

CHAPTER 3

OPERATION AND RECLAMATION PLAN

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3.0 OPERATION AND RECLAMATION PLAN

3.1 Scope

This Chapter will present the surface facilities, operation plan, underground operation, environmental protection, and reclamation plan.

3.2 Surface Facilities/Construction Plans

3.2.1 Site/Selection and Preparation. The site selection was limited to the only area where the coal outcropped in the lease area. This site is extremely small at this point and very few options are available at this time. See the proposed surface facilities layout Plate 3-1 and pre-mining land configuration on Plates 9-1, 9-2 and 9-3.

A Forest Service road use permit was obtained from the U.S. Forest Service, Manti LaSal National Forest, Price, Utah, in order to build, use and maintain the road to the mine permit area. This Forest Development Road does not lie within the permit area and is not included as part of this permit application. The Forest Road that passes by the mine site will be included in the permit area for the purpose of drainage control.

The topsoil will be stripped according to the plan located in Chapter 8. These topsoil stockpiles will be seeded with the topsoil stockpile seed mix found in Section 3.5.5.2. The topsoil stockpiles will be protected from encroachment by placing earthen berms where needed. If straw berms are to be installed to prevent erosion and contamination, approval will be requested from the DOGM prior to their installation.

3.2.2 Portals. Four portals have been placed on the Starpoint Sandstone in the Hiawatha coal seam. Three of the four portals will be used, while one of the portals is sealed. Three portals will be used for intake ventilation, beltline, and a return ventilation fan. A fifth portal, may be added west of the intake portal, to be used as access to the proposed bathhouse.

During the early part of 1985 a drilling program was conducted to determine the extent of the upper, or Blind Canyon Seam. The drilling results indicated that the upper seam was not economically minable at the present time, therefore portals to access the upper seam will not be necessary. The location of the drilling stations are included on Plate 3-2B.

3.2.3 Surface Buildings and Structures. There were no existing structures prior to construction of the mine site. At the present time no buildings are anticipated, however, one trailer is to be placed on site to act as temporary warehouse, office building and rock dust supply.

A generator set with two power centers will be located on the surface to provide power underground. Fuel tanks needed to run this generator set will be placed on the surface as well. The fuel tanks and all oil containers will be stored inside a containment area with a three foot high concrete block wall placed on the perimeter (see Plate 3-1) in order to prevent a spill from leaving the containment area and contaminating the surrounding area. The containment area will be of sufficient volume to hold all the fuel and oil that will be stored within the area, this being approximately 5000 gallons. The containment area will have valves placed in the outer walls in order to drain any spills or water in the containment area, and to facilitate draining oil from the generator. Oil used underground will be stored in this fuel containment area as well. The generator set will be placed on the main pad at a temporary location pending construction of a permanent substation location on the upper pad, refer to Plate 3-1.

Utility poles from the generator to the portal will be placed as shown on Plate 3-1. All structures will be designed and constructed to minimize damage to fish, wildlife and related environmental values as outlined in UMC 817.181. All utility poles are constructed to prevent damage to raptors, and incorporate raptor proof designs.

An underground bathhouse, see Plate 3-14, has been installed to provide

shower and sanitary facilities for the miners. This bathhouse was designed and installed in accordance with all State Health and MSHA regulations. The water and sewage plans can be found in Appendix 3-13 and 3-14 respectively.

3.2.4 Coal Handling, Processing, Preparation, and Storage. Coal will exit the mine on a 36-48" conveyor or belt. This mainline conveyor will extend approximately 60' outside of the portal where it will dump the coal onto a grizzly. The coal on the mainline conveyor contains sufficient water to control the coal dust, therefore with the short length of the conveyor and the water used to control the dust it will not be necessary to cover the conveyor. The division of air quality has issued a permit allowing for the conveyors to remain uncovered (see Appendix 11-1). The belt conveyor will be of very simple construction using two wire ropes, bottom stands, rollers and a head pulley installed over the grizzly. Refer to Plate 3-1.

The grizzly used at the end of the mainline belt will direct the lump coal into a chute and to a separate lump coal pile. The undersized product will then go through the grizzly and onto a chute to be deposited into the coal stockpile. These two piles will be located next to each other on the same pad. The coal stockpile will be equipped with water sprays to suppress dust when needed. The coal will then be loaded out of the two stockpiles with a front-end loader and dumped into trucks.

An automated coal processing facility is proposed to be installed when economic conditions allow. The facility is anticipated to be built during the spring and summer of 1988. The facility layouts can be found on Plates 3-11, 3-12 and 3-13. The belts, screens and crushers will be equipped with water sprays to control fugitive dust. The two lower bins will be covered to control dust. The loadout belt will be covered and equipped with a let down chute to reduce the dust emissions. The truck loading area will have a building constructed in the future to control dust and protect the future truck scales. The truck scales and building may be constructed during the fall of 1988, or possibly during the summer of 1989.

3.2.5 Power System, Transmission Lines, Substations, Feeders. Power for the mine, both underground and surface use, will be provided by a diesel generator located on the surface. The generator will provide a 480 VAC power supply to a power center located next to the generator. Power lines will be run overhead to the mine portals where they will go underground. All the electrical installations will meet the appropriate 30 CFR Part 75 and 77 MSHA regulations. All power lines will be constructed to protect raptors with no exposed conductors on the power poles and all power lines will be jacketed and insulated. The placement of the existing power lines can be found on Plate 3-1.

3.2.6 Water Supply System. The culinary water used at the mine will be purchased from a vendor, supplied from the Huntington City water supply or taken from the deep well located at the mine portals. This deep well has been installed in accordance with state health regulations for culinary use. The culinary water will be placed in containers designed for this purpose.

The water used underground will be placed in the mine sumps located underground. The location of the sumps will change as mining progresses across the reserve and will not remain in any one area. These sumps will be filled with water produced underground, or from a pump located in Crandall Creek.

3.2.7 Sewage System. The bathhouse, located underground, was designed and constructed in accordance with the State Health Departments rules and regulations. The sewage will be contained in a concrete holding tank and pumped by a licensed contractor and disposed of at state approved sewage treatment plant. The sanitary facilities underground will comply with all MSHA regulations. The proposed sewage facility can be found in Appendix 3-14.

3.2.8 Water Diversion Structures. See Chapter 3 Appendix.

3.2.9 Sedimentation Control Structures and Water Treatment Facilities. The existing sedimentation pond has been reconstructed during the 1986 construction season in accordance with UMC 817.46, as detailed in the Runoff and Sediment Control Plan located in Chapter 7.

Underground sumps will be built in order to effectively treat underground water before discharging into Crandall Creek, refer to Plate 3-7 for the sump locations. These sumps will be designed and submitted to the EPA for approval before discharge begins. All discharge into the creek will meet effluent limitations of the NPDES permit and monitored in accordance with same, refer to Appendix 3-8.

The sediment pond and the underground sumps are the only water treatment facilities proposed at the mine site.

A NPDES permit has been issued for the sediment pond and is included as Appendix 3-8.

During the construction of the surface facilities straw bale dikes will be erected and maintained during the construction as shown on Plate 3-1. These three areas will have straw bale dikes erected prior to construction in that area. All water from the pad area construction will be treated in the newly renovated sediment pond.

During the renovation of the sediment pond, if necessary, water entering the pond will be pumped into the mine sump and discharged to Crandall Creek after treatment.

3.2.10 Transportation, Roads, Parking Areas. The coal from the mine will be transported to the rail loadout or final destination by truck. The trucks are typical 40 ton tandem trailer coal haulers used in the Utah coal fields. Genwal Coal presently leases a loading site on the Utah Railway located at Mohrland, Utah.

The Forest Development Road from Huntington Creek to the truck turn around area will be designated as a Class One road and will be maintained in compliance with the road use permit issued by the U.S. Forest Service, Manti-LaSal National Forest. The forest access road will remain as part of the post mining land use

in accordance with the Forest Service Permit (see Appendix 2-3). The Class Two Forest Service Access Road to the main pad area from the truck turn around area will be designed, maintained and restored in accordance with the Forest Service road use permit. The Class Two Road from the main pad area to the portal area will be designed (as shown on Plate 3-6), maintained and restored in accordance with UMC 817.160-170. The Class Three Road to the powder magazine pad will be designed (as shown on Plate 3-6), maintained and restored in accordance with UMC 817.170-176.

The Forest Development Road has been designed and approved by the USFS prior to construction. The design drawings are on file with the Manti-LaSal National Forest in Price, Utah. Due to the fact this road is under the jurisdiction of the USFS and to avoid future discrepancies, these plans will not be made part of this permit. This road is addressed in Appendix 2-3.

All roads in the permit area will have weekly inspections performed in order to determine the maintenance required to minimize and correct erosion problems before they become extensive. Maintenance will be performed as required to control erosion. This maintenance will include maintaining the ditches, resurfacing when needed and maintaining proper drainage.

The Class One Forest Service Road will be utilized by coal haul trucks, mining equipment on a limited basis, support vehicles, employees and recreational users. The Class Two Roads located on the permit area, the portal pad road and the access road to the main pad from the truck turn around area, will be utilized by both surface and underground mining equipment, support vehicles and employee vehicles. The Class Three Road to the powder magazine area will be utilized by service vehicles on a very limited basis.

The Class Three Road to the powder magazine will be reseeded (see Plate 3-1).

Two parking areas will be maintained at the mine site. These parking areas, the upper main parking area and the stockpile area will be utilized by Genwal

for equipment and employee parking. A forest parking area will be developed past the mine site for primarily recreational/forest service parking. The Forest Service parking area will be used during the winter months for snow storage. The parking areas on the main pad and stockpile areas will be used exclusively by Genwal Coal and its employees.

The plan view for the above roads may be found on Plate 3-1. The typical cross section for each road and their corresponding profile may be found on Plate 3-6.

3.2.11 Total Area For Surface Disturbance During Permit Term. The total disturbed area for the life of the mine will be 6.65 acres as described in Section 1.1. See Plates 3-1 and 2-1.

3.2.12 Additional Areas For Surface Disturbance For The Life Of The Mine. No additional surface disturbance is anticipated for the life of the mine.

3.2.13 Detailed Construction Schedule. Construction will begin as soon as weather and snow conditions permit in 1986. Construction of the main pad areas, upper pad area, portal road, parking areas, forest access road and sediment pond will be completed by July 31, 1986. The following table represents construction beginning on June 1, 1986, however construction will begin when the climate allows and all dates will then become relative:

Start Date	Event	Completion
June 1	Sediment Pond Enlargement	June 20
June 1	Construct Cut Off Ditches	June 15
June 20	Topsoil Removal Main Pad	June 25
June 20	Reconstruct Upper Pad	June 30
June 26	Construct Cut Off Ditches	July 3
June 26	Construct Access Road, Main Pad, Portal Road and Parking areas	July 20

July 20

Move Existing Trailer,
Generator, and Fuel

July 31

3.3 Operation Plan

3.3.1 Mining Plans.

3.3.1.1 Multiple Seam Consideration. The lower Blackhawk Formation of the Wasatch Plateau is known to contain two minable seams in this general area. These two seams are locally referred to as the Hiawatha and Blind Canyon (lower and upper seams respectively). Originally two seams were thought to exist in the mine plan area, however a drilling program that began in March, 1985, and since concluded, has revealed that the upper seam is not of minable thickness in the Tract 1 area. Future drilling will be done to determine the feasibility of mining the upper seam, if the horizontal extent and mining conditions make mining the upper seam economical the upper seam will be mined. If the economics of mining the upper seam are present, plans will be developed and submitted to the proper agencies for approval.

3.3.1.2 Portals, Shafts and Slopes. The Hiawatha seam is the only minable seam in this area. Four portals are located on the top of Star Point Sandstone, however only three of these portals will be used. The three portals in use will provide for intake ventilation, beltline, and a return air way. These portals existed during previous mining attempts and will be utilized during current mining operations. The highwall above the portals has been secured and canopies have been installed to bring the portals up to MSHA standards.

The Blind Canyon seam is not of minable thickness in the mine permit area and no portals, shafts or slopes are anticipated. THE BLM has determined the upper seam is not minable and during 1985 approval was given by both the BLM and the Division to commence pillaring of the lower seam.

A fifth portal has been installed to provide access to the bathhouse facilities. (See Plate 3-1.)

3.3.1.3 Mining Methods, Room and Pillar, Longwall.

3.3.1.4 Projected Mine Development. See Plate 3-3.

3.3.1.5 Retreat Mining. Retreat mining will be done in accordance with the approved MSHA roof control plan. All pillars in the mine, with the exception of the pillars designated in Chapter 12 as barrier pillars or other pillars needed to protect the outcrop, will be fully extracted, however safety or economic reasons may dictate some pillars or partial pillars may remain in place. Pillars used to protect mains, submains, and fire breaks will be left until final retreat or when they serve no useful purpose.

3.3.1.6 Roof Control, Ventilation, Water Systems, Dust Suppression, Dewatering and Electrical. The following plans can be found in the Chapter 3 Appendix:

Roof Control Plan	Appendix 3-3
Ventilation Plan	Appendix 3-5
Sumps	Plate 3-7
Air Quality Approval	Chapter 11

The sump area, as shown on Plate 3-7, will have a capacity of approximately 3.0 acre feet of water. The impoundment walls will be constructed of concrete block with mortared joints and sealed on both sides. All the contact areas around the walls will be sealed with concrete to prevent seepage. These sumps will be constructed so as to allow the sediment to settle out and have an oil skimmer installed, as shown on Plate 3-7, to allow the water to be pumped directly to Crandall Creek under a modified NPDES permit. All water pumped to Crandall Creek will meet all effluent limitations and will be sampled in accordance with the NPDES permit requirements.

Utility poles located on the surface will be constructed to protect raptors, all wires will be insulated and there will be no exposed conductors. All electrical installations will be done in accordance with MSHA regulations.

Utility poles are presently installed from the generator to the portal as shown on Plate 3-1.

The generator will be located on the main pad area and placed in a concrete block open top enclosure as shown on Plate 3-1. The enclosure will be constructed to contain all fuel and oil stored on the site. At a future date, a top may be installed on the generator to prevent weather problems.

3.3.2 Barrier Pillars. Barrier pillars design and sizing is included in Chapter 12 and are shown on Plate 3-3.

3.3.2.1 Protection Of Oil and Gas Wells. There are no oil and gas wells located on the property or within the potential areas of coal mining. The topography in the area of coal mining activities does not lend itself to this type of development. Wells that have been drilled in the recent past have been located in the canyon bottoms and not the surrounding ridges. With this in mind no provisions have been made to protect oil and gas wells, however if such activities do take place, Genwal will work towards a mutual agreement between the interested parties.

3.3.2.2 Protection Of Surface Structures, Streams. No surface structures or streams exist over the coal seam, therefore no protection will be afforded. There exists a concern for the Crandall Creek in the southwest area of the property, this has been addressed in Chapter 12.

3.3.2.3 Property Boundaries. All property boundaries will be protected with barrier pillars designed in accordance with Utah State Industrial Commission's and BLM's regulations. These barriers have been tentatively calculated and located on the mining sequence map, however these will be finalized when the coal height and overburden are more accurately known. The formula used to calculate these pillars can be found in the Utah State Industrial Commission Underground Mining Code. More information may be found in Chapter 12.

3.3.2.4 Outcrop Protection. Barrier pillars will be left for outcrop protection where outlined in Chapter 12.

3.3.3 Conservation Of Coal Resource.

3.3.3.1 Projected Maximum Recovery. Mining recovery of the coal in Tract 1 is projected to be greater than 50% of the total in place coal. Lease SL-062648 contains approximately 400,000 tons of recoverable coal. Of the recoverable coal available, only 170,000 tons remain for advance work and 230,000 tons will be mined on final retreat. Lease U-54762 contains approximately 2.5 million tons of coal in place of which approximately 1.50 is recoverable. Approximately .5 million tons will be left in place for final retreat leaving approximately one million tons minable on the advance.

Genwal Coal Company will mine coal from rock to rock in areas where coal is less than 9' thick, however in order to protect the environment from unsightly waste rock piles, all attempts will be made to leave the rock in place. In areas greater than 9', a coal top or bottom will be left for safety reasons and attempted to be mined on the retreat. (Note: No coal is thicker than 7' within this permit area.)

3.3.3.2 Justification For Non-Recovery. All coal above five feet thick that can be safely and economically mined will be mined. Coal below five feet of thickness may be mined if it is economically feasible and the equipment is available to operate safely and efficiently. State and federal regulations require certain barrier pillars to be left in place and these will remain in place as required.

3.3.3.3 Access To Future Reserves. Access to future reserves will be maintained by the North Mains entries centrally located on the property. This set of entries will maintain access to coal both to the north and east. Coal to the west will be accessed by entries driven north and west. Coal to the east will be accessed by entries driven to the outcrop barrier. Barrier pillars will be left on both the east and west side of the north mains to protect future

access, refer to Plate 3-3.

3.3.4 Equipment Selection.

3.3.4.1 Surface Equipment. Underground supply equipment will be used on the surface as needed. The following is a list of equipment used exclusively on the surface:

- 1 - Front End Loader
- 1 - Dozer
- 1 - 2 Ton Water Truck
- 1 - 1000 KVA Generator with 1200 HP
Pick-up trucks
- 1 - 220 HP Cat Power Pac - used when loadout installed

3.3.4.2 Underground Equipment. Typical mining equipment used in this area will be employed to mine coal in this permit area. Two continuous miners will be employed to mine coal in this lease area, however a conventional section of equipment is available if it becomes necessary. The following is a list of equipment, or equivalent, that will be utilized underground and on the surface as required:

- Joy 12 CM Miners
- Joy 10 SC Cars
- Lee Norse Top Dog Roof Bolters
- Feeder Breakers
- Battery Powered Scoops and face haulage
- Various Electrical Equipment

3.3.5 Mine Safety, Fire Protection and Security.

3.3.5.1 Signs. All signs required at the mine site will be designed, constructed and installed in accordance with UMC 817.11. The following is a list of signs to be utilized at the mine site.

Sign	Location
Identification Sign	Permit Boundary on Road
Perimeter Markers	Perimeter of Dist. Area
Explosives (when required)	Blasting Zones
Buffer Zone Signs	Within 100' of creek
Topsoil Markers	Topsoil Stockpiles

3.3.5.2 **Fences and Gates.** No fences are proposed at this time. If security or safety become a problem, a fence or gate will be erected at the entrances to the main pad and coal stockpile areas. These gates or fences will be constructed to prevent unauthorized access to the mine property. A gate will be erected across the road to the powder magazine.

3.3.5.3 **Fire Protection.** Fire protection will be maintained in accordance with all Federal and State regulations pertaining to coal mining operations. Additionally the fire prevention plan can be found in the Chapter 3 Appendix.

3.3.5.4 **Explosives.** There are no structures or dwellings within one mile of the mine permit area. All blasting will be done under the direction of a person trained, examined and certified as provided by 30 CFR 850 and applicable regulations of the State Industrial Commission.

Explosives will be stored on the surface in accordance with 30 CFR Part 75 and 77 and all state and local regulations. These magazines are located on the Plate titled Proposed Surface Facilities, refer to Plate 3-1.

The use of explosives will be done in accordance with UMC 817.62-68 and all records as outlined in UMC 817.68 will be kept at the mine site or at the mine office in Huntington, Utah, for a period of at least three years.

The applicant will post blasting signs, in accordance with UMC 817.11, in

the vicinity of the surface blasting operations indicating that blasting is being done in the area and the audible signals and meanings. The applicant will limit access to people from the area immediately prior to and after the blast until the applicants representative determines all is clear. Signals, audible within a half mile, will be given prior to and after the blast as outlined in UMC 817.65.

The amount of explosives used within any 8 millisecond period will be determined with the following equation as outlined in UMC 817.65 k (1)(1), $W=(D/60)^2$, where W is the max. weight of the explosive, and D is the distance in feet to the nearest dwelling, etc.

Blasting will be done between sunrise and sunset, unless other criteria is met in UMC 817.65.

Blasting will be done so as no fly rock will leave the permit area, where practical. Netting will be used to achieve this where there exists a possibility of this occurrence.

3.3.6 Operations Schedule.

3.3.6.1 Annual Production Per Year For Permit Term. The mine capacity will be 360,000 tons per year.

3.3.6.2 Operating Schedule-Days-Shifts. The mine will operate three (3) eight (8) hour shifts per day, five days per week, 52 weeks per year. When market or mining conditions dictate, production will be expanded to seven days per week, 52 weeks per year.

3.3.6.3 Operation Employment. The mine will employ approximately 30 people at the present capacity, however if market or mining conditions dictate as many as 50 people may be employed at the mine.

3.3.7 Mine Permit Area.

3.3.7.1 Projected Mining Per Year. See Plate 3-3.

3.3.7.2 Acreage and Delineation Of Mine Permit Area. Refer to Section 1.1 and 2.1.

3.3.8 Mine Plan Area. The mine plan area is shown on Plate 2-1.

3.3.8.1 Projected Mining By Future Permit For The Planned Life Of The Mine. All coal around the permit area has the potential for future mining by the Crandall Canyon Mine. Provisions have been made to access future reserves, however, we can not formulate a logical mining plan at this time without knowing the sequence of the Federal Coal Leasing Program, refer to Plate 2-1.

3.3.9 Waste Disposal Plans.

3.3.9.1 Underground Development Waste. The Crandall Canyon Mine produces a run of mine product for final sale, this product does not contain any mine related rock or development waste. The method of mining used at the Crandall Canyon mine produces no development waste, however small amounts of rock wastes are generated in unexpected roof falls and overcasts. This rock waste is not brought to the surface, it is disposed of on pillar lines or stored in areas that have been mined and no second mining is to be done. The material disposed of on the pillar lines will be of the same nature that naturally caves in the pillaring process, therefore no leachate will be formed other than that associated with normal pillaring. In no event will the disposal of this material interfere with future recovery of the coal resource without consent of the BLM or the managing agency of the coal resource. All disposal of the developing waste will be done in accordance with MSHA regulations.

Underground development waste, coal processing waste, and all potential acid or toxic forming materials will be returned to the underground workings. The

underground development waste that is brought to the surface or coal processing waste, will be temporarily stored at the west end of the coal stockpile prior to disposal, underground on the pillar line. There will be no coal processing waste dams, valley fills, head-of-hollow fills or durable rock fills.

The material disposed of underground will be hauled by scoop from the temporary storage area to an active pillar line. All material will be disposed of in accordance with MSHA regulations. A copy of the MSHA approval will be submitted to the Division after we receive confirmation from MSHA.

Any underground development materials that are temporarily stored at the surface will be sampled and analyzed for acid or toxic forming materials. All potential acid or toxic forming materials will be returned underground as soon as practical.

On an annual basis the in-mine roof, floor and midseam will also be analyzed for its potential acid or toxic forming characteristics.

3.3.9.2 Solid Waste. The waste generated by the normal activities which include, but are not limited to the following: wood, paper, scrap metal and belting etc., will be disposed of underground on pillar lines where possible in accordance with MSHA regulations. No oil or grease will be intentionally disposed of underground. All solid waste brought to the surface will be disposed of in a trash container until the container becomes full, at which time the container will be transported to a State approved landfill for the final disposal. The container will be emptied at intervals no longer than two months when the mine is not idle. At the present time the landfills to be used will be the state approved Sinbad Landfill or American Kinfolk Landfill, which are located next to the county landfill, approximately six miles north of Orangeville, Utah, and .5 miles north of Huntington, Utah, respectively, (see Appendix 3-9), however if another State approved landfill becomes available and more cost effective this landfill will be utilized. The operator will notify the Division prior to any waste disposal in any landfill other than the Sinbad or American Kinfolk Landfills. The location of this landfill and a statement

from the DOH indicating the landfill permit number, the permit term and any conditions that the DOH has concerning the disposal of noncoal waste will be submitted to the Division. In no event will liquids be disposed of in landfills that are not approved to handle such material.

Scrap metal and used equipment will be stored underground or on the surface next to the solid waste container until the material is sold to a scrap metal or used equipment dealer.

Oil contaminated soil from the gas and oil storage area will be disposed of at the Sinbad landfill prior to reclamation or moving of the facility. Areas outside the berm area will be cleaned and disposed of when an area of 10 square feet is saturated. This oil contaminated material will be placed in the solid waste container prior to final disposal in the landfill.

No toxic or hazardous waste will be disposed of in the Sinbad landfill. In the unlikely event that hazardous or toxic material is encountered, Genwal will notify the Division of Oil, Gas and Mining and the State Health Department for disposal plans.

3.3.9.3 Sediment Pond Waste. Sludge removed from the pond, which is removed during the cleaning process, will be temporarily stored on the surface west of the coal stockpile. All moisture and runoff from the sludge pile during temporary storage will be contained. Preceding the removal of any sediment pond sludge material, an adequate gravel or earthen berm will be constructed to contain sludge and runoff. Prior to cleaning the sediment pond, the sludge will be tested for any toxic contaminants. If toxic contaminants are present the Department of Health and the Division of Oil, Gas, and Mining will be consulted about the proper method of offsite disposal. Non-hazardous sludge removed from the pond will be temporarily stored for drying on the surface west of the coal stockpile. All moisture and runoff from the sludge pile will be contained. Preceding the removal of any sediment pond sludge, a meeting will be arranged with the Division and the Manti-LaSal National Forest to assess the adequacy of the containment berm.

3.3.9.4 Sanitary Waste. There will only be one regularly assigned employee on the surface per shift. To handle the sanitary waste needs on the surface, a portable construction type toilet will be located on the surface and maintained in accordance with approved State Health standards. This toilet will be removed upon completion of the bathhouse.

A bathhouse is proposed to be installed underground. The waste from the toilets and showers will be pumped to a holding tank located underground. The holding tank will be pumped and the materials disposed of by a licensed contractor at a State Health approved disposal site. See Appendix 3-14. The applicant will keep records of the sewage pumped from the tank by the contractor. The sanitary waste needs for the miners underground will be handled in the accordance with MSHA regulations.

The permanent bath house facilities was built in accordance with State Health and Forest Service regulations. These agencies were contacted prior to the design and implementation for their input and approval as necessary. See Appendix 3-14 for the sanitary system.

3.4 Environmental Protection

3.4.1 Preservation Of Land-Use.

3.4.1.1 Projected Impacts Of Mining On Current and Future Land-Use. Acreage delineated as surface disturbed areas will be withdrawn from current land-use status. This impact will be negligible and roads have been designed to allow passage through our disturbed area so as to reduce impact and make other areas available for the same current land use. With regrading and revegetating, our surface disturbed area should again be capable of supporting the same land use as it was capable of supporting prior to mining. Refer to Chapter 4 Section 4.4.

3.4.1.2 Control Measures To Mitigate Impacts. See 3.4.1.1 above.

3.4.2 Protection Of Human Values.

3.4.2.1 Projected Impacts Of Mining On Human Values - Historical and Cultural. Applicant determines there will be no effects of mining on historical resources. Applicant proposes there will be no impacts of mining on human values, cultural or historical. See Chapter 5, Sections 5.3 and 5.4 and Appendix 5-6 and also Chapter 1, Section 1.2.

The archaeological site at the mouth of Crandall Creek is not threatened by road improvements and the area will be fenced as stated in the plan. The initial road development has progressed along Crandall Canyon past site (42EM722) and the applicant has fenced off the designated site accordingly. A detailed report on the Sherman Shelter was completed by the USFS and is included within this chapter as Appendix 5-4.

Although the archaeological report mentions a scattering of historic mining remains, they are remains of habitation and human use rather than mining. The remains consist of a rusty automobile body; either a 1939-1940 Ford or Mercury, numerous tin cans and bottles, bedsprings, and piles of wood from old cabins which have been destroyed by vandals. These habitation remains (1939-1955) are of absolutely no historic value and no study will be undertaken to document these worthless remains. A clear map of area surveyed in relation to areas of potential surface disturbance is included, refer to Appendix 5-1.

3.4.2.2 Control Measures To Mitigate Impacts. See 3.4.2 above.

3.4.3 Protection Of Hydrologic Balance.

3.4.3.1 Projected Impacts Of Mining On Hydrological Balance. Applicant proposes there will be no impacts of mining on the hydrologic balance. See Chapter 7 Sections 7.1.4 and 7.2.4.

Genwal has purchased 20 shares of Huntington-Cleveland Irrigation Company

water from Mr. Joseph Harvey, Huntington, Utah. A copy of the paperwork indicating Genwal ownership has been forwarded to the DOGM and is included in Chapter 7. The change in diversion point and a change in water usage with the State Engineer's Office has been completed and filed, refer to Chapter 7. This documentation has previously been submitted to DOGM.

3.4.3.2 Control Measures To Mitigate Impacts. See Chapter 7, Sections 7.1.5 and 7.2.5.

3.4.3.3 Monitoring Procedures To Measure Projected Impacts and Control. See Chapter 7, Sections 7.1.5 and 7.2.5.

3.4.4 Preservation Of Soil Resources.

3.4.4.1 Projected Impacts Of Mining On Soil Resources. Topsoil will have to be removed from disturbed surface area prior to grading and leveling, there will be a loss of soil vegetation that it will support and creation of source of dust emission.

3.4.4.2 Control Measures To Mitigate Impacts. See Chapter 8, Section 8.11.

3.4.5 Protection Of Vegetative Resources.

3.4.5.1 Projected Impacts Of Mining On Vegetative Resources. Loss of all vegetative resources in surface disturbed areas, no impacts on adjacent vegetation.

3.4.5.2 Mitigating Measures To Be Employed To Reduce Impacts On Vegetative Resources. The disturbed area within the permit area, including the three topsoil stockpiles, will be reclaimed upon permanent cessation of mining operations. During the operational phase on the property, water will be applied to the coal and roads within the permit area and adjacent forest development road, when needed, to reduce fugitive dust emissions. Additionally magnesium

chloride may be applied to the roads to reduce dust emissions. Prior to the use of this product on the forest access road, the forest service will be contacted and arrangements made for the application under their direction.

3.4.5.3 Monitoring Procedures-Reference Areas, and Revegetation. See Chapter 3, Section 3.5.5.5.

3.4.6 Protection Of Fish and Wildlife.

3.4.6.1 Projected Impacts Of Mining On Fish and Wildlife. Operation will unavoidably impact small vertebrate species and increase hunting pressure on big game species. Impact to the fishery in Crandall Creek which is adjacent to the permit area will be kept to a minimum.

The applicant will protect wildlife habitat on the permit area by careful design and construction of mining facilities and transportation corridors, keeping surface disturbance to a minimum. The applicant has committed to report to the regulatory authority the presence of any threatened or endangered species in the area. A generator located within the mine site will supply all power requirements. Power lines have been constructed within the permit area. These power lines are insulated and have no exposed power conductors, and should provide no threat to raptors in the area.

3.4.6.2 Mitigating Measures To Be Employed To Protect Fish and Wildlife. See Chapter 10, Section 10.5.

Crandall Canyon is used as a grazing area for elk and deer during the summer months. Lower Crandall Canyon is critical winter range for deer. Migration of elk and mule deer of the Manti-LaSal Range occurs as a sheet migration with no specific corridors as such.

Impacts on the lower 2 km. of the canyon will remove approximately 0.5 acre of moose habitat, winter habitat in particular. This represents only a minute portion of the moose winter habitat as the moose habitat encompasses all the Hun-

tington drainages. Of the 0.5 acre winter range to be disturbed, of which the riparian habitats are ranked as being of critical value, only approximately 3000 square feet of wooded area will be disturbed. According to Larry Dalton of the State of Utah Division of Wildlife Resources, there is a tremendous volume of adjacent unoccupied habitat suitable to absorb displaced moose. The southeastern Utah moose herd is proliferating at a substantial pace due to the abundance of suitable unoccupied habitat.

Moose are drawn to Crandall Canyon because of the water and vegetation which grows along the Crandall Creek. The Division of Wildlife Resources provided a map of moose wintering habitat in the area, the information from that map is shown on Plate 10-1. Crandall Canyon is of critical grazing value to moose all year long.

As per Larry Dalton, State of Utah, Division of Wildlife Resources, there are no known locations of drumming logs in Crandall Canyon or near the proposed surface or haul road areas to be disturbed.

The only construction work that may have an impact on the Crandall Creek fishery is the construction of the haul and access road. This haul and access road will be constructed and maintained under jurisdiction of the USFS. Impacts and required mitigation are addressed in the approved environmental assessment, authorizing the construction of the Crandall Canyon Road and Bridge as proposed by Genwal Coal Company, dated May 18, 1981. Also, the approved air pollution control plan, as submitted in the permit, contains itemized mitigation for dust abatement during our construction phase. In 1983 the practice of dumping rock and soil adjacent to the mine site near Crandall Creek was stopped, to reduce impact to fish spawning and food production in Crandall Creek. Efforts will continue in the future to limit disturbance of fishery habitat.

Information and commitments to show how UMC 817.97(d)(1) will be met, applicant again refers the regulatory authority to the USFS, which is the agency having jurisdiction over the haul and access road.

Section 10.5 on page 10 of the Aquatic Resources Report indicates further monitoring to establish baseline data. Applicant feels that the initial aquatic study and report provides sufficient baseline data. Applicant therefore does not propose any further monitoring of habitat value and biotic community, but only for stream flow and water quality as proposed in previously submitted ground and surface water monitoring plans.

Genwal recognizes the fact that the Division of Wildlife Resources and the Division of Oil, Gas & Mining consider all seeps and springs to be important to wildlife. If, during the monitoring of the springs, it is proven that mining activities have reduced the flow of any seep or spring in the area by 50% or more, Genwal will notify the Division of Wildlife Resources, the Division of Oil, Gas and Mining and the U.S. Forest Service and begin working on an acceptable mitigation plan involving the use of guzzlers. These guzzlers will be designed in cooperation with the Division of Wildlife Resources, the Division of Oil, Gas and Mining and the U.S. Forest Service and placed in the area of the effected spring. No other sources of water, other than the springs located by the seep and spring survey, are known to exist in the mine plan area. Genwal owns shares in the Huntington-Cleveland Irrigation Company that can be transferred if required, to meet the demands of an alternate water supply.

Genwal Coal Company will attempt to educate the employees of Crandall Canyon Mine on the protection of wildlife resources. The employees will be shown, on an annual basis, the film prepared by the Utah Division of Wildlife Resources relating to wildlife protection and awareness.

3.4.6.3 Monitoring Procedures. Applicant proposes none.

Applicant will monitor golden eagle nest prior to pillaring of the area directly affecting the nest and report to the Division the presence of any golden eagles in the area.

Applicant will also develop and carry out appropriate reasonable mitigation plans in cooperation with the regulatory authority should coal mining activities

significantly diminish stream flow or water quality deteriorate.

3.4.7 Protection Of Air Quality.

3.4.7.1 Projected Impacts Of Mining Operation On Air Quality. Creation of airborne dust as a nuisance pollutant.

3.4.7.2 Mitigating Measures To Be Employed To Control Air Pollutants. See "Air Pollution Control Plan," included with Chapter 11 as Appendix 11-2.

3.4.7.3 Air Quality Monitoring Plans. Applicant proposes no air quality monitoring plan, no monitoring plan recommended by Division of Environmental Health, see letter included in Chapter 11 as Appendix 11-1.

3.4.8 Subsidence Control Plan. Applicant's survey, as stated in the mine plan, indicates that no structures exist above the areas where there is potential subsidence on the surface. Renewable resource protection is addressed in Chapter 12.

3.4.8.1 Projected Impacts Of Subsidence. For a more complete discussion refer to Chapter 7 and 12.

3.4.8.2 Control Measures To Mitigate Impacts. Not applicable.

3.4.8.3 Monitoring Procedures To Measure Projected Impacts and Controls. Applicant commits to implementing the proposed USFS subsidence monitoring plan, and applicant hereby incorporates same into applicant's mining and reclamation plan as found as Appendix 12-5.

The applicant commits to notifying the Division of Oil, Gas and Mining upon obtaining the knowledge of a landslide or other damage that may have potential adverse effects as specified under UMC 817.99.

3.4.9 Waste Disposal Plans. See Section 3.3.9.

3.4.9.1 Projected Impacts Of Disposal Areas and Methods On Environment. Applicant proposes no disposal areas.

3.4.9.2 Control Measures To Mitigate Impacts. See 3.4.9.1 above.

3.5 Reclamation Plan

The revised acreage in Table 4 is correct in itemizing 6.65 acres of proposed disturbance within the permit area of 423.9 acres (total lease acreage, including new lease), refer to Plates 2-1, 3-1 and 3-8.

3.5.1 Contemporaneous Reclamation. All surface areas which are disturbed during our construction phase and which will not be needed for mining operations, (i.e., cut banks and outslopes of fill and areas near the sedimentation pond) will be revegetated in the fall of the year following completion of our construction phase. This revegetation will be performed as described in Section 3.5.5 of this chapter.

A reclamation map showing post construction contemporaneous reclamation areas and final reclamation accompanies this chapter as Plate 3-5. The correct number of acres to be revegetated in final reclamation is 5.55 acres (additional 1.1 acres is a road).

Plants to be used to stabilize the topsoil stockpile are listed in Appendix 3-15.

The disturbed areas within the mine plan area over which the water reports to the sediment pond and which have been contemporaneously reclaimed will achieve an 80% cover on the slopes. The other contemporaneously reclaimed area will be seeded with enough vegetation to prevent erosion. Refer to Appendix 3-16 for details of the irrigation plan to maintain 80% cover.

3.5.2 Soil Removal and Storage. The topsoil will be removed from the acres indicated on the soil survey map as TCE and JDE, which includes the Datino Variant, Jodero Variant and Twin Creek soils, after vegetative cover that would interfere with the use of the topsoil is cleared from these areas. The topsoil will be removed in a single lift. A small front-end loader on cat tracks and a D-6 dozer or equivalent will be used to remove and load topsoil into tandem or off-road haul trucks. A qualified person of supervisory capacity will monitor on site the topsoil removal and stockpiling operation to insure the protection and preservation of the topsoil resources. Refer to Chapter 8 for additional information.

Additional yardage of subsoil will be used to make up the topsoil shortage. Subsoil will be taken from the area indicated JDE on the soil survey map Plate 8-1.

Topsoil will be removed in a separate layer from areas to be affected by surface operations after vegetation cover has been cleared and before any actual surface disturbance of the land commences. The topsoil removed shall be stockpiled on a stable surface area within the permit area, protected from erosion, compaction and contamination by an effective cover of non-noxious, quick grazing annual and perennial plants (see Section 3.5.5 of this chapter for plant types and seeding procedures) (see Plate 3-8 of this chapter for stockpile location).

3.5.3 Abandonment. If operations are to be temporarily suspended for 30 days or longer, the applicant will submit a notice of intention to the Division. This notice will include a description of the extent and nature of existing surface and underground disturbance prior to temporary cessation. The statement will also cover the type of reclamation which will have been accomplished to date and also include the type of ongoing monitoring, number of opening closures, water treatment activities and other topographic rehabilitative efforts which have been or will be undertaken during this period. The applicant will maintain and secure the surface facilities and mine openings.

Applicant will implement the temporary cessation regulations as follows:

(a) Each person who conducts underground coal mining activities shall effectively support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit. Temporary abandonment shall not relieve a person of his or her obligation to comply with any provisions of the approved permit.

(b) Before temporary cessation of mining and reclamation operations for a period of thirty days or more, or as soon as it is known that a temporary cessation will extend beyond thirty days, each person who conducts underground mining activities shall submit to the Division a notice of intention to cease or abandon operations. This notice shall include a statement of the exact number of surface acres and the horizontal and vertical extent of subsurface strata which have been in the permit area prior to cessation or abandonment, the extent and kind of reclamation of surface area which will have been accomplished, and identification of the backfilling, regrading, revegetation, environmental monitoring, underground opening closures and water treatment activities that will continue during the temporary cessation.

(c) Each mine entry which is temporarily inactive but has a further projected useful service under the approved permit application, shall be protected by barricades or other covering devices, fenced and posted with signs to prevent access into the entry and to identify the hazardous nature of the opening. These devices shall be periodically inspected and maintained in good operating condition by the person who conducts the underground coal mining activities.

Each exploration hole, other drill hole, bore hole, shaft, well or other exposed underground opening which has been identified in the approved permit application for use to return underground workings, or to be used to monitor ground water conditions, shall be temporarily sealed until required for actual use.

Backfilling and regrading of disturbed lands has been committed to in order to restore all areas affected by surface operations as near as possible to the contour of the land prior to disturbance. Reclamation of affected areas including revegetation is outlined in Section 817.111-117. All openings will be sealed as per the request of the MMS letter dated September 24, 1981, from Jackson Moffitt).

All surface equipment, as well as structures, including all concrete foundations, will be removed by the applicant after the permanent cessation of operations. At the time that the mine closure plan is submitted to the MMS, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery County Recorder's Office.

During permanent cessation of operations, all surface equipment and structures, including all concrete foundations will be removed by the applicant after the permanent cessation of operations. At the time that the mine closure plan is submitted to the USGS, a copy will be forwarded to the Division for concurrence and approval and for addition to the mine plan on file. A copy will also be placed at the Emery County Recorder's Office. A formal plan will be submitted to the USGS for approval prior to final sealing of any openings. As per their on site inspection and plan approval, the openings will be sealed.

Cross sections that show the final configuration of the permit area have been completed, refer to Plates 3-5 and 3-4.

Included as Appendix 3-11 is a cost estimate for monitoring the revegetation success rate.

3.5.3.1 Sealing Of Mine Openings. The applicant has drilled from the Hiawatha seam upwards to the Blind Canyon seam as described in Chapter 6. The drilling occurred in areas that pillar extraction will occur and no provisions were made to seal the bore hole.

Temporary sealing of the portals, if needed, will be accomplished by the construction of protective barricades or other covering devices, fenced and posted with signs indicating the hazardous nature of the opening. Permanent closure plans will include sealing the portals as per the request of the Mineral Management Service (See UMC 817.132).

Upon cessation of mining operations all drift openings to the surface from underground will be backfilled, regraded and reseeded as per Section 3.5.5 of this chapter. Prior to final sealing of any openings, the MMS will require an on site inspection and a submission of formal sealing methods for approval of the MMS. The formal sealing methods will be presented as a plan including cross sections demonstrating the measures taken to seal or manage mine openings will comply with UMC 817.13-15.

Permanent sealing of the portals will be done as shown on page 3-30a,b. A drain will be placed in the western most portal, this drain will be 18" deep 10' wide and extend under the backfill to the highwall. This drain will be redesigned if the mine produces greater quantities of water than anticipated.

3.5.3.2 Removal Of Surface Structures. All waste material generated from the removal of the structures will be removed from the property and sold as scrap or disposed of in the appropriate approved state disposal areas, which at the present time will be the Sinbad landfill. The only structures to remain after the mining operation will be the sedimentation system and all necessary diversions required to insure routing of all disturbed area drainage to the pond and diversions to maintain the integrity of the pond until the requirements of UMC 817.46 are met, these diversions can be found on Plate 3-4 and 7-5.

Upon cessation of mining operations, the water supply well (MW-1) will be permanently abandoned in accordance with regulations promulgated by the Utah Division of Water Rights. This will include filling of the well with a neat cement grout in accordance with the regulations.

3.5.3.3 Disposition Of Dams, Ponds and Diversions. Upon final cessation of mining the area will be reclaimed. Upon completion of the reclamation earthwork the sediment pond will be cleaned out and the material disposed of in the approved method. Once it is determined that the pond is no longer required for sediment control of the reclaimed area, the pond will be cleaned out again. The material in the pond should only be topsoil that has eroded from the reclaimed site, (care will be taken not to mix the pond liner with this topsoil) this topsoil will be stockpiled and allowed to dry at the edge of the pond. Once the topsoil has been dried the sediment pond will be reclaimed and the topsoil spread on top of the pond area.

3.5.4 Backfilling and Grading Plans. See Plate 3-4.

3.5.4.1 Recontouring. All areas affected by surface operations will be graded and restored to a contour that is compatible with natural surroundings and post mining land use as near as possible to the contour of the land prior to disturbance by our mining operations. See map included with Vegetation and Terrestrial Wildlife Report included as Appendix 9-1 in Chapter 9. For approximate contours prior to our surface disturbance refer to the maps presented as Plates 9-1, 9-2 and 9-3. The final regraded contours can be found on Plate 3-5.

3.5.4.2 Removal Or Reduction Of Highwall. Backfilling and grading will proceed so as to eliminate or reduce the highwall. This can be by recontouring as per Section 3.5.4.1 of this chapter. The portals will be backfilled with soil and two rows of solid concrete blocks placed across each entry and then backfilled to the surface and recontoured as shown on Plate 3-5. The block stoppings will be placed as far from the surface as is necessary to obtain a competent top and bottom, see the figure on page 3-30b. The highwall above the coal stockpile will be backfilled with as much material as is available, however a substantial highwall will exist and a small flat spot will be left as a potential campsite.

3.5.4.3 Terracing and Erosion Control. No terracing will be done. All final grading, preparation of overburden before replacement of topsoil will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to equipment operators in which case the grading, preparation and placement in a direction other than generally parallel to the contour will be used.

3.5.4.4 Soil Redistribution and Stabilization. Regraded land will be treated as required by the Division to eliminate slippage surfaces and promote root penetration. Before topsoil replacement, the subsoil will be disced in areas having average slopes of less than 30% and ripped in other areas until the grade becomes impractical. Topsoil will be redistributed in a manner that achieves an approximate, uniform stable thickness that will prevent excess compaction of the topsoil and also protect the topsoil from wind and water erosion before and after it is reseeded and planted.

Topsoil will be redistributed with a small front end loader on cat tracks and a D-6 dozer or equivalent. A qualified person, of supervisory capacity, will monitor on site the topsoil redistribution operation. This monitoring will ensure even distribution of the 1.0 feet of soil. To minimize compaction of the topsoil, after redistribution, the topsoil will be disced and/or harrowed on the contour.

As previously indicated, the topsoil stockpile will be sampled and analyzed prior to redistribution. Six auger sample locations, at evenly spaced intervals, will be taken from the stockpile. Two of the auger samples will be in the top 1/3 volume of the stockpile; two will be in the middle 1/3 volume of the stockpile; and two will be in the lower 1/3 volume of the stockpile. Substitute topsoil will be stored separately as described in Chapter 8.

3.5.5 Revegetation.

3.5.5.1 Soil Preparation. An engineering sketch of the topsoil stockpile will be done prior to the sampling, so that the 1/3 volume

determinations can be calculated and marked on the pile. Each auger sample will be taken on the correct angle to the approximate center of the pile. Angle and center of the pile are to be determined from the engineering sketch. Each sample will then be mixed and quartered to the size necessary for lab determination of necessary amendments. Results of the six samples, along with consultation from the regulatory authority, will determine the necessary amendments to the topsoil.

Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil layer so that it supports the required vegetation. All soil tests shall be performed by a qualified laboratory using methods approved by the Division and shall be conducted prior to the redistribution of the topsoil. If possible, the topsoil will be redistributed in the late fall (late September or early October) just prior to the seeding time so as to have a seed bed free of weeds and annual grasses. If the seed bed is prepared early and weeds and annual grasses become established on it before seeding, they will be killed before seeding is attempted. A clean seed bed is essential at time of seeding. Pesticides will not be used to clear the seed bed. Farming or road building equipment will be used to remove weeds if it is needed. If spraying of the weeds is found to be necessary, a plan will be submitted to DOGM for approval.

Soil test data along with recommended amendments in the case of soil deficiencies will be submitted to the USFS prior to soil redistribution.

3.5.5.2 Seeding and Transplanting. The position of the leases will leave no north facing slopes to revegetate.

The correct number of acres to be revegetated in the final reclamation is 5.55 acres, 4.65 acres within the surface facilities area and 0.9 acres in the topsoil stockpile areas. The seed mix listed below was used as temporary cover to stabilize topsoil stockpiles in the past:

Temporary Mix	Lb./acre PLS
Agropyron smithii (western wheat grass)	4
Agropyron trachycaulum (slender wheat)	4
Bromus marginatus (mtn. Brome)	3
Elymus cinereus (Great Basin wild rye)	2
Melilotus officinalis (yellow sweet clover)	2
Total Seed Mix	15

A similar seed mix was used in the past for temporary cover, with the exception that Elymus junceus (Russian wild rye) was used in place of Great Basin wild rye due to seed availability.

In the future the seed mix which will be used in the final reclamation will also be used for temporary cover to stabilize topsoil stockpiles. Lynn Kunzler of the DOGM conferred with the Forest Service regarding the change in seeding procedure and seed mix. An agreement was made, that if Genwal Coal would use the seed mix described for each soil type in final reclamation as the seed mix for temporary reclamation, the changes in seed mix would be approved by the Forest Service. The temporary seeding will be observed by a representative from the DOGM, Forest Service and Genwal Coal. If the seed mix should need changes due to over or under growth of a particular plant, a substitution will be made.

The contemporaneous reclamation plan for steep slope areas (areas having a slope greater than 30%) will be modified to provide a greater and faster growth rate as follows:

1) Medicago sativa (alpalha - 1.35) was added at a rate of two lbs. PLS/acre to the above seed mix in the past and will be added in the future if necessary.

2) Hydromulch will be substituted by curlex during application.

3) The slopes will be irrigated weekly to promote plant growth during the life of the mine. The irrigation system will consist of pipe laid across the ground fitted with an adequate number of sprinkler heads. Refer to Appendix 3-16 for details of the irrigation plan.

3.5.5.3 Final Reclamation. All areas affected by surface operations will be graded and restored to a contour that is compatible with natural surroundings. All final grading will be done along the contour to minimize erosion and instability unless this operation becomes hazardous to the equipment operators. Backfilling and grading will proceed so as to eliminate or reduce the highwall. Refer to Plates 3-5 and 3-4.

The outslope between the road and Crandall Creek will be supplemented with the planting mix (see Appendix 3-15a).

Backfilling and grading will be done according to the reclamation timetable as originally submitted.

If possible, the topsoil will be redistributed in the late fall (late September or early October) just prior to the seeding time so as to have a seedbed free of weeds and annual grasses. If the seedbed is prepared early and weeds and annual grasses become established on it before seeding, they will be removed before seeding is attempted, refer to Chapters 8 and 9. Seeding will be done as soon as possible after the seedbed is prepared, but not prior to October 1st. If this can not be done within 30 days, the Division will be notified.

On slopes of 30% or less a straw mulch of 1.5 tons per acre will be used to retain enough moisture for seed germination. The slopes greater than 30% will require a hydro-mulch of one ton of wood fiber mulch per acre. The wood fiber mulch shall be suspended in water to form a slurry type material and shall be sprayed evenly over the area where it is to be applied after seeding is accomplished. The straw mulch will be applied to slopes less than 30% and anchored into the soil by pulling a notched disc over the straw cover which

results in pushing the straw ends into the soil. On slopes of 30% or greater, the ground will be hydroseeded, then mulched with one ton of wood fiber hydro-mulch with tacifier added to the mulching process. Any woody plant seedlings will be planted in small depressions on the slopes. No attempts at irrigation will be made during final reclamation.

Typical cross sections and topographic maps which adequately represent the existing land configuration of the area affected by surface operators are shown on Plates 9-1, 9-2 and 9-3. Postmining reclamation cross sections and surface topography will be as near to premining as is possible and practical as noted on Plate 3-5.

A reclamation map showing post construction contemporaneous reclamation areas and final reclamation accompanies this document as Plate 7-5 and 3-5 respectively. Slope rounding on Plate 3-1 has been revised to meet the required slope of 1.5:1 at the specified reclaimed cross sections. Two distinct areas showing post construction contemporaneous reclamation and final reclamation can be found on Plates 7-5.

One seed mix has been developed for all disturbed areas, made up of native and naturalized grass, forb and shrub species (see Appendix 3-15). Trees will be planted in the wooded areas and riparian zone (see Appendix 3-15a).

Slopes of 30% or less and flat areas will be seeded with a rangeland drill equipped with depth control flanges on the discs. Row spacing will be 12 inches.

Appendix 3-15 includes a list of grasses, forbs, shrubs and trees to be used after December 1988 for both interim stabilization of topsoil stockpiles and for reclamation. This list was compiled by Lynn Kunzler in conjunction with the USFS. If changes in the seed mixture become necessary due to over- or undergrowth, seed availability, etc., all parties involved will come to an agreement as to the right seed mixture for each area.

Slopes of 31% or greater will be broadcast seeded using a hydroseeder prior

to mulching. Wherever possible, the seed will be harrowed in before mulching is applied. The seed must be high quality seed (high % of germination, with weed seed content at a minimum and without any noxious weed seeds).

Refer to Plate 3-4 and 3-5 for the areas to be planted with planting mixture (Appendix 3-15a). Two tenths of a pound per acre of Louisiana Sagebrush (*artemisia ludoviciana*) could be added if needed for erosion control. Trees in the wooded area will be planted in the Spring of 1989.

Concerning the revegetation of slopes 31% or greater, these slopes will be hydroseeded, then mulched with one ton of wood fiber hydromulch per acre.

No attempts will be made to establish rabbitbrush or sagebrush as previous experience has shown that it is impossible to stop these shrubs from invading the area on their own. If plants of snowberry do not establish from the seeding at the end of the second year, hand plantings of tubular started plants from native plant nurseries will be planted randomly on approximately one rod intervals where they occurred in the original land cover of the disturbed areas.

Trees, species and rates, to be planted on the slopes of 30% or less (in conjunction with the seed mixture (see Appendix 3-15)).

The willows will be planted within 20 feet of the drainage to assure sufficient moisture for growth. The standard for the tree seedlings will be planted at the rate of 610 seedlings per acre. When considering a normal mortality rate, this would establish the required 90% of the USFS recommended density standard of 550 trees per acre.

The seeding rates used are average for the seeding method used. It is hoped that the shrub seeds in the seeding mixtures will take hold and give a random spacing of plants over the area. If the seeded shrubs do not take, then the tublings will be planted in clumps. While clumping will not give a uniform seed dispersal over the entire area it would enhance wildlife habitat at little cost.

Species diversity standards have been established for revegetated areas. These will insure that a good mix of grasses, forbs, shrubs and trees, where appropriate, will be re-established, and that the reclaimed area will not be dominated by one or two species. The applicant has committed to protecting revegetated areas and to managing the reference area in a manner compatible with postmining land use.

Contemporaneous reclamation will be undertaken following construction. Plates 7-5 and 3-4 have been submitted showing areas of contemporaneous reclamation. All future seeding will use the seed mix identified in Appendix 3-15. Final reclamation denoted on Plates 3-4 and 7-5 will be completed during the spring of 1989.

The US Forest Service, US Fish and Wildlife Service and DOGM have requested that the riparian habitat be restored along Crandall Creek. The proposed seed mix and planting mix should accomplish this goal.

Applicant hereby commits to avoid the use of persistent pesticides and chemicals and to prevent fires.

Should lack of precipitation cause the vegetation to fail, all areas will be revegetated. No attempts will be made at irrigating the revegetated areas during final reclamation. The species recommended for revegetation are known to survive in this region without artificial application of additional water.

3.5.5.4 Mulching. Refer to Section 3.5.5.2.

3.5.5.5 Management. Refer to Section 3.5.5.2.

3.5.5.6 Revegetation Monitoring. Success or revegetation shall be monitored by techniques approved by the Division after consultation with appropriate State and Federal agencies. Comparison of ground cover and productivity will be made on the basis of reference areas. Ground cover and productivity figures from the reference area will be used as a standard for all

revegetated areas. The shrub density standard for all areas will be 1336 shrubs/acres (as per baseline data). The standard for trees will be 550 per acre (as per Forest Service recommendations). Stocking rates will be higher to account for mortality.

Applicant has used the reference area method to set criteria for determining success. One reference area was established, as shown on the Vegetation Community Study Map referred to as Plate 9-1. This mix will meet the postmining land use of light livestock grazing and wildlife use. Data on cover and tree density have been submitted. Shrub planting to enhance the habitat for wildlife use will be developed prior to implementation and submitted to DOGM for approval if the seeding is not successful as previously described in Section 3.5.5.2.

The original plots were done by ocular estimate of circular plots. The circular plots were done randomly by laying a steel circle of 11 feet circumference upon the ground and recording the vegetation density, the bare ground, surface fragments and litter values as a percent of the enclosed circular area. On the MSG area the following original species densities in percent of composition are recorded: 92% grass, 2% forbs and 6% shrubs. On the reseeding there will be a minimum of 5% shrubs with a maximum of 20%, minimum of 2% forbs with a maximum of 20% and the remainder will be taken up by the grass species so to meet required standards. On the reference area, the following densities were found on the original survey: grasses 94%, forbs 1% and shrubs 5%. On the SFA area there will be a minimum of 6% grasses with a maximum of 20%, minimum of 14% forbs with a maximum of 30% and the remainder being taken up by shrubs.

A standard for the riparian area could be set up as 10% minimum and 25% maximum grasses, 16% minimum and 30% maximum forbs and shrubs taking up the balance.

On the MSG area including the reference area, there was no sign that any domestic livestock had ever used this area. The slope steepness of 70% and greater prohibits nearly all domestic livestock use. There was considerable signs that elk and mule deer had and were using the area. The 30% and less

slopes and the riparian area show that domestic livestock have used the areas. However, the mine operations on the 30% and less slopes and on the riparian area will exclude all grazing because of the mining operations. Proper use of the area will be no problem.

In addition to the diversity figures already committed to, it will also be insured that no one species makes up more than 60% of the cover in its respective vegetation class; individual species of shrubs and trees will make up no more than 80% of the density figure for the class.

A detailed plan for monitoring revegetated areas is presented below. This includes specific methods for collecting data on cover, productivity and shrub and tree density, as well as a time table for all monitoring activity.

The reference area will be reviewed by the SCS for range conditions every five years, during the field season before permit renewal. If the range condition is found to be in a deteriorating condition because of encroachment of wildlife or livestock the area will be fenced.

The areas that are to be revegetated will be monitored during the 1st, 2nd, 3rd, 5th, 9th and 10th years during the last half of the month of June, thus corresponding to the time of the original vegetation survey. If on any year, the monitoring shows the vegetation to be below the requirements, steps will be taken to increase the vegetation by addition seeding of the required seed mixture. The circular plots will be located randomly across the entire revegetated area. A steel hoop of 11 feet circumference enclosing an area of 9.6 square feet will be used to determine the ocular plot for estimating in percent cover by species and total vegetative cover, the percent of bare ground, the percent of surface fragments and the percent litter within the hoop boundaries. For tree and shrub densities, the point centered quarter plats will be used to check their densities. For sample adequacy of vegetational data during the 9th and 10th year, the formula suggested in the latest DOGM guidelines will be used. It is $n_{\min} = (ts)^2 / (dx)^2$.

Approximately 22 plots in the MSG area and 10 plots in the reference area will be needed to meet the standard of the DOGM formulas. The following formula will be used, the 9th and 10th year, to test similarity of the reference area to its affected vegetational counterpart with respect to cover and shrub density and productivity:

$$t = (x_1 - x_2) / (s_1^2/n_1 + s_2^2/n_2)^{1/2}$$

$$df = n_1 + n_2 - 2$$

Resulting figures and data from the reclaimed areas will be compared with the data collected the same year from the reference area to determine vegetative compliance. The reclaimed area must meet the success criteria during years nine and ten of the liability period. The t-test to check revegetation data and reference area data will be collected the same year.

Adequate sampling will be ensured, especially at the time of bond release, years 9 and 10. Reclamation will be considered successful when percent cover density and productivity are within 90% of the reference area or other approved standard (with a confidence interval of 90%).

As a final step during the last field check upon the vegetational productivity, an adequate sample, as determined by the above adequacy formula, within the reference area will be clipped and weighed and the weights recorded by individual species for each plot. The average weights of these plots will be compared to the average production of species of similar plots taken in the revegetated areas. The production of plots taken from the reseeded area must fall within the limits of 90% or better of the production of plots taken from the reference area. All weights for comparison will be dry weights.

The applicant has given a schedule for monitoring the reference area to ensure that it stays in good range condition. The applicant commits to using standard SCS range inventory techniques for this sampling or to obtaining SCS personnel to do the monitoring. All such monitoring data will be submitted to

the Division with the annual report. The applicant also commits to fencing the revegetated area until plants are well established, should grazing pressure on the revegetated area be excessive. Any fencing will be approved by the Division prior to erection.

3.5.6 Schedule Of Reclamation.

3.5.6.1 Detailed Timetable For Completion Of Each Major Step In Reclamation. All reclamation, other than areas handled in contemporaneous reclamation, (see Section 3.5.1 in this Chapter) will commence with final grading of disturbed surface areas, which should be completed in approximately one month. Within 30 days following completion of final grading (which should be in late September or early October), topsoil from the stockpile will be redistributed. Nutrients and soil amendments, if shown to be required by soil tests, shall be applied to the redistributed topsoil before the end of October. Seeding, transplanting and mulching will then proceed when moisture conditions are optimal for planting and seeding. Seeding will commence as soon as the seedbed is finished in the late fall. Tree planting will be done in early spring as soon as one can work the soil.

The sediment pond and associated control devices will be removed after the criteria of UMC 817.46 (u) have been achieved. The sediment ponds will then be reclaimed and revegetated according to the approved reclamation plan and the permanent runoff control system will be completed.

3.5.6.2 Reclamation Monitoring. See Section 3.5.5.5 of this Chapter. All procedures described in this plan (final grading and topsoil placement) will be monitored by supervisory personnel knowledgeable in this proposed plan and all pertinent aspects of the Division's permanent program. Post reclamation water monitoring is described in Chapter 7.

3.5.7 Cost Estimate For Reclamation.

3.5.7.1 Cost Estimate Of Each Step Of Reclamation. The Crandall

Canyon Mine bond estimate will be determined as soon as the proposed permit changes are approved.

3.5.7.2 Forecast Of Performance Bond Liability During Permit Term.

Permit term and life of mine are the same. The liability cost for both the forecast and cost estimate are the same at \$135,375.

Applicant proposes the type of bonding to be instituted for the mine life and reclamation monitoring period to be the entire performance bond for the entire permit term (five year life of mine plus a ten year liability period) dependent upon reclamation success beginning at the time of the last augmented seeding, pursuant to UMC 805.13(b).

The form of the performance bond that will be submitted to the Division pursuant to UMC 806.11(a) will be a surety bond (MR Form 5) as received from DOGM.

3.6 Bibliography

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Ft. Collins, Colorado

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507 25th Street
Ogden, Utah 84401

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Ecology Research Consultants, Inc.
1716 Heath Parkway, P.O. Box 2105
Ft. Collins, Colorado 80522

Selection, Propagation and Field Establishment of Native Plant Species on
Disturbed Arid Lands
Bulletin 500
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Logan, Utah 84321