as Proposed, Looking East

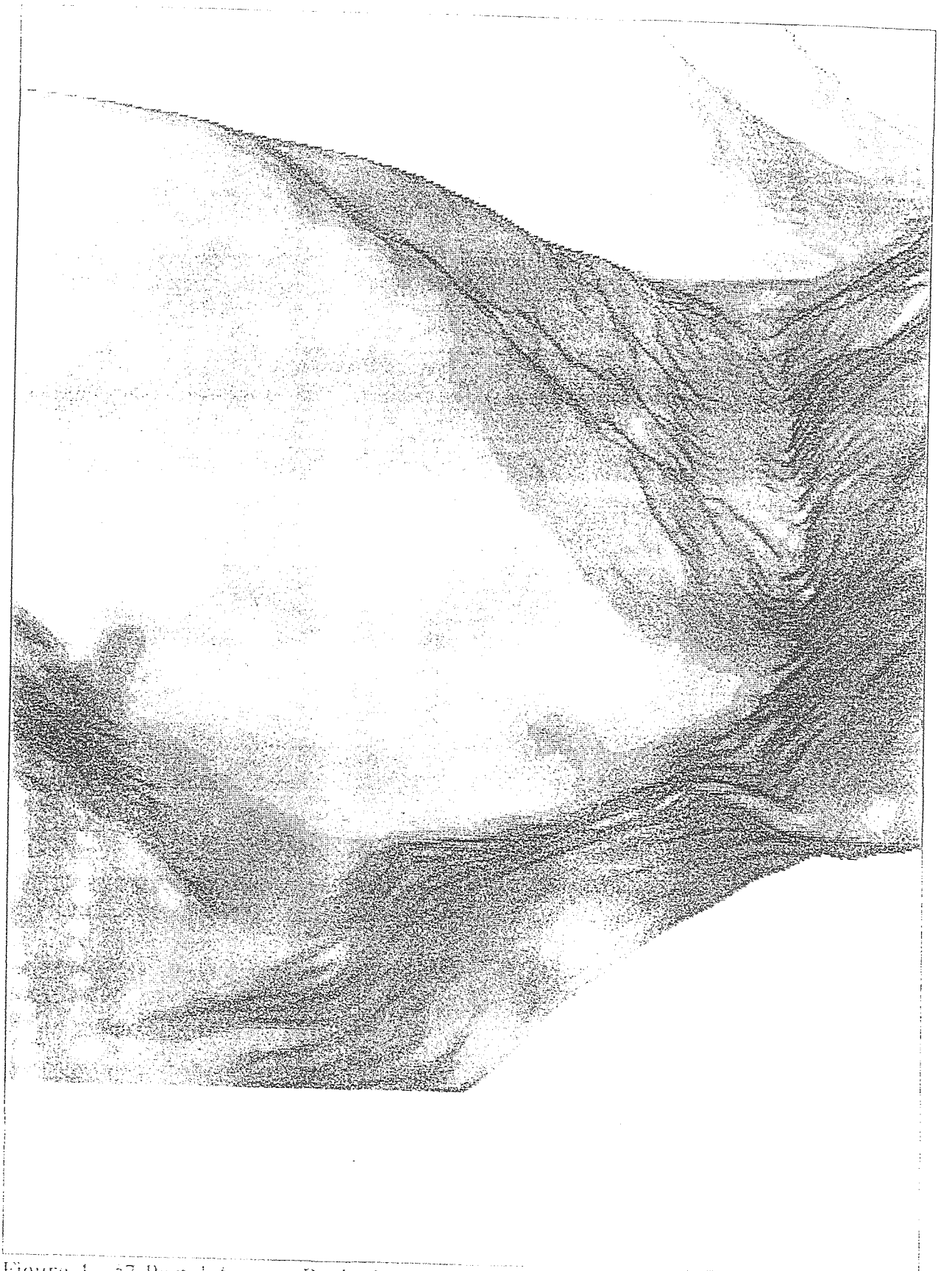


Figure 4 - 57 Portal Area as Revised, Looking East