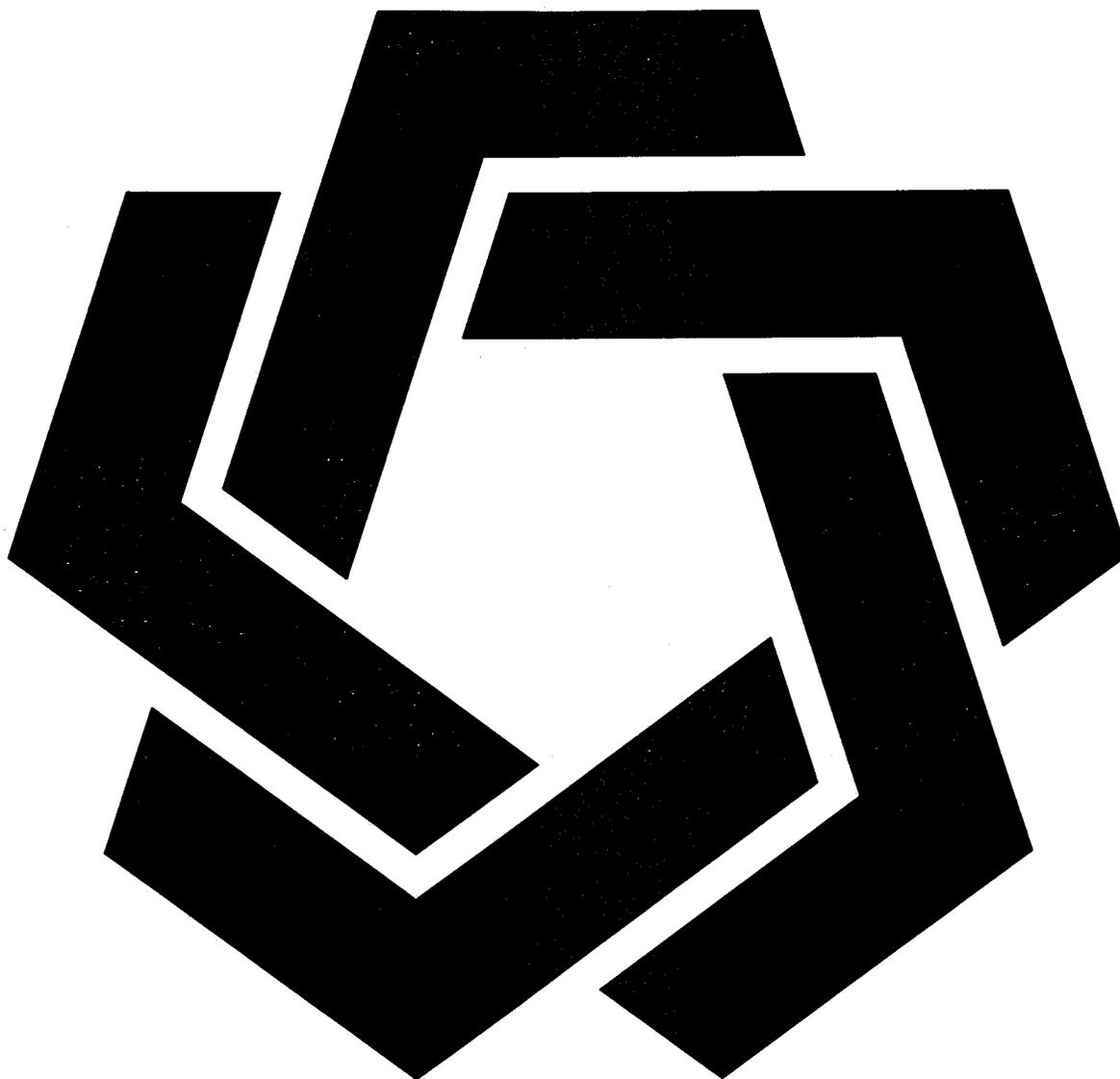


**State of Utah
Division of Oil, Gas and Mining
Utah Coal Regulatory Program**



**TECHNICAL ANALYSIS
CULVERT AND SURFACE EXPANSION
GENWAL RESOURCES, INC.
CRANDALL CANYON MINE
ACT/015/032
JUNE 24, 1997**

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INTRODUCTION

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

This Technical Analysis is considered to be final for this permitting action. All deficiencies have been addressed or are listed as stipulations to approval.

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

**GENWAL CULVERT INSTALLATION
AND FACILITIES PAD ENLARGEMENT**

**GENWAL RESOURCES, INC.
CRANDALL CANYON MINE
ACT/015/032**

JUNE 1997

SUMMARY OF OUTSTANDING STIPULATIONS

R645-301-321, The applicant has committed to gather required productivity information, and this needs to be in the application.

R645-301-800, Before the facilities expansion and culvert installation can proceed, the permittee must post a reclamation bond for *at least* \$1,654,000 and provide a copy of the bond agreement to the Division.

LEGAL AND ADMINISTRATIVE INFORMATION

IDENTIFICATION OF INTERESTS, VIOLATION INFORMATION, AND RIGHT OF ENTRY INFORMATION

Regulatory Reference: UCA R645-301-112; R645-301-113; R645-301-114

Analysis:

The applicant and operator are both Genwal Resources, Inc., a corporation incorporated under the laws of Utah. Gary Gray is identified as the resident agent. The Intermountain Power Agency (IPA) and Andalex Resources, Inc., will pay the abandoned mine reclamation fee. The application contains Genwal's employer identification number, address, and telephone number.

IPA and Andalex Resources, Inc., jointly own Genwal Resources, Inc. The application contains employer identification numbers and lists of officers and directors with dates they assumed their positions for all three of these entities. Andalex Resources, Inc., is 100% owned and controlled by Andalex Resources, B. V. This company is owned and controlled by, in ascending order, Andalex Resources, S. A., Andalex Holdings, Ltd., and the Andrew Trust. Appendix 1-9, Section A, shows the officers and directors of the companies that own and control Andalex Resources, Inc. Andalex Resources, B. V., Andalex Resources, S. A., Andalex Holdings, Ltd., and the Andrew Trust do not have employer identification numbers.

IPA is currently engaged in the reclamation of the Horse Canyon Mine in Emery County. A list of current and previous mining permits held by Andalex and its affiliates is included in Appendix 1-9, Appendix B. The Crandall Canyon Mine is the only coal mining and reclamation operation owned or controlled by Genwal Resources.

The legal owners of the area affected by surface operations and facilities are the United States and Genwal Resources, Inc. The U. S. Forest Service, the State of Utah, and Genwal Resources, Inc., are surface and coal owners within the permit area. Owners of surface and mineral property contiguous to the permit area are the United States and Genwal.

Findings:

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

VIOLATION INFORMATION

Regulatory Reference: R645-301-113

Analysis:

The application says neither the applicant nor any subsidiary, affiliate, or persons controlled by or under common control with the applicant has had a federal or state mining permit suspended or revoked in the last five years. They have not forfeited a mining bond or similar security deposited in lieu of bond. There are no unabated cessation orders or air and water quality violation notices received prior to the date of the application by any coal mining and reclamation operation owned or controlled by Genwal or by any person who owns or controls Genwal.

Findings:

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

RIGHT OF ENTRY INFORMATION

Regulatory Reference: R645-301-114

Analysis:

The application says the applicant bases its legal right to enter and begin operations in the permit area on:

Federal coal lease U-54762 issued to Genwal Coal Co. December 1, 1986, and currently owned by Andalex and IPA.

Assignment of federal leases SL-062648 and SL-050655 from the heirs of John Sanders on July 11, 1991.

Assignment of federal coal lease UTU-68082 to the joint owners (NEICO and IPA) in March 1994.

Assignment of Utah State coal lease ML-21568 to the joint owners (NEICO and IPA) 3 July 11, 1991.

Assignment of Utah State coal lease ML-21569 to the joint owners (NEICO and IPA) July 11, 1991.

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In addition to the leases, the Forest Service has issued four special use permits. These are for the Crandall Canyon road, the topsoil stockpiles, the sediment pond, and some surface facilities near the portals.

One of the special use permits is for an area of 0.10 acres for "snow storage and summer parking." The legal description in the permit is Township 16 South, Range 7 East, Section 6, SW ¼ NE ¼. This legal description appears to be in error. All of the disturbed and proposed disturbed areas are completely within Section 5. It appears this special use permit is for the Forest Service turnaround area. This is at least one-eighth mile from the nearest part of land described in the legal description. The application can be considered complete and accurate, but the Forest Service should correct the legal description in its permit.

Findings:

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

UNSUITABILITY CLAIMS

Regulatory Reference: UCA R645-301-115

Analysis:

Available information does not show the area to be within an area designated as unsuitable for coal mining and reclamation activities. Operations are being conducted within 100 feet of a public road, and the application contains a copy of the Forest Service special use permit for the road.

There are no occupied dwellings within 300 feet of the permit area.

Findings:

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

PERMIT TERM, INSURANCE, PROOF OF PUBLICATION, FACILITIES OR STRUCTURES USED IN COMMON, FILING FEE, NOTARIZED SIGNATURE

Regulatory Reference: UCA R645-301-116; R645-301-117; R645-301-118; R645-301-123

Analysis:

The permit was issued May 13, 1993, for a period of five years.

A certificate of liability insurance is in Appendix 1-10. Insurance coverage is afforded by the Federal Insurance Company, and the producer is the Price Insurance Agency. The policy number is 3710-39-89. The general aggregate limit is \$2,000,000, and the limit for each occurrence is \$1,000,000. The policy includes XCU coverage. There is a \$1000 deductible for property damage. The State of Utah is named as the certificate holder. The certificate shows the mine name and number, and the cancellation clause has been changed in accordance with Division requirements.

The application contains a proof of publication for the required newspaper advertisement. The public notice mentioned that the construction would be within 100 feet of the Forest Service road and that there could be some disruption of public access during construction. The notice was published four consecutive weeks in August and September of 1996.

The application includes a statement signed by Gary Gray, the resident agent, that the information in the application is true and correct to the best of his information and belief.

Findings:

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

ENVIRONMENTAL RESOURCE INFORMATION

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

PERMIT AREA

Regulatory Requirements: 30 CFR Sec. 783.12; R645-301-521.

Analysis:

Plate 1-1--Lease Map shows the boundaries of the various leases which make up the permit area. Plate 4-2--Land Use Map shows both the lease boundaries and the permit area boundary. Both of these plates were certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah. A description of the permit area is found on page 1-10 of the plan and is as follows:

Township 15 South, Range 6 East, Salt Lake Base & Meridian

Section 25: S $\frac{1}{2}$

Section 26: S $\frac{1}{2}$

Section 35: All

Section 36: All

Township 15 South, Range 7 East, Salt Lake Base & Meridian

Section 30: Lots 7-12, SE $\frac{1}{4}$

Section 31: All

Section 32: S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$

Township 16 South, Range 6 East, Salt Lake Base & Meridian

Section 1: Lots 1-12, SW $\frac{1}{4}$

Section 2: All

Township 16 South, Range 7 East, Salt Lake Base & Meridian

Section 5: SW $\frac{1}{4}$

Section 6: Lots 1-4, NE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$

Findings:

The plan fulfills the requirements of this section.

HISTORIC AND ARCHAEOLOGICAL RESOURCE INFORMATION

Regulatory Reference: R645-301-411.140

Analysis:

The cultural resources surveys revealed one site located near the junction of the Forest Service and Huntington Canyon roads that probably meets the criteria for inclusion in the National Register of Historic Places. The area is outside of Genwal's permit area, and it has been fenced. Within the permit area, there are no public parks, cemeteries, or lands within the National System of Trails or the Wild and Scenic Rivers System.

The area proposed to be disturbed by culverting Crandall Creek was also surveyed for cultural resources, but none were found. Based on this, the Division should recommend that the State Historic Preservation Officer give a clearance for the project to proceed.

Findings:

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

VEGETATION RESOURCE INFORMATION

Regulatory Reference: UCA R645-301-321

Analysis:

Crandall Canyon contains ten vegetative communities. Six of these occurred in areas that have been disturbed. These communities were classified as cottonwood, sagebrush, mountain shrub/grassland, mixed mountain shrub/conifer/aspen, spruce/fir/aspen, and riparian. Also, portions of the disturbed area were previously disturbed. Appendix 3-1 contains details of the original vegetation sampling.

Genwal has committed to take aerial color infrared photographs every five years beginning in 1995 to monitor the effects of underground mining on vegetation.

The application contains a report from Environmental Industrial Services about the vegetation in the riparian area. Also included is a vegetation survey of north-facing slopes done in 1996 by Patrick Collins of Mt. Nebo Scientific

The current mining and reclamation plan contains vegetation information gathered in 1980

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including the riparian area. One of the dominant grasses in the 1994 sampling of the riparian area was downy brome, but this grass was not present in any areas, including the previously disturbed area, before the mine was reopened. It is unlikely this grass would have invaded on its own without some disturbance.

A reference area has been established in a mountain shrub/grassland community on a south-facing slopes above the mine, and the applicant now proposes one in a spruce/fir/aspen community on the north-facing slope. The area proposed to be disturbed by the culvert installation is primarily in riparian and spruce/fir/aspen communities, and there are also some areas on the south of the stream that have been affected by natural disturbances, especially earth movement. These areas have less than half as much vegetative cover as adjacent areas.

Adequate numbers of samples were taken for the riparian and spruce/fir/aspen areas. However, the required sample size for the naturally-disturbed areas is 19.5 although only 12 samples were taken. Not meeting the minimum sample size is not a problem unless the applicant proposes to use the baseline information as a success standard for final bond release.

Since baseline information will be used as the revegetation success standard for the riparian area, the application includes raw data for the riparian area sampling. This data is needed when comparing for final bond release to make a pooled standard deviation. Depending on the sampling distribution of the data, it might also be necessary to transform it, and the raw data would be needed for this purpose.

Woody plant density information is in reports from Mt. Nebo Scientific in Appendices 3-11 and 3-14. Measured woody plant densities were 11224 and 11989 per acre for the riparian and non-riparian areas respectively.

The application needs to contain productivity information for the different plan communities proposed to be disturbed and for the spruce/fir/aspen reference area. This information is commonly gathered using Natural Resources Conservation Service methods. The applicant has committed to gather this data, but it needs to be in the application.

The location of the spruce/fir/aspen reference area is shown on Plate 2-4.

Other information required by this section of the regulations is considered adequate.

Findings:

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

R645-301-321, The applicant has committed to gather required productivity information, and

this needs to be in the application.

FISH AND WILDLIFE RESOURCE INFORMATION

Regulatory Reference: UCA R645-301-322

Analysis:

Wildlife Information

Fish and wildlife information is presented in Section 3.22 and in Appendixes 3-2 and 3-3. The plan and application contain results from several studies, including macroinvertebrate studies done in 1980 and 1994; fish and stream investigations performed in 1982, 1983, 1994, and 1995; several raptor surveys; and a survey for all birds in the area of the proposed expansion.

The current and proposed disturbed areas contain some habitat for big game animals. Primary summer ranges are on the plateaus, and most winter range areas are at lower elevations than the mine.

Most of the permit area does not contain good cliff nesting habitat, but there are a few areas with golden eagle nests. Most recently, a pair of eagles nested in a cliff above the mine in 1995. Raptor nests are shown on Plate 3-1A and on a map submitted as an addendum to Appendix 3-3. The map in the addendum contains results from the 1996 survey.

Appendix 3-3 contains a 1980 report that discusses accipiters in Crandall Canyon. The report has evidence of past nesting and hunting activity, but no birds have been found in more recent searches. However, Crandall Canyon and similar canyons in the Huntington Creek area should be considered good accipiter habitat.

A list of twenty-two bird species identified by the Fish and Wildlife Service as migratory birds of high federal interest is in Appendix 3-3. Section 3.22.21 lists seven of these species that have the potential of migrating within the region where the mine is located.

Table 5 in Appendix 3-3 has a list of reptile and amphibian species which may be found in the area according to published information. Reptiles are found throughout the permit area, but amphibians are only associated with water. The application says baseline studies in the spring of 1994 did not encounter any threatened or endangered reptiles or amphibians. More detail of this work is in an addendum to Appendix 3-2.

The application contains studies of macroinvertebrates and fish populations in Crandall Creek from 1994. In response to comments from the Forest Service, the applicant has committed to inventory macroinvertebrate populations in the creek every three years.

Appendix 3-2 and Section 3.22.1 discuss the importance of Crandall Creek as fish habitat. One of the recommendations in a 1982 report from Walter Donaldson, regional fish manager for the Division of Wildlife Resources, was to occasionally blow up beaver dams as they tend to accumulate silt and deter upstream trout movement. However, April 1, 1996, correspondence from the Forest Service says beaver dams are rarely barriers to fish passage. Cutthroat trout spawn during high water periods in the spring when they can swim over the dams. In March 8, 1996, correspondence to the Division, Wildlife Resources said, for its size, Crandall Creek contains a significant population of resident fish and provides a significant spawning ground/nursery.

In Section 3.33.300, the application says the culvert would be at the extreme upper end of the fisheries habitat, so no upstream habitat will be affected. In three years of surveys, the Division of Wildlife Resources has not found fish above a beaver pond just above the mine. However, the Forest Service in February 5, 1997, correspondence said the surveys done in 1995 were taken in late June and August and do not give any kind of picture of the function of the higher reaches of the creek for the cutthroat population. The correspondence also says the culvert would cause a significant loss of habitat and will affect the population's ability to access headwaters.

Appendix 3-10 is a memorandum from Marvin Boyer and Pete Cavalli of the Division of Wildlife Resources concerning a fish population survey done in 1996 with some data from 1994 and 1995 surveys. This document says the data strongly suggest that the middle reach of Crandall Creek, the area near the mine, is an important spawning and nursery area. It also says preliminary results of sampling for genetic study indicate the fish are a pure strain of Colorado River cutthroat trout.

Threatened or Endangered Species

The application has a list of 13 threatened or endangered species identified in a February 1995 listing for Emery County. Of the 13 species, two, the bald eagle and peregrine falcon, could potentially occur in the permit area. However, the occurrence is most likely to be migration through the area rather than nesting or roosting. The application is correct that it is most likely that peregrine falcons would only be migrating through the area, but pairs have been found recently in the areas of the Trail Mountain and Star Point Mines. The pair near the Star Point Mine was nesting.

In addition to the species discussed in the application, there is also a potential to affect the threatened and endangered fish of the upper Colorado River basin through surface water depletion. However no additional surface water losses are expected with the expansion project.

The application contains a new addendum to Appendix 3-3 that has lists of threatened, endangered, proposed, candidate, and sensitive species for the State of Utah. Those species that may occur in Emery County are marked, and it contains a separate list of those species that are known or suspected of being in the Manti Lasal National Forest.

The application lists five sensitive species potentially present in the mine's area of influence. As

discussed above, the Division of Wildlife Resources has recently (1997) preliminarily identified Colorado River cutthroat trout from Crandall Creek through genetic tests. However, the tests are not conclusive. If the fish in Crandall Creek are Colorado River cutthroats, it is very significant because this would be the only known population of Colorado River cutthroat trout in the Wasatch Plateau. It would indicate there is a barrier to fish passage that keeps Yellowstone cutthroats from coming up Crandall Creek from the Huntington River.

Another sensitive species, the goshawk, was found near the old portals in 1980. This information is contained in a wildlife inventory report for the original application. It is almost certain other goshawks nest in the permit area.

There are no threatened or endangered plant species known for the area according to information from Bob Thompson of the Forest Service, and no threatened or endangered plant species were encountered in the vegetation survey. However, at least two sensitive species have been found in the general vicinity. Canyon sweetvetch (*Hedysarum occidentale* var. *canone*) is present in Huntington Canyon near the turnoff to Crandall Canyon. Intermountain bitterweed (*Hymenoxys helenioides*) has been collected in Carbon and Emery Counties in mountain brush, sagebrush, aspen, and meadow communities between 8800 and 10,700 feet elevation. The permit area probably contains suitable habitat for this species, but it is unlikely to be adversely affected.

Findings:

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

SOILS RESOURCE INFORMATION

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

Analysis:

The Major Permit Modification adequately presents environmental resource information describing the soils within the surface facility expansion area as follows:

- There are no prime farmlands within the surface facility expansion area.
- Supplemental soil surveys present information which delineate the soils on a map, describe and identify the soils, evaluate present and potential soil productivity, and correlate the new soils information with past 3rd Order surveys.
- The supplemental soil survey falls between a 1st and 2nd Order soil survey.
- Salvaged subsoils have been chemically and physically analyzed to allow for use as

substitute topsoil during reclamation.

There are no prime farmlands within the surface facility expansion area. Both the current surface facility area and the proposed culvert expansion area are located in Crandall Canyon, and as such, these areas are not conducive for agricultural purposes because of slope steepness, high soil rock content, and restrictive climate limitations. At the request of Genwal, the Soil Conservation Service conducted both prime farmland and alluvial valley floor investigations in 1981. Two separate letters of negative determination, dated respectively August 10, 1981 and November 23, 1981, were received from the SCS and are enclosed in Appendices 2-1 and 2-2.

Supplemental soil surveys present information which delineate the soils on a soils map, describe and identify the soils, evaluate present and potential soil productivity, and correlate the new soils information with past 3rd Order surveys. Supplemental soil surveys were conducted by Randy Gainer (formerly a Genwal Resources employee), Chris Hansen (Earthfax Engineering, Inc.), and David Steed (Environmental Industrial Service). Work was performed during 1995 and 1996 to assess the undisturbed soils within the area of the proposed culvert expansion project; appendix 2-3B contains the supplemental soil inventory while Appendix 3-2 discusses hydric soils within the Crandall Creek riparian area. Plate 2-4 illustrates the soils, soil boundaries and soil pit locations within the proposed culvert expansion area as referenced by Appendices 2-3B and 3-2.

Soils in Crandall Canyon were previously mapped (Order III) by the US Forest Service. North aspect soils on the south side of Crandall Creek are part of the Curecanti-Elwood-Duchesne Families Complex (map unit 107) and Bundo-Lucky Star-Adel Families Complex (map unit 711). In addition to these soil complexes, two small inclusions (map units A and B) of alluvial/colluvial soils were identified, described and mapped. These inclusions are soils that have been marked for salvage during construction of the culvert expansion project.

Map Unit A is located south of the warehouse on a terrace above the canyon floor and consists of a mix of colluvial and fluvial/alluvial deposits. Soil pit TP-3 was hand excavated to a 3.3' depth; soils consisted primarily of sandy loam to very stony loam with very weak soil structure.

Map Unit B is located in the bottom of the canyon and generally consists of poorly developed sandy loams of fluvial deposition by Crandall Creek. Soil pit TP-4 was also hand excavated to a depth of 4.5'. Soil horizons are the result of episodic deposition rather than in-place soil development. Soils here consist primarily of loam to sandy loam with little to no soil structure.

Soil pit TH-2 was hand excavated on the south face of Crandall Canyon directly across from the current load-out facility. This pit was located near the proposed disturbed area boundary which represents north aspect soils on the south face of Crandall Canyon. The soil generally consists of sandy loam to cobbly loam and included a 0.13' thick organic horizon. Soil depth was limited to 1.85' at this location where weathered bedrock was encountered.

Additional soil sampling adjacent to Crandall Creek was performed in August 1995 by EIS personnel. Soil samples were collected as part of a riparian vegetation study (Appendix 3-2) and consisted of two samples, Bench 1 and 2, obtained from the soil inclusion area Map Unit B, and six samples, SS-1 through SS-6 Riparian, collected adjacent to the creek. SS-1 Riparian was obtained at the top of the proposed culvert disturbance; SS-2 and SS-3 Riparian were collected in the central portion of the creek near the soil inclusion area Map Unit B; SS-4 through SS-6 Riparian were collected in lower sections of the disturbance area. Hand excavated pits were dug to a depth between 18 to 30 inches. Detailed soils logs are not available for these soil pits.

Soil horizons were sampled and analyzed for the parameters as required by the Divisions soil and overburden guidelines¹ for pits TH-2, TP-3 and TP-4. Composite samples were collected for Bench 1, 2 and SS-1 through SS-6. Analysis results are summarized in Appendix 2-3B, Table 8-1 through 8-4. Laboratory data sheets are included in Attachment A of this appendix. Based on the analyses results, the physical and chemical profile of the soils generally fall within the acceptable ranges as required by the Division's guidelines.

The supplemental soil survey falls between a 1st and 2nd Order soil survey. Soil characterizations in Appendix 2-3B for pits TP-3 and TP-4 meet the standards of the National Cooperative Soil Survey and the Soil Conservation Service.² Soil description for pit TH-2 is lacking in specificity and detail to meet the standards of the National Cooperative Soil Survey. No profile descriptions were given for Bench 1 & 2, and pits SS#1 through #6. Therefore, soil pits TP-3 and TP-4 may represent 5 acres using 1st Order survey requirements, and between 3 and 20 acres for a 2nd Order survey. The proposed culvert expansion project adds an additional 5.98 acres for a total surface facility acreage of 13.68.

The Division guidelines require a 1st Order soil survey with a minimum-size delineation of 1 hectare (2.5 acres) or less. A 2nd Order soil survey has a minimum-size delineation of 0.6 to 4 hectares (1.5 to 10 acres). First Order surveys are made for very intensive land uses requiring very detailed and very precise knowledge and information about soils and their variability, generally in small areas. This type of information is necessary for mapping soils to the detail needed to project soil salvage and resulting volumes. Second Order surveys are made for intensive land uses that require precise knowledge and detailed information about soil resources and their variability.

Salvaged subsoils have been chemically and physically analyzed to allow for use as substitute topsoil during reclamation. Past soil salvage indicates that topsoil and subsoil were removed during the construction season of 1982. Actual procedures are not known, but MRP states that

¹Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, Leatherwood and Duce, 1988.

²Soil Survey Manual, USDA Handbook #18, October 1993.

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the subsoil and topsoil were not stockpiled separately. Therefore, the resulting soil mixture containing subsoils will be used as a substitute topsoil. In addition, soils to be salvaged within the proposed culvert expansion area will include subsoil mixed with topsoil.

Based on soil analysis results summarized in Appendix 2-3B, Table 8-1 through 8-4, the physical and chemical profile of the soils generally fall within the acceptable ranges as required by the Division's guidelines.

Findings:

The requirements of this section of the regulations are considered adequate.

LAND USE RESOURCE INFORMATION

Regulatory Reference: R645-301-411

Analysis:

The premining uses of the land were non-developed recreation, native wildlife habitats, and dispersed cattle grazing. Because of the very steep topography, grazing is very limited on the side slopes.

The application includes a map showing grazing allotments in part of the permit area.

Emery County has zoned the area CE-1, critical environmental. This zoning designation does not preclude mining. The Manti-LaSal National Forest Land and Resource Management Plan includes the area in four different management units. These are the Leasable Minerals Area, General Big Game Winter Range, Range Forage Production, and the Riparian Management Unit.

The area was mined from 1939 to 1955. Approximately 35,000 tons of coal was removed from the Hiawatha seam by room and pillar methods.

Findings:

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

HYDROLOGIC RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14; R645-100-200, -301-720.

Analysis:

The addition of the 1400 ft. culvert and the addition of over 73,000 cu. yd. of fill material do constitute a significant revision to the permit. The surface area is increased from 5.55 acres to 12.78 acres, a 130% increase. There are also significant additions and revisions of machinery, equipment, and facilities used in the mining operations.

The original plan, dated 12/23/94 Revised 10/1/95, contains the baseline data that are relevant to the proposed culvert and expansion. The baseline data in the following areas have been reviewed and determined to be unchanged from the original Technical Analysis and approval:

- ◆ Sampling and Analysis: para. 723
- ◆ Baseline Information: para. 724
- ◆ Baseline Cumulative Impact Area Information: para 725
- ◆ Modeling: para 726
- ◆ Groundwater Monitoring Plan: para.731.210
- ◆ Surface-water Monitoring Plan: para. 731.220

Findings:

The Baseline hydrologic information used to establish the original mining application are applicable to the culvert and expansion. As such, the requirements of R645-301-723 through 726, 728, and 732.200 have been met.

PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION

Regulatory Reference: **R645-301-728**

Analysis:

Appendix 7-15, PROBABLE HYDROLOGIC CONSEQUENCES DETERMINATION contains the relevant information. Related information is also contained in Appendices 7-50, CONSTRUCTION SEQUENCE-72" CULVERT and APPENDIX 5-22, CRANDALL CANYON MINE SITE RECLAMATION PLAN. Included is a description of the short-term effects caused by the culvert construction project and plans to mitigate those effects. Basically there will be an increased sediment load to the stream during construction which will be controlled by multiple straw bales and silt fences. These will be placed at the downstream end of the construction site and in Crandall Creek. The two silt fences in the stream are of a higher order than is customary for such projects and is expected to be adequate under the flows expected during construction. The plan also contains a commitment to clean the sediment traps as needed to

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maintain efficiency.

The construction plan includes a detailed description of an under drain, enclosed in gravel and filter fabric, located below the main culvert. This under drain will handle low stream flows during construction and greatly reduce sediment migration into the stream. The sediment pond will still be used and will be enlarged to handle the increased operations area size.

The stream channel and adjacent side slopes will be buried in-situ (without topsoil removal) during the life of the project and will be reclaimed when the mine is closed. The plans, as described in the above appendices, include a description of the several areas and reclamation sequences for each area. Most areas will be handled with standard methods which include backfill and regrading, topsoil replacement, and seeding and mulching. The south slope of Crandall Creek is rather steep and presents the greatest challenge to reclamation. The stream channel also is a reclamation challenge. Existing soils will be left in place in both areas. A fabric isolator and soil marker is used to keep from damaging the in-situ soils during reclamation. The stream channel and banks are reclaimed in a similar manner. The reclamation phase also includes straw bales and silt fences as described above.

The culvert project is believed to not impact the hydrologic balance and ground-water or surface-water availability. Except for the construction and reclamation periods described above, the sediment yield from the disturbed areas should not be affected. No acid-forming or toxic-forming materials are involved in the project.

Findings:

The plan fulfills the requirements of this section of the regulations.

MAPS, PLANS, AND CROSS SECTIONS OF RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.24, 783.25; R645-301-323, -301-411, -301-521, -301-622, -301-722, -301-731.

Analysis:

Affected Area Boundary Maps

Plate 1-1--Lease Map shows the boundaries of the various leases which make up the permit area. Plate 4-2--Land Use Map shows both the lease boundaries and the permit area boundary. Plate 5-3--Surface Facilities Map shows the actual disturbed area associated with the surface facilities, including the area and surface facilities associated with the 1997 expansion.

These plates were certified in April of 1997 by Dan W. Guy, a professional engineer

licensed and registered in the state of Utah.

Permit Area Boundary Maps

Plate 1-1--Lease Map shows the boundaries of the various leases which make up the permit area. Plate 4-2--Land Use Map shows both the lease boundaries and the permit area boundary.

These plates were certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

Findings:

The plan fulfills the requirements of this section.

OPERATION PLAN

MINING OPERATIONS AND FACILITIES

Regulatory Reference: 30 CFR Sec. 784.2, 784.11; R645-301-231, -301-526, -301-528.

Analysis:

General

See pages 5-5 to 5-10, Appendix 7-50.

The operation is located on U.S Forest Service (USFS) land on Crandall Creek, which is a tributary of Huntington Creek. The canyon in which the operation is located is very narrow with steep sides. Access to the site is by way of a USFS road from Huntington Canyon. At the upper end of the site is a USFS turnaround, parking area, and trail head. Through a special use permit, USFS allows the permittee to use this area for employee parking and snow storage.

There are in this area 2 minable coal seams: the lower Hiawatha seam and the upper Blind Canyon seam. This mine is entirely in the Hiawatha seam, but the permittee will conduct exploratory drilling in the future to determine the feasibility of mining the Blind Canyon seam. The seam is accessed directly through an outcrop and old workings.

The entire surface operation was initially located entirely on the north side of Crandall Creek. In 1997, the site underwent major modification. Crandall Creek was diverted into a 72-inch culvert over the entire length of the site. The bottom of the canyon was then filled with

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approximately 73,000 cubic yards of material to create a large working pad. The sediment pond was relocated and enlarged. The coal loading facilities were enlarged and relocated onto the new pad and a run-of-mine coal stockpile was created on the south side of Crandall Creek. A new bathhouse and office building was built up canyon from the coal loading facilities on the south side of Crandall Creek.

The construction sequence for the 1997 site expansion was as follows:

- A. Temporary silt fences were placed in the stream bed.
- B. A stream channel drain system was constructed, beginning at the outlet end.
 1. Vegetation was removed from the area to be disturbed. Geotextile fabric was placed on the stream channel surface.
 2. A layer of drain rock was placed on top of the geotextile fabric.
 3. An 18-inch perforated drain pipe was placed on the drain rock.
 4. Another layer of drain rock was placed over and around the 18-inch drain rock.
 5. Another layer of geotextile fabric was placed on top of the drain rock.
 6. A layer of lightly-colored marker material was placed on top of the geotextile fabric.
 7. A layer of earth fill was placed on top of the marker material.
- C. A permanent riprap channel was constructed at the outlet end of the stream channel drain system to handle flow from that system and from the soon-to-be-placed main bypass culvert.
- D. The construction of the stream channel drain system was continued upstream.
- E. The main 72-inch bypass culvert was placed and backfilled.
- F. An inlet system and trash rack was installed at the inlet of the 72-inch bypass culvert. The stream was then diverted into the bypass culvert.
- G. The sediment pond was built.
- H. The main pad was built.

Type and Method of Mining Operations

See pages 5-8 to 5-9, 5-12, 5-13, Appendix 5-3.

Coal is mined by both room-and-pillar and longwall methods using a 3-entry system. Continuous mining machinery is, of course, used for entry and panel development and for second mining in those areas missed by the longwall machinery. Entries are 20 feet wide and are placed on 60-foot centers. Safety factors for rooms and main entries range, respectively, from 1.37 to 2.45 and from 1.39 to 4.37.

From 1991 through 1995, annual coal production increased from 877,500 tons to 1,660,900 tons using only continuous mining machinery. From 1995 through 2000, annual production using room-and-pillar and longwall methods is expected to be 2,500,000 tons.

Facilities and Structures

See pages 5-22 to 5-26, Plate 5-3.

The surface area is divided, roughly, into 3 areas: the pond and coal handling area, the office and shop area, and the portal area.

The pond and coal handling area is located at the lower end of the site. A 48-inch conveyor crosses the canyon from a transfer point just outside the belt portal to a run-of-mine coal stockpile on the south side of Crandall Creek. A 54-inch reclaim conveyor goes down canyon from the coal stockpile to a pair of crushers. From the crushers, a 48-inch feed conveyor goes to a 100-ton product bin which feeds 2 short 48-inch loading conveyors which in turn go to a pair of truck scales located adjacent to the 100-ton product bin. The sediment pond lies about 100 feet down canyon from the 100-ton product bin.

The office and shop area lies about 400 feet up canyon from the coal stockpile. It includes the bathhouse and office, the shop, the warehouse, the culinary water tank, the rock dust silo, the trash dumpsters, and the electrical substation.

The portal area lies across the canyon from and above the coal handling area. The slope below the portal area is covered with a layer of shotcrete. The portal area includes the portals, the fan housing, the fan transformer, a small office, and the belt transfer by which coal is transferred from the run-of-mine belt to the 48-inch coal stockpile conveyor which crosses the canyon.

Findings:

The plan fulfills the requirements of this section.

AIR POLLUTION CONTROL PLAN

Regulatory Reference: R645-301-420

Analysis:

The plan contains a copy of Genwal's Air Quality Approval Order which includes air quality monitoring and fugitive dust control plans. The Approval Order has been recently updated to show an increase in production.

The expanded surface facilities will necessitate changes to the Air Quality Approval Order. The applicant commits to receiving an amended and approved Approval Order before putting the new facilities in operation.

Findings:

Information provided in the proposal is considered adequate to meet the requirements of this section of the regulations. The applicant will need to receive approval from the Division of Air Quality before putting its new facilities into operation.

SUBSIDENCE CONTROL

Regulatory Reference: R645-301-332

Analysis:

The subsidence control plan is contained in Chapter 5. Potential damage from subsidence includes disruption of water flows; creating cracks that could affect grazing, wildlife and recreational uses; and tree falls and cliff failures that could affect nesting birds, particularly raptors.

The land is used for domestic grazing on gentle slopes and for wildlife habitat and recreation over the total acreage. The vegetative resources should not be negatively affected by subsidence, so the current land use is expected to continue. According to the application, the Forest Service says there is no marketable timber in the area of potential subsidence. If subsidence affects grazing, the applicant will compensate the appropriate party by paying the fair market value for the loss.

If subsidence monitoring detects an area that is actively subsiding, the area will be surveyed for tree nesting raptors and measures implemented to protect any nest sites from destruction during the nesting season.

Springs within the potential subsidence limit are a significant resource to the local wildlife and may be affected. If documentation concludes that mining efforts at the Crandall Canyon Mine have eliminated the flow from the seeps and springs, then acceptable remedial action plans will be submitted for approval and subsequently installed.

Any loss of flow is likely to be detrimental to wildlife. Wildlife resources expects mitigation when flows are reduced 50% or more.

Findings:

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

FISH AND WILDLIFE RESOURCE PROTECTION

Regulatory Reference: R645-301-333

Analysis:

Potential impacts to fish and wildlife include elimination of 1200 feet of fisheries habitat during the mining operations, increased hunting pressure on big game, effects to small vertebrates, temporary loss of critical riparian and other wildlife habitat within the disturbed area, increased sediment loading of Crandall Creek and other waters downstream, and possible disruption of water sources.

Crandall Creek is considered important fish habitat, and all riparian habitat is considered critical wildlife habitat. The application contains correspondence from the Division of Wildlife Resources discussing a wildlife protection and mitigation plan that has been developed through several months of negotiations between the applicant, Wildlife Resources, the Forest Service, Water Rights, and the Division. This plan is intended to protect the Colorado River cutthroat trout population and to mitigate for the loss of fisheries and riparian habitat.

Major points of the plan include:

1. Certain modifications would be made to Crandall Creek above the mine.
2. All the fish in the area of the culvert would be captured and transplanted to a secure and suitable temporary location. Some of these fish will be put back into Crandall Creek above the mine..
3. Alterations would be made to another stream to isolate it from other fish populations. This stream would be treated to eliminate all fish, and Colorado

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River cutthroats would be transplanted to it.

4. In Scad Valley, a sheep corral would be eliminated and two or three new corrals constructed. Some roads would be reclaimed to try to improve the quality of spawning habitat in this area.

Unfortunately, it is possible that moving the sheep corral and reclaiming certain roads may not result in improved stream habitat in Scad Valley Creek and would not fulfill the requirements of R645-301-333 and R645-301-358. The Forest Service and Wildlife Resources intend to monitor this section of stream to see if the project is successful.

In Section 3.23.3, the application contains several methods that would be used during the construction phase to protect water quality in Crandall Creek, including more frequent water monitoring and the use of straw bales and silt fences in and adjacent to the stream. The applicant commits to develop and implement appropriate mitigation plans with the regulatory authority should stream flow diminish significantly or water quality deteriorate. Other measures to be used to protect water quality are discussed in Chapter 7 and are reviewed in the hydrology sections of this analysis.

Findings:

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

TOPSOIL AND SUBSOIL

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

Analysis:

The Operation Plan sufficiently presents procedures for safeguarding the soil resources during construction and operation phases of the culvert-expansion project. Soil salvage and stockpiling operations are adequately described as follows:

- Approximately 3500 cubic yards of soil will be selectively salvaged from the proposed expansion disturbance area. A soil scientist will be available to insure that optimal soil salvage of the best available material occurs.
- To preserve the natural undisturbed soils associated with the stream channel and the steep slope area on the southern flank of the stream, soils will not be salvaged but buried and protected under a geotextile fabric and marker layer prior to placing any backfill during construction.
- Subsoils salvaged within the proposed culvert expansion area will be used as substitute

- topsoil.
- Five years prior to reclamation, Genwal will consult with the Division and form a task force for re-evaluating and optimizing the proposed reclamation techniques and practices.
- Topsoil and substitute topsoil salvaged from the expansion area will be stored in Stockpile #3.

Approximately 3500 cubic yards of soil will be selectively salvaged from the proposed expansion disturbance area. A soil scientist will be available to insure that optimal soil salvage of the best available material occurs. A projected 1084 cubic yards of topsoil and subsoil will be salvaged from Map Unit A, north slope area down from the warehouse, 0.11 acres. 1860 cubic yards of soil will be salvaged from Map Unit B, south slope bench area across the creek, 0.23 acres. An additional 536 cubic yards of soil will be salvaged from a 0.25 acre location identified as Map Unit C, the permanent Coal Pile area, adjacent slope where the southern flank of the coal pile will rest against the existing hillside. In addition, soil will be salvaged within the sediment pond and temporary road area. Figure 8B illustrates the three map units identified for soil salvage.

All topsoil salvage activities will occur under the direction of a soils scientist to assure optimum recovery of the soil resources and that the best available material is salvaged.

To preserve the natural undisturbed soils associated with the stream channel and the steep slope area on the southern flank of the stream, soils will not be salvaged but buried and protected under a geotextile fabric and marker layer prior to placing any backfill during construction. Within the 1.10 acres associated with the stream, streambank and the 1.53 acres of steep slope area on the southern flank of the stream, no topsoil will be salvaged to help preserve the alluvial and residual soil structure and native characteristics. The native soils in these two areas will be left undisturbed and covered with a geotextile fabric prior to placing any backfill during construction.

Prior to placing the geotextile fabric, all trees and brush will first be removed from along the sides of the stream channel and hillside. Trees will be cut approximately 3" to 5" above the ground with the roots left intact to help hold the soils in-place.

The purpose of the geotextile is to protect the existing stream and hillside soils in their in-place condition, and to provide a protective barrier between the topsoil and the imported fill material. A marker material consisting of a fill material of a different color will be placed between the geotextile fabric and the fill. This marker layer will serve as a visual aid to assist reclamation efforts in the future when the fill is being removed.

Subsoils salvaged within the proposed culvert expansion area will be used as substitute topsoil. Within the proposed culvert expansion area, subsoil and topsoil will not be removed nor stockpiled separately. Therefore, the subsoil will be used with the topsoil during reclamation. Based on soil analyses results summarized in Appendix 2-3B, Table 8-1 through 8-4, the physical and chemical

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profile of both the topsoil and subsoil fall within the acceptable ranges as required by the Division's guidelines.

Five years prior to reclamation, Genwal will consult with the Division and form a task force for re-evaluating and optimizing the proposed reclamation techniques and practices. Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the reclamation techniques and practices associated with handling the topsoil as proposed in the reclamation plan. This consultation will include forming a task force of members with various suitable reclamation expertise to review the plan and recommend the best and most suitable reclamation practices. The review and consultation will re-assess and revise, where needed, the existing reclamation plan.

Topsoil and substitute topsoil salvaged from the expansion area will be stored in Stockpile #3. The existing soil stockpile #3 is being proposed to store the topsoil and substitute topsoil salvaged from the culvert expansion project. After the soil has been placed on the stockpile, 2 tons per acre of organic mulch and an approved seed mix will be applied as approved by the Division. The mulch and seed will be applied to the topsoil stockpile in the early fall.

Findings:

The requirements of this section of the regulations are considered adequate.

INTERIM STABILIZATION

Regulatory Reference: R645-301-331

Analysis:

The applicant will ensure that the smallest area practicable will be disturbed. When an area is disturbed, revegetation measures will be implemented to establish and maintain the area and to minimize erosion.

All surface areas which are disturbed during construction and which will not be needed for mining operations will be revegetated in the fall of the year following completion of construction. The plan contains a seed mix to be used in these areas. Alfalfa would be added on steeper slopes to increase erosion protection.

Contemporaneously reclaimed areas within the disturbed area from which runoff reports to the sediment pond will achieve 80% cover on the slopes. Appendix 3-5 contains details of the irrigation plan to maintain 80% cover.

Findings:

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

ROAD SYSTEMS AND OTHER TRANSPORTATION FACILITIES

Regulatory Reference: 30 CFR Sec. 784.24, 817.150, 817.151; R645-301-521, -301-527, -301-534, -301-732.

Analysis:

Road Systems

See pages 5-27 to 5-30, 5-34 to 5-35, Plate 5-3, 5-10, 5-19, Appendix 1-2.

There are 3 roads associated with this site: the Forest Development Road, the Forest Service Access Road, and the Portal Access Road. The Forest Development Road and the Forest Service Access Road are classified as primary roads. The Portal Access Road is classified as an ancillary road.

The Forest Development Road connects the site with the main road in Huntington Canyon. It was built by the U.S. Forest Service (USFS) and is thus outside the permit area. It is, however, maintained by the permittee as a primary road in accordance with a USFS road use permit. It will be retained as a permanent feature following final reclamation.

The Forest Service Access road goes from the entrance to the site to the Forest Service turnaround area at the upper end of the site. It was built by USFS but was upgraded by the permittee to accommodate this operation. It is a primary road. It will be retained as a permanent feature following final reclamation. It is shown in plan view on Plate 5-3--Surface Facility Map. A profile and typical cross section of this road are shown on Plate 5-10--Road Profile and Cross Section.

The Portal Access Road connects the warehouse area with the portal area. It is an ancillary road. It will be completely reclaimed during final reclamation. It is shown in plan view on Plate 5-3--Surface Facility Map. A profile and typical cross section of this road are shown on Plate 5-10--Road Profile and Cross Section.

With the major surface facilities expansion in 1997, the Forest Service Access Road from the site entrance to the Forest Service trail head parking area was modified and improved in several ways. The road was realigned and widened by 15 feet, which returned it to its original 2-lane width. The old truck scales were removed, the oil storage facility was modified and cleaned up, and the road was regraded and paved through that area. A third lane was constructed from the truck turnaround to the loadout. This did away with the necessity for trucks to use the road and thus eliminated the potential for hazardous encounters between trucks and automobile traffic. But perhaps

the greatest improvement was the modernization of the truck loadout, which speeded the loading process and thus eliminated the "stacking" of trucks and the congestion that resulted from it.

The Forest Service trail head parking area was also improved during the 1997 surface facilities expansion. The greatest improvement was the improvement in its accessibility which resulted in the improvements made in the Forest Service Access Road. But other improvements were made as well. The trail head parking area was regraded. By agreement with the Forest Service, the trail head parking area had previously been used for snow storage in the winter. With the removal of the old truck scales and the modification of the oil storage facility, space was created in that area for snow storage and it was no longer necessary for the permittee to store snow in the trail head parking area.

Other Transportation Facilities

See pages 5-27 to 5-28, Plate 5-3.

Besides the roads, there are also 3 conveyors among the surface transportation facilities: a 48-inch run-of-mine conveyor, a 54-inch reclaim conveyor, and a short 48-inch loading conveyor. The conveyors are shown on Plate 5-3--Surface Facility Map and discussed in Section 5.26.

Findings:

The plan fulfills the requirements of this section.

SPOIL AND WASTE MATERIALS

Regulatory Reference: 30 CFR Sec. 701.5, 784.19, 784.25, 817.71, 817.72, 817.73, 817.74, 817.81, 817.83, 817.84, 817.87, 817.89; R645-100-200, -301-210, -301-211, -301-212, -301-412, -301-512, -301-513, -301-514, -301-521, -301-526, -301-528, -301-535, -301-536, -301-542, -301-553, -301-745, -301-746, -301-747.

Analysis:

See pages 5-31 to 5-33.

The only excess spoil is sediment pond waste and no burned waste is disposed of at this site. The operation also generates no coal mine waste, coal refuse, or coal processing waste.

Sediment pond waste is either disposed of in underground workings or hauled to a permitted coal waste disposal facility. Noncoal waste (trash) is collected in dumpsters and hauled to a landfill by a contractor when necessary.

Findings:

The plan fulfills the requirements of this section.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

The original plan, dated 12/23/94 Revised 10/1/95, contains several sections that are relevant to the proposed culvert and expansion. The plan sections in the following areas have been reviewed and determined to be unchanged from the original Technical Analysis and approval:

- ◆ Discharges into an Underground Mine: para. 731.510
- ◆ Gravity Discharges from Underground Mines: para. 731.520
- ◆ Water Quality Standards and Effluent Limitations: para. 751
- ◆ Siltation Structures: Other Treatment Facilities, 742.230
- ◆ Impoundments, 733, 743

Findings:

The Operation Plan hydrologic information used to establish the original mining application are applicable to the culvert and expansion. As such, the requirements of the above-listed paragraphs have been met.

SURFACE-WATER MONITORING PLAN,

Regulatory Reference R645-301-731.220

Analysis:

As part of the Surface-water Monitoring Plan, the July 5, 1996 Technical Analysis by the Division required the Operator to provide, "Detailed descriptions of construction activities.....that will prevent sediment from entering the stream." These are provided in Appendix 7-50, CONSTRUCTION SEQUENCE- 72" CULVERT. This appendix provides detailed descriptions for constructing the following:

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- Silt fences along the construction site and in the stream to catch sediment.
- An in-stream drain system to divert the stream and reduce sediment during construction and reclamation.
- An energy dissipator at the culvert outlet.
- The 72" corrugated metal culvert, with due consideration to operations and sequences to reduce sediment contributions to the stream.
- The Operations Pad, which is the main purpose of this project, and enlargement of the sediment pond.

The sequence includes leaving the stream channel and south canyon slope topsoil in place and isolating them with a geotextile and marker soil layer to preserve the morphology during the life of the culvert project. This will greatly facilitate reclamation also. **The requirements imposed by the Division have been met with the sequence presented in Appendix 7-50.**

As part of the Surface-water Monitoring Plan, the July 5, 1996 Technical Analysis by the Division required the Operator to provide, "Comparison of water samples upstream and downstream of the construction site to determine relative turbidity and suspended solids." This requirement was based on Crandall Creek being defined as a "critical fisheries habitat".

Considerable effort has been exerted by the U.S. Forest Service, Utah Division of Wildlife, Bureau of Land Management, Utah Water Rights, and Utah Division of Oil, Gas, and Mining to come to a consensus on how to handle the fish in Crandall Creek. The details of that plan are contained in Appendix 3-12, CRANDALL CREEK/ COLORADO CUTTHROAT TROUT MITIGATION PLANS. That plan is evaluated elsewhere in this Technical Analysis. Sufficient to point out here is that the plan makes the previous requirement for comparison of water samples upstream and downstream of the construction site unnecessary. **That requirement is rescinded.**

The Surface-water Monitoring Plan in the original mining application is applicable to the culvert and expansion.

Findings:

The plan fulfills the requirements of this section of the regulations.

DIVERSIONS: GENERAL,

Regulatory Reference R645-301-732.300, 742.300,

Analysis:

Page 7-46 and especially Appendix 7-4, CRANDALL CANYON MINE SEDIMENTATION AND DRAINAGE CONTROL PLAN contain a complete description of the

temporary and permanent diversions. The main culvert, which is the primary feature of this permit modification, is appropriately designed for a 100-year, 6-hour storm (para. 742.323). All other culverts and ditches are designed for the required (para. 742.323) 10-year, 6-hour storm. In addition, they have been checked and will pass the 10-year, 24-hour storm which is more stringent. It's noteworthy that this site has the fortunate situation where the main culvert inlet has an inherent safety factor. That is, the culvert inlet has a total of 18 ft. of vertical rise before spilling onto the operations pad and the design flow requires only 6.6 ft. of rise. The result of that is the culvert can pass the design flow plus an additional flow.

Although not a regulatory requirement, the Operator has included two 36-inch risers in the main culvert to facilitate maintenance and clean out.

The main culvert is fitted with two trash racks, one at and one above the inlet. Other culverts will also have trash racks and the commitment is made to inspect regularly and maintain to prevent plugging. Reference para. 742.423.3. Culverts and riprap are provided in those locations where erosion would be a problem due to steep slopes and erosive soils.

All designs are prepared by a Registered Professional Engineer, as required.

Findings:

The plan fulfills the requirements of this section of the regulations.

DIVERSIONS: PERENNIAL AND INTERMITTENT STREAMS,

R645-301-742.320,

Analysis:

The culvert capacity was calculated using the SCS, Type B method as presented in Addendum to Appendix 7-7. The resulting 431cfs was confirmed by DOGM calculations. The 100 yr- 6 hr event was used which conforms to R645-301-742.323 requirements and to the DOGM position paper on the subject. It is noteworthy that this site has the fortunate situation where the inlet has an inherent safety factor. That is, the culvert inlet has a total of 18 ft. of vertical rise before spilling onto the operations pad. The result of that is the culvert can pass the design flow, 431 cfs, plus an additional 200 cfs.

Findings:

The requirements of R645-301-742.330 have been met. This portion of the plan is approved with Entrance Type B as shown in Addendum to Appendix 7-7. The Operator is cautioned to be

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certain the culvert inlet type used for design is the one installed in the field. As shown on the nomograph, other inlet types could substantially reduce culvert capacity.

The Division would recommend that a trashrack be installed upstream of the culvert inlet. Substantial quantities of trees and wood debris are present along the entire stream and they should be kept from entering the culvert.

STREAM BUFFER ZONES,

R645-301-731.600,

Analysis:

Section 7.31.6, Stream Buffer Zones covers this topic. The plan outlines the areas that will be maintained as a buffer zone and have the required signs.

Findings:

The plan fulfills the requirements of this section of the regulations.

SEDIMENT CONTROL MEASURES,

R645-301-732, 742,

See Siltation Structures: Sedimentation Ponds below.

SILTATION STRUCTURES: SEDIMENTATION PONDS,

R645-301-732.200, 742.200,

Analysis:

Design for the new sediment pond is contained in Appendix 7-4, CRANDALL CANYON MINE SEDIMENTATION AND DRAINAGE CONTROL PLAN. Plates 7-5 and 7-3 show construction details. As required by the Division, the piezometer installed in the side of the old sedimentation pond has been retained in the new pond.

The new sediment pond has been enlarged and redesigned to accommodate the larger pad area with the culvert project. The revised pond extends out on top of the new culvert and thus is above a perennial stream. The calculations used for the pond design include a 10-yr, 24-hr event

for the pond and a 25-yr, 6-hr event for the spillway which are the correct regulatory designs. Reference R645-301-742.221.33 and .223. The concrete cutoff at the spillway inlet is an appropriate design. Ditches and culverts conveying water to the pond are appropriately sized.

Findings:

The plan fulfills the requirements of this section of the regulations.

DISCHARGE STRUCTURES

R645-301-744,

Analysis:

There is an energy dissipator on the culvert outlet which appears to be adequately designed. The energy dissipator has an apron and sloped sides with riprap of adequate size for the expected design flows. There is also a layer of two-inch rock below the riprap which will further protect the stream from erosion. The energy dissipator design provides for an exit velocity less than the natural stream velocity for the design flows. This is a good design and should minimize sediment contributions as required.

Findings:

The plan fulfills the requirements of this section of the regulations.

SUPPORT FACILITIES AND UTILITY INSTALLATIONS

Regulatory Reference: 30 CFR Sec. 784.30, 817.180, 817.181; R645-301-526.

Analysis:

See page 5-26, Plates 5-3, 5-8.

The electrical substation is the only support facility at this site. It is located on the facilities pad near the warehouse and adjacent to the rock dust bin. It is shown in plan view on Plate 5-3--Surface Facility Map and in more detail on Plate 5-8--Electrical Substation Installation.

Findings:

The plan fulfills the requirements of this section.

SIGNS AND MARKERS

Regulatory Reference: 30 CFR Sec. 817.11; R645-301-521.

Analysis:

See pages 5-6 to 5-7.

The required signs and markers are put in place and maintained at this site. They include mine and permit identification signs, perimeter markers, buffer zone markers, and topsoil markers.

Findings:

The plan fulfills the requirements of this section.

USE OF EXPLOSIVES

Regulatory Reference: 30 CFR Sec. 817.61, 817.62, 817.64, 817.66, 817.67, 817.68; R645-301-524.

Analysis:

See page 5-14.

All blasting will be done in accordance with R645-301-524. All blasting will be done under the direction of a person trained, examined and certified as required by 30 CFR 850 and all other applicable regulations of the Utah Industrial Commission. As required by R645-301-524.700, blasting records will be kept at the site or at the mine office in Huntington, Utah for at least 3 years.

In accordance with R645-301-524.520, signals which are audible for at least one half mile will be given before and after blasting. Access to the blast area will be restricted. The operator will post blasting signs, in accordance with R645-301-524.510, in the vicinity of the blasting operations to indicate that blasting is taking place and explain the meaning of the audible signals.

The maximum weight of explosive detonated within any 8-millisecond period will be determined by the equation of R645-301-524.651. Blasting will be done only between sunrise and sunset unless otherwise approved by the Division as provided in R645-301-524.420. Flyrock will be prevented from leaving the permit area and will not be cast more than one half the distance to the nearest occupied building within the permit area.

Findings:

The plan fulfills the requirements of this section.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

Affected Area Maps

The boundary of the actual disturbed area is shown adequately on Plate 5-3--Surface Facility Map. The boundary of the permit area--or affected area--is shown adequately on Plate 5-2--Mining Projections.

Plate 5-3 was certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah. Plate 5-2 was prepared by or under the supervision of and certified in March of 1996 by R. Jay Marshall, a professional engineer licensed and registered in the state of Utah.

Mining Facilities Maps

The mining facilities are shown adequately on Plate 5-3--Surface Facility Map.

Plate 5-3 was certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

Mine Workings Maps

Mine workings are shown on Plate 5-2--Mining Projections. Also shown on Plate 5-2 are the permit area boundary, the various lease boundaries, section lines, and areas of proposed development, as well as the locations of the portals and surface facilities.

Plate 5-2 was prepared by or under the supervision of and certified in March of 1996 by R. Jay Marshall, a professional engineer licensed and registered in the state of Utah.

Monitoring and Sample Location Maps

Plate 5-2--Mining Projections shows the locations of both exploratory drill holes and those holes that were drilled for the purpose of water monitoring.

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Plate 5-2 was prepared by or under the supervision of and certified in March of 1996 by R. Jay Marshall, a professional engineer licensed and registered in the state of Utah.

Plate 2-1--Soil Types Study Map shows those locations where soil samples were taken for the characterization and delineation of the prevailing soil pedons.

Plate 2-1 was prepared by or under the supervision of and certified by Richard B. White, a professional engineer licensed and registered in the state of Utah.

Plate 5-5 shows the locations of subsidence monitoring stations and control points.

Plate 5-5 was prepared by or under the supervision of and certified in January of 1996 by R. Jay Marshall, a professional engineer licensed and registered in the state of Utah.

Plate 7-12--Seep and Spring Locations shows the locations of seep and spring monitoring points. Plate 7-16--Stream Monitoring Stations shows the locations of stream monitoring points.

Plates 7-12 and 7-16 were prepared by or under the supervision of and certified by Richard B. White, a professional engineer licensed and registered in the state of Utah.

Findings:

The plan fulfills the requirements of this section.

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.

POSTMINING LAND USE

Regulatory Reference: R645-301-412

Analysis:

The areas where surface disturbance resulted from mining operations will be restored to its

premining usefulness as rangeland, wildlife habitat, and recreational use. No alternative land uses are proposed.

R645-301-412.200 requires that the application include a copy of comments concerning the proposed postmining land use from the legal or equitable owners of the surface of the permit area and Utah and local government agencies which would have to initiate, implement, approve, or authorize the use of the land following reclamation. The citations from the Manti-LaSal National Forest Land and Resource Management Plan can be considered as comments from the Forest Service for most of the disturbed area. The plan states that the road will be left in place pursuant to the wishes of the Forest Service, the surface landowner. Appendix 1-2 contains correspondence from the Forest Service stating that the improved roadway is to be retained beyond the proposed life of the mine but that some reclamation will be required.

The portion of the disturbed area not managed by the Forest Service is owned by Genwal. The only other land owner within the permit area is the State of Utah, and this land will not be affected by surface operations.

Findings:

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

APPROXIMATE ORIGINAL CONTOUR RESTORATION

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

Analysis:

See pages 5-38, 5-43.

During final reclamation, the entire operations area will be regraded and restored to its approximate original contour. All cut slopes and highwalls will be eliminated. This will be made possible by the presence of surplus fill material which was hauled in during the 1997 surface facilities expansion.

Findings:

The plan fulfills the requirements of this section.

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:

See 5-43, Appendices 5-21, 5-22.

Reclamation will occur in 2 phases: Phase I and Phase II. Phase I reclamation will involve demolition of the surface facilities, portal sealing, and backfilling and grading. Phase II will take place 2 years after Phase I, after vegetation has been established and the area has stabilized. Phase II will involve removal and regrading of the sediment pond.

For purposes of planning and explanation, the area has been divided into 7 separate reclamation areas, as shown in Figure 1: 1) the Old Substation Area, 2) the Shop Area, 3) the Portal Area, 4) the Old Loadout Area, 5) the Forest Service Road, 6) the Expansion Area, and 7) the Phase II Reclamation Area or Sediment Pond Area. In practice, however, these areas will be reclaimed either simultaneously or within days or weeks of each other.

Reclamation will take place according to the following scheme:

PHASE I

1. Demolition and Removal of Surface Facilities--Portal Area

The underground bath house, mine fan, portable fan transformer, belt transfer station, portal access road guard rail, water pipelines, and diversion culvert above the portals will be demolished and removed. All shotcrete will be removed from the area above the portal access road, the area above the portals, and the area above the old coal loadout.

2. Removal and Disposal of Expansion Area Fill Material inside Mine Portals

At the same time the surface facilities in the portal area are being demolished, the truck loadout, conveyors, coal reclaim facilities and crusher will be demolished and removed from the expansion area. Approximately 20,410 cubic yards of fill material which will not be needed in backfilling and grading will be disposed of in old mine entry areas inside the portal.

3. Sealing and Backfilling of Portals

After excess fill material has been disposed of inside the portal, the portals will be sealed and backfilled. The seals will be concrete block structures and will be placed 25 to 35 feet in from the portals.

4. Backfill, Grade and Topsoil--Portal Area

The portal area will be backfilled, returned to its approximate original contour and covered with at least 12 inches of suitable topsoil material.

5. Revegetation--Portal Area

Revegetation will be done in the sequence: 1) application of fertilizer, 2) hydroseeding, 3) hydromulching, and 4) planting of containerized plants. Hydroseeding will combine seed with tackifier and a small amount of mulch. Hydromulching will combine wood mulch and tackifier. Containerized plants will be planted in the second year of reclamation.

6. Demolition--Old Substation Area

The mine powerline and its termination structure will be demolished and removed.

7. Backfill, Grade and Topsoil--Old Substation Area

As excess fill material is disposed of in old mine entries, additional fill from the expansion area will be used to backfill and grade the old substation area. The area will be returned to its approximate original contour and covered with 12 inches of suitable topsoil material.

8. Revegetation--Old Substation Area

The area will be revegetated according to the 4-step sequence set forth above for the revegetation of the portal area.

9. Demolition and Removal of Surface Facilities--Shop Area

The shop/warehouse building, substation, rock dust bin, oil storage facility, parking lot asphalt and a portion of the retaining wall separating the shop area from the Forest Service road will be demolished and removed.

10. Backfill, Grade and Topsoil--Shop Area

Fill from the expansion area will be used to backfill and grade the shop area. The

area will be returned to its approximate original contour and covered with 12 inches of suitable topsoil material.

11. Revegetation--Shop Area

The area will be revegetated according to the 4-step sequence set forth above for the revegetation of the portal area.

12. Demolition and Removal of Surface Facilities--Old Loadout Area

By the time of final reclamation, the surface facilities in this area will have been removed during the 1997 surface facilities expansion. The remaining asphalt will be removed as will the upper portion of the coal pile retaining wall.

13. Backfill, Grade and Topsoil--Old Loadout Area

Fill from the expansion area will be used to backfill and grade the old loadout area. The area will be returned to its approximate original contour and covered with 12 inches of suitable topsoil material.

14. Revegetation--Old Loadout Area

The area will be revegetated according to the 4-step sequence set forth above for the revegetation of the portal area.

15. Reclaim Forest Service Road North of Expansion Area

The Forest Service road from the site entrance to the trail head will be reconfigured according to the Special Use Permit of August 26, 1989. The width of the asphalt surface will be reduced from a 27-foot subgrade with a 22-foot running surface to a 20-foot subgrade with a 14-foot running surface. The unpaved area will be covered with 12 inches of topsoil and revegetated as described above for the revegetation of the portal area.

16. Demolition and Removal of Surface Facilities--Expansion Area

The overhead conveyor, stacking tube, reclaim vault, tunnel/escapeway tube, crusher building, loadout conveyor, truck loadout and loading platform will be demolished and removed from the area.

17. Removal of Fill Material and Recontouring--Expansion Area

As discussed above, the fill material from this area will be used to backfill the portal

area, the old substation area, the shop area and the old loadout area. The surplus will be disposed of in old mine entry areas or hauled offsite for disposal.

The reclamation of this area will be done differently from that of the other areas. For reclamation purposes, the area has been divided into 3 rather distinct subareas: the north slope area, the south slope area and the Crandall Creek channel area. The north slope area will be reclaimed like the other areas. The south slope area and the Crandall Creek channel area will be reclaimed quite differently, as will described below.

18. Restoration of South and North Slope Areas--Expansion Area

Fill material will be removed in 5-foot to 10-foot lifts. As the light-colored marker material is encountered, it will be removed and the underlying geotextile material peeled back to expose the original, undisturbed topsoil. The topsoil will be revived, revegetated and worked by hand in 5-foot to 10-foot increments as the fill material is removed and it (the topsoil) is uncovered.

19. Revegetation--South Slope Expansion Area

As the protective geotextile is removed, the underlying topsoil will be reclaimed in 5-foot to 10-foot increments. The topsoil will first be treated with PAM (polyacrylamide) to lessen its compaction and enhance its capacity to absorb moisture. It will then be revived with an inoculum. Seed will then be broadcast and raked in by hand. A wood fiber mulch will then be applied over the seed and the entire surface sprayed with a bonded fiber matrix tackifier.

20. Removal and Disposal of 72-inch Bypass Culvert

When the 72-inch bypass culvert has been uncovered, Crandall Canyon Creek will be diverted into the 18-inch underdrain. The bedding material around the 72-inch culvert will then be removed. The culvert itself will be removed in 20-foot lengths from its inlet to a point just above the sediment pond, where a new inlet headwall will be constructed. This will leave in place approximately 400 feet of culvert. Crandall Creek will continue to flow through the 18-inch underdrain until the north slope area has been reclaimed.

21. Topsoiling--North Slope Expansion Area

The north slope area is not as steep as the south slope. Thus, after the 72-inch culvert has been removed, the north slope will be covered with 12 inches of topsoil like the other areas outside of the south slope.

22. Revegetation--North Slope Expansion Area

This area will be revegetated according to the 4-step sequence set forth above for the revegetation of the portal area.

23. Restoration of the Stream Channel

The stream channel will be restored after the north slope has been covered with topsoil. Using the underdrain system as a platform, small equipment will remove the underdrain and its associated bedding material in 20-foot increments, starting at the inlet and going to the new inlet to the 72-inch culvert. Here the underdrain will be capped and the creek diverted again into the 72-inch culvert. As the underdrain is removed, silt fence will be placed on either side of the stream to provide sediment control.

24. Revegetation of the Stream Channel

The stream channel will be revegetated in the same way as the south slope area. The topsoil will first be treated with PAM (polyacrylamide) to lessen its compaction and enhance its capacity to absorb moisture. It will then be revived with an inoculum. Seed will then be broadcast and raked in by hand. A wood fiber mulch will then be applied over the seed and the entire surface sprayed with a bonded fiber matrix tackifier.

25. Sediment Control and Treatment

Through Phase I reclamation, the sediment pond will remain in place to treat runoff from the north side of the site. As has been mentioned, during removal of the underdrain and in areas which do not drain to the pond, silt fences will be installed for sediment control.

26. Topsoil Stockpile Location Reclamation

Following removal of topsoil from storage sites, the underlying ground will be scarified. The areas will then be revegetated according to the 4-step sequence set forth above for the revegetation of the portal area.

PHASE II

27. Phase II Reclamation--Sediment Pond Removal

The removal of the sediment pond and the remaining 72-inch culvert and underdrain system will be done following the same procedure as in Phase I reclamation. The reclamation of the area will also be according to the procedures set forth above for the north slope, the south slope and the stream channel.

In order to assess the stability of the reclamation fills, the permittee commissioned a stability analysis, which is found in Appendix 5-21. The stability analysis was done in March of 1997 by JME Companies of Lakewood, Colorado. It was based on soil engineering parameters determined for this site by EarthFax Engineering of Salt Lake City, Utah in a study done in November of 1990.

Stability was assessed at 6 sample locations. Actual measured values of cohesion ranged from 700 psf to 1600 psf, but the study assumed a more conservative value of 200 psf in order to more accurately model a non-engineered fill such as those at this site. The study found that the static stability safety factor for these samples ranged from a minimum of 1.40 to a maximum of 2.44. These values are well above the value of 1.3 required by R645-301-553.130.

Findings:

The plan fulfills the requirements of this section.

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:

There are no new mine openings associated with the installation of the culvert. Genwal has plans for future development of openings, but approval for those will need to occur through a separate permitting action before they are developed.

Findings:

The plan fulfills the requirements of this section.

TOPSOIL AND SUBSOIL

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

Analysis:

The permit application includes plans for soil redistribution, use of soil nutrients and amendments, and stabilization of reclaimed soils as follows:

- Soil redistribution will replace an average 12 to 16 inches of soil to selected portions of the Original Surface Facility and Surface Expansion areas, for a total soil replacement volume of 9,230 cubic yards.
- Special reclamation techniques will be used that revitalize and stabilize the existing soils left-in-place and to restore the previous channel morphology; no additional topsoil will be redistributed in these areas.
- Soil nutrients and amendments will be applied to the soils after soil redistribution and during final reclamation.
- Standard soil stabilization practices should include surface roughening techniques, such as gouging and/or deep pocking, to help minimize compaction.

Soil redistribution will replace an average 12 to 16 inches of soil to selected portions of the Original Surface Facility and Surface Expansion areas, for a total soil replacement volume of 9,230 cubic yards. Soil redistribution volumes are presented in a table on Page 2-8 and in Figure 8C. In review, the Original Surface Facility Area, 4.50 acres, will receive 12" of soil for a total of 7,260 cubic yards; and the Expansion Area, 0.98 acres, will receive 16" on the north and south slope bench areas and 12" on the coal pile area for a total of 1,970 cubic yards of soil. Areas that will not receive topsoil total 8.20 acres.

Special reclamation techniques will be used that revitalize and stabilize the existing left-in-place soils and restore the previous channel morphology within the steep, south slopes and Crandall Creek areas associated with the culvert expansion; no additional topsoil will be redistributed on these areas. Reclamation procedures for the culvert expansion area are discussed on pages 2-9 through 2-10, page 2-12, and in Appendix 5-22. In the south slope and stream bottom areas where the topsoil was left in-place and protected by the geotextile fabric, these areas will not receive any additional soil during final reclamation. Topsoil recovered from these areas will instead be used to reclaim the original surface facility area.

Fill material will be removed in 5-10 foot lifts, thus exposing the marker layer and geotextile fabric in incremental steps. Reclaiming the south slope in 5-10 foot vertical increments, as the yard is being removed, will allow better access to the slope for hand work such as seeding, raking and mulching and also minimize soil disturbance and exposure to erosion.

The marker layer will be carefully removed and the exposed geotextile fabric will be peeled away from the surface of the slope. The soil will then be sampled and tested for physical and chemical characteristics to determine what amendments might be needed. The steep, south slope will be treated with PAM (polyacrylamide), a soil treatment to enhance moisture retention and relieve compaction. After fertilization, the seed will be broadcast and hand raked into the soil surface. A soil inoculum will also be incorporated to aid the re-establishment of soil bacteria, mycorrhizal fungi

and mycelium. Wood fiber mulch will then be sprayed over the slope and then a bonded fiber matrix tackifier will be applied.

Soil nutrients and amendments will be applied to the soils after soil redistribution and during final reclamation. Two soil samples per acre will be submitted to a lab for assessment of nutrient requirements. All lab work will be conducted by a Division approved and qualified laboratory. Results of the samples, along with consultation with the Division, will determine the necessary nutrients and amendments to the soil.

Standard soil stabilization practices should include surface roughening techniques, such as gouging and/or deep pocking, to help minimize compaction. In those areas to receive topsoil, the surface will be regraded and ripped to help ensure positive contact and minimize slippage between the freshly prepared surface and the redistributed topsoil. Regraded areas with slopes less than 20% will be disced while slopes greater than 20% will be scarified using a trackhoe. Topsoil will be protected from wind and water erosion before and after reseeding. Genwal proposes to disc and harrow the soil after redistribution to minimize compaction. *However, such traditional agricultural-type methods on steep slopes will not only prove difficult, but are not likely to be highly successful for providing a stable surface for plant establishment. The Division recommends also using surface roughening techniques, such as gouging and/or deep pocking, to minimize compaction. These techniques have also proven noteworthy for controlling surface runoff and erosion, helping harvest water, and providing micro-conditions that promote plant establishment.*

Findings:

The requirements of this section of the regulations are considered adequate.

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:

See pages 5-27 to 5-30, 5-34 to 5-35, Plate 5-3, 5-10, 5-19, Appendix 1-2.

There are 3 roads associated with this site: the Forest Development Road, the Forest Service Access Road, and the Portal Access Road. The Forest Development Road and the Forest Service Access Road are classified as primary roads. The Portal Access Road is classified as an ancillary road.

The Forest Development Road connects the site with the main road in Huntington

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Canyon. It was built by the U.S. Forest Service (USFS) and is thus outside the permit area. It is, however, maintained by the permittee as a primary road in accordance with a USFS road use permit. It will be retained as a permanent feature following final reclamation.

The Forest Service Access road goes from the entrance to the site to the Forest Service turnaround area at the upper end of the site. It was built by USFS but was upgraded by the permittee to accommodate this operation. It is a primary road. It will be retained as a permanent feature following final reclamation. It is shown in plan view on Plate 5-3--Surface Facility Map. A profile and typical cross section of this road are shown on Plate 5-10--Road Profile and Cross Section.

The Forest Service road will be reconfigured according to the Special Use Permit of August 26, 1989. The width of the asphalt surface will be reduced from a 27-foot subgrade with a 22-foot running surface to a 20-foot subgrade with a 14-foot running surface. The unpaved area will be covered with 12 inches of topsoil and revegetated.

The Portal Access Road connects the warehouse area with the portal area. It is an ancillary road. It will be completely reclaimed during final reclamation. It is shown in plan view on Plate 5-3--Surface Facility Map. A profile and typical cross section of this road are shown on Plate 5-10--Road Profile and Cross Section.

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.

R645-301-732.300, 742-300, Diversions: General

Analysis:

The July 5, 1996 Technical Analysis by the Division required the Operator to provide:

- ◆ Construction aspects during the culvert expansion project to accommodate future reclamation,
- ◆ Specific objectives and construction sequencing during the reclamation phase,
- ◆ Specific objectives and methods to control sediment in the stream during reclamation

- construction,
- ◆ Stream diversion methods, if used during reclamation,
- ◆ Objectives and methods for accomplishing restoration of the stream channel and steep side slopes,

Appendix 5-22, CRANDALL CANYON MINE SITE RECLAMATION PLAN provides the specific details of reclamation of the culvert project and the entire mine site. Related information is also contained in Appendix 7-50, CONSTRUCTION SEQUENCE-72" CULVERT. Plates 5-16 and 5-17 also show the reclaimed site. Included in the reclamation plan are the designation of eight specific areas and a reclamation sequence for each. Six of the eight areas are reclaimed in typical fashion involving:

- Structure removal
- Asphalt paving removal
- Backfilling, regrading, and recontouring to Approximate Original Contour (AOC)
- Topsoil distribution
- Seeding and mulching

Two of the areas, the Stream Channel and South Side of the canyon, require special treatments such as removal of the culvert and under drain, and revitalizing the in-situ soils. These appendices satisfy the above Division requirements.

The reclamation plan includes removal of all culverts except two, one at the upper end and one at the lower end of the site. The two that are left are needed to carry runoff under the Forest Service road. That road is left in place to sustain the postmining land use of recreation.

The plan is explicit in methods of construction, restoration of approximate original contour, and revegetating the site. This is expected to "restore or approximate the premining characteristics of the original stream channel including the natural riparian vegetation" as required under paragraph 742.313.

The July 5, 1996 Technical Analysis by the Division required that, "the turbidity be monitored on a continuous basis during reclamation". This requirement was based on Crandall Creek being defined as a "critical fisheries habitat".

Considerable effort has been exerted by the U.S. Forest Service, Utah Division of Wildlife, Bureau of Land Management, Utah Water Rights, and Utah Division of Oil, Gas, and Mining to come to a consensus on how to handle the fish in Crandall Creek. The details of that plan are contained in Appendix 3-12, CRANDALL CREEK/ COLORADO CUTTHROAT TROUT MITIGATION PLANS. That plan is evaluated elsewhere in this Technical Analysis. Sufficient to point out here is that the plan makes the previous requirement for continuous turbidity monitoring

unnecessary. **That requirement is rescinded.**

Findings:

The plan fulfills the requirements of this section of the regulations

SILTATION STRUCTURES,

R645-301-763

Analysis:

The Reclamation Plan in Appendix 5-22, CRANDALL CANYON MINE SITE RECLAMATION PLAN and Appendix 7-4, CRANDALL CANYON MINE SEDIMENTATION AND DRAINAGE CONTROL PLAN describes the sequence and methods of handling sediment runoff during the critical period when the vegetation is being reestablished. Included are silt fences along both sides of the stream the entire length of the site to minimize localized runoff. The sediment pond is retained during the first phase of reclamation and removed during Phase Two. During reclamation all areas are regraded and revegetated as required. Included is a timetable which shows the timely removal of the pond.

Findings:

The plan fulfills the requirements of this section of the regulations

CONTEMPORANEOUS RECLAMATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.100; R645-301-352, -301-553, -302-280, -302-281, -302-282, -302-283, -302-284.

Analysis:

Surface areas which were disturbed during construction and which were not needed for mining operations were revegetated in the fall of the year following construction. Disturbed areas which contribute directly to the sediment pond were also contemporaneously revegetated in order to minimize erosion. Plate 5-17--Reclamation (Phase II) shows both the final reclamation and those areas which were contemporaneously reclaimed during the time of normal mining operations as well.

Findings:

The plan fulfills the requirements of this section.

REVEGETATION

Regulatory Reference: R645-301-340

Analysis:

Revegetation Plan

Topsoil will be redistributed within 30 days of completion of grading in late September or early October. Soil amendments will be applied if necessary before the end of October. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in conjunction with seeding or in the following spring as soon as the soil is workable.

The applicant commits to inoculating the soil with microorganisms prior to seeding. Some research indicates this is a necessary step for establishing certain species although there has been successful revegetation in some areas with essentially sterile soil and no attempt to inoculate. Hopefully, there will be further research on this subject before the site is actually reclaimed, and the applicant and the Division should look at current findings at that time to determine the best methods.

The application contains a seed/planting mix for riparian and one for non-riparian areas. The seed mix for non-riparian areas was developed primarily for the south-facing slope where existing disturbances are located. The north-facing slope has a very different vegetation community, but many of the species in the existing seed/planting mixture are appropriate for the north-facing slopes. Also, the application contains a plan to transplant woody plants of species more suited to the north-facing slopes.

The seed/planting mix for riparian areas includes a mixture of species suitable for both upland and riparian areas. Willows, dogwoods or roses would be planted at one-foot intervals along the stream. In response to comments from the Forest Service, the applicant has committed to plant horsetail plugs about every two feet. Additional trees and shrubs would be planted farther away from the creek.

The seeding and planting mixes in the plan fulfill regulatory requirements for introduced species, diversity, seasonality, and the postmining land use. Three introduced species are included, and they are all highly desirable. They should not be overly competitive or displace native species in the area. Small burnet and yellow sweet clover are fairly short-lived species that will probably not be present after the ten-year extended responsibility period. The seed and planting mixes are expected to provide successful revegetation if proper reclamation methods are used.

The entire area of disturbance will be hydromulched with a long fiber wood mulch. Tackifying agents will be added to the hydromulch, and the application shows tackifier application rates for varying slopes.

The applicant and the Division investigated the use of various mulches, particularly for the steep north-facing hillside. There are many types of hydromulch available, and the applicant intends to use one with coarse, long fibers. This type of mulch is preferred over a mat because mats often have erosion under them.

It is anticipated that mulch technology will change over the next several years until the site is reclaimed. The applicant will need to use the best technology currently available to control erosion and sedimentation, particularly in the area near the stream.

No irrigation is anticipated. The applicant commits to avoid using persistent pesticides and to prevent personnel-caused fires. However, a contingency irrigation plan is recommended for transplants. Dry conditions could necessitate watering transplants for the first one or two summers.

Musk thistle is a very serious problem at mid- to high elevations in Utah. Although this noxious weed is not widespread in Huntington Canyon, it has been found at the Crandall Canyon Mine. Disturbed and newly seeded areas are very prone to noxious weed invasion. The applicant should plan now for noxious weed control during reclamation as it will almost certainly be necessary.

On January 1, 1994, the Forest Service issued a closure order for any straw or hay that is not certified to be free of noxious weeds. This includes transportation across Forest Service lands. The applicant is not planning to use straw or hay mulch in reclamation, but any straw or hay bales that are used for sediment control will need to be certified.

Revegetation Success Standards

A vegetation reference area has been established in the mountain shrub/grassland community above the mine portals for comparison with vegetation on reclaimed areas that had this community before mining. Another reference area has been established to compare to areas with spruce/fir/aspen communities. This reference area is south of the proposed expansion area.

Woody plant density standards have been established for three areas of the mine. For areas to be compared with the mountain shrub/grassland reference area, the standard for woody species density has been set at 1336 shrubs per acre. This is based on reference area data. The standard for north-facing slopes has been set at 4000 per acre based on baseline information in the plan and consultation with Wildlife Resources. The riparian area has about 11,224 shrubs and trees per acre, and shrubs and trees will be planted in this area at the rate of about 3000 per acre. It is expected that these will multiply through the extended responsibility period, and the success standard has been set at 6000 per acre.

There are some differences between the proposed disturbed and reference area spruce/fir/aspen communities, but they are primarily in species composition rather than the total amount of cover. The proposed reference area has 75.25% total living cover, and the area proposed to be disturbed has 78.75%. These values are not statistically different at the 90% confidence level. The proposed disturbed area has statistically more overstory than the reference area, but understory cover values are statistically the same for both areas. Also, the woody species density is higher in the reference area.

Despite the differences between the proposed disturbed and reference areas, there are several similarities, including location, community type, soils, aspect, and total cover. The actual species present and the amount of cover from overstory vary, but these will vary even more significantly when comparing reclaimed and reference areas. Additionally, the woody plant density success standards are established in consultation with Wildlife Resources rather than being based strictly on baseline information in the plan. For these reasons, the reference area is considered an acceptable revegetation success standard for spruce/fir/aspen areas.

Portions of the north-facing slope have been affected by natural soil movement and have less vegetation than adjacent areas. The Division could accept a different revegetation success standard for these areas rather than comparing them to the spruce/fir/aspen reference area. However, the applicant has not proposed a separate standard in the application even though the report from the applicant's consultant discusses using another standard. A revegetation reference area was not proposed, and the number of samples taken in these areas is not sufficient to allow the baseline method to be used.

In order to meet the erosion control performance standards in the areas that have had soil movement, it will probably be necessary to establish nearly as much vegetation as in spruce/fir/aspen areas. The main question is whether establishing this much vegetation is feasible. The various revegetation and stabilization techniques that are planned should allow more vegetation to become established than currently exists. If, in the future, the applicant desires to propose a reference area revegetation success standard in a similar area, the Division could compare it to the area now proposed to be disturbed. If there is some possibility a different success standard may be proposed in the future, the areas with soil movement should be mapped now.

The application includes diversity standards for all current and proposed disturbed areas. The standards currently in the plan and proposed in the application are minimum and maximum relative cover values for grasses, shrubs, and broadleaf forbs in the three major disturbed vegetation types. In addition, the application states that no one species will make up more than 60% of the cover in its respective vegetation class except that individual species of shrubs and trees will make up no more than 80% of the density for this class. The application gives a monitoring schedule and methodologies for checking success of revegetation.

In the proposed disturbed spruce/fir/aspen areas, the standard will be 3-15% relative cover from broadleaf forbs, at least 15% cover from trees and shrubs, and the balance from grasses. This leaves a

lot of latitude between grasses and woody plants since woody plants are expected to eventually dominate the area. Until then, grasses are expected to dominate the cover.

The riparian area should be dominated by woody species. The standard is 5-10% relative cover from broadleaf forbs, 40-85% relative cover from trees and shrubs, and 10-50% relative cover from grasses and grasslike plants.

For both riparian and spruce/fir/aspen areas, as in the other areas, no one species will make up more than 60% of the cover in its respective vegetation class except that individual species of trees and shrubs will make up no more than 80% of the density for this class.

The diversity standards for south-facing slopes are based on Natural Resource Conservation Service range site potential plant community data. For riparian areas and north-facing slopes, the standards are based on professional judgment by a soil scientist and botanist with the Forest Service and a Division biologist. The standards allow some flexibility but ensure a reasonably diverse plant community.

R645-301-353.140 requires that the vegetative cover be capable of stabilizing the soil surface from erosion. The applicant proposes to use the Erosion Condition Classification System to compare reclaimed areas with adjacent undisturbed areas. This method was developed by the Office of Surface Mining, and, while it is a qualitative judgment, it provides a reasonably good estimate of how stable a site is. Even if vegetative cover is equal to that of the reference area, the reclaimed area may not be stable.

R645-301-356.250 says that for areas previously disturbed by mining that were not reclaimed and that are remined or redisturbed, at a minimum, the vegetative ground cover will be not less than the ground cover existing before redisturbance and will be adequate to control erosion. The vegetative ground cover existing before redisturbance was 50.3%. Relatively little of this cover was from plants that would be considered weeds. This figure has been established as the vegetative cover standard for success for the areas previously disturbed by mining.

Wildlife Habitat

High value habitats (pinyon-juniper, agricultural and riparian areas) will be restored; in many cases, they will be enhanced beyond their premining condition. The goals are to create a diversified cover and/or habitat that will support a wide range of species while restoring to a premining condition and, where feasible, enhancing habitat.

On September 21, 1993, representatives from Genwal, the Division, and Wildlife Resources met on-site to discuss wildlife habitat enhancement for reclamation. Subsequently, Wildlife Resources wrote Genwal a letter with enhancement suggestions. This letter has been incorporated in the plan, and Genwal commits to use the recommendations. They include making several rock piles and placing

modified utility poles with attached nesting boxes near the perimeter of the disturbed area. These measures were felt by Wildlife Resources to be the most practical means of enhancing wildlife habitat in this area. Combined with the revegetation plan, these methods can be considered the best technology currently available.

Findings:

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

CESSATION OF OPERATIONS

Regulatory Reference: 30 CFR Sec. 817.131, 817.132; R645-301-515, -301-541.

Analysis:

If operations are to temporarily cease for 30 days or more, the permittee will submit to the Division a notice of intention to cease or abandon operations. This notice will include a description of the extent and nature of surface and underground disturbance prior to temporary cessation. It will also describe the reclamation which will have been accomplished, any ongoing monitoring, water treatment, and temporary closure of mine openings and securing of mine facilities (page 5-41).

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:

Affected area boundary maps.

The boundary of the actual disturbed area is shown adequately on Plate 5-3--Surface Facility Map. The boundary of the permit area--or affected area--is shown adequately on Plate 5-2--Mining Projections.

Plate 5-3 was certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah. Plate 5-2 was prepared by or under the supervision of and certified in March of 1996 by R. Jay Marshall, a professional engineer licensed and registered in the state of Utah.

Bonded area map.

The boundary of the actual disturbed area, which in this case is identical to the bonded area, is shown adequately on Plate 5-3--Surface Facility Map.

Plate 5-3 was certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

Reclamation backfilling and grading maps.

Reclamation topography is shown by contours on Plate 5-16--Reclamation (Phase I) and Plate 5-17--Reclamation (Phase II). Reclamation topography is shown by cross sections on Plates 5-17A and 5-17B, both of which are designated Reclamation Cross Sections.

Plates 5-16, 5-17, 5-17A and 5-17B were certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

Reclamation facilities maps.

Reclamation facilities are shown on Plate 5-16--Reclamation (Phase I) and Plate 5-17--Reclamation (Phase II).

Plates 5-16 and 5-17 were certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

Final surface configuration maps.

The final surface configuration, after removal of the sediment pond, is shown by contours on Plate 5-17--Reclamation (Phase II).

Plate 5-17 was certified in April of 1997 by Dan W. Guy, a professional engineer licensed and registered in the state of Utah.

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)

The bond will be a surety agreement between the permittee and a bonding company. However, the details of the bond, i.e., its amount and the bonding company which holds it, are not yet known to the Division. The permittee must post a bond and provide the Division with its details before the permit can be issued.

Determination of bond amount.

See page 5-42, Appendix 5-20.

The reclamation bond was increased in 1997 to take into account the cost of reclaiming the surface facilities expansion. Using information provided by the permittee, which is found in Appendix 5-20, the Division determined the necessary bond amount to be at least \$1,645,000. The following table, which is found on page 5-42, is a summary of the reclamation cost calculations:

Direct Costs	
Demolition and Removal Total	\$649,612
Earth Work Total	\$426,786
Drainage Total	\$55,650
Revegetation Total	\$21,344
Topsoil Total	\$64,166
Total Direct Costs	\$1,217,558
Indirect Costs	
Monitoring and Maintenance (10%)	\$121,756
Contingency (10%)	\$121,756
Engineering Redesign (5%)	\$60,878
Mobilization/Demobilization (2.5%)	\$30,439
Contract Management Fee (5%)	\$60,878
Total Indirect Costs	\$395,707

TECHNICAL ANALYSIS

Last revised - June 24, 1997

Total Reclamation Costs (1997 Dollars)	\$1,613,265
Escalation (2.52% for 1 year)	\$40,654
Reclamation Cost (1999 Dollars)	\$1,653,919
Reclamation Cost (Rounded to Nearest \$1000)	\$1,654,000

Findings:

The plan fulfills the requirements of this section. However, before the facilities expansion and culvert installation can proceed, the permittee must post a reclamation bond for *at least* \$1,654,000 and provide a copy of the bond agreement to the Division.

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