

C/015/0032  
Received 3/14/17  
Task #5399



P.O. Box 910, East Carbon, Utah 84520 794 North "C" Canyon Rd, East Carbon, Utah 84520  
Telephone (435) 888-4000 Fax (435) 888-4002

Utah Division of Oil, Gas & Mining  
Utah Coal Program  
1594 West North Temple, Suite 1210  
P.O. Box 145801  
Salt Lake City, UT 84114-5801

March 13, 2017

Attn: Daron Haddock  
Permit Supervisor

Re: Genwal Resources, Inc. C/015/032  
C17-002 Crandall Canyon Reclamation Plan

Dear Mr. Haddock,

Please find attached the application to update the Reclamation Plan for the approved Crandall Canyon MRP.

If you have any questions or problems with this request, please feel free to call me directly at 435-888-4026.

A handwritten signature in black ink, appearing to read "Karin Madsen", is written over a horizontal line.

Karin Madsen  
Engineering Tech  
UtahAmerican Energy, Inc.

# APPLICATION FOR PERMIT PROCESSING

<input checked="" type="checkbox"/> Permit Change	<input type="checkbox"/> New Permit	<input type="checkbox"/> Renewal	<input type="checkbox"/> Transfer	<input type="checkbox"/> Exploration	<input type="checkbox"/> Bond Release	Permit Number: ACT/015/032
Title of Proposal: C17-002 Reclamation Plan						Mine: Crandall Canyon Mine
						Permittee: Genwal Resources, Inc.

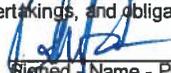
Description, include reason for application and timing required to implement

**Instructions:** If you answer yes to any of the first 8 questions (gray), submit the application to the Salt Lake Office. Otherwise, you may submit it to your reclamation

<input type="checkbox"/> Yes	<input type="checkbox"/> No	1. Change in the size of the Permit Area? _____ acres Disturbed Area? _____ acres <input type="checkbox"/> increase <input type="checkbox"/> decrease.
<input type="checkbox"/> Yes	<input type="checkbox"/> No	2. Is the application submitted as a result of a Division Order? DO #
<input type="checkbox"/> Yes	<input type="checkbox"/> No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	4. Does application include operations in hydrologic basins other than as currently approved?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	6. Does the application require or include public notice/publication?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	9. Is the application submitted as a result of a Violation?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	10. Is the application submitted as a result of other laws or regulations or policies? Explain:
<input type="checkbox"/> Yes	<input type="checkbox"/> No	11. Does the application affect the surface landowner or change the post mining land use?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2?)
<input type="checkbox"/> Yes	<input type="checkbox"/> No	13. Does the application require or include collection and reporting of any baseline information?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	15. Does application require or include soil removal, storage or placement?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	17. Does the application require or include construction, modification, or removal of surface facilities?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	18. Does the application require or include water monitoring, sediment or drainage control measures?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	19. Does the application require or include certified designs, maps, or calculations?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	20. Does the application require or include subsidence control or monitoring?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	21. Have reclamation costs for bonding been provided for?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
<input type="checkbox"/> Yes	<input type="checkbox"/> No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

**X Attach 1 complete digital copy of the application and maps.**

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

  
 Signed Name - Position - Date  
 Karin Madsen - Engineering Tech - 3-13-17

Subscribed and sworn to before me this 13<sup>th</sup> day of March, 2017.

My Commission Expires: March 27, 2017  
 Notary Public  
 STATE OF Utah  
 COUNTY OF Cash



Received by Oil, Gas & Mining
ASSIGNED TRACKING NUMBER



Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

## WordPerfect Document Compare Summary

Original document: G:\Current Drawings\MRP Maps\Crandall Canyon\Reclamation Plan Update\Text\APP 5-22 Approved.wpd

Revised document: G:\Current Drawings\MRP Maps\Crandall Canyon\Reclamation Plan Update\Text\APP 5-22 3-13-2017.wpd

Deletions are shown with the following attributes and color:

~~Strikeout~~, **Blue** RGB(0,0,255).

Deleted text is shown as full text.

Insertions are shown with the following attributes and color:

Double Underline, Redline, **Red** RGB(255,0,0).

Moved blocks are marked in the new location, and only referenced in the old location.

Moved block marks are shown in the following color:

**Orange** RGB(255,200,0).

The document was marked with 183 Deletions, 197 Insertions, 2 Moves.

**APPENDIX 5-22**

**CRANDALL CANYON MINE SITE RECLAMATION PLAN**

**(Revised: March 13, 2017)**

## CRANDALL CANYON MINE SITE RECLAMATION PLAN

*HISTORICAL NOTE: Due to the tragic mine disaster of August 6, 2007, the Crandall Canyon Mine has been sealed. Water has gradually backed up in the mine and is now discharging from behind the portal seals. The discharge is under the authority of an approved UPDES permit. However, as of February 2009, the iron levels exceeded permit compliance limits. In December 2009, a treatment facility designed to remove the iron was constructed in the "old loadout area" located directly below the mine portals. At the present time (March 2017) it is uncertain whether or not long-term treatment of the mine discharge water will be required, because naturally-occurring chemical processes within the mine could potentially bring the iron content of the water to within compliance limits at some time in the future. This present reclamation plan assumes that mine-water discharge will continue indefinitely but that no iron-removal treatment will be required at the time of reclamation.*

*Also, as a result of the Crandall Canyon Mine disaster, Genwal has deeded a portion of the upper mine yard (Expansion Area) to Emery County. This area is now included as part of a permanent memorial to the deceased miners, owned and maintained by Emery County. As a result, this area is no longer included in the final reclamation plan for the mine.*

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### Phase 1

The reclamation of the disturbed areas of the Crandall Canyon mine site is described in outline and detail below. This description is based upon discussions in the text of Chapters 2, 3, 4, 5, and 7 which address the regulations regarding reclamation requirements. In the interest of clarity, the following discussion describes the reclamation process in terms of several general areas within the mine yard. Refer to Figure 1 in this Appendix. Within each of these general areas, reclamation will follow a general sequence of 1) demolition, 2) backfilling, grading and topsoil application, 3) reclamation and revegetation. However, in practice, reclamation will be performed in several of these areas simultaneously. The final step, reclamation and revegetation, for all the areas will not be done until the fall.

Following Phase 1 reclamation, the only structures to remain will be the sedimentation pond and associated spillway and discharge structure, portions of the main 72" diameter culvert, the undisturbed culvert UD-1, as well as the conveyance ditches, berms and culverts necessary to route drainage to the sediment pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Genwal recognizes that development of a feasible reclamation plan for final reclamation of the expansion area containing the best available reclamation methodology is an essential part of this permitting process. Therefore, Genwal has contacted consultants with revegetation and reclamation experience to gather together the best reclamation techniques for reclamation of the steep-slope area. JBR Environmental Consultants, who has had prior experience with reclamation in difficult areas, has provided a letter detailing reclamation methodology that they believe will contribute to the successful reclamation of this area. This letter, included as Attachment 1, was

written in response to Genwal's discussions held with JBR as the reclamation plan was being revised. Genwal feels that incorporation of the various reclamation techniques that JBR has identified as being successful in past situations will greatly enhance the success of this reclamation effort. Genwal also recognizes that in the time between now and when final reclamation is actually done, technology may evolve new and better reclamation ideas. Genwal commits to modifying the reclamation plan prior to final reclamation should better reclamation products and methodology become available. This reclamation plan will be reviewed prior to implementation to incorporate applicable methodology and techniques which are considered best technology currently available (BTCA) at the time of reclamation.

### **Area Descriptions**

The reclamation plan has been divided into several general areas for the purpose of explanation. It is likely that reclamation efforts will occur in multiple areas during the same time interval. These areas are depicted on Figure 1 and described in summary below.

Portal Area:— The Portal Area consists of an inclined access road, the mine portals leading into the underground mine, and structures in this area.

Expansion Area:— In 1997, the surface facilities ~~will have been~~ expanded to the area south of the Forest Service road by culverting approximately 1,500' of Crandall Canyon through a 72" bypass culvert. Earthen fill material will have been trucked in to construct the Expansion Area. The truck loadout facilities ~~will have been~~were relocated to the Expansion Area along with the Overhead Conveyor, Stacking tube, Reclaim Tunnel and Conveyor, Crusher Building, MCC Building, Substation, and other associated structures. The fill from the Expansion Area will be utilized during final reclamation to restore approximate original contour in areas of cuts and highwalls. This fill ~~will~~ consists of 8" x 0" earth and rock material obtained from an approved off-site borrow area.

The Expansion Area has been divided into a North Slope Expansion Area and South Slope Expansion Area for the purposes of the reclamation discussion. The North Slope Expansion Area is that area north of the ~~existing~~reconstructed Crandall Creek channel and south of the existing Forest Service road. The South Slope Expansion Area includes the ~~steeper~~ hillside located south of the ~~existing~~reconstructed Crandall Creek channel. Due to the original steep slopes encountered on the South Slope, ~~special reclamation procedures have been prescribed for this area.~~ Much of the Genwal has determined that the use of more gentle slopes (2 horizontal to 1 vertical maximum) provides for better overall stability of slopes. Furthermore, modest terracing will be used to break up the long slope to help will erosion and drainage control.

Due to the gentler slopes associated with this reclamation plan, the original channel for the Crandall Creek will not be restored. However, a new channel will be constructed for Crandall Creek that allows for the more stable slopes (2 horizontal to 1 vertical maximum) utilizes throughout the site. The reconstructed channel will resemble the original channel and follow its original path as closely as possible, but will be slightly higher in elevation to the original channel

and have a somewhat gentler slope. The entire length of the new channel will be riprap armored to prevent erosion. The new channel will intersect the original channel just below the sediment pond upon the completion of Phase 2 of this reclamation plan designed for the South Slope is based on input from reclamation specialists who have experience in steep-slope reclamation situations.(see Plate 5-17).

As a result of the 2007 mine disaster, the upper end (westernmost end) of the Expansion Area has been deeded to Emery County as part of the Crandall Canyon Memorial. This area is contiguous with the existing Forest Service trailhead, and will not be disturbed from its existing condition as a part of the final minesite reclamation.

Old Substation Area: The Old Substation Area is the pad that was originally constructed in the northern part of the mine yard above the shop for a substation. However, the substation was never constructed at this location. Other than an existing powerline, there are no facilities on this site to be removed and the area has had interim revegetation.

Old Loadout Area: The Old Loadout Area is located adjacent to and just north of the Forest Service road and the new loadout. This is the area where coal was previously stockpiled and loaded into trucks prior to construction of the 1997 expansion area. The area has subsequently been utilized as the site of the operational mine-water iron treatment facility. This current reclamation plan assumes that at the time of final reclamation the mine discharge water will not require treatment, and that the “old loadout area” will be reclaimed with slopes not to exceed 2 horizontal units to 1 vertical unit.

Forest Service Road: The Forest Service Road runs east-west through the mine site. As a result of construction of the Crandall Canyon Memorial in the summer of 2008, part of this road was deeded to Emery County. The road is to be kept in place following reclamation activities, but will undergo a change in width.

Shop Area: The Shop Area is located west of the mine portal area and north of the Forest Service Road. Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt.-

## RECLAMATION PLAN OUTLINE

1. Demolition and Removal of Surface Facilities - Portal Area
2. Removal and Disposal of Expansion Area Fill Material ~~inside Mine Portals~~
3. Seal and Backfill Portals
4. Backfill, Grade and Topsoil - Portal Area
5. Revegetation - Portal Area
6. Demolition - Old Substation Area
7. Backfill, Grade and Topsoil - Old Substation Area
8. Revegetation - Old Substation Area
9. Demolition and Removal of Surface Facilities - Shop Area
10. Excavation, Backfill, Grade and Topsoil - Shop Area
11. Revegetation - Shop Area
12. Demolition and Removal of Surface Facilities - Old Loadout Area
13. Backfill, Grade and Topsoil - Old Loadout Area
14. Revegetate - Old Loadout Area
15. Reclaim Forest Service Road North of Expansion Area
16. Demolition and Removal of Surface Facilities - Expansion Area
17. Removal of Fill Material and Recontouring - Expansion Area
18. Restoration of South and North Hillside Slopes - Expansion Area
19. ~~Revegetation - South Slope of Expansion Area~~
- ~~20.~~ Removal and Disposal of 72" Culvert
- ~~21.~~ Topsoiling - North Slope of the Expansion Area
- ~~22.~~ 1. Revegetation - North and South Slopes of the Expansion Area
- ~~23.~~ 2. ~~Restoration~~ Reconstruction of the Stream Channel
- ~~24.~~ 3. ~~Rev~~ Vegetation of the Stream Channel
- ~~25.~~ 4. Sediment Control and Treatment
- ~~26.~~ 5. Topsoil Stockpile Reclamation
- ~~27.~~ 6. Phase 2 Reclamation

Note: A Reclamation Timetable has been provided at the end of this discussion.

## RECLAMATION PLAN DETAIL

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

When mining operations have been permanently ceased and the portals and surface facilities are no longer needed to support the mine, all buildings and other structures will be dismantled and hauled off site to an approved landfill. Reusable materials will be salvaged and recycled to the extent possible.

At the Portal Area, facilities to be removed are: ~~underground bath house,~~ mine fan housing structure, ~~fan transformer (portable),~~ belt transfer station, guard rail at top and along access road, ~~water pipelines,~~ and the diversion culvert above portals. The existing mine-water discharge collection and discharge pipelines will be routed so that the mine water discharges out from the west end of the portal bench. The discharge water will travel down a new riprapped cascading ramp, constructed within the existing roadway area, to a newly constructed wetlands area that will be constructed within the Shop Area.

The existing shotcrete above the portal road, above the portals and above the old coal loadout area, along with wire mesh, clips and other similar materials will be removed and disposed of in an appropriate state approved landfill.

All combustible materials will be removed from the underground bathhouse and hauled to an approved solid waste landfill. Any structures that would interfere with sealing of the portals, such as beltline structure, ~~would~~will also be removed.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

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

~~\_\_\_\_\_~~ \_\_\_\_\_ At the same time the structures in the portal area are being demolished and removed, the other surface facility structures located on the Expansion Area (truck loadout, conveyors, crusher building, etc.) will also be removed. ~~After the removal of these structures from the Expansion Area, excess fill material from this area will be taken inside the mine entries for permanent placement [note: Please note that~~ reclamation of the Expansion Area is described in greater detail later in this plan]. Fill material, in excess of that needed for backfilling the Portal Area, Shop Area ~~and~~ Old Loadout Area (an ~~estimated 20,410 loose cubic yards, Table 5-20-10 in Appendix 5-20)~~ d recontoured Expansion Area will be loaded, hauled and disposed of ~~underground in the mine workings (see Figure 1 in Appendix 5-20 for the disposal area in the mine workings.)~~ at an approved landfill. As shown on Table 5-20-10 of Appendix 5-20, this excess volume of fill material was originally determined to be 61,532 cubic yards. However, after these calculations

were initially prepared, the upper end of the mine yard was deeded to Emery County as part of the Crandall Canyon Memorial. As a result of this situation, the fill material in this area will now remain in place permanently as part of the memorial facility. Therefore, the total amount of fill material to be removed and hauled away during final reclamation has now been reduced.

The equipment used in the performance of this step would be a l-h-d unit (scoop), dozer w/ripper, and a front end loader.

### 3. Seal and Backfill Portals

~~Upon the completion of the disposal of the excess Expansion Area fill material in the mine workings, the portals will be sealed and backfilled.~~ The four portals on the north side are: bath house entrance, intake air entry, belt entry and fan (return air) entry. The three portals on the south side are the intake, belt and fan entries. The seals will be constructed ~~approximately 25-35~~ a minimum of 25 feet in by ~~from~~ the portal openings, and will be ~~built~~ constructed according to MSHA regulations. Equipment necessary for sealing would be a cement mixer and hand tools. After finishing the construction of the seals, the ~~approximate 25 to 35~~ approximate 25-feet of entry from the portals to the seals will be backfilled with additional fill material from the Expansion Area.

### 4. Backfill, Grade and Topsoil - Portal Area

~~Once the portals have been sealed and backfilled, reclamation work can then commence on the Portal Area. This work consists~~

~~As a result of the Crandall Canyon Mine disaster of August 6, 2007, the portals of the mine were sealed. A system of collection pipes was also installed at the portals to collect and handle the mine discharge water which began to build up behind the seals. The mine water is presently discharging at an average rate of approximately 500 gallons per minute. This volume of discharge is expected to continue in the future. Figure 5-14 shows the details of the portal drain collection system. Presently, water from the four portals is collected into a common pipe which is directed across the hillside and is treated with aeration and chemicals to encourage precipitation of the iron particles from the water. The water then enters a settling pond that allows time for the iron particles to precipitate out of the water. After time in the settling pond, the water ultimately discharges into the main bypass culvert at an approved UPDES outfall point. There is also a small amount of seepage water collected in a French drain outside one of the old portals from the old part of the mine (which is sealed off underground), which also reports to the main discharge pipe. All of the collection system is installed either within the portals, inside the steel canopies, or else buried along and within the portal bench. This discharge piping daylights from the buried installation and continues overland across the hillside in an exposed 12" diameter pipe to the treatment area, then to the UPDES outfall where it enters the natural flow of Crandall Creek.~~

~~There is also a small amount of water which seems to be infiltrating into the Star Point Sandstone behind the mine portal seals, and is seeping out to the surface through the underlying porous sandstone ledge located directly above the Old Loadout Area, at a rate of approximately 3 gpm.~~

~~This reclamation plan acknowledges that the water will continue to discharge from the mine (i.e., from the portal collection pipes, the old works French drain, and the saturated sandstone ledge) at current flow rates indefinitely into the future. The company proposes to address the long-term discharge of mine-water in the following manner: 1) backfill the portals, reroute the existing collection piping system to direct water flow to the west; 2) replace the existing exposed overland drainpipe (running across the hillside to the iron treatment facility, then to the UPDES outfall) with an approved armored (rip-rapped) open channel constructed within the existing roadway grade to direct the discharge water to a new wetlands area; and 3) collect the~~

seepage from the sandstone ledge with a drain rock/drainpipe system as part of backfilling the cuts to approximate original sandstone ledge area below the portals. These elements are discussed individually as follows:

1) The existing collection system utilizes 10" heavy-wall PVC pipe extending through the seals in all four portals. Additional 4" pipes also collect seepage water outside the seals which is contained behind low check dams constructed within the portals. All piping is buried and was installed with plans to be part of a permanent post-reclamation discharge system. Upon reclamation, after the steel portal canopies have been removed, the portals will be completely backfilled as described below, leaving only the stub of pipe exiting from the re-contoured surface grade so water can drain to the west. Figure 5-14 shows details of the existing pipe collection system.

2) Presently, the discharge water is conveyed from the portals and across the hillside through a 12" PVC pipeline. This line then empties into a maelstrom aeration unit, then into the water treatment basin. After an appropriate settling time, the water exits the basin and enters an existing CMP culvert located under the roadway, which then leads to the main bypass culvert at an approved UPDES monitoring point. Upon final reclamation, the PVC pipe will be replaced with an overland open channel running down the existing roadway grade to a new wetlands area. A detail of this channel can be found on Plate 5-17d, and also in Plates 5-16 and 5-17. There would be no other flow in this channel other than the continuous 450 gpm (average) mine discharge flow.

3) Upon final reclamation, the sandstone ledge below the portals (a.k.a. Old Loadout Area) will be backfilled to a slope of 2 horizontal units to 1 vertical contour as described in Item 13 below. As explained above, due to the porous nature of this sandstone, it is now conveying a small but constant amount of mine water (approx.3 gpm) from behind the seals to the ledge outcrop below the portals. The seepage conduit appears to be localized and can easily be contained during final reclamation. This will be done by installing a drain system between the ledge-rock and the back-filled slope which will collect the seepage water into a single discharge pipe. This will then be directed so that all discharge enters into the Crandall Creek. The details of this backdrain collection system are explained in greater detail in Item 13 (Old Loadout Area) below, as well as Figure 5-15 and Appendix 5-28.

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Once the portals have been sealed and backfilled (see Figure 5-14), reclamation work can then commence on the Portal Area. This work consists of removing all paving and road base, then backfilling the cuts to 2 horizontal units to 1 vertical unit contour, placing topsoil on the backfilled area and seeding the topsoiled area. Since the Portal Area (and the associated access road) is on a slope, this work will be done in short segments starting at the eastern-most (upper-most) portion of the area and working westward across the portal area ~~and thence~~. Then work will continue down the access road to the Shop Area to create the new drainage channel.

Fill material from the Expansion Area will be utilized to backfill and reclaim the highwall and portal area. The fill material will contain rock fragments of all sizes, including a significant amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will ~~be topped with 12"~~ of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill in highwall and yard areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material ~~up~~ to the Portal Area. The lifts will be built up horizontally with a slight slope on each lift toward the highwall. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is put in~~added~~. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and either disked or hand-raked into the soil (depending on the steepness of the slope).

Areas to receive topsoil will be marked with stakes indicating the depth of application. A Revised 4/05/2003 reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

## **5. Revegetation - Portal Area**

Revegetation procedures for the Portal Area and the south portal pocket cuts involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not

be done until fall (September-October).

## 6. Demolition - Old Substation Area

The only structures existing at the Old Substation Area ~~is~~are the termination structure for the mine powerline and undisturbed culvert UD-1. This powerline will be dismantled and removed from the site prior to completion of final reclamation. Culvert UD-1 will remain to convey mine discharge water under the Forest Service Road and into Crandall Creek.

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

~~As excess fill from the Expansion Area is placed in the underground mine workings, additional fill from the Expansion Area will be hauled to the Old Substation Area for backfilling. The cut slope above the pad will be backfilled to the approximate original contour. The area will then be topsoiled and revegetated.~~

~~Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during~~

The existing grade and topsoil will remain after final reclamation. ~~The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.~~

~~The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.~~

Revised 4/05/2003 A large portion of this area is already undisturbed (see Plate 5-3).

## 8. Revegetation - Old Substation Area

Revegetation

~~Text Was Moved From Here: †~~

will not be required for the Old Substation Area. A large portion of this area is undisturbed. Any disturbed area that received interim revegetation will not be disturbed and the established vegetation will remain after final reclamation.

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

Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt. All structures will be removed from the site. Some components will be salvaged and recycled. Non-salvageable material will be disposed of in an approved solid waste landfill. All asphalt removed from the site will be disposed on in an approved RCRA disposal site.

~~— A portion of the retaining wall which separates the Shop Area from Culvert UD-1 will remain to convey mine discharge water under the Forest Service Road will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material and into Crandall Creek.~~

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

## **10. Excavation, Backfill, Grade and Topsoil - Shop Area**

With the Portal Area and Old Substation Area reclamation completed, ~~and the retaining wall removed,~~ the reclamation activities can continue at the Shop Area. ~~Although this area is not as steep as the previous areas, the same reclamation procedures will be used. The cut slope behind the shop will be backfilled to approximate original contour using fill material from the Expansion Area. The~~ Reclamation will begin with the excavation for the wetlands area. Once the rough grade has been established, a wetlands area will be constructed to utilize mine water discharged from the Portal Area. The wetlands will be designed and constructed utilizing professionals familiar with wetlands design and construction, as well as reference material including, “Utah’s Wetlands Workbook: A Guide to Proper Wetlands Management and Development” by Patricia A. Lock, Wetlands Specialist. At the western edge of the wetlands area, a new culvert will be installed that will connect with the existing culvert UD-1 to allow drainage of the water to the reconstructed Crandall Creek channel. The backfill lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope pond. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration. A silt fence will be installed at the edges of the wetlands to prevent topsoil erosion into the wetlands.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the

redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

## **11. Revegetation - Shop Area**

Revegetation procedures for the Shop Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

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

~~At~~ The Old Loadout area is now the site of the operational iron treatment facility. This reclamation plan assumes that the treatment facility will no longer be required at the time of final reclamation, the facilities at the Old Loadout Area will have already been removed and disposed of as part of the 1997 Surface Expansion Project, and all components of the system will have been removed at that time and water diverted to the new wetlands area. All asphalt removed from the site will be disposed on in an approved RCRA disposal site. A portion of the existing coal pile retaining wall will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, and truck with flat bed trailer.

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

With portions of the retaining wall removed, reclamation activities can continue at the Old Loadout Area. The same reclamation procedures will be used as described previously. The cut slope behind the retaining wall will be backfilled to approximate original contour a slope not

to exceed 2 horizontal units to 1 vertical unit using fill material from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Because of the mine water which is now occurring behind the seals in the portals, there are several seeps which issue from the porous sandstone ledge located between the portal bench and the Old Loadout area below. Much of this seep water now appears to be coming from under the existing belt transfer (a.k.a., crusher) building, although other areas along the face of the ledge contribute seep flow as well. In order to properly handle this seepage on a permanent basis, a back-drain system will be installed at the interface of the sandstone ledge and the earthen reclamation backfill material. This back-drain system is described in greater detail in the geotechnical stability analysis prepared by RB&G Engineering, which appears in Appendix 5-28.

The back-drain would consist of a 2' thick layer of drain-rock placed against the entire height and width of the ledge face, between the rock ledge and the backfill material. Historical measurements of the seep (collected at the base of the ledge at the retaining wall), show an average flow rate of 3 gpm, with a maximum flow of about 5 gpm. Engineering analysis indicates that only a couple of inches of drain-rock is needed to adequately carry this small flow. However, a 24" contact layer has been specified in order to facilitate ease of placement and containment during construction, as the backfill is constructed layer-by-layer from the base to the top of the ledge. In addition to the drain-rock layer the back-drain will also include a number of perforated drainpipes installed within the drain-rock layer. Two 6" diameter pipelines will be installed horizontally at the base of the ledge; one at the base of the existing retaining wall, and the other along the top of the retaining wall. The retaining wall is a massive reinforced concrete structure, measuring 12" thick and approximately 8' high in this area. This wall will be left in place at the toe of the ledge to add increased structural stability to the backfilled slope and drain

system. A third perforated drain pipe will extend vertically from the horizontal drainpipes up to the location of the base of the existing (but to be removed during reclamation) crusher/transfer building. As mentioned earlier, it is from this area from whence much of the seepage water emanates. Therefore, a vertical pipe extending up to this location will provide added assurance that the seep-water can be adequately collected and routed to discharge. This vertical pipe will connect to the upper horizontal pipe atop the retaining wall. The two horizontal collection pipes will then join together and exit from behind the backfilled area and discharge the collected seep water directly into the mine-water discharge channel MD-1 (see Item 4) near the inlet to the culvert MC-1 under the road. Refer to Figure 5-15 and Appendix 5-28 for details of the under-drain system. See Appendix 7-4 for details of the mine-water discharge channel MD-1.

#### **14. <sup>=</sup>Revegetation - Old Loadout Area**

Revegetation procedures for the Old Loadout Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

#### **15. Reclaim Forest Service Road North of Expansion Area**

The Forest ~~Service~~Service/Emery County road from the trailhead/turnaround will be reclaimed according to the Special Use Permit. As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the asphalt road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt removed from the permit area as part of this road narrowing will be taken to a approved RCRA disposal site. The reclaimed area will be topsoiled and revegetated as described above.

Based ~~on recent~~upon past correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. This position differs from the stipulations of the existing Forest Service Special Use Permit that requires that a 14' asphalt running surface be left in place upon final reclamation. Genwal commits to reclaiming the road through the ~~minesite~~mine site to any standard desired by the Forest ~~Service~~Service/Emery County at the time of final reclamation. At the present time, however, it is difficult for Genwal to commit to a reclamation standard for the road that is contrary to the existing Forest Service Special Use Permit. Since the road now provides permanent access to the Crandall Canyon Memorial, which is owned by Emery County, the final disposition of the

reclamation requirements regarding pavement removal may be determined in the future depending on discussions between the agencies involved.

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

The facilities to be removed from the Expansion Area are: the overhead conveyor, stacking tube, reclaim vault and tunnel/escapeway tube, crusher building, MCC building, loadout conveyor, truck loadout and loading platform. Removal of these facilities will take place simultaneously with removal of facilities from the aforementioned areas. After these surface facilities are removed, the only structures that will remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

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

Reclamation of the Expansion Area ~~(which includes the south portal access ramp) is different from the other reclaimed areas because restoration of the approximate original contour~~ involves removal of fill material ~~rather than~~ for other areas on the site, and the placement of backfill material to a height that covers the south portals to the Princess Mine. As described in the preceding sections, fill material removed from the Expansion Area will be used to regrade ~~and restore approximate original contour at~~ the Portal Area, Old Substation Area, Shop Area, and the Old Loadout Area. Therefore, these reclamation operations will be accomplished simultaneously. Expansion Area fill that is not slated for use as backfill ~~for the aforementioned areas~~ (i.e., excess fill) will be disposed of ~~in the underground mine workings as described previously~~ at an approved off-site land fill.

Reclamation of the Expansion Area involves three separate procedures involving three separate areas: the North Slope of the Expansion Area, the reconstructed Crandall Creek Channel Area, and the South Slope of the Expansion Area. As described previously, the North Slope Expansion Area is that area north of the ~~existing~~ reconstructed Crandall Creek channel and south of the existing Forest Service road. The South Slope Expansion Area includes the steeper hillside located south of the ~~existing~~ reconstructed Crandall Creek channel and the south portal area. The reconstructed Crandall Creek Channel Area is the area within and immediately on either side of the ~~existing~~ projected creek channel (see Plates 5-16 and 5-17).  
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Reclamation of the ~~North Slope~~ Expansion Area will follow the normal reclamation procedures described above for the other general areas (i.e. regrading, topsoiling and revegetation). ~~Reclamation on the steeper than normal slopes of the South Slope Expansion~~

~~Area will involve a~~ The gentler slopes will not require different reclamation ~~technique which is~~ designed to revitalize the existing left-in-place topsoil. ~~Reclamation~~ techniques than other areas of the mine site.

As a result of the Crandall Canyon Mine disaster of August 6, 2007, Genwal deeded a portion of the upper mine yard (upper end of the Expansion Area) to Emery County to be used as part of a permanent memorial to the deceased miners. (Refer to Appendix 5-27 for details of the deed agreement.) This deeded area measures approximately 240' x 330' (1.82 acres) and now serves as the parking area for the memorial, as well as the beginning portion of the trail that leads to the memorial headstones, as shown on Plate 5-3. As well as deeding this area to the County, the company also conveyed to the County a permanent easement for a road through the privately-owned part of the mine site. This road is a continuation of the existing Forest Service road, and will provide permanent public access to the memorial, even after final reclamation of the Crandall Creek Channel Area is also designed to revitalize the existing left-in-place topsoil and restore the previous channel morphology. minesite. Since the parking area is now owned by Emery County as part of the memorial, the upper end of the Expansion Area, including the initial (upper) approximately 220' segment of bypass culvert running underneath it, will be left in place permanently. Other than leaving this upper area in place, all other elements of reclamation of the Expansion Area, as described herein remain the same. Refer to Appendix 5-27 for the Crandall Canyon Mine Memorial, Emery County Memorandum of Understanding and Quit-Claim Deed.

## **18. Restoration of South and North Hillside Slopes - Expansion Area**

Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the techniques and practices being proposed for the Expansion Area. This consultation will include forming a task force of members with various areas of reclamation expertise to review the reclamation plan and recommend the best and most suitable reclamation techniques and products available at that time. The review and consultation will re-assess and revise, where needed, the existing reclamation plan to provide the best and most appropriate reclamation measures for the site.

At the time of final reclamation, all surface facilities located on the Expansion Area pad will be disassembled and removed from the site. In the area of the (then removed) coal stockpile, all coal will be removed from the small adjacent slope area where the south flank of the coal pile had previously rested. Prior to reclaiming this area, all coal fines will be vacuumed from the surface. ~~Using the existing pad as a work surface, a 12" layer of topsoil will then be reapplied to the disturbed area. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.~~

~~Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and~~

depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and hand-raked into the soil.

Revegetation procedures for this area will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation.

Following the surface facility demolition activities, fill material will be removed from the Expansion Area in approximately 5'-10' lifts. During the fill removal process, the culvert inlet structure will be left in place on the west end of the yard to continue the diversion of water through the 72" culvert. A 40 foot wide berm will be left intact at the culvert inlet to continue to serve as the culvert headwall and to continue to divert water into the 72" culvert.

The sequence for removing the fill material, culvert, and underdrain system from the Expansion Area will be essentially the same as during the 1997 construction process but in reverse order. (See construction details in Appendix 7-50).

Fill will be removed from the Expansion Area in 5'-10' lifts starting from the west end of the yard, below the memorial parking area, and proceeding to the east end. At the intersection of the South Slope and the pad fill the marker soil/geotextile fabric will be located. The marker soil will be carefully removed from on top of the geotextile fabric on the South Slope as the yard fill is being removed. This will allow reclamation to be done on vertical increments of the hillside that will be easy to access from the adjacent yard level. Removal of fill material adjacent to the South and North Slopes will be done very carefully in order not to disturb the in-place soil subsoil resources where these subsoils are scheduled to remain in-place. Fill removal in this area will be done with small earth-moving equipment (Bobcats, backhoes, etc.) and/or by hand if necessary in order to minimize disturbance of the topsoil. Once the geotextile fabric has been exposed, the fabric will be carefully peeled away from the soil and the condition of the underlying soil materials observed at this time. The soil will be reclaimed and revegetated in 5-10 foot horizontal zones that can be easily accessed and worked by hand from the adjacent pad fill level. After each level has been reclaimed as described below, another lift (5-10 feet of fill) will be removed from the fill. Revegetation work will continue on the next increment of hillside below the previously reclaimed level. This work will be done in continued successive lifts, involving fill removal, peeling away the geotextile, revitalization of the in-place topsoil, and

revegetation of the newly exposed increment.subsoil.

Fill material from the Expansion Area will be utilized to backfill and contour the North and South Slopes to a maximum slope of 2 horizontal units to one vertical unit. The fill material will contain rock fragments of all sizes, including a significant amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will be topped with 12" of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill for the North and South Slope Areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material as needed. The lifts will be built up horizontally with a slight slope on each lift away from the projected Crandall Creek channel. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is added. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

It should be noted that approximate originalthe contours of the North Slope of the Expansion Area will also be re-establishedestablished as the Expansion Area fill is being removed in lifts as described previously. As the fill is being removed in vertical lifts, the adjacent North Slope surface will be regraded and prepared for subsequent topsoil application as noted above with a maximum slope of 2 horizontal units to 1 vertical unit.

Sediment control during fill excavation and placement will be met by continued use of the sediment pond east and downstream from the yard area. The main 72" culvert inlet and an adequate amount of fill to maintain the existing headwall will be left intact during this phase of the fill retrieval process:

## **19. ~~Revegetation - South Slope of the Expansion Area~~**

~~Reclamation of the South Slope will take place in vertical increments (lifts) simultaneously with the removal of the fill material in corresponding lifts. As fill lifts are being removed, the adjacent newly exposed hillside will be reclaimed and revegetated.~~

~~It is anticipated that after the Expansion Area fill is removed in lifts and the geotextile fabric is peeled away in vertical increments, the underlying soil material could be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration. This treatment will be applied in successive 5-10' lifts as the fill is removed and the hillside is exposed.~~

~~The re-exposed soil structure will most likely be undamaged but lacking in microbes and~~

nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil the non-riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater):

————By removing the fill in 5'-10' lifts and simultaneously reclaiming the adjacent South Slope in corresponding lifts, the pad area can then serve as convenient operating platform for the machinery and supplies used during the reclamation effort. In this manner heavy machinery will not be required to maneuver on the steep slopes. All reclamation work performed directly on the steep slopes will be done with hand labor and tools. The reclamation process will be supported by heavy equipment staged on the adjacent pad level:

20 as long as is possible.

## **19. Removal and Disposal of 72" Culvert**

During the 1997 construction of the expanded surface facilities, the creek channel configuration was left intact throughout the entire length of the Expansion Area. This was accomplished by covered the channel in situ with a geotextile fabric during initial construction period. The geotextile was placed over the channel to preserve the indigenous soil and morphology of the existing creek bed. The fabric was placed along the bottom and 5 feet above the channel embankment. A colored marker material was placed on top of the geotextile to serve as a visual marker horizon during reclamation operations.

Fill removal (will proceed in vertical lifts on the North and South Slope reclamation) will proceed vertical lifts until Areas until the approximate rough elevation of the new Crandall Creek channel is established from its beginning point below the Memorial Parking Area to the location of the new culvert sections below the Sediment Pond. The existing 72" main culvert will remain intact during these excavation operations.

A new section of 72" culvert (approximately 60 feet) will be installed and tied to the existing 72" main culvert above the Sediment Pond as shown on Plate 5-16. A new culvert inlet and headwall will be established where the newly constructed Crandall Creek channel will enter the 72" culvert has been exposed system to bypass the Sediment Pond. A new temporary 24" culvert will then be run upon the new rough surface from the new 72" culvert tie-in to the location below the Memorial Parking. This 24" culvert will act as a bypass for streamflow while the 72" culvert is removed. Prior to removing the culvert, the stream flow will be diverted into the 18" underdrain system by removing the cap from the drain pipe located at the upstream end

of the culvert. This will be done during a low flow period of the year, such as July or August. Once the streamflow has been successfully diverted into the underdrain system, removal of the 72" culvert can begin. Removal of the culvert will be done in 20' segments starting from the upstream end and working downstream. Once enough 72" culvert has been removed, the new temporary 24" culvert will be extended and a temporary inlet and headwall will be constructed to intercept the water from the underdrain system. The Crandall Creek streamflow will then flow through the temporary 24" culvert to the new 72" inlet above the Sediment Pond. Once the bypass culvert is operational, the remaining 72" culvert can be removed, proceeding downstream to the intersection with the new 72" diversion, where the existing 72" will be sealed upstream from the intersection with the new portion of 72" culvert for the Crandall Creek. The 72" culvert from above the Sediment Pond and beyond will remain through Phase 1 reclamation. All culvert material will be removed from the site and disposed of in an approved landfill. ~~The remaining culvert bedding material (2" x 0" gravel), which is located on top of the underdrain system, will be left in place at this time to provide a stable work area for heavy equipment involved in subsequent reclamation of the North Slope as described later in this discussion.~~

~~—The 72" culvert will be removed downstream to an elevation just above the sediment pond. At this time, a new culvert inlet and headwall will be re-established for the remaining 72" culvert segment. The headwall will be rebuilt at this location according to original headwall design and will be rip rapped in a similar manner.—~~

At this stage of the reclamation process, approximately ~~1,100'~~990' of 72" culvert will have been removed, and approximately ~~400'~~310' will remain ~~in place~~ in place, below and around the left-in-place ~~s~~Sediment ~~p~~Pond. ~~However, stream flow~~Streamflow will ~~still~~ continue to flow temporarily through the underdrain system at this time until the North Slope reclamation has been completed.

21through the temporary 24" bypass culvert until the fill and excavation grading of the North and South Slope Areas is completed. Care will be used to maintain the integrity of the temporary 24" bypass culvert until earthwork is completed on the North and South Slopes.

## **20. Topsoiling - North and South Slopes of the Expansion Area**

~~After the Expansion Area fill and the 72" culvert have been removed, the underdrain system will still remain intact. Because this phase of work will be done during low flow, the stream will be adequately carried through the underdrain system. Mobile earthmoving equipment will still be able to operate on top of the 2" x 0" bedding material located over the underdrain system.—~~ Reclamation of the North Slope, which is not as steep as the south slope and South Slopes, will be done with the standard protocol for reclamation involving topsoiling and revegetation. No special or unusual techniques will be required as the new contouring will have a maximum slope of 2 horizontal units to 1 vertical unit.

Topsoil will be reapplied to the North and South Slopes in the conventional manner.

Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

## **221. Revegetation - North and South Slopes of the Expansion Area**

Revegetation procedures for the North and South Slopes of the Expansion Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

## **232. Restoration Reconstruction of the Stream Channel**

After the north and south slopes has ve been topsoiled, the ~~underdrain system will then be removed and the stream channel morphology restored~~ temporary 24" bypass culvert and its associated inlet and headwall will be removed. Prior to removal of the ~~underdrain~~ temporary culvert, silt fences will be established in ~~along~~ both sides of the new Crandall Creek channel downstream from the existing 72" culvert outlet. These silt fences will be located in an area convenient for maintenance and cleanout.

Removal of the ~~underdrain system~~ temporary 24" bypass culvert will be done during low flow conditions ~~and will be completed in reverse order from the way it was originally installed~~. Using small mobile equipment, such as a backhoe, the remaining culvert ~~bedding material, drain rock and 18" drain pipe~~ will be removed in 20' segments starting from the upper ~~lower~~ end and working downstream ~~upstream~~. ~~After the drain rock and drain pipe are removed, the lower layer of geotextile can be carefully peeled back, re-establishing the "natural" streambed in the process~~. All drain rock, drain pipe and geotextile material removed during this process will be disposed of at an approved landfill. As each 20' segment of the underdrain system is removed, silt fencing will be installed on either side of the newly restored ~~reconstructed~~ stream channel. The purpose of this silt fencing is to treat drainage from the adjacent recently reclaimed areas.

After the ~~underdrain system~~ temporary 24" bypass culvert has been removed and the stream channel re-established downstream past UD-1, a rip rapped ditchway will be installed to carry drainage from the side ~~UD-1~~ culvert outlet down the North Slope to the restored ~~reconstructed~~ stream channel. Refer to Plate 5-16.

The ~~underdrain system~~ temporary 24" bypass culvert will be removed ~~downstream to an elevation just above the sediment pond at the location of the new 72" culvert inlet and headwall~~ upon completion of the earthwork and topsoil application. At this time, the remaining 18" drain pipe below the Memorial Parking Area will be recapped and the stream flow redirected back into the 72" culvert. ~~[Note: this new sediment pond/culvert/underdrain configuration will~~

remain in place until Phase 2 reclamation, as described later]. At this stage of the reclamation process, approximately 1,100' of 72" culvert and underdrain system will have been removed and approximately 400' will still remain in place to divert channel flow below and around the left-in-place sediment pond.

#### **24. Revegetation remaining section of the 72" culvert.**

#### **23. Vegetation of the Stream Channel**

It is anticipated that after the underdrain system is removed and the geotextile fabric is peeled away, the underlying soil material along the stream banks will be somewhat compacted. To enhance the ability of the soil to absorb moisture, a mixture of PAM (Polyacrylamide) or best technology currently available at the time of reclamation, Topsoil will be applied to the soil surface. PAM is designed to relieve compaction of the soil and open up channels for air and water penetration.

—The re-exposed soil structure will most likely be undamaged but lacking in microbes and nutrients. In order to regenerate naturally existing soil organisms and assist in reactivating soil activity, an inoculum will be applied to the soil to reestablish soil bacteria, microhorizia and mycelium. To enhance soil microbial establishment and promote more rapid stabilization of the soil, the riparian seed mixture (as listed in Appendix 3-6) will be hand broadcast over the area and raked into the soil surface. A wood fiber mulch will be applied over the seed bed then the surface will be sprayed with a bonded fiber matrix tackifier. This type of tackifier has appeared to have a much greater ability than regular tackifier to hold and stabilize the soil surface. The bonded fiber matrix tackifier will be applied at a rate of 3,500 pounds per acre (or manufacturer's recommended application if greater).

#### **25. Sediment Control and Treatment**

—In practice, many of the reclamation procedures outlined above will be conducted simultaneously. However, the sediment pond will provide complete sediment control during all phases of the reclamation process until such time as the upper 1,100' segment of 72" culvert has been removed and removal of the underdrain system begins. Sediment control during removal of the underdrain will consist of silt fences constructed on either side of the newly restored stream channel and silt fences constructed within Crandall Creek below the outlet of the 72" culvert.

#### **26. Topsoil Stockpile Location Reclamation**

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Stream Channel similarly to the North and South Slopes. Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil

redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Revegetation Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

Vegetation procedures for the stockpile locations stream channel will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area above the channel's riprap armor with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed distributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

## **24. Sediment Control and Treatment**

In practice, many of the reclamation procedures outlined above will be conducted simultaneously. However, the sediment pond will provide complete sediment control during all phases of the reclamation process until such time as the upper 988' segment of 72" culvert (below the Memorial facility) has been removed and removal of the temporary 24" bypass culvert begins. Sediment control during removal of the temporary bypass culvert will consist of silt fences constructed on either side of the newly reconstructed stream channel and silt fences constructed within Crandall Creek below the outlet of the 72" culvert.

## **25. Topsoil Stockpile Location Reclamation**

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Following the removal of the topsoil stockpiles from the storage sites (during final reclamation retopsoiling activities), the topsoil pile locations will be reclaimed. (Enough topsoil

will remain stockpiled for Phase 2 reclamation. Refer to the Phase 2 reclamation discussion in item #276 below.) The topsoil stockpile locations will not require soil redistribution since the native topsoil is still in place. At these locations, the ground will be lightly scarified and then reclaimed according to the standard reclamation protocol.

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Revegetation procedures for the ~~Old Substation Area~~ stockpile locations will involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

Phase 2

**276. Phase 2 Reclamation - Removal of Sedimentation Pond**

During Phase 2 reclamation, prior to any earthwork activity, silt fences will be installed across the entire length of the downstream at the east end of the sediment pond embankment to filter any sediment resulting from removal of the pond. Additional silt fences will be installed in Crandall Creek below the culvert outlet to provide additional sediment control.

Removal of the sediment pond and the remaining 72" culvert/underdrain system will follow the same procedures described previously for the removal of the expansion area fill. The pond embankment will be removed in lifts down to the 72" pipe. Reclamation (grading, topsoiling and revegetation) of the North and South Slopes will be done in the same manner as described for the Expansion Area in Phase 1 reclamation. After the 72" culvert has been exposed the end cap will be removed from the 18" drain pipe located in the underdrain system. Flow will then be diverted through ~~the underdrain system in the drain rock below the 72" pipe.~~ The 72" pipe will be completely removed at this time. a temporary 24" bypass culvert during excavation and removal of the remaining 72" main culvert.

After the 72" pipe has been completely removed, the ~~geotextile fabric will be removed from the top of the underdrain system. The drain rock and 18" drain pipe will be removed with a small backhoe and hauled off-site for disposal. The drain rock beneath the drain pipe will be shoveled out of the channel and the geotextile that was placed over the original channel will be removed by hand, restoring the original stream channel morphology~~ new channel for the Crandall Creek will be established. The disturbed area will be ~~revegetated~~ vegetated in the manner previously described for the previously reclaimed areas. In many ways, Phase 2 reclamation of the sediment pond embankment will be nearly identical to the Expansion Area reclamation described previously for Phase 1. ~~Both areas involve the steeper South Slope, the stream channel culvert/underdrain system, and the less steep North Slope.~~ Therefore, all pertinent aspects of reclamation which apply to Phase 1, as described in this appendix, will also apply to Phase 2. This includes ~~the special steep-slope reclamation techniques for the South Slope, the left-in-place soil revitalization for the channel area, and~~ the standard reclamation procedures for the North ~~Slope~~ and South Slopes.

**RECLAMATION TIME TABLE  
CRANDALL CANYON MINE**

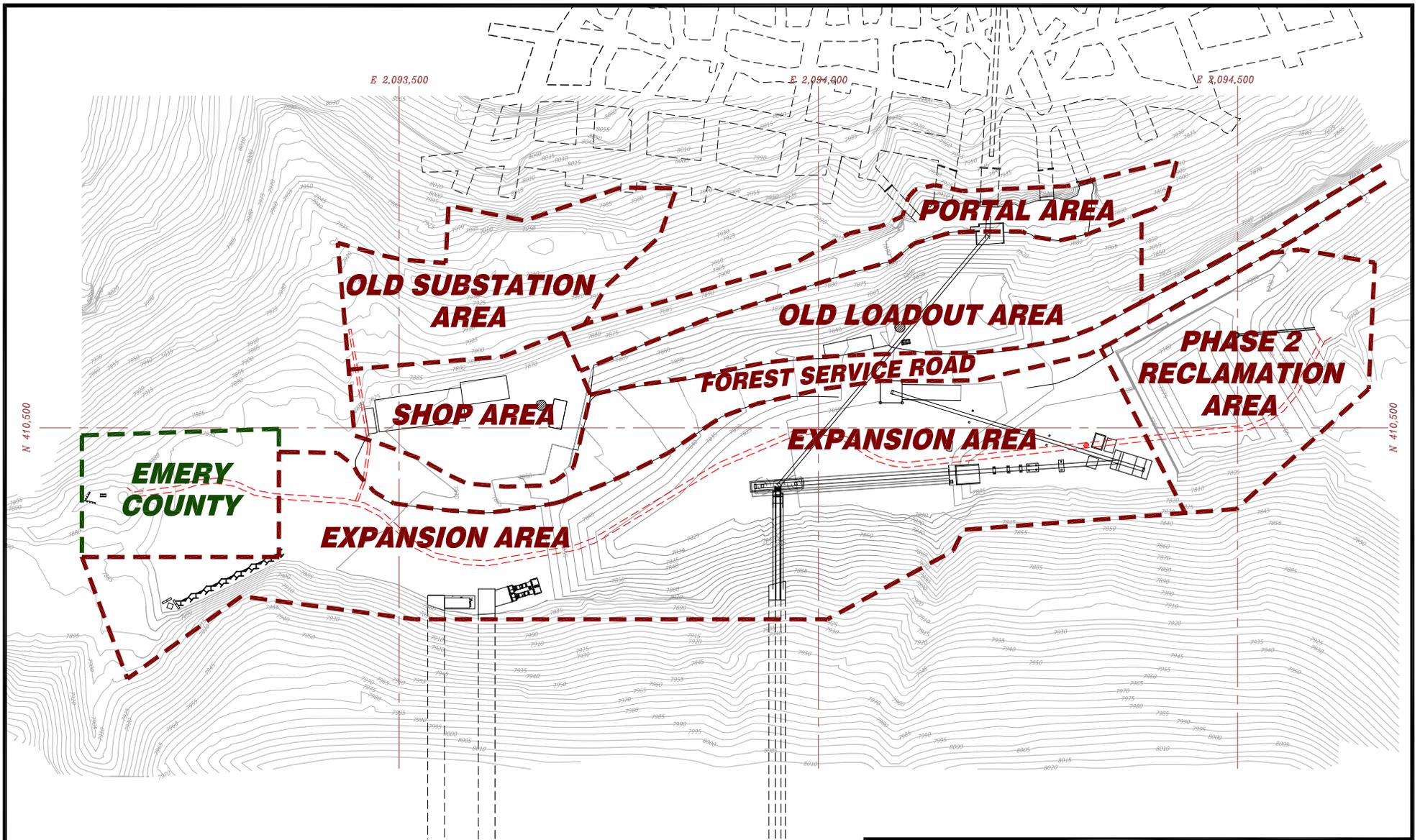
**RECLAMATION OPERATION**

	MAY				JUNE				JULY				AUGUST				SEPTEMBER				OCTOBER			
	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4	WK1	WK2	WK3	WK4
<b>PORTAL AREA</b>																								
Remove structures																								
Remove asphalt																								
Haul earthfill into mine workings																								
Seal portals																								
Backfill, regrade, recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SUBSTATION AREA</b>																								
Remove structures																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SHOP</b>																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD LOADOUT AREA</b>																								
Remove structures																								
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>FOREST SERVICE ROAD</b>																								
Remove asphalt																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - NORTH SIDE</b>																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Re-establish drainage ditches and rip rap																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - SOUTH SIDE</b>																								
Remove structures																								
Remove asphalt (if any)																								
Remove fill (haul to mine workings)																								
Remove marker material, geotextile																								
Revitalize existing topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - STREAM CHANNEL</b>																								
Remove 72" CMP																								
Remove underdrain and geotextile																								
Revitalize existing topsoil																								
Re-establish culvert inlet/headwall																								
Seeding/mulching																								

INCORPORATED  
EFFECTIVE:

JUL 30 1997

UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE



<b>RECLAMATION AREAS</b>			
<b>RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE</b>			
 <b>GENWAL™</b> RESOURCES, INC. 794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520 P.O. BOX 910, PRICE, UTAH 84520 PHONE: (435) 888-4000      FAX: (435) 888-4002		<b>CRANDALL CANYON MINES</b>	
		PERMIT NUMBER C015/032	
DRAWN BY	PJ	SCALE	NO SCALE
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	FIGURE 1

ATTACHMENT 1

JBR ENVIRONMENTAL CONSULTANTS, INC.  
RECLAMATION RECOMMENDATION LETTER

Jean M. Semborski  
Andalex Resources Inc.  
Project Engineer  
P.O. Box 902  
Price, UT 84501

May 22, 1997

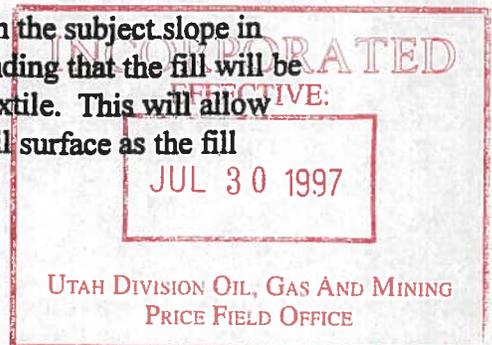
RE: Crandall Canyon Culvert Reclamation Plan ACT/015/032

Dear Ms. Semborski:

This is to your request of May 16, 1997 regarding the reclamation plans for the site of Genwal's proposed fill and culvert in Crandall Canyon. Based on our discussions, and my review of your reclamation plan on May 15, 1997, I believe the main topics of interest in the proposed reclamation plan are:

- 1) The existing soil horizon in the canyon that would be covered by the fill will be removed from the surface environment for a number of years as well as being compacted to various degrees by the overlying fill. Extended burial of the soil may affect its density by compaction and may reduce the viability of the soil micro fauna by compaction and reduction of oxygen.
- 2) The north-facing slope under the fill is steep and erosion may be a problem if normal, mechanized seedbed preparation (scarifying and gouging) is conducted which disturbs the soil and may make it more prone to erosion.
- 3) Use of sewage sludge or chemical fertilizer to amend the soil must be done carefully or it may result in contamination of the adjacent stream.
- 4) Prevention of erosion of the soil after seeding is important because of the nearby stream channel.

My general recommendation is that Genwal should propose to reclaim the subject slope in sections as it is being exhumed from under the fill. It is my understanding that the fill will be removed in lifts to allow careful removal of the marker soil and geotextile. This will allow convenient access to all areas of the treated slope from the adjacent fill surface as the fill elevation is gradually reduced.



J. Semborski Letter

May 22, 1997

Page 2

The seedbed preparation and seeding should be done with hand labor using hand rakes to lightly scarify the top inch or so of the soil surface, broadcast seed and fertilizer. This light hand work will produce a suitable seedbed for the seed and will thoroughly allow incorporation of the fertilizer into the seedbed. The hand raking should not be so deep as to destabilize the overall soil horizon.

Material such as polyacrylamide (PAM) can be added to the soil to chemically open up the soil for air and water penetration. However, I do not think that the compacted density of the soil immediately after it is exhumed should be much of a hindrance to long-term revegetation success. First of all, most of the soil will be buried under less than the full height of the fill thus the degree of compaction will not be uniform. The soil on the upper portions of the slope will be much less compacted than the soil at the bottom of the slope. Secondly, assuming that the reclamation and reseeding is done in the fall, the soil will be loosened over the winter and early spring by the effects of the weather before germination of the seeds. I would expect the combined effects of frost heave, moisture penetration, and burrowing animals during that first fall, winter, and early spring to naturally mitigate much of the original compacted density.

Erosion control material should be applied after preparation of the seedbed is completed. Hydraulically applied fiber mulch with tackifier and/or bonded fiber matrix should be effective in controlling erosion and may be more cost effective than stapled fiber matting.

With regard to the potential lack of viability of the soil because of its burial, I am not sure that this effect will materially affect the potential revegetation success, using the methods described above. I am familiar with successful revegetation of disturbed mining surfaces where there is no topsoil present. I am aware of materials such as mill tailings, waste rock, alluvium, road base, and heap leach waste that have been successfully revegetated without application of topsoil. These materials are typically enhanced with the use of fertilizer to help support the initial vegetation growth. In these cases, the material used as growth medium did not have the soil micro-fauna typically associated with topsoil, yet the vegetation became well established with chemical fertilizer addition. I have also observed many highway road cut sites where the seedbed was recently exhumed from its previous burial under significant overburden and these slopes have subsequently been revegetated.

In my experience, the main limitations to successful revegetation are lack of suitable soil texture, inadequate chemical nutrients in the growth material, and lack of moisture. In your case, the initial soil texture (gradation) should be unchanged by the burial. Lack of nutrients in the exhumed soil could be determined with sampling and mitigated with chemical fertilizer but its application would have to be carefully planned and carried out to reduce the potential for contamination of the nearby stream from the fertilizer. The location of the soil in question on a north-facing slope at higher elevations should indicate that sufficient moisture for vegetation growth is likely.

J. Semborski Letter

May 22, 1997

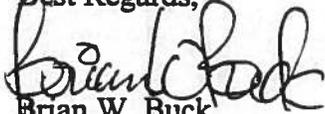
Page 3

The micro-fauna of the topsoil in question at the Crandall Canyon site may be reduced in numbers and diversity by burial but the soil should still possess suitable gradation, chemical nutrient content and moisture for the above-described reasons. This material should therefore provide a suitable growth material for revegetation. The compacted soil may benefit from use of a mycorrhizal inoculum but even this may not be necessary for the initial establishment of a vegetation cover. The soil micro-fauna will eventually be naturally re-established by the affects of the growing vegetation and exposure to the surface environment. This may be accelerated up with use of a suitable cover crop.

I believe that future revegetation of the slope in question at the Crandall Canyon site should be readily feasible if the recommendations contained in this letter are followed.

Thank you for calling on JBR to assist you with this project. Please call if you have any questions on my recommendations.

Best Regards,



Brian W. Buck  
Vice President

**APPENDIX 5-22**

**CRANDALL CANYON MINE SITE RECLAMATION PLAN**

**(Revised: March 13, 2017)**

## **CRANDALL CANYON MINE SITE RECLAMATION PLAN**

*HISTORICAL NOTE: Due to the tragic mine disaster of August 6, 2007, the Crandall Canyon Mine has been sealed. Water has gradually backed up in the mine and is now discharging from behind the portal seals. The discharge is under the authority of an approved UPDES permit. However, as of February 2009, the iron levels exceeded permit compliance limits. In December 2009, a treatment facility designed to remove the iron was constructed in the “old loadout area” located directly below the mine portals. At the present time (March 2017) it is uncertain whether or not long-term treatment of the mine discharge water will be required, because naturally-occurring chemical processes within the mine could potentially bring the iron content of the water to within compliance limits at some time in the future . This present reclamation plan assumes that mine-water discharge will continue indefinitely but that no iron-removal treatment will be required at the time of reclamation.*

*Also, as a result of the Crandall Canyon Mine disaster, Genwal has deeded a portion of the upper mine yard (Expansion Area) to Emery County. This area is now included as part of a permanent memorial to the deceased miners, owned and maintained by Emery County. As a result, this area is no longer included in the final reclamation plan for the mine.*

### **Phase 1**

The reclamation of the disturbed areas of the Crandall Canyon mine site is described in outline and detail below. This description is based upon discussions in the text of Chapters 2, 3, 4, 5 and 7 which address the regulations regarding reclamation requirements. In the interest of clarity, the following discussion describes the reclamation process in terms of several general areas within the mine yard. Refer to Figure 1 in this Appendix. Within each of these general areas, reclamation will follow a general sequence of 1) demolition, 2) backfilling, grading and topsoil application, 3) reclamation and revegetation. However, in practice, reclamation will be performed in several of these areas simultaneously. The final step, reclamation and revegetation, for all the areas will not be done until the fall.

Following Phase 1 reclamation, the only structures to remain will be the sedimentation pond and associated spillway and discharge structure, portions of the main 72" diameter culvert, the undisturbed culvert UD-1, as well as the conveyance ditches, berms and culverts necessary to route drainage to the sediment pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Genwal recognizes that development of a feasible reclamation plan for final reclamation of the expansion area containing the best available reclamation methodology is an essential part of this permitting process. Therefore, Genwal has contacted consultants with revegetation and reclamation experience to gather together the best reclamation techniques for reclamation of the steep-slope area. JBR Environmental Consultants, who has had prior experience with reclamation in difficult areas, has provided a letter detailing reclamation methodology that they believe will contribute to the successful reclamation of this area. This letter, included as Attachment 1, was

written in response to Genwal's discussions held with JBR as the reclamation plan was being revised. Genwal feels that incorporation of the various reclamation techniques that JBR has identified as being successful in past situations will greatly enhance the success of this reclamation effort. Genwal also recognizes that in the time between now and when final reclamation is actually done, technology may evolve new and better reclamation ideas. Genwal commits to modifying the reclamation plan prior to final reclamation should better reclamation products and methodology become available. This reclamation plan will be reviewed prior to implementation to incorporate applicable methodology and techniques which are considered best technology currently available (BTCA) at the time of reclamation.

### **Area Descriptions**

The reclamation plan has been divided into several general areas for the purpose of explanation. It is likely that reclamation efforts will occur in multiple areas during the same time interval. These areas are depicted on Figure 1 and described in summary below.

**Portal Area:** The Portal Area consists of an inclined access road, the mine portals leading into the underground mine, and structures in this area.

**Expansion Area:** In 1997, the surface facilities expanded to the area south of the Forest Service road by culverting approximately 1,500' of Crandall Canyon through a 72" bypass culvert. Earthen fill material will have been trucked in to construct the Expansion Area. The truck loadout facilities were relocated to the Expansion Area along with the Overhead Conveyor, Stacking tube, Reclaim Tunnel and Conveyor, Crusher Building, MCC Building, Substation, and other associated structures. The fill from the Expansion Area will be utilized during final reclamation to restore approximate original contour in areas of cuts and highwalls. This fill consists of 8" x 0" earth and rock material obtained from an approved off-site borrow area.

The Expansion Area has been divided into a North Slope Expansion Area and South Slope Expansion Area for the purposes of the reclamation discussion. The North Slope Expansion Area is that area north of the reconstructed Crandall Creek channel and south of the existing Forest Service road. The South Slope Expansion Area includes the hillside located south of the reconstructed Crandall Creek channel. Due to the original steep slopes encountered on the South Slope, Genwal has determined that the use of more gentle slopes (2 horizontal to 1 vertical maximum) provides for better overall stability of slopes. Furthermore, modest terracing will be used to break up the long slope to help will erosion and drainage control.

Due to the gentler slopes associated with this reclamation plan, the original channel for the Crandall Creek will not be restored. However, a new channel will be constructed for Crandall Creek that allows for the more stable slopes (2 horizontal to 1 vertical maximum) utilizes throughout the site. The reconstructed channel will resemble the original channel and follow its original path as closely as possible, but will be slightly higher in elevation to the original channel and have a somewhat gentler slope. The entire length of the new channel will be riprap armored to prevent erosion. The new channel will intersect the original channel just below the sediment pond upon the completion of Phase 2 of this reclamation plan (see Plate 5-17).

As a result of the 2007 mine disaster, the upper end (westernmost end) of the Expansion Area has been deeded to Emery County as part of the Crandall Canyon Memorial. This area is contiguous with the existing Forest Service trailhead, and will not be disturbed from its existing condition as a part of the final minesite reclamation.

Old Substation Area: The Old Substation Area is the pad that was originally constructed in the northern part of the mine yard above the shop for a substation. However, the substation was never constructed at this location. Other than an existing powerline, there are no facilities on this site to be removed and the area has had interim revegetation.

Old Loadout Area: The Old Loadout Area is located adjacent to and just north of the Forest Service road and the new loadout. This is the area where coal was previously stockpiled and loaded into trucks prior to construction of the 1997 expansion area. The area has subsequently been utilized as the site of the operational mine-water iron treatment facility. This current reclamation plan assumes that at the time of final reclamation the mine discharge water will not require treatment, and that the “old loadout area” will be reclaimed with slopes not to exceed 2 horizontal units to 1 vertical unit.

Forest Service Road: The Forest Service Road runs east-west through the mine site. As a result of construction of the Crandall Canyon Memorial in the summer of 2008, part of this road was deeded to Emery County. The road is to be kept in place following reclamation activities, but will undergo a change in width.

Shop Area: The Shop Area is located west of the mine portal area and north of the Forest Service Road. Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt.

## RECLAMATION PLAN OUTLINE

1. Demolition and Removal of Surface Facilities - Portal Area
2. Removal and Disposal of Expansion Area Fill Material
3. Seal and Backfill Portals
4. Backfill, Grade and Topsoil - Portal Area
5. Revegetation - Portal Area
6. Demolition - Old Substation Area
7. Backfill, Grade and Topsoil - Old Substation Area
8. Revegetation - Old Substation Area
9. Demolition and Removal of Surface Facilities - Shop Area
10. Excavation, Backfill, Grade and Topsoil - Shop Area
11. Revegetation - Shop Area
12. Demolition and Removal of Surface Facilities - Old Loadout Area
13. Backfill, Grade and Topsoil - Old Loadout Area
14. Revegetate - Old Loadout Area
15. Reclaim Forest Service Road North of Expansion Area
16. Demolition and Removal of Surface Facilities - Expansion Area
17. Removal of Fill Material and Recontouring - Expansion Area
18. Restoration of South and North Hillside Slopes - Expansion Area
19. Removal and Disposal of 72" Culvert
20. Topsoiling - North Slope of the Expansion Area
21. Revegetation - North and South Slopes of the Expansion Area
22. Reconstruction of the Stream Channel
23. Vegetation of the Stream Channel
24. Sediment Control and Treatment
25. Topsoil Stockpile Reclamation
26. Phase 2 Reclamation

Note: A Reclamation Timetable has been provided at the end of this discussion.

## RECLAMATION PLAN DETAIL

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

When mining operations have been permanently ceased and the portals and surface facilities are no longer needed to support the mine, all buildings and other structures will be dismantled and hauled off site to an approved landfill. Reusable materials will be salvaged and recycled to the extent possible.

At the Portal Area, facilities to be removed are: mine fan housing structure, belt transfer station, guard rail at top and along access road, and the diversion culvert above portals. The existing mine-water discharge collection and discharge pipelines will be routed so that the mine water discharges out from the west end of the portal bench. The discharge water will travel down a new riprapped cascading ramp, constructed within the existing roadway area, to a newly constructed wetlands area that will be constructed within the Shop Area.

The existing shotcrete above the portal road, above the portals and above the old coal loadout area, along with wire mesh, clips and other similar materials will be removed and disposed of in an appropriate state approved landfill.

All combustible materials will be removed from the underground bathhouse and hauled to an approved solid waste landfill. Any structures that would interfere with sealing of the portals, such as beltline structure, will also be removed.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

### **2. Removal and Disposal of Expansion Area Fill Material**

At the same time the structures in the portal area are being demolished and removed, the other surface facility structures located on the Expansion Area (truck loadout, conveyors, crusher building, etc.) will also be removed. Please note that reclamation of the Expansion Area is described in greater detail later in this plan. Fill material, in excess of that needed for backfilling the Portal Area, Shop Area, Old Loadout Area and recontoured Expansion Area will be loaded, hauled and disposed of at an approved landfill. As shown on Table 5-20-10 of Appendix 5-20, this excess volume of fill material was originally determined to be 61,532 cubic yards. However, after these calculations were initially prepared, the upper end of the mine yard was deeded to Emery County as part of the Crandall Canyon Memorial. As a result of this situation, the fill material in this area will now remain in place permanently as part of the memorial facility. Therefore, the total amount of fill material to be removed and hauled away during final reclamation has now been reduced.

The equipment used in the performance of this step would be a l-h-d unit (scoop), dozer

w/ripper, and a front end loader.

### **3. Seal and Backfill Portals**

The four portals on the north side are: bath house entrance, intake air entry, belt entry and fan (return air) entry. The three portals on the south side are the intake, belt and fan entries. The seals will be constructed a minimum of 25 feet in by the portal openings, and will be constructed according to MSHA regulations. Equipment necessary for sealing would be a cement mixer and hand tools. After finishing the construction of the seals, the approximate 25 feet of entry from the portals to the seals will be backfilled with additional fill material from the Expansion Area.

### **4. Backfill, Grade and Topsoil - Portal Area**

As a result of the Crandall Canyon Mine disaster of August 6, 2007, the portals of the mine were sealed. A system of collection pipes was also installed at the portals to collect and handle the mine discharge water which began to build up behind the seals. The mine water is presently discharging at an average rate of approximately 500 gallons per minute. This volume of discharge is expected to continue in the future. Figure 5-14 shows the details of the portal drain collection system. Presently, water from the four portals is collected into a common pipe which is directed across the hillside and is treated with aeration and chemicals to encourage precipitation of the iron particles from the water. The water then enters a settling pond that allows time for the iron particles to precipitate out of the water. After time in the settling pond, the water ultimately discharges into the main bypass culvert at an approved UPDES outfall point. There is also a small amount of seepage water collected in a French drain outside one of the old portals from the old part of the mine (which is sealed off underground), which also reports to the main discharge pipe. All of the collection system is installed either within the portals, inside the steel canopies, or else buried along and within the portal bench. This discharge piping daylights from the buried installation and continues overland across the hillside in an exposed 12" diameter pipe to the treatment area, then to the UPDES outfall where it enters the natural flow of Crandall Creek.

There is also a small amount of water which seems to be infiltrating into the Star Point Sandstone behind the mine portal seals, and is seeping out to the surface through the underlying porous sandstone ledge located directly above the Old Loadout Area, at a rate of approximately 3 gpm.

This reclamation plan acknowledges that the water will continue to discharge from the mine (i.e., from the portal collection pipes, the old works French drain, and the saturated sandstone ledge) at current flow rates indefinitely into the future. The company proposes to address the long-term discharge of mine-water in the following manner: 1) backfill the portals, reroute the existing collection piping system to direct water flow to the west; 2) replace the existing exposed overland drainpipe (running across the hillside to the iron treatment facility, then to the UPDES outfall) with an approved armored (rip-rapped) open channel constructed within the existing roadway grade to direct the discharge water to a new wetlands area; and 3) collect the seepage from the sandstone ledge with a drain rock/drainpipe system as part of backfilling the

sandstone ledge area below the portals. These elements are discussed individually as follows:

1) The existing collection system utilizes 10" heavy-wall PVC pipe extending through the seals in all four portals. Additional 4" pipes also collect seepage water outside the seals which is contained behind low check dams constructed within the portals. All piping is buried and was installed with plans to be part of a permanent post-reclamation discharge system. Upon reclamation, after the steel portal canopies have been removed, the portals will be completely backfilled as described below, leaving only the stub of pipe exiting from the re-contoured surface grade so water can drain to the west. Figure 5-14 shows details of the existing pipe collection system.

2) Presently, the discharge water is conveyed from the portals and across the hillside through a 12" PVC pipeline. This line then empties into a maelstrom aeration unit, then into the water treatment basin. After an appropriate settling time, the water exits the basin and enters an existing CMP culvert located under the roadway, which then leads to the main bypass culvert at an approved UPDES monitoring point. Upon final reclamation, the PVC pipe will be replaced with an overland open channel running down the existing roadway grade to a new wetlands area. A detail of this channel can be found on Plate 5-17d, and also in Plates 5-16 and 5-17. There would be no other flow in this channel other than the continuous 450 gpm (average) mine discharge flow.

3) Upon final reclamation, the sandstone ledge below the portals (a.k.a. Old Loadout Area) will be backfilled to a slope of 2 horizontal units to 1 vertical contour as described in Item 13 below. As explained above, due to the porous nature of this sandstone, it is now conveying a small but constant amount of mine water (approx.3 gpm) from behind the seals to the ledge outcrop below the portals. The seepage conduit appears to be localized and can easily be contained during final reclamation. This will be done by installing a drain system between the ledge-rock and the back-filled slope which will collect the seepage water into a single discharge pipe. This will then be directed so that all discharge enters into the Crandall Creek. The details of this backdrain collection system are explained in greater detail in Item 13 (Old Loadout Area) below, as well as Figure 5-15 and Appendix 5-28.

Once the portals have been sealed and backfilled (see Figure 5-14), reclamation work can then commence on the Portal Area. This work consists of removing all paving and road base, then backfilling the cuts to 2 horizontal units to 1 vertical unit contour, placing topsoil on the backfilled area and seeding the topsoiled area. Since the Portal Area (and the associated access road) is on a slope, this work will be done in short segments starting at the eastern-most (upper-most) portion of the area and working westward across the portal area. Then work will continue down the access road to the Shop Area to create the new drainage channel.

Fill material from the Expansion Area will be utilized to backfill and reclaim the highwall and portal area. The fill material will contain rock fragments of all sizes, including a significant

amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will be topped with 12" of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill in highwall and yard areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material to the Portal Area. The lifts will be built up horizontally with a slight slope on each lift toward the highwall. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is added. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil, prior to seeding, if a need is indicated by laboratory results. The fertilizer will be spread on the redistributed topsoil and either disked or hand-raked into the soil (depending on the steepness of the slope).

Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

## **5. Revegetation - Portal Area**

Revegetation procedures for the Portal Area and the south portal pocket cuts involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

## **6. Demolition - Old Substation Area**

The only structures existing at the Old Substation Area are the termination structure for the mine powerline and undisturbed culvert UD-1. This powerline will be dismantled and removed from the site prior to completion of final reclamation. Culvert UD-1 will remain to convey mine discharge water under the Forest Service Road and into Crandall Creek.

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

The existing grade and topsoil will remain after final reclamation. A large portion of this area is already undisturbed (see Plate 5-3).

## **8. Revegetation - Old Substation Area**

Revegetation will not be required for the Old Substation Area. A large portion of this area is undisturbed. Any disturbed area that received interim revegetation will not be disturbed and the established vegetation will remain after final reclamation.

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

Facilities to be removed from the Shop area include: Shop/Warehouse building, Substation, Rock Dust Bin, Oil Shed and parking lot asphalt. All structures will be removed from the site. Some components will be salvaged and recycled. Non-salvageable material will be disposed of in an approved solid waste landfill. All asphalt removed from the site will be disposed on in an approved RCRA disposal site. Culvert UD-1 will remain to convey mine discharge water under the Forest Service Road and into Crandall Creek.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

## **10. Excavation, Backfill, Grade and Topsoil - Shop Area**

With the Portal Area and Old Substation Area reclamation completed, reclamation activities can continue at the Shop Area. Reclamation will begin with the excavation for the wetlands area. Once the rough grade has been established, a wetlands area will be constructed to utilize mine water discharged from the Portal Area. The wetlands will be designed and constructed utilizing professionals familiar with wetlands design and construction, as well as reference material including, "Utah's Wetlands Workbook: A Guide to Proper Wetlands Management and Development" by Patricia A. Lock, Wetlands Specialist. At the western edge of the wetlands area, a new culvert will be installed that will connect with the existing culvert UD-1 to allow drainage of the water to the reconstructed Crandall Creek channel. The backfill

lifts will be built up horizontally with a slight incline on each lift toward the pond. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration. A silt fence will be installed at the edges of the wetlands to prevent topsoil erosion into the wetlands.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

## **11. Revegetation - Shop Area**

Revegetation procedures for the Shop Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

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

The Old Loadout area is now the site of the operational iron treatment facility. This reclamation plan assumes that the treatment facility will no longer be required at the time of final reclamation and all components of the system will have been removed at that time and water diverted to the new wetlands area. All asphalt removed from the site will be disposed on in an approved RCRA disposal site. A portion of the existing coal pile retaining wall will be removed, loaded onto trucks and hauled to an approved landfill. That portion not removed will be buried under a minimum of four feet of backfill material.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, crane, and truck with flat bed trailer.

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

With portions of the retaining wall removed, reclamation activities can continue at the Old Loadout Area. The same reclamation procedures will be used as described previously. The cut slope behind the retaining wall will be backfilled to a slope not to exceed 2 horizontal units to 1 vertical unit using fill material from the Expansion Area. The lifts will be built up horizontally with a slight incline on each lift toward the existing cut slope. The dozer/loader will spread the material in lifts of 18 to 24 inches deep. The mobile equipment will compact each lift as the next lift is put in. Near the top of the slope, a backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, the surface will be roughened with the backhoe bucket to prevent slippage of the topsoil layer and promote root penetration.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results of the most needful increment.

The areas to be topsoiled will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Because of the mine water which is now occurring behind the seals in the portals, there are several seeps which issue from the porous sandstone ledge located between the portal bench and the Old Loadout area below. Much of this seep water now appears to be coming from under the existing belt transfer (a.k.a., crusher) building, although other areas along the face of the ledge contribute seep flow as well. In order to properly handle this seepage on a permanent basis, a back-drain system will be installed at the interface of the sandstone ledge and the earthen reclamation backfill material. This back-drain system is described in greater detail in the geotechnical stability analysis prepared by RB&G Engineering, which appears in Appendix 5-28.

The back-drain would consist of a 2' thick layer of drain-rock placed against the entire height and width of the ledge face, between the rock ledge and the backfill material. Historical measurements of the seep (collected at the base of the ledge at the retaining wall), show an average flow rate of 3 gpm, with a maximum flow of about 5 gpm. Engineering analysis indicates that only a couple of inches of drain-rock is needed to adequately carry this small flow. However, a 24" contact layer has been specified in order to facilitate ease of placement and

containment during construction, as the backfill is constructed layer-by-layer from the base to the top of the ledge. In addition to the drain-rock layer the back-drain will also include a number of perforated drainpipes installed within the drain-rock layer. Two 6" diameter pipelines will be installed horizontally at the base of the ledge; one at the base of the existing retaining wall, and the other along the top of the retaining wall. The retaining wall is a massive reinforced concrete structure, measuring 12" thick and approximately 8' high in this area. This wall will be left in place at the toe of the ledge to add increased structural stability to the backfilled slope and drain system. A third perforated drain pipe will extend vertically from the horizontal drainpipes up to the location of the base of the existing (but to be removed during reclamation) crusher/transfer building. As mentioned earlier, it is from this area from whence much of the seepage water emanates. Therefore, a vertical pipe extending up to this location will provide added assurance that the seep-water can be adequately collected and routed to discharge. This vertical pipe will connect to the upper horizontal pipe atop the retaining wall. The two horizontal collection pipes will then join together and exit from behind the backfilled area and discharge the collected seep water directly into the mine-water discharge channel MD-1 (see Item 4) near the inlet to the culvert MC-1 under the road. Refer to Figure 5-15 and Appendix 5-28 for details of the under-drain system. See Appendix 7-4 for details of the mine-water discharge channel MD-1.

#### **14. Revegetation - Old Loadout Area**

Revegetation procedures for the Old Loadout Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

#### **15. Reclaim Forest Service Road North of Expansion Area**

The Forest Service/Emery County road from the trailhead/turnaround will be reclaimed according to the Special Use Permit. As stipulated in the existing Forest Service special use permit (8/26/89) covering the road, during final reclamation the width of the asphalt road surface within the permit area will be reduced from a 27 foot subgrade and 22 foot running surface to a 20 foot subgrade and 14 foot running surface. Asphalt removed from the permit area as part of this road narrowing will be taken to a approved RCRA disposal site. The reclaimed area will be topsoiled and revegetated as described above.

Based upon past correspondence, the Forest Service now indicates that it prefers to have the asphalt totally removed from the road surface upon final reclamation. This position differs

from the stipulations of the existing Forest Service Special Use Permit that requires that a 14' asphalt running surface be left in place upon final reclamation. Genwal commits to reclaiming the road through the mine site to any standard desired by the Forest Service/Emery County at the time of final reclamation. At the present time, however, it is difficult for Genwal to commit to a reclamation standard for the road that is contrary to the existing Forest Service Special Use Permit. Since the road now provides permanent access to the Crandall Canyon Memorial, which is owned by Emery County, the final disposition of the reclamation requirements regarding pavement removal may be determined in the future depending on discussions between the agencies involved.

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

The facilities to be removed from the Expansion Area are: the overhead conveyor, stacking tube, reclaim vault and tunnel/escapeway tube, crusher building, MCC building, loadout conveyor, truck loadout and loading platform. Removal of these facilities will take place simultaneously with removal of facilities from the aforementioned areas. After these surface facilities are removed, the only structures that will remain will be the sedimentation pond and associated spillway and discharge structure as well as the conveyance ditches, berms and culverts necessary to route drainage to the pond. Refer to Plates 5-16 and 7-5 for location of these structures.

Equipment used in the demolition and disposal of the facilities include: a front end loader, a backhoe, highway end dump trucks, a trackhoe, a crane, truck with flat bed trailer, oxy-acetylene torches, air compressor and power tools, etc.

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

Reclamation of the Expansion Area involves removal of fill material for other areas on the site, and the placement of backfill material to a height that covers the south portals to the Princess Mine. As described in the preceding sections, fill material removed from the Expansion Area will be used to regrade the Portal Area, Old Substation Area, Shop Area, and the Old Loadout Area. Therefore, these reclamation operations will be accomplished simultaneously. Expansion Area fill that is not slated for use as backfill (i.e., excess fill) will be disposed of at an approved off-site land fill.

Reclamation of the Expansion Area involves three separate procedures involving three separate areas: the North Slope of the Expansion Area, the reconstructed Crandall Creek Channel Area, and the South Slope of the Expansion Area. As described previously, the North Slope Expansion Area is that area north of the reconstructed Crandall Creek channel and south of the existing Forest Service road. The South Slope Expansion Area includes the hillside located south of the reconstructed Crandall Creek channel and the south portal area. The reconstructed Crandall Creek Channel Area is the area within and immediately on either side of the projected creek channel (see Plates 5-16 and 5-17).

Reclamation of the Expansion Area will follow the normal reclamation procedures described above for the other general areas (i.e. regrading, topsoiling and revegetation). The gentler slopes will not require different reclamation techniques than other areas of the mine site.

As a result of the Crandall Canyon Mine disaster of August 6, 2007, Genwal deeded a portion of the upper mine yard (upper end of the Expansion Area) to Emery County to be used as part of a permanent memorial to the deceased miners. (Refer to Appendix 5-27 for details of the deed agreement.) This deeded area measures approximately 240' x 330' (1.82 acres) and now serves as the parking area for the memorial, as well as the beginning portion of the trail that leads to the memorial headstones, as shown on Plate 5-3. As well as deeding this area to the County, the company also conveyed to the County a permanent easement for a road through the privately-owned part of the mine site. This road is a continuation of the existing Forest Service road, and will provide permanent public access to the memorial, even after final reclamation of the minesite. Since the parking area is now owned by Emery County as part of the memorial, the upper end of the Expansion Area, including the initial (upper) approximately 220' segment of bypass culvert running underneath it, will be left in place permanently. Other than leaving this upper area in place, all other elements of reclamation of the Expansion Area, as described herein remain the same. Refer to Appendix 5-27 for the Crandall Canyon Mine Memorial, Emery County Memorandum of Understanding and Quit-Claim Deed.

#### **18. Restoration of South and North Hillside Slopes - Expansion Area**

Five years prior to beginning reclamation operations, Genwal will consult with the Division to re-evaluate the techniques and practices being proposed for the Expansion Area. This consultation will include forming a task force of members with various areas of reclamation expertise to review the reclamation plan and recommend the best and most suitable reclamation techniques and products available at that time. The review and consultation will re-assess and revise, where needed, the existing reclamation plan to provide the best and most appropriate reclamation measures for the site.

At the time of final reclamation, all surface facilities located on the Expansion Area pad will be disassembled and removed from the site. In the area of the (then removed) coal stockpile, all coal will be removed from the small adjacent slope area where the south flank of the coal pile had previously rested. Prior to reclaiming this area, all coal fines will be vacuumed from the surface.

Following the surface facility demolition activities, fill will be removed from the Expansion Area in 5'-10' lifts starting from the west end of the yard, below the memorial parking area, and proceeding to the east. Removal of fill material adjacent to the South and North Slopes will be done very carefully in order not to disturb the in-place subsoil resources where these subsoils are scheduled to remain in-place. Fill removal in this area will be done with small earth-moving equipment (Bobcats, backhoes, etc.) and/or by hand if necessary in order to minimize disturbance of the subsoil.

Fill material from the Expansion Area will be utilized to backfill and contour the North and South Slopes to a maximum slope of 2 horizontal units to one vertical unit. The fill material will contain rock fragments of all sizes, including a significant amount of 6" to 8" rock fragments. These rocks will assist in providing slope stability and aid revegetation by helping to retain moisture. The fill material will be topped with 12" of topsoil material to promote plant growth.

Mobile heavy equipment will be utilized to move and place fill for the North and South Slope Areas and the south portal pocket cuts. A front end loader and end dumps will be used to remove fill material from the Expansion Area and haul the material as needed. The lifts will be built up horizontally with a slight slope on each lift away from the projected Crandall Creek channel. Material will be spread into lifts of 18 to 24 inches deep. The loader will compact each lift as the next lift is added. A backhoe will be used to place and compact the final lift. Before placing topsoil on the final backfilled surface, that surface will be roughened with the backhoe bucket. This will help prevent slippage of the topsoil layer and promote root penetration.

It should be noted that the contours of the North Slope of the Expansion Area will also be established as the Expansion Area fill is being removed in lifts as described previously. As the fill is being removed in vertical lifts, the adjacent North Slope surface will be regraded and prepared for subsequent topsoil application as noted above with a maximum slope of 2 horizontal units to 1 vertical unit.

Sediment control during fill excavation and placement will be met by continued use of the sediment pond east and downstream from the yard area. The main 72" culvert inlet will be left intact during this phase of the fill retrieval process as long as is possible.

## **19. Removal and Disposal of 72" Culvert**

During the 1997 construction of the expanded surface facilities, the creek channel configuration was left intact throughout the entire length of the Expansion Area. This was accomplished by covered the channel in situ with a geotextile fabric during initial construction period. The geotextile was placed over the channel to preserve the indigenous soil and morphology of the existing creek bed. The fabric was placed along the bottom and 5 feet above the channel embankment. A colored marker material was placed on top of the geotextile to serve as a visual marker horizon during reclamation operations.

Fill removal will proceed in vertical lifts on the North and South Slope Areas until the approximate rough elevation of the new Crandall Creek channel is established from its beginning point below the Memorial Parking Area to the location of the new culvert sections below the Sediment Pond. The existing 72" main culvert will remain intact during these excavation operations.

A new section of 72" culvert (approximately 60 feet) will be installed and tied to the existing 72" main culvert above the Sediment Pond as shown on Plate 5-16. A new culvert inlet

and headwall will be established where the newly constructed Crandall Creek channel will enter the 72" culvert system to bypass the Sediment Pond. A new temporary 24" culvert will then be run upon the new rough surface from the new 72" culvert tie-in to the location below the Memorial Parking. This 24" culvert will act as a bypass for streamflow while the 72" culvert is removed. Prior to removing the culvert, the stream flow will be diverted into the 18" underdrain system by removing the cap from the drain pipe located at the upstream end of the culvert. This will be done during a low flow period of the year, such as July or August. Once the streamflow has been successfully diverted into the underdrain system, removal of the 72" culvert can begin. Removal of the culvert will be done in 20' segments starting from the upstream end and working downstream. Once enough 72" culvert has been removed, the new temporary 24" culvert will be extended and a temporary inlet and headwall will be constructed to intercept the water from the underdrain system. The Crandall Creek streamflow will then flow through the temporary 24" culvert to the new 72" inlet above the Sediment Pond. Once the bypass culvert is operational, the remaining 72" culvert can be removed, proceeding downstream to the intersection with the new 72" diversion, where the existing 72" will be sealed upstream from the intersection with the new portion of 72" culvert for the Crandall Creek. The 72" culvert from above the Sediment Pond and beyond will remain through Phase 1 reclamation. All culvert material will be removed from the site and disposed of in an approved landfill.

At this stage of the reclamation process, approximately 990' of 72" culvert will have been removed, and approximately 310' will remain in place, below and around the left-in-place Sediment Pond. Streamflow will continue through the temporary 24" bypass culvert until the fill and excavation grading of the North and South Slope Areas is completed. Care will be used to maintain the integrity of the temporary 24" bypass culvert until earthwork is completed on the North and South Slopes.

## **20. Topsoiling - North and South Slopes of the Expansion Area**

Reclamation of the North and South Slopes, will be done with the standard protocol for reclamation involving topsoiling and revegetation. No special or unusual techniques will be required as the new contouring will have a maximum slope of 2 horizontal units to 1 vertical unit.

Topsoil will be reapplied to the North and South Slopes in the conventional manner. Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting

samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

## **21. Revegetation - North and South Slopes of the Expansion Area**

Revegetation procedures for the North and South Slopes of the Expansion Area involves a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

## **22. Reconstruction of the Stream Channel**

After the north and south slopes have been topsoiled, the temporary 24" bypass culvert and its associated inlet and headwall will be removed. Prior to removal of the temporary culvert, silt fences will be established along both sides of the new Crandall Creek channel downstream from the existing 72" culvert outlet. These silt fences will be located in an area convenient for maintenance and cleanout.

Removal of the temporary 24" bypass culvert will be done during low flow conditions. Using small mobile equipment, such as a backhoe, the remaining culvert will be removed in 20' segments starting from the lower end and working upstream. All drain rock, drain pipe and geotextile material removed during this process will be disposed of at an approved landfill. As each 20' segment of the underdrain system is removed, silt fencing will be installed on either side of the newly reconstructed stream channel. The purpose of this silt fencing is to treat drainage from the adjacent recently reclaimed areas.

After the temporary 24" bypass culvert has been removed and the stream channel re-established downstream past UD-1, a rip rapped ditchway will be installed to carry drainage from the UD-1 culvert outlet down the North Slope to the reconstructed stream channel. Refer to Plate 5-16.

The temporary 24" bypass culvert will be removed upon completion of the earthwork and topsoil application. At this time, the remaining 18" drain pipe below the Memorial Parking Area will be recapped and the stream flow rediverted back into the remaining section of the 72" culvert.

### **23. Vegetation of the Stream Channel**

Topsoil will be applied to the Stream Channel similarly to the North and South Slopes. Topsoil will be hauled in by truck and spread with a front end loader and/or backhoe. Areas to receive topsoil will be marked with stakes indicating the depth of application. A reclamation supervisor will oversee the topsoil redistribution operation. Topsoil will be left in a roughened condition prior to seeding to minimize compaction and erosion as well as promote infiltration of precipitation.

Genwal has committed to adding nutrients as determined by laboratory analysis conducted on topsoil samples taken before topsoil redistribution and during final reclamation. The method used to ensure adequate and representative samples from different locations and depths within the topsoil stockpile include: taking two soil samples per stockpile and collecting samples with a soil auger at two foot increments. Samples of the undisturbed soil adjacent to the regraded site will also be taken for a baseline chemical reference. Fertilizer will be added to the redistributed topsoil as indicated by laboratory results.

Vegetation procedures for the stream channel will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area above the channel's riprap armor with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the distributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

### **24. Sediment Control and Treatment**

In practice, many of the reclamation procedures outlined above will be conducted simultaneously. However, the sediment pond will provide complete sediment control during all phases of the reclamation process until such time as the upper 988' segment of 72" culvert (below the Memorial facility) has been removed and removal of the temporary 24" bypass culvert begins. Sediment control during removal of the temporary bypass culvert will consist of silt fences constructed on either side of the newly reconstructed stream channel and silt fences constructed within Crandall Creek below the outlet of the 72" culvert.

### **25. Topsoil Stockpile Location Reclamation**

Following the removal of the topsoil stockpiles from the storage sites (during final reclamation retopsoiling activities), the topsoil pile locations will be reclaimed. (Enough topsoil will remain stockpiled for Phase 2 reclamation. Refer to the Phase 2 reclamation discussion in

item #26 below.) The topsoil stockpile locations will not require soil redistribution since the native topsoil is still in place. At these locations, the ground will be lightly scarified and then reclaimed according to the standard reclamation protocol.

Revegetation procedures for the stockpile locations will involve a four step program: 1) application of fertilizer (if laboratory testing indicates a need), 2) hydroseed, 3) hydromulch the entire area with a wood fiber mulch to stabilize soil during vegetative growth and control runoff, 4) plant containerized stock to further stabilize the soil and provide vegetative diversity. Hydroseeding will combine the tackifier and small amount of mulch with the seed mix (to mark the area of coverage) during application to the redistributed topsoil. All seed utilized on the site will be certified pure live seed. After the seeding step, the mulch (wood fiber and hay/straw) and tackifier will be applied to the seedbed surface. The plant containerized stock will be planted in the second year of reclamation. Revegetation work will not be done until fall (September-October).

## Phase 2

### **26. Phase 2 Reclamation - Removal of Sedimentation Pond**

During Phase 2 reclamation, prior to any earthwork activity, silt fences will be installed across the entire length of the downstream at the east end of the sediment pond embankment to filter any sediment resulting from removal of the pond. Additional silt fences will be installed in Crandall Creek below the culvert outlet to provide additional sediment control.

Removal of the sediment pond and the remaining 72" culvert/underdrain system will follow the same procedures described previously for the removal of the expansion area fill. The pond embankment will be removed in lifts down to the 72" pipe. Reclamation (grading, topsoiling and revegetation) of the North and South Slopes will be done in the same manner as described for the Expansion Area in Phase 1 reclamation. After the 72" culvert has been exposed the end cap will be removed from the 18" drain pipe located in the underdrain system. Flow will then be diverted through a temporary 24" bypass culvert during excavation and removal of the remaining 72" main culvert.

After the 72" pipe has been completely removed, the new channel for the Crandall Creek will be established. The disturbed area will be vegetated in the manner previously described for the previously reclaimed areas. In many ways, Phase 2 reclamation of the sediment pond embankment will be nearly identical to the Expansion Area reclamation described previously for Phase 1. Therefore, all pertinent aspects of reclamation which apply to Phase 1, as described in this appendix, will also apply to Phase 2. This includes the standard reclamation procedures for the North and South Slopes.

**RECLAMATION TIME TABLE  
CRANDALL CANYON MINE**

**RECLAMATION OPERATION**

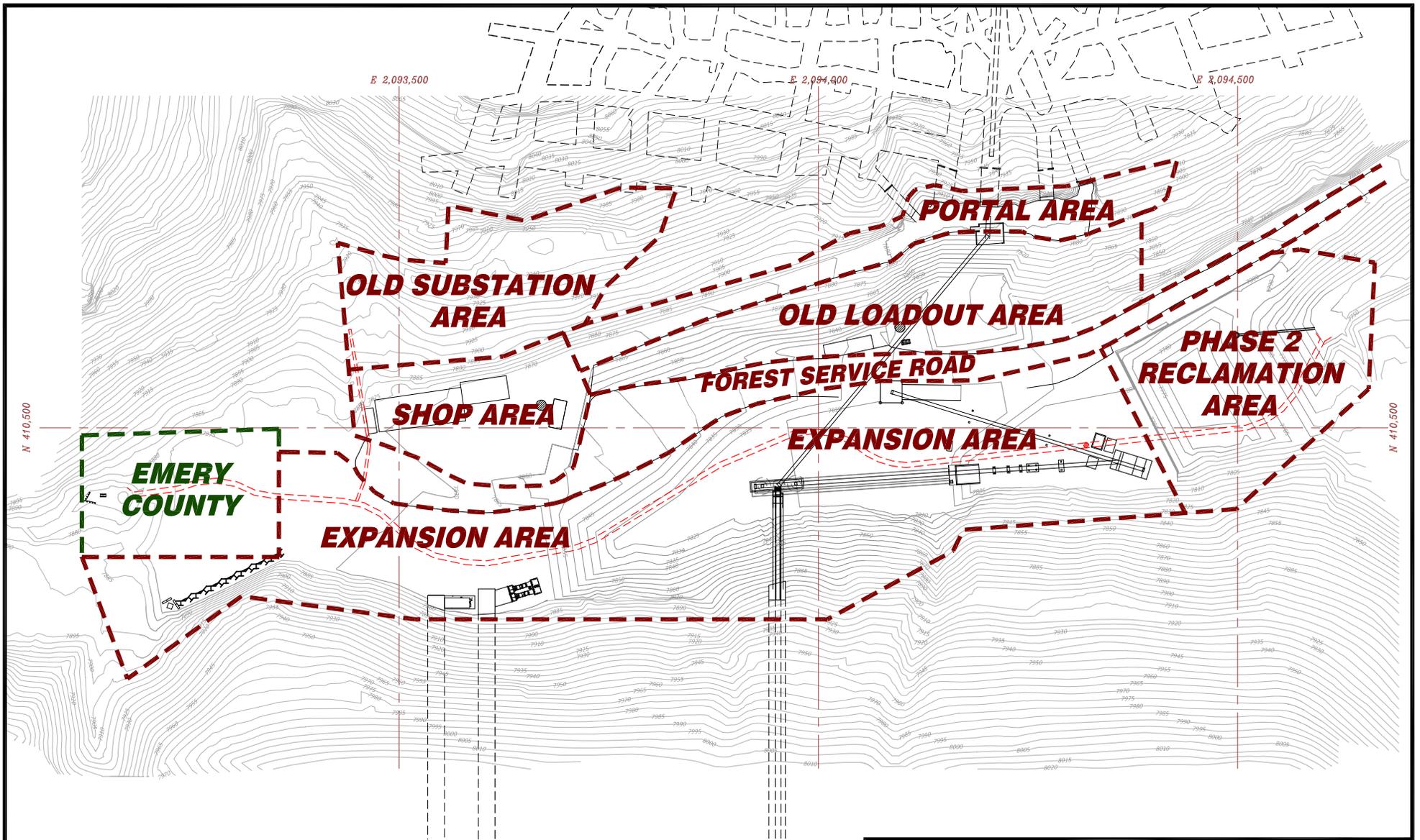
**MAY**      **JUNE**      **JULY**      **AUGUST**      **SEPTEMBER**      **OCTOBER**  
 WK1 WK2 WK3 WK4    WK1 WK2 WK3 WK4

RECLAMATION OPERATION	MAY WK1	MAY WK2	MAY WK3	MAY WK4	JUNE WK1	JUNE WK2	JUNE WK3	JUNE WK4	JULY WK1	JULY WK2	JULY WK3	JULY WK4	AUGUST WK1	AUGUST WK2	AUGUST WK3	AUGUST WK4	SEPTEMBER WK1	SEPTEMBER WK2	SEPTEMBER WK3	SEPTEMBER WK4	OCTOBER WK1	OCTOBER WK2	OCTOBER WK3	OCTOBER WK4
<b>PORTAL AREA</b>																								
Remove structures	█	█	█	█																				
Remove asphalt	█																							
Haul earthfill into mine workings					█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Seal portals													█	█	█	█	█	█	█	█	█	█	█	
Backfill, regrade, recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SUBSTATION AREA</b>																								
Remove structures					█	█	█	█																
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD SHOP</b>																								
Remove structures	█	█	█	█																				
Remove asphalt	█	█	█	█																				
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>OLD LOADOUT AREA</b>																								
Remove structures					█	█	█	█																
Remove asphalt																								
Backfill/regrade/recontour																								
Topsoil																								
Seeding/mulching																								
<b>FOREST SERVICE ROAD</b>																								
Remove asphalt																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - NORTH SIDE</b>																								
Remove structures	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Remove asphalt (if any)	█	█	█	█																				
Remove fill (haul to mine workings)					█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Re-establish drainage ditches and rip rap																								
Topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - SOUTH SIDE</b>																								
Remove structures	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Remove asphalt (if any)	█	█	█	█																				
Remove fill (haul to mine workings)					█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	
Remove marker material, geotextile																								
Revitalize existing topsoil																								
Seeding/mulching																								
<b>EXPANSION AREA - STREAM CHANNEL</b>																								
Remove 72" CMP																								
Remove underdrain and geotextile																								
Revitalize existing topsoil																								
Re-establish culvert inlet/headwall																								
Seeding/mulching																								

INCORPORATED  
EFFECTIVE:

JUL 30 1997

UTAH DIVISION OIL, GAS AND MINING  
PRICE FIELD OFFICE



<b>RECLAMATION AREAS</b>			
<b>RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE</b>			
 <b>GENWAL™</b> RESOURCES, INC. 794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520 P.O. BOX 910, PRICE, UTAH 84520 PHONE: (435) 888-4000      FAX: (435) 888-4002		<b>CRANDALL CANYON MINES</b>	
		PERMIT NUMBER C015/032	
DRAWN BY	PJ	SCALE	NO SCALE
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	FIGURE 1

ATTACHMENT 1

JBR ENVIRONMENTAL CONSULTANTS, INC.  
RECLAMATION RECOMMENDATION LETTER

Jean M. Semborski  
Andalex Resources Inc.  
Project Engineer  
P.O. Box 902  
Price, UT 84501

May 22, 1997

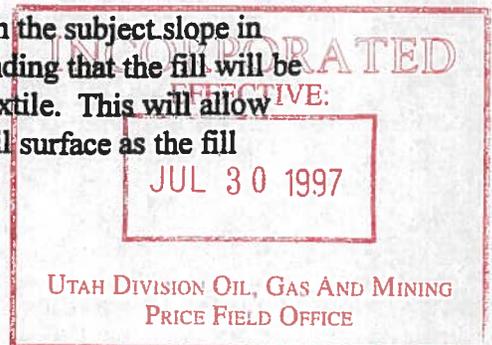
RE: Crandall Canyon Culvert Reclamation Plan ACT/015/032

Dear Ms. Semborski:

This is to your request of May 16, 1997 regarding the reclamation plans for the site of Genwal's proposed fill and culvert in Crandall Canyon. Based on our discussions, and my review of your reclamation plan on May 15, 1997, I believe the main topics of interest in the proposed reclamation plan are:

- 1) The existing soil horizon in the canyon that would be covered by the fill will be removed from the surface environment for a number of years as well as being compacted to various degrees by the overlying fill. Extended burial of the soil may affect its density by compaction and may reduce the viability of the soil micro fauna by compaction and reduction of oxygen.
- 2) The north-facing slope under the fill is steep and erosion may be a problem if normal, mechanized seedbed preparation (scarifying and gouging) is conducted which disturbs the soil and may make it more prone to erosion.
- 3) Use of sewage sludge or chemical fertilizer to amend the soil must be done carefully or it may result in contamination of the adjacent stream.
- 4) Prevention of erosion of the soil after seeding is important because of the nearby stream channel.

My general recommendation is that Genwal should propose to reclaim the subject slope in sections as it is being exhumed from under the fill. It is my understanding that the fill will be removed in lifts to allow careful removal of the marker soil and geotextile. This will allow convenient access to all areas of the treated slope from the adjacent fill surface as the fill elevation is gradually reduced.



J. Semborski Letter

May 22, 1997

Page 2

The seedbed preparation and seeding should be done with hand labor using hand rakes to lightly scarify the top inch or so of the soil surface, broadcast seed and fertilizer. This light hand work will produce a suitable seedbed for the seed and will thoroughly allow incorporation of the fertilizer into the seedbed. The hand raking should not be so deep as to destabilize the overall soil horizon.

Material such as polyacrylamide (PAM) can be added to the soil to chemically open up the soil for air and water penetration. However, I do not think that the compacted density of the soil immediately after it is exhumed should be much of a hindrance to long-term revegetation success. First of all, most of the soil will be buried under less than the full height of the fill thus the degree of compaction will not be uniform. The soil on the upper portions of the slope will be much less compacted than the soil at the bottom of the slope. Secondly, assuming that the reclamation and reseeding is done in the fall, the soil will be loosened over the winter and early spring by the effects of the weather before germination of the seeds. I would expect the combined effects of frost heave, moisture penetration, and burrowing animals during that first fall, winter, and early spring to naturally mitigate much of the original compacted density.

Erosion control material should be applied after preparation of the seedbed is completed. Hydraulically applied fiber mulch with tackifier and/or bonded fiber matrix should be effective in controlling erosion and may be more cost effective than stapled fiber matting.

With regard to the potential lack of viability of the soil because of its burial, I am not sure that this effect will materially affect the potential revegetation success, using the methods described above. I am familiar with successful revegetation of disturbed mining surfaces where there is no topsoil present. I am aware of materials such as mill tailings, waste rock, alluvium, road base, and heap leach waste that have been successfully revegetated without application of topsoil. These materials are typically enhanced with the use of fertilizer to help support the initial vegetation growth. In these cases, the material used as growth medium did not have the soil micro-fauna typically associated with topsoil, yet the vegetation became well established with chemical fertilizer addition. I have also observed many highway road cut sites where the seedbed was recently exhumed from its previous burial under significant overburden and these slopes have subsequently been revegetated.

In my experience, the main limitations to successful revegetation are lack of suitable soil texture, inadequate chemical nutrients in the growth material, and lack of moisture. In your case, the initial soil texture (gradation) should be unchanged by the burial. Lack of nutrients in the exhumed soil could be determined with sampling and mitigated with chemical fertilizer but its application would have to be carefully planned and carried out to reduce the potential for contamination of the nearby stream from the fertilizer. The location of the soil in question on a north-facing slope at higher elevations should indicate that sufficient moisture for vegetation growth is likely.

J. Semborski Letter

May 22, 1997

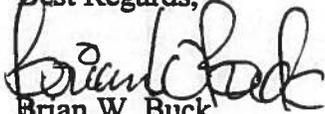
Page 3

The micro-fauna of the topsoil in question at the Crandall Canyon site may be reduced in numbers and diversity by burial but the soil should still possess suitable gradation, chemical nutrient content and moisture for the above-described reasons. This material should therefore provide a suitable growth material for revegetation. The compacted soil may benefit from use of a mycorrhizal inoculum but even this may not be necessary for the initial establishment of a vegetation cover. The soil micro-fauna will eventually be naturally re-established by the affects of the growing vegetation and exposure to the surface environment. This may be accelerated up with use of a suitable cover crop.

I believe that future revegetation of the slope in question at the Crandall Canyon site should be readily feasible if the recommendations contained in this letter are followed.

Thank you for calling on JBR to assist you with this project. Please call if you have any questions on my recommendations.

Best Regards,



Brian W. Buck  
Vice President

# **Crandall Canyon Mine**

## **Appendix 5-27**

**Crandall Canyon Memorial  
Emery County Memorandum  
of Agreement,  
Quit-Claim Deed**

**MEMORANDUM OF AGREEMENT**

**by and between**

**INTERMOUNTAIN POWER AGENCY,  
ANDALEX RESOURCES, INC. and  
EMERY COUNTY, UTAH**

**THIS MEMORANDUM OF AGREEMENT (“Agreement”)** is entered into this 21 day of May, 2008 (the “**Effective Date**”) by and between **INTERMOUNTAIN POWER AGENCY**, a political subdivision of the State of Utah (“**IPA**”); **ANDALEX RESOURCES, INC.**, a Delaware corporation (“**ANDALEX**”); and **EMERY COUNTY, UTAH**, a body corporate and politic, acting through the **COMMISSION OF EMERY COUNTY, UTAH (“Emery County”)**. Concerning IPA’s obligations under this Agreement, the Los Angeles Department of Water and Power, as Operating Agent for the IPA, shall administer this Agreement on behalf of IPA.

**WHEREAS**, IPA and ANDALEX jointly own certain properties for the production, mining, and loading of coal at or near the town of Huntington in Emery County, Utah known as the Crandall Canyon Mine;

**WHEREAS**, on or about August 6, 2007, an accident occurred at the Crandall Canyon Mine resulting in six miners being trapped in the Mine;

**WHEREAS**, the six trapped miners, Kerry Allred, Don Erickson, Luis Hernandez, Juan Carlos Payan, Brandon Phillips and Manuel Sanchez, are now deceased;

**WHEREAS**, the families of the six trapped miners have now expressed their desire to establish a monument at the site of the Crandall Canyon Mine as a permanent memorial;

**WHEREAS**, on February 19, 2008, Emery County unanimously voted to support and represent the families of the six trapped miners in their efforts to establish the permanent memorial;

**WHEREAS**, ANDALEX and IPA fully support the families’ efforts to establish a permanent memorial to the six trapped miners; and

**WHEREAS**, ANDALEX, IPA and Emery County now desire to enter into this Memorandum of Agreement for the purpose of setting forth their agreement and understanding concerning the establishment of a permanent memorial to the six miners trapped in the Crandall Canyon Mine and will endeavor to complete the memorial by August 6, 2008.

**NOW THEREFORE**, for and in consideration of the above premises and in consideration of the mutual benefits to be derived, the parties agree as follows:

1. ANDALEX, IPA and Emery County mutually agree to cooperate for the purpose of establishing a monument at the site of the Crandall Canyon Mine as a permanent memorial to the six miners trapped in the Crandall Canyon Mine on August 6, 2007. The memorial shall be hereinafter referred to as the “**Crandall Canyon Memorial.**” The location map and site plan for the Crandall Canyon Memorial, including an associated trail and parking lot, to be established at the site of the Crandall Canyon Mine are attached hereto as Exhibit 1.
2. As shown on Exhibit 1, the Crandall Canyon Memorial shall be located on land owned by the United States Forest Service (“**USFS**”). The dedicated parking lot for the Crandall Canyon Memorial will be located on fee land jointly owned by ANDALEX and IPA. The trail leading from the parking lot to the site of the Crandall Canyon Memorial will be located partially on land owned by USFS, and partially on land owned by ANDALEX and IPA. It is the intent of the parties hereto that Emery County will own all permits, rights-of-way, and real property necessary for the establishment, construction, and maintenance of the Crandall Canyon Memorial and associated facilities, including the parking lot and trail.
3. Emery County shall prepare and submit an application to the USFS for a Special Use Permit for the Crandall Canyon Memorial site and trail. ANDALEX and IPA agree to assume joint responsibility for the costs associated with the preparation of the application for the Special Use Permit. In addition, if the USFS determines that analysis is required under the National Environmental Policy Act (“**NEPA**”) for federal actions associated with the Crandall Canyon Monument, ANDALEX and IPA agree to assume joint responsibility for the costs associated with the preparation of any such analysis.
4. ANDALEX and IPA will convey by quit claim deed to Emery County the real property (located near the upper section of the mine material storage yard) to be dedicated to the memorial parking lot and the beginning section of the trail (“**Deeded Land**”), on land located in Emery County, Utah, and more particularly described as follows:

Beginning at the Northwest Corner of the Southwest Corner of Section 5, Township 16 South, Range 7 East of the Salt Lake Baseline and Meridian; thence running N88°06'35"E for 235.13'; thence South for 152.75'; thence West for 235.00'; thence North along the west section line of Section 5 for 145.00' to the Point of Beginning, containing 0.803 acres, more or less.

5. ANDALEX and IPA will also grant to Emery County an easement (“**Road Easement**”) for a public road through the minesite which will connect the Deeded Land to the existing Forest Service Road No. 50248 (a.k.a., Crandall Canyon Road), on land located in Emery County, Utah, and more particularly described as follows:

Encompassing 22.0' on either side (44' total) of a center line

beginning at a point that is located N88°06'35"E 695.40' from the Northwest Corner of the Southwest Corner of Section 5, Township 16 South, Range 7 East of the Salt Lake Baseline and Meridian; thence running S59°33'11"W for 12.78'; thence S54°25'37"W for 50.0'; thence S56°02'53"W for 50.0'; thence S65°54'48" W for 50.0'; thence S80°43'13"W for 50.0'; thence N84°43'48" for 50.0'; thence N62°43'15"W for 50.0'; thence N70°56'20"W for 50.0'; thence N73°32'52"W for 48.36'; thence S88°06'35"W for 319.18' to the end point which is located 22.0' South of the Northwest Corner of the Southwest Corner of said Section 5.

This easement follows the alignment of the existing public access through the minesite to the Forest Service trailhead. The ANDALEX operator, Genwal Resources, Inc. ("**GRI**") will continue to be responsible for all maintenance of this road until such time as the mine is reclaimed as provided in the MRP as that term is defined in paragraph 6 below and Phase 1 bond release is obtained. At the time of final reclamation GRI will reclaim this segment of road to the extent required by State and Federal regulations.

6. The parties acknowledge that the Deeded Land is currently included within the Crandall Canyon Mine Mining and Reclamation Plan, Permit No. C015/032 ("**MRP**") filed with the Utah Division of Oil, Gas and Mining ("**DOG**M"). ANDALEX through GRI, as permittee, shall amend the MRP to acknowledge the memorial parking area and trailhead within the Deeded Land as permanent structures and will obtain a post-mining land use change in the MRP to reflect this change. GRI will remove those portions of the Deeded Land used in conjunction with the memorial from all MRP permitting and reclamation requirements.
7. Within the Deeded Land a fence and/or barrier shall be constructed by GRI to delineate and separate the boundary of the memorial parking area from the mine operational area, at the approximate location and configuration as shown on Exhibit 1 attached hereto. The parties acknowledge that the mine operation area outside the parking area delineation can continue to be used by GRI for mine-related operations and reclamation until the mine is reclaimed as provided in paragraphs 8, 9 and 10 herein, and is further subject to the terms of that certain Right-of-Way Easement effective as of January 1, 2004, by and between ANDALEX, IPA and PacifiCorp ("**PacifiCorp ROW**"). The quit claim deed conveying the Deeded Land to Emery County will expressly except and reserve these uses.
8. GRI shall continue to be responsible for all MRP permitting and reclamation obligations for the operational area of the Deeded Land located outside the delineated memorial area and for the road easement. Emery County will assume no permitting or reclamation liabilities under the MRP for the Deeded Land or the Road Easement and GRI agrees to indemnify and hold harmless Emery County from all costs, penalties and liabilities associated with its permitting and reclamation obligations under the MRP.
9. A 6-foot diameter undisturbed drainage culvert is presently located under the Deeded Land, and will not be removed as a result of post-mining reclamation. GRI will amend

the MRP permit to acknowledge that within the Deeded Land, the memorial parking area and trail and the underlying culvert will remain as permanent structures as a post-mining land use, as shown on Exhibit 2 attached hereto. GRI will be responsible for all maintenance and upkeep of this segment of culvert until such time as the mine site is reclaimed and Phase 1 bond release is achieved under the MRP. Prior to Phase 1 bond release, GRI will make any and all necessary repairs to the culvert so that it is deemed at that time by Emery County to be fully functional. Following Phase 1 bond release, Emery County will assume responsibility for maintenance of the culvert and will indemnify and hold GRI harmless from all costs and liabilities associated with the culvert.

10. Emery County acknowledges that a small area within the northeast corner of the Deeded Land (as shown on Exhibit 1) is now, and has been in the past, used as an integral part of the existing Forest Service trailhead and trailhead parking facility, open to the public, and agrees that this unrestricted usage will continue in the future, at the discretion of the Forest Service, both while the mine remains in operation and after reclamation is completed in accordance with the MRP and Forest Service Special Use Permit PRI42.
11. ANDALEX and IPA agree to assume joint responsibility for costs associated with the construction of the Crandall Canyon Memorial, trail, parking lot, and parking lot delineation. Further, ANDALEX and IPA agree to oversee the construction of the Crandall Canyon Memorial project and to secure all necessary construction contracts related thereto. The trail leading to the Crandall Canyon Memorial shall be designed and constructed to meet applicable Emery County and USFS standards, if any.
12. Following execution of this Memorandum of Agreement, ANDALEX and IPA will promptly initiate discussions with USFS to effect a land exchange with USFS whereby: (i) ANDALEX and IPA would acquire from USFS joint ownership of a yet to be defined parcel of USFS land surrounding the site of the Crandall Canyon Memorial and located adjacent to the Deeded Land, and (ii) in exchange, USFS would acquire ownership of a yet to be defined parcel of real property owned by ANDALEX and IPA and located in lower Huntington Canyon, as shown on Exhibit 3 attached hereto. It is anticipated that USFS will issue the Special Use Permit discussed in Paragraph 3 above to Emery County for renewable five (5) year terms with the understanding that the surface area situated around the site of the Crandall Canyon Memorial will ultimately be conveyed by USFS to ANDALEX and IPA in a land exchange. The parties hereto will use their best efforts to diligently pursue the exchange with the USFS. Once the land associated with the Crandall Canyon Memorial has been acquired by ANDALEX and IPA through the exchange from USFS, it will be conveyed to Emery County to ensure that Emery County can maintain full administrative control of the Crandall Canyon Memorial without the long-term involvement of USFS.
13. ANDALEX and IPA agree to assume joint responsibility for the costs associated with reasonably necessary title searches and abstracts for the property to be transferred to Emery County by the terms of this Agreement. However, ANDALEX and IPA will not warrant title to such property.

14. It is the intent of ANDALEX, IPA and Emery County that, subject to Paragraphs 8, 9 and 10 above, following the construction of the Crandall Canyon Memorial, issuance of the necessary permits and the transfer of real property as described herein, Emery County shall assume permanent responsibility for maintenance and upkeep of the Crandall Canyon Memorial, trail, parking lot and any other properties or structures associated therewith. Following such time, and subject to paragraphs 8, 9 and 10, Emery County shall indemnify and hold harmless ANDALEX, IPA and GRI from all costs and liabilities associated therewith.
15. This Memorandum of Agreement shall take effect on the Effective Date and shall terminate upon the first to occur of the following events:
  - (a) ANDALEX, IPA and Emery County have satisfied their respective obligations hereunder; or
  - (b) Ten (10) years following the Effective Date.
16. This Memorandum of Agreement may not be assigned by any party hereto, without the prior written consent of the other parties hereto. The provisions of this Memorandum of Agreement are binding on, and shall inure to the benefit of the parties hereto and their permitted successors and assigns.
17. All notices, requests, demands and other communications required or permitted under this Memorandum of Agreement shall be in writing and shall be deemed to have been given on the date of delivery in person or of deposit in the United States mail, postage prepaid, if sent by registered or certified mail, return receipt requested, addressed to the parties at the addresses set forth below, or at such other addresses as to which the parties give notice in accordance herewith.

If to IPA: Intermountain Power Agency  
c/o Los Angeles Department of Water and Power  
111 North Hope Street, Room 1263  
Los Angeles, California 90012  
Attention: William Engels  
Facsimile: (213) 367-0269

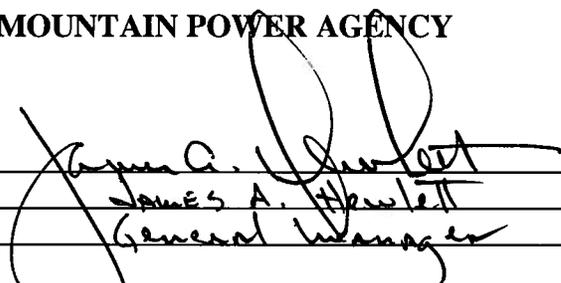
If to ANDALEX: ANDALEX Resources, Inc.  
6750 N Airport Rd  
P.O. Box 902  
Price, UT 84501  
Attention: David Shaver  
Facsimile: (435) 888- 4002

If to Emery County: Emery County Commission  
Emery County Courthouse  
Castle Dale, UT 84513  
Attention: Ray D. Petersen  
Facsimile: (435) 381-5644

18. No waiver of any of the provisions of this Memorandum of Agreement shall be deemed or shall constitute a waiver of any other provision hereof.
19. Nothing in this Memorandum of Agreement shall entitle any person or entity other than the parties hereto, their successors and assigns, to any claim, cause of action, remedy or right of any kind.
20. This Memorandum of Agreement may be executed in any number of counterparts and each such counterpart hereof shall be deemed to be an original instrument, but all such counterparts together shall constitute for all purposes one document.
21. This Memorandum of Agreement constitutes all of the promises and agreements between the parties hereto with respect to the subject matter of this Agreement and supersedes any and all prior understandings, inducements or conditions, either expressed or implied, oral or written

**IN WITNESS WHEREOF**, the parties have executed this Memorandum of Agreement as of the date first shown above.

**INTERMOUNTAIN POWER AGENCY**

By:   
 Name: JAMES A. Hewlett  
 Title: General Manager

**ANDALEX RESOURCES, INC.**

By: P. Bruce Hill  
 Name: P. Bruce Hill  
 Title: President & CEO

**EMERY COUNTY, UTAH**, a body corporate and politic, acting through the **COMMISSION OF EMERY COUNTY, UTAH**

By: Drew Sitterup  
 Name: Drew Sitterup  
 Title: Commission Chair

# U.S. FOREST SERVICE

SECTION 6  
1/4 CORNER

SECTION 5

235.13'

FOREST SERVICE  
TRAILHEAD PARKING

SHOP

FOREST SERVICE  
ROAD #50248

"ROAD EASEMENT"

MINE STORAGE  
AREA

PARKING AREA  
DELINEATION FENCE  
(APPROXIMATE LOCATION)

UNDISTURBED DRAINAGE CULVERT

SOUTH CRANDALL  
MINE PORTALS

MINE OPERATIONS AREA } "DEEDED LAND"  
MEMORIAL PARKING AREA } (0.803 ACRES)

"CRANDALL CANYON  
MEMORIAL"

PACIFICORP  
EASEMENT

ANDALEX-IPA FEE

### LINE TYPE LEGEND

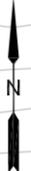
-  SECTION LINE
-  LAND OWNERSHIP / CONTROL BOUNDARY
-  EXISTING CONTOUR LINES AT 5' INTERVALS
-  EXISTING CONTOUR LINES AT 1' INTERVALS

### COLOR LEGEND

	MEMORIAL PARKING AREA WITHIN "DEEDED LAND"
	MINE OPERATIONS AREA WITHIN "DEEDED LAND"
	"ROAD EASEMENT"
	U.S. FOREST SERVICE LAND

## EXHIBIT 1

CRANDALL CANYON MEMORIAL  
SITE PLAN



# U.S. FOREST SERVICE

SECTION 6  
1/4 CORNER

SECTION 5

"DEEDED LAND"

USFS TRAIL

FOREST SERVICE  
TRAILHEAD PARKING

"ROAD EASEMENT"

MEMORIAL  
PARKING AREA

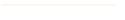
UNDISTURBED DRAINAGE CULVERT  
REMAINING SEGMENT

TRAIL

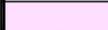
"CRANDALL CANYON  
MEMORIAL"

ANDALEX-IPA FEE

### LINE TYPE LEGEND

-  SECTION LINE
-  LAND OWNERSHIP / CONTROL BOUNDARY
-  RECLAIMED CONTOUR LINES AT 5' INTERVALS

### COLOR LEGEND

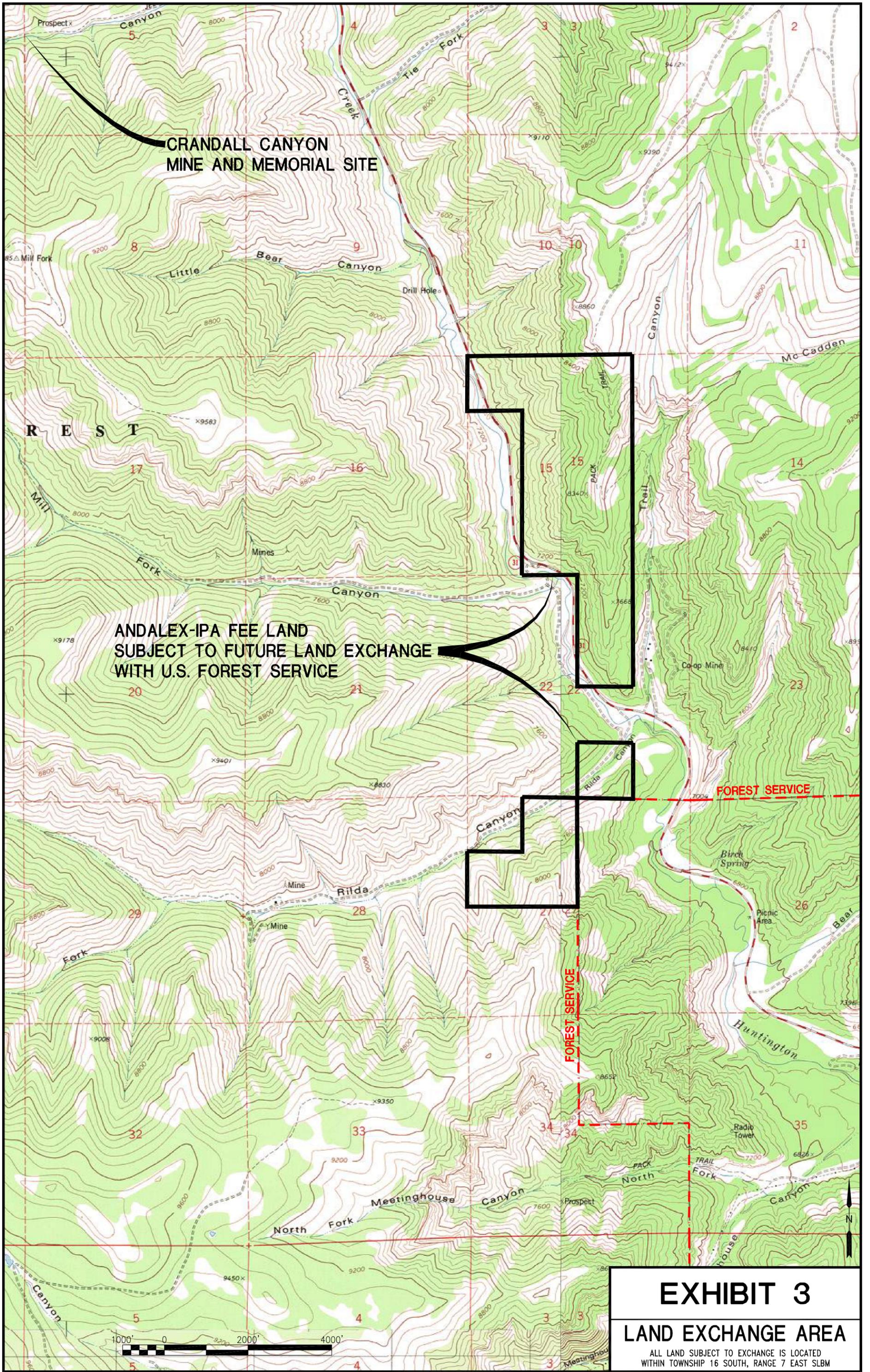
	"DEEDED LAND"
	"ROAD EASEMENT"
	U.S. FOREST SERVICE LAND



## EXHIBIT 2

POST-MINING  
RECLAMATION





**CRANDALL CANYON  
MINE AND MEMORIAL SITE**

**ANDALEX-IPA FEE LAND  
SUBJECT TO FUTURE LAND EXCHANGE  
WITH U.S. FOREST SERVICE**

**FOREST SERVICE**

**FOREST SERVICE**

# EXHIBIT 3

## LAND EXCHANGE AREA

ALL LAND SUBJECT TO EXCHANGE IS LOCATED  
WITHIN TOWNSHIP 16 SOUTH, RANGE 7 EAST SLBM

**WHEN RECORDED, RETURN TO:**

David A. Blackwell, Esq.  
Emery County Attorney  
1850 North 500 West  
P.O. Box 249  
Castle Dale, Utah 84513

**AMENDED QUITCLAIM DEED**

INTERMOUNTAIN POWER AGENCY, a political subdivision of the State of Utah, having an address of 111 North Hope Street, Room 1263, Los Angeles, California 90012, and ANDALEX RESOURCES, INC., a Delaware corporation, having an address of 6750 North Airport Road, P.O. Box 902, Price, Utah 84501 (collectively "Grantors"), amend and replace the Corrected Quit-Claim Deed dated as of June 4, 2008 by and between Grantors and Emery County, Utah recorded at Entry No. 390768, official records of Emery County, Utah and hereby quit-claim to EMERY COUNTY, UTAH, a body corporate and politic, having an address of Emery County Courthouse, Castle Dale, Utah 84513, for the sum of Ten Dollars (\$10.00), and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the following:

1. Deeded Land. A tract of land identified in Exhibit 1 attached hereto, as the "Deeded Land" located in Emery County, Utah, as follows:

Beginning at the Northwest Corner of the Southwest Quarter of Section 5, Township 16 South, Range 7 East of the Salt Lake Base and Meridian; thence running N88°06'35"E for 330.18'; thence South for 245.89'; thence West for 330.00'; thence North along the west section line of Section 5 for 235.00' to the Point of Beginning, containing 1.82 acres, more or less.

EXCEPTING AND RESERVING UNTO GRANTORS and their agents, affiliates, successors and assigns unlimited access to the area at the approximate location and configuration identified in Exhibit 1 attached hereto as the "mine operations area" for mine-related operations and reclamation until Phase 1 bond release occurs pursuant to the terms of the Crandall Canyon Mine Mining and Reclamation Plan, Permit No. C/015/032, on file with the Utah Division of Oil, Gas and Mining;

AND FURTHER SUBJECT TO the terms of that certain Right-of-Way Easement, effective as of January 1, 2004, by and between Grantors and PacifiCorp, recorded at Entry 368298, Book 315, Page 235, official records of Emery County, Utah.

2. Nonexclusive Road Easement. A nonexclusive easement for a public road identified in Exhibit 1 attached hereto as the "Road Easement" which will connect the Deeded Land to the existing Forest Service Road No. 50248 (a.k.a. "Crandall Canyon Road"), on land located in Emery County, Utah, and more particularly described as follows:

Encompassing 22.0' on either side (44' total) of a center line beginning at a point that is located N88°06'35"E 695.40' from the Northwest Corner of the Southwest Corner of Section 5, Township 16 South, Range 7 East of the Salt Lake Base and Meridian; thence running S59°33'11"W for 12.78'; thence S54°25'37"W for 50.0'; thence S56°02'53"W for 50.0'; thence S65°54'48" W for 50.0'; thence S80°43'13"W for 50.0'; thence N84°43'48" for 50.0'; thence N62°43'15"W for 50.0'; thence N70°56'20"W for 50.0'; thence N73°32'52"W for 48.36'; thence S88°06'35"W for 319.18' to the end point which is located 22.0' South of the Northwest Corner of the Southwest Corner of said Section 5.

3. Land Exchange Area. A tract of land identified in Exhibit 2 attached hereto, referred to as the "Land Exchange Area", more particularly described as follows:

That portion of the Northwest Quarter of the Northwest Quarter of Section 15, Township 16 South, Range 7 East, Salt Lake Base and Meridian lying Westerly of State Route 31, containing 7.5 acres, more or less, as scaled.

PROVIDED THAT, consistent with Paragraph 12 of that certain unrecorded Memorandum of Agreement between Grantee and Emery County dated as of May 21, 2008, said Land Exchange Area will, at some time in the future, be conveyed by Emery County, Utah to the U.S. Forest Service in exchange for conveyance by the U.S. Forest Service to Emery County, Utah of certain property owned by the U.S. Forest Service surrounding the site of the Crandall Canyon Memorial, identified in Exhibit 1 attached hereto, referred to as the Memorial Area and generally described as follows:

Beginning at the Northeast Corner of the Southeast Quarter of Section 6, Township 16 South, Range 7 East of the Salt Lake Baseline and Meridian; thence running West for 330'; thence South for 330'; thence East for 330' thence North along the east section line of Section 6 for 330', containing 2.5 acres, more or less (or some other suitable parcel configuration encompassing the Memorial site as mutually agreed upon by Emery County and the Forest Service at the time of the exchange)



# U.S. FOREST SERVICE

SECTION 6  
1/4 CORNER

SECTION 5

235.13'

FOREST SERVICE

TRAILHEAD PARKING

SHOP

FOREST SERVICE  
ROAD #50248

USFS TRAIL

"ROAD EASEMENT"

MINE STORAGE  
AREA

PARKING AREA  
DELINEATION FENCE  
(APPROXIMATE LOCATION)

UNDISTURBED DRAINAGE CULVERT

SOUTH CRANDALL  
MINE PORTALS

MINE OPERATIONS AREA

MEMORIAL PARKING AREA

"DEEDED LAND"  
(0.803 ACRES)

TRAIL

"CRANDALL CANYON  
MEMORIAL"

145.00'

235.00'

152.75'

PACIFICORP  
EASEMENT

## ANDALEX-IPA FEE

### LINE TYPE LEGEND

-  SECTION LINE
-  LAND OWNERSHIP / CONTROL BOUNDARY
-  EXISTING CONTOUR LINES AT 5' INTERVALS
-  EXISTING CONTOUR LINES AT 1' INTERVALS

### COLOR LEGEND

-  MEMORIAL PARKING AREA WITHIN "DEEDED LAND"
-  MINE OPERATIONS AREA WITHIN "DEEDED LAND"
-  "ROAD EASEMENT"
-  U.S. FOREST SERVICE LAND

## EXHIBIT 1

### CRANDALL CANYON MEMORIAL SITE PLAN



# **Crandall Canyon Mine**

## **Appendix 5-28**

### **Geotechnical Stability Analysis**

July 11, 2011

Dave Shaver  
West Ridge Resources, Inc.  
P.O. Box 1077  
Price, UT 84501

Re: Crandall Canyon Mine

Dear Mr. Shaver:

Slope Stability Analyses and Design Recommendations have been completed for the Crandall Canyon Mine near Huntington, Utah. The results of the study are summarized in the report transmitted herewith.

We appreciate the opportunity of providing this service for you. If there are any questions relating to the information contained herein, please call.

Sincerely,

RB&G ENGINEERING, INC.

  
Bradford E. Price, P.E.



bep/jal

**CRANDALL CANYON MINE**  
Near Huntington, Utah

***Slope Stability Analyses and Design Recommendations***

**I. INTRODUCTION**

**1. PURPOSE AND SCOPE**

A slope stability analysis has been performed for a fill to be constructed as part of the rehabilitation of the Crandall Canyon Mine. The purpose and scope of this analysis was to provide recommendations relative to design and construction. The scope of work was limited to site reconnaissance and design analyses and recommendations.

**2. SITE LOCATION AND DESCRIPTION**

The Crandall Canyon Mine is located about 14 miles northwest of Huntington, Utah. The mine portal is situated about 1 mile west of Highway 31 within a narrow canyon. The mine has been closed and it is our understanding that rehabilitation work is required. While the mine was in operation, the hillside in the vicinity of the mine portal was excavated. The cut surface of the hillside below the portal bench is about 80 feet high. The plan view base of the area excavated is trapezoidal in shape with average dimensions of about 80 feet by 120 feet.

The excavated materials consisted of overburden soils, weathered and competent bedrock. Rock bolts and shotcrete were installed in potentially unstable areas. At the time of our site visit (August 2009), the excavation appeared to be stable.

**3. PROJECT DESCRIPTION**

It is our understanding that rehabilitation of the mine requires that the exposed excavation in the vicinity of the portal be backfilled. The fill will generally restore the hillside to the slopes which existed prior to excavation.

## II. DESIGN RECOMMENDATIONS

### 1. STABILITY ANALYSES

Subsurface investigations to determine the properties of the materials within the existing hillside were not performed. For purposes of this analysis, it has been assumed that the existing hillside is stable and that the critical failure surface will be contained within the added fill section. During the analyses, the bedrock materials within the existing hillside were assumed to have a unit weight of 150 pcf, an internal friction angle of 0 degrees and a cohesion value of 5000 psf.

It is our understanding that granular fill materials will be available to construct the fill. We have assumed that the fill material will have a total unit weight of about 135 pcf, internal friction angle of 36 degrees and 10 psf cohesion.

The 2002 USGS Seismic Hazard Deaggregation feature of the USGS web site was used to determine the mapped probabilistic peak ground acceleration (PGA) value for this site. The mapped PGA value is 0.16g for an event having a 10% probability of exceedance in 50 years. It is our opinion that the seismic event corresponding to this probability of exceedance is appropriate for this project. Stability analyses were performed using pseudo-static methods with acceleration equal to  $\frac{1}{2}$  the mapped PGA value.

It is our understanding that the existing road through the bottom of the canyon will remain after rehabilitation is complete. In order to leave the road at the present alignment, a fill slope of about 1.76H: 1V (Horizontal: Vertical) will be required. Stability analyses indicate that this slope will have a factor of safety against failure of about 1.33 provided that the fill materials used have strength parameters at least as great as those assumed. Pseudo-static seismic stability analysis resulted in a factor of safety of 1.12.

Figures illustrating the slope stability analyses are attached to this report along with a drawing showing plan and cross section views. It is our understanding that plans to fill the area between the portal bench and the top of the portal wall is being submitted separately and it will be noted from the attached drawing that the fill section analyzed extends from the roadway to the portal bench level. Recommended gradation properties and Atterberg limits for fill materials are shown on the drawings.

## 2. OTHER CONSIDERATIONS

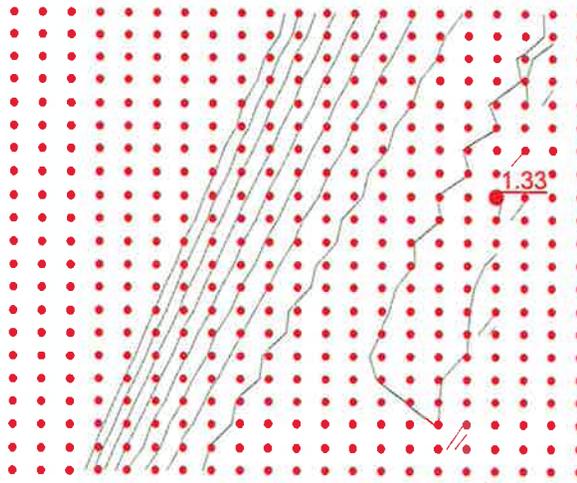
During the site visit, water was observed seeping from the existing slope. In order to prevent the fill materials from becoming saturated, it is recommended that a drainage layer be installed between the existing slope and the fill. The drainage layer should consist of clean well graded gravel and should be 2 feet thick measured perpendicular to the existing slope. The drain gravel layer should have at least 3 feet of cover to protect against frost and to inhibit infiltration of surface water. Slotted collection pipes should be placed within the drainage layer at the locations indicated on the plan sheet to collect the water and carry it outside the embankment. Details of the recommended drainage system are provided in the attached plan sheets.

It is our understanding that seepage from the hillside has been measured and recorded over the last 12 months. It has been reported to us that the measured seepage rates average about 3 gallons per minute and have not exceeded 5 gallons per minute. The drainage system shown on the drawings has been designed to carry at least 50 gallons per minute; however, the drainage system is intended to collect and channel only the water seeping from the existing hillside. If it is desired to place water collected from within the mine into the drainage system, larger pipes and thicker drainage layers will be required.

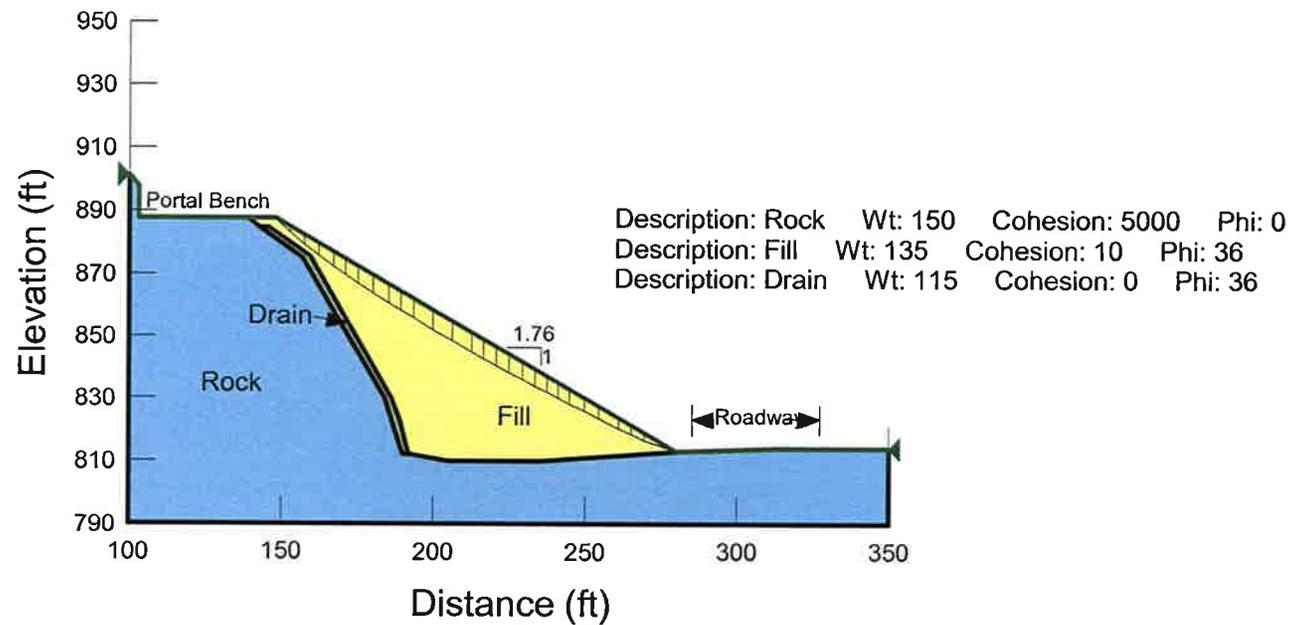
## 3. EMBANKMENT REQUIREMENTS

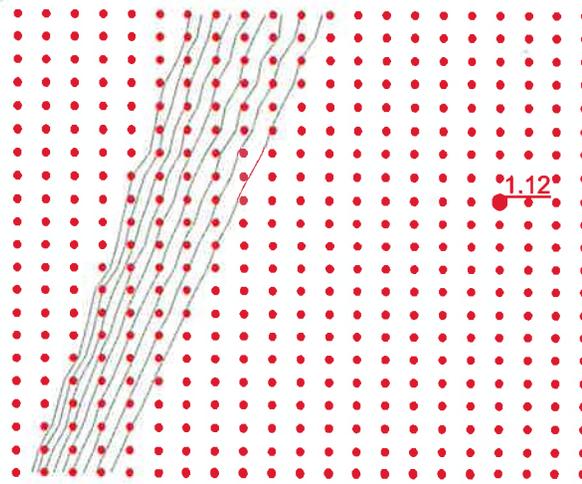
The soils used to construct the embankment should meet the gradation requirements and Atterberg limits shown on the attached plan sheet. The soils should be moisture conditioned to within 2 percent of the optimum moisture content and then spread in loose lifts not exceeding 12 inches thick. Each lift should be compacted to at least 95 percent of the maximum dry density. Optimum moisture content and dry density should be determined by the standard Proctor test (ASTM D 698). One to two density tests should be performed for each lift of fill to verify field compaction. If lifts are compacted with a smooth drum roller or otherwise become smooth or dry, the top 2 inches of the lifts should be scarified prior to placing the subsequent lift.

Gravel drain material used to construct the drainage system should be compacted. In order to compact against the existing slope, hand operated compaction equipment such as jumping jacks and/or walk behind rollers will likely be necessary. We recommend that gravel drain material to be compacted with hand equipment be placed in lifts not exceeding 8 inches in thickness. Each lift should be compacted with a minimum of 4 passes of the compaction equipment.

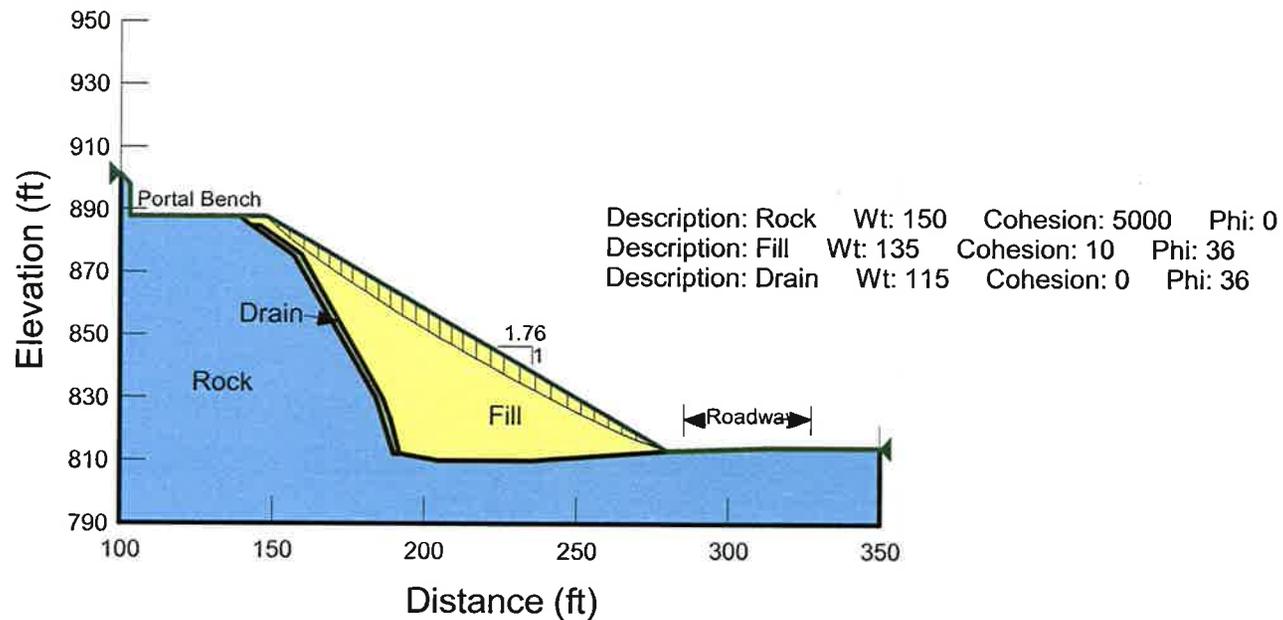


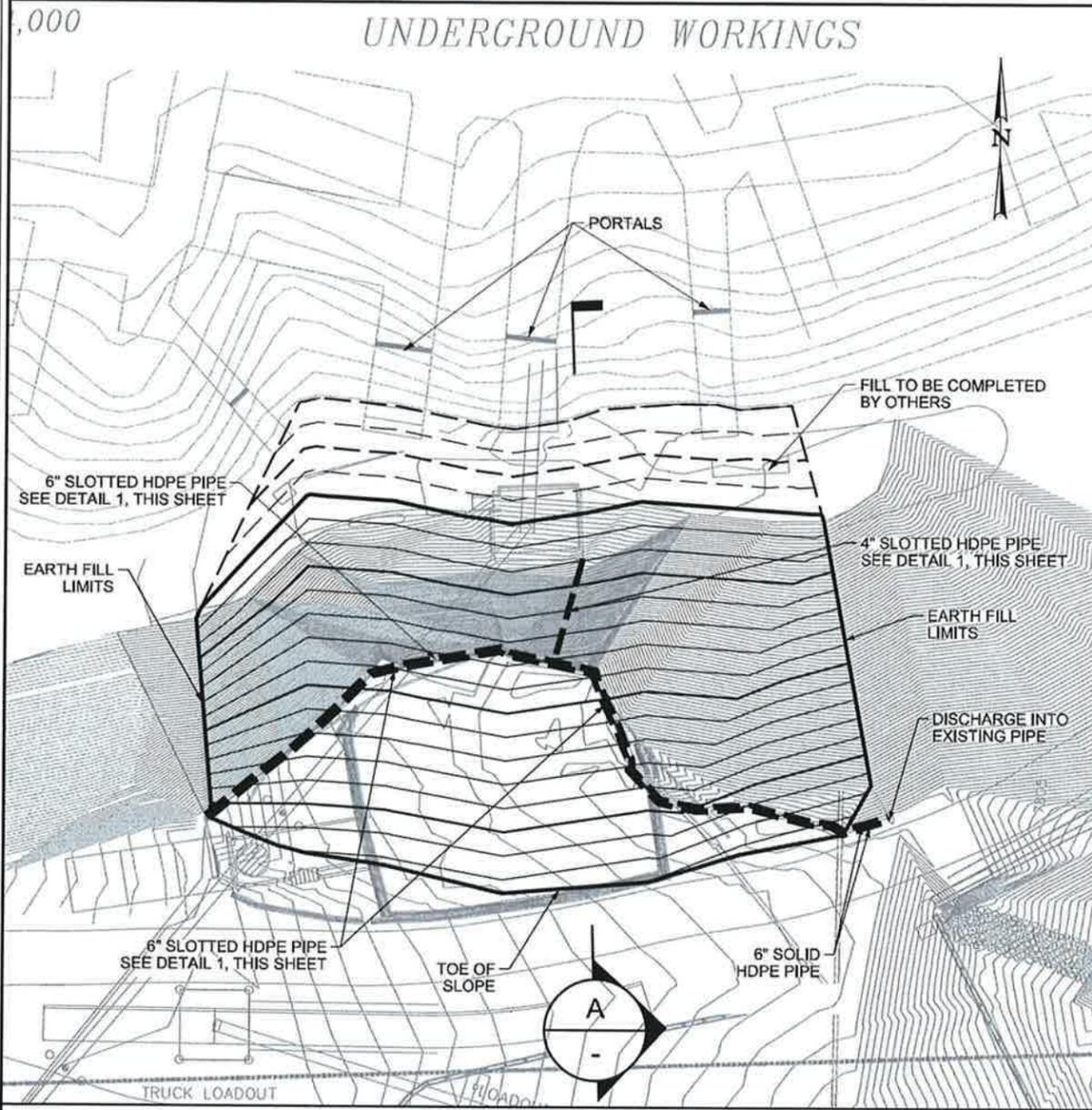
Crandall Canyon Mine Slope Stability  
Static Conditions





Crandall Canyon Mine Slope Stability  
 Seismic Condtion  
 Pseudo-static Coefficient = 0.08g

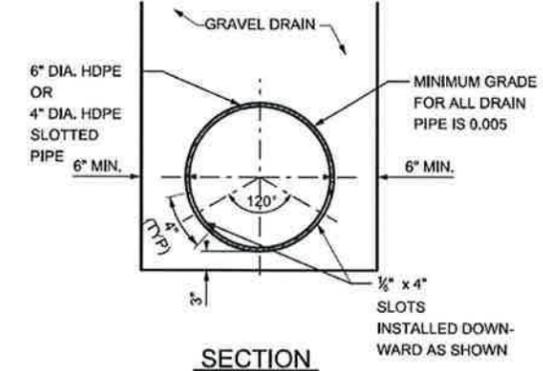
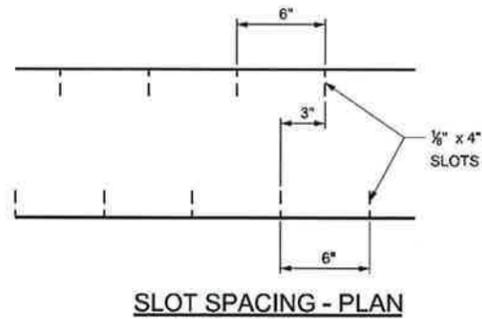
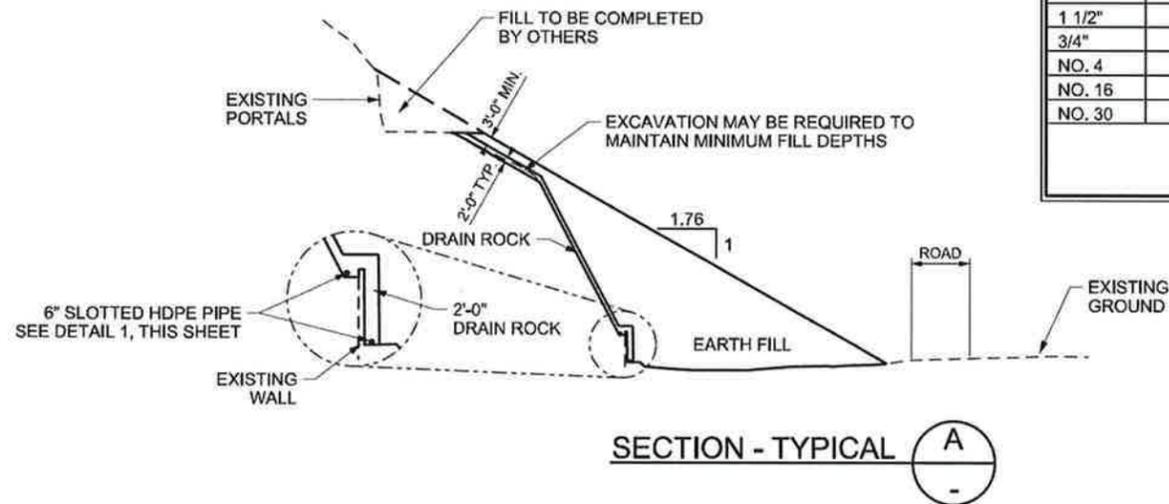




**SITE PLAN OPTION 1**



GRADATION REQUIREMENTS			
GRAVEL DRAIN		EARTH FILL	
SIEVE SIZE	PERCENT PASSING	SIEVE SIZE	PERCENT PASSING
1 1/2"	100	6"	100
3/4"	70-100	3"	70-100
NO. 4	20-50	NO. 4	30-70
NO. 16	0-15	NO. 200	0-20
NO. 30	0-5		
PLASTICITY INDEX ≤ 6 FRICTION ANGLE ≥ 36°			



**6" HDPE OR 4" HDPE SLOTTED PIPE**

SLOTTED PIPE	1
DRAIN DETAIL	-

**NOTES:**

**1. GENERAL**

- A. THE CONTRACTOR IS RESPONSIBLE TO CONTROL ALL SURFACE AND SUBSURFACE WATER. INSURE THE SITE IS MAINTAINED IN COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
- B. THE CONTRACTOR IS RESPONSIBLE TO VERIFY ALL EXISTING CONSTRUCTION MATERIAL TYPES, DIMENSIONS, ELEVATIONS AND CONDITIONS.

**2. EARTHFILL**

- A. FOUNDATION SURFACES SHALL CONSIST OF ALL EXISTING SOIL OR ROCK MATERIALS TO BE WITHIN THE FOOTPRINT OF NEW CONSTRUCTION. VEGETATION, LOOSE OR OTHERWISE UNSUITABLE FOUNDATION MATERIALS SHALL BE STRIPPED BY THE CONTRACTOR PRIOR TO FILL PLACEMENT.
- B. FILL SHALL NOT BE PLACED UPON A FROZEN SURFACE, NOR SHALL SNOW, ICE OR FROZEN MATERIAL BE INCORPORATED IN THE FILL.

- C. FILL SHALL BE PLACED IN APPROXIMATELY HORIZONTAL LAYERS. THE THICKNESS OF EACH LAYER BEFORE COMPACTION SHALL NOT EXCEED 12 INCHES. THE THICKNESS OF EACH LAYER OF HAND COMPACTED FILL, INCLUDING FILL COMPACTED BY MANUALLY DIRECTED POWER TAMPERS, SHALL NOT EXCEED 8 INCHES.

- D. EARTH FILL SHALL BE MOISTURE CONDITIONED TO WITHIN 2 PERCENT OF OPTIMUM MOISTURE CONTENT AS DETERMINED BY ASTM D698.

- E. EARTH FILL SHALL BE COMPACTED TO 95% OF THE MAXIMUM LABORATORY DENSITY AS DETERMINED BY ASTM D698. FIELD COMPACTION SHALL BE VERIFIED BY AT LEAST 1 DENSITY TEST PER LIFT OF FILL.

- F. GRAVEL DRAIN MATERIAL SHALL BE COMPACTED TO THE SATISFACTION OF ENGINEER. DRAIN MATERIAL SHALL BE COMPACTED WITH AT LEAST 4 PASSES OF THE COMPACTION EQUIPMENT.

- G. GRAVEL DRAIN MATERIAL SHALL BE MAINTAINED AT LEAST 6 INCHES ABOVE SURROUNDING EARTHFILL MATERIAL.

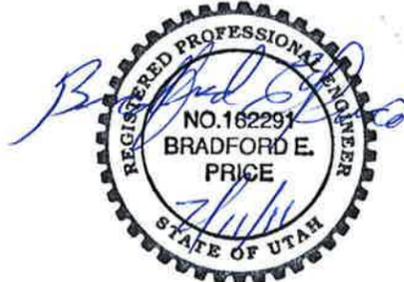
- H. GRAVEL DRAIN MATERIAL MAY BE OBTAINED FROM APPROVED SOURCES OF AGGREGATE FOR CONCRETE OR MAY BE PRODUCED FROM APPROVED DEPOSITS.

**3. DRAIN PIPE**

- A. JOINTS SHALL BE MADE BY BUTT FUSION WHEN POSSIBLE. THE PIPE MANUFACTURER'S FUSION PROCEDURES SHALL BE FOLLOWED AT ALL TIMES AS WELL AS THE RECOMMENDATIONS OF THE FUSION MACHINE MANUFACTURER.
- B. IF MECHANICAL FITTINGS ARE UTILIZED, THE RECOMMENDATION OF THE MECHANICAL FITTING MANUFACTURER MUST BE FOLLOWED.
- C. THE DIMENSION RATION (DR) OF THE SOLID AND SLOTTED DRAIN PIPES SHALL BE 11.
- D. DRAIN PIPE SHALL HAVE SLOPE OF AT LEAST 0.5%. EARTH FILL MAY BE PLACED BENEATH GRAVEL DRAIN AT WEST END OF PIPE TO PROVIDE POSITIVE DRAINAGE.

**4. ESTIMATED QUANTITIES**

DRAIN ROCK	2,260 CU YDS.
EARTH FILL	12,783 CU YDS.
6" SLOTTED HDPE PIPE	574 LIN. FT.
6" SOLID HDPE PIPE	40 LIN. FT.
4" SLOTTED HDPE PIPE	46 LIN. FT.



7/11/2011  
11:20:00\_CrandallCanyonMineSlopeStab@CadSheet\_files\$11-01.dgn



1435 WEST 820 NORTH  
PROVO, UTAH 84601-1343  
801 374-5771  
PROVO  
801 521-5771 SALT LAKE CITY

NO.	AUTHORIZED BY	REVISION	MADE BY	DATE

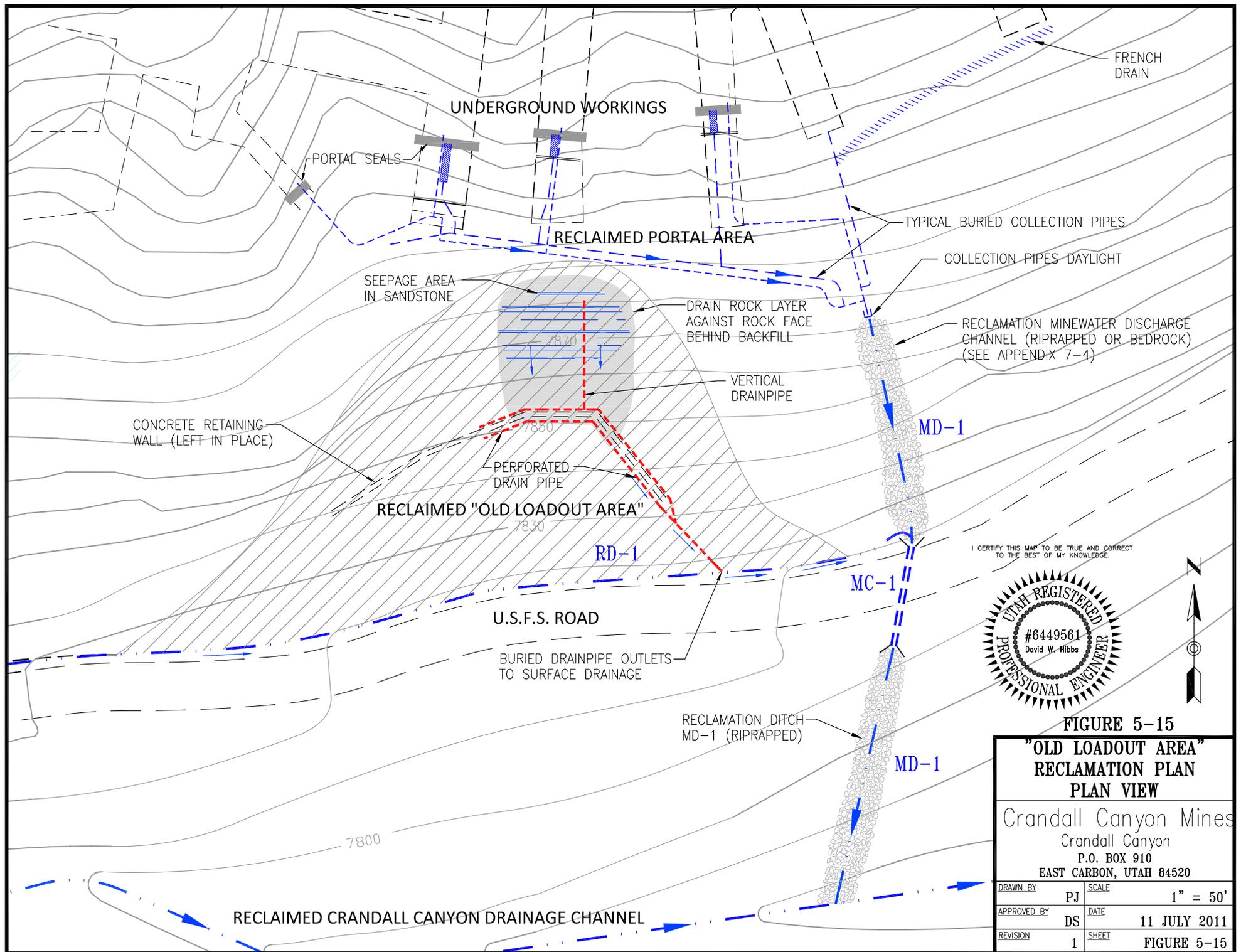
DESIGNED BY: B. HOBROCK  
DRAWN BY: J. RUSBY  
CHECKED BY: S.E. PRICE  
SCALE: H.P.S.E.  
W.R.T.  
DATE: JULY 2011

**EMERY COUNTY, UTAH**

**CRANDALL CANYON MINE  
SLOPE STABILITY**

**EARTHFILL**

201001-006  
PROJECT NO.  
SEE FILE  
FILE DRAWING NO.  
SHEET 1  
OF 1 SHEETS

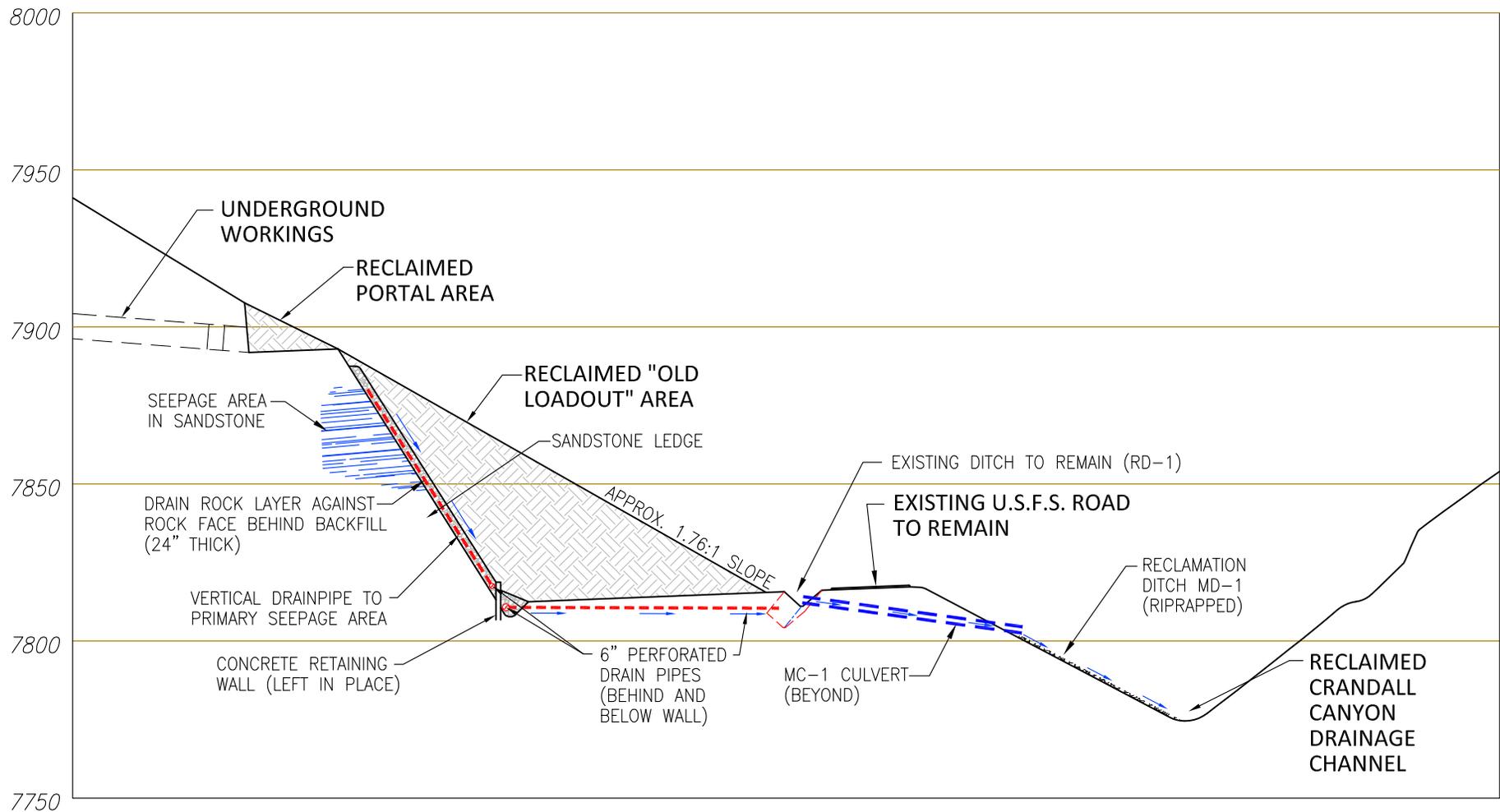


**FIGURE 5-15**

**"OLD LOADOUT AREA"  
RECLAMATION PLAN  
PLAN VIEW**

Crandall Canyon Mines  
Crandall Canyon  
P.O. BOX 910  
EAST CARBON, UTAH 84520

DRAWN BY	PJ	SCALE	1" = 50'
APPROVED BY	DS	DATE	11 JULY 2011
REVISION	1	SHEET	FIGURE 5-15



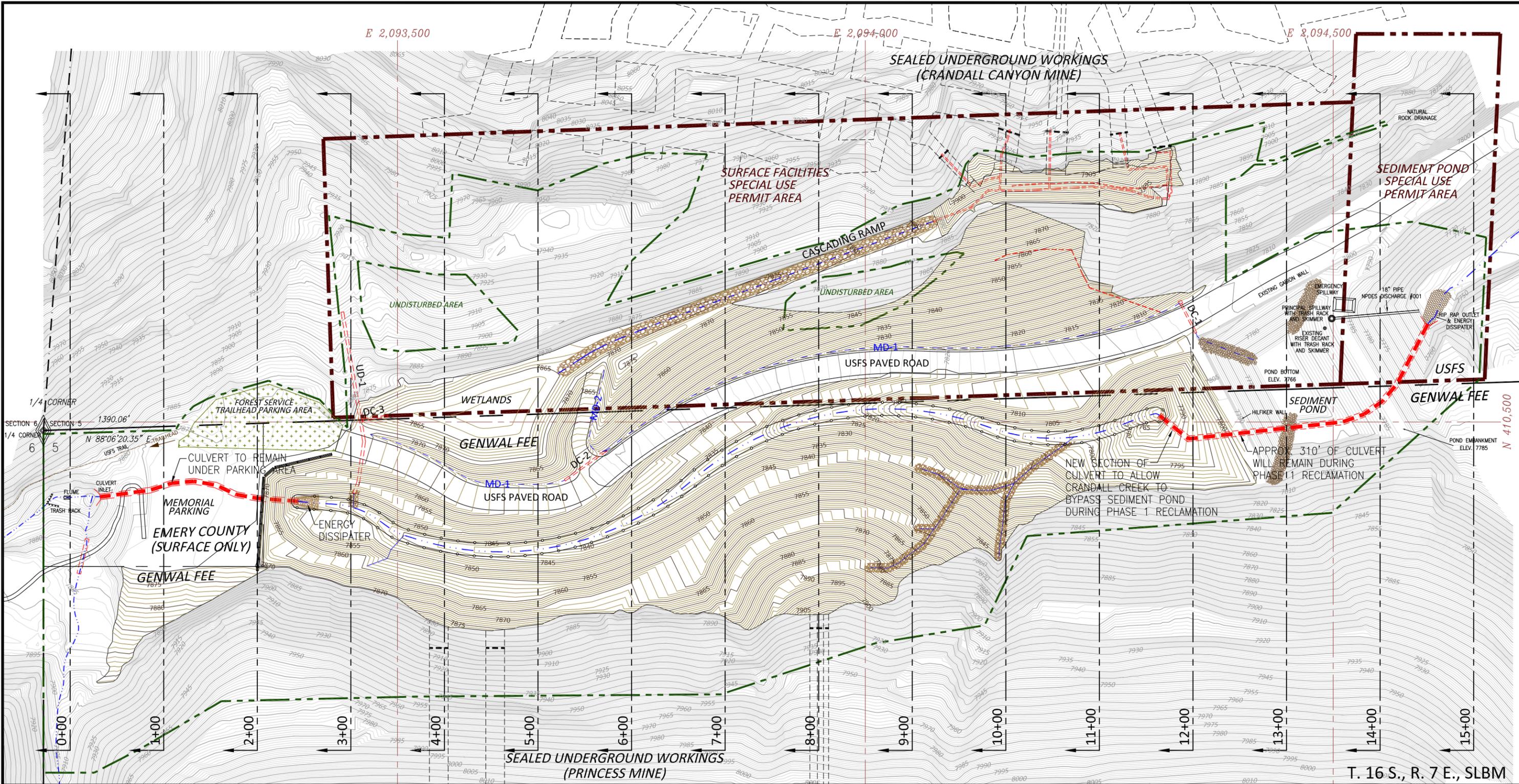
TYPICAL CROSS SECTION VIEW - LOOKING DOWNCANYON

FIGURE 5-15(a)

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.



<b>"OLD LOADOUT AREA"</b>	
<b>RECLAMATION PLAN</b>	
<b>TYP. CROSS SECTION VIEW</b>	
Crandall Canyon Mines	
Crandall Canyon	
P.O. BOX 910	
EAST CARBON, UTAH 84520	
DRAWN BY	PJ
APPROVED BY	DS
REVISION	1
SCALE	1" = 50'
DATE	11 JULY 2011
SHEET	FIGURE 5-15(a)



G:\Current Drawings\MRP Maps\Crandall Canyon\Reclamation Plan Update\Plate 5-16 - Reclamation Plan Update\Plate 5-16 - Reclamation Contours Phase 1, 3/13/2017 10:04:23 AM, 1:1

**LEGEND**

	EXTENT OF DISTURBANCE		RECLAIMED INDEX CONTOURS (5' INTERVALS)
	CROSS-SECTION		RECLAIMED INTERMEDIATE CONTOUR (1' INTERVALS)
	RECLAMATION DIVERSION DITCH		EXISTING INDEX CONTOUR (5' INTERVALS)
	ALTERNATE SEDIMENT CONTROL		EXISTING INTERMEDIATE CONTOURS (1' INTERVALS)
	72" MAIN CULVERT		CONCRETE JERSEY BARRIERS
	PIPING FOR MINE WATER DISCHARGE SYSTEM		FOREST SERVICE SPECIAL USE PERMIT BOUNDARY
	RIP RAP CHANNEL PROTECTION		

**NOTES:**

- SEDIMENT POND TO REMAIN IN-PLACE DURING PHASE 1 RECLAMATION.
- MAXIMUM SLOPE ON ALL RECLAIMED SLOPES TO BE 2 HORIZONTAL TO 1 VERTICAL UNIT.
- SEE PLATES 5-17A THROUGH 5-17D FOR CROSS-SECTION PROFILES.

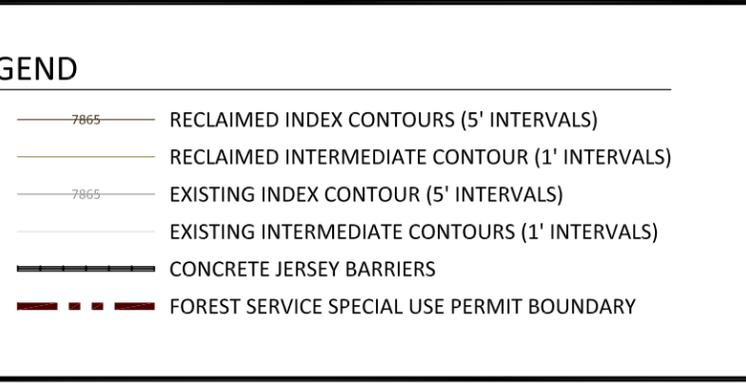
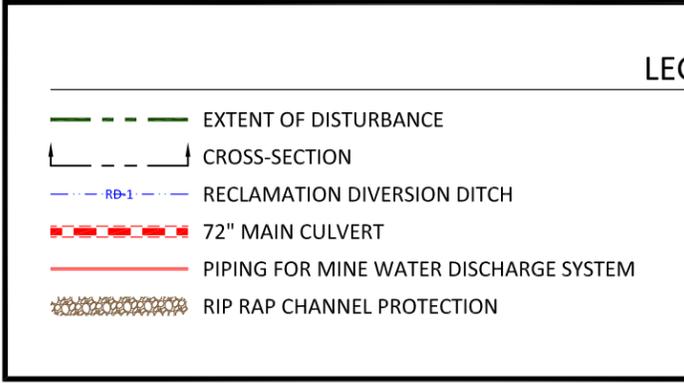
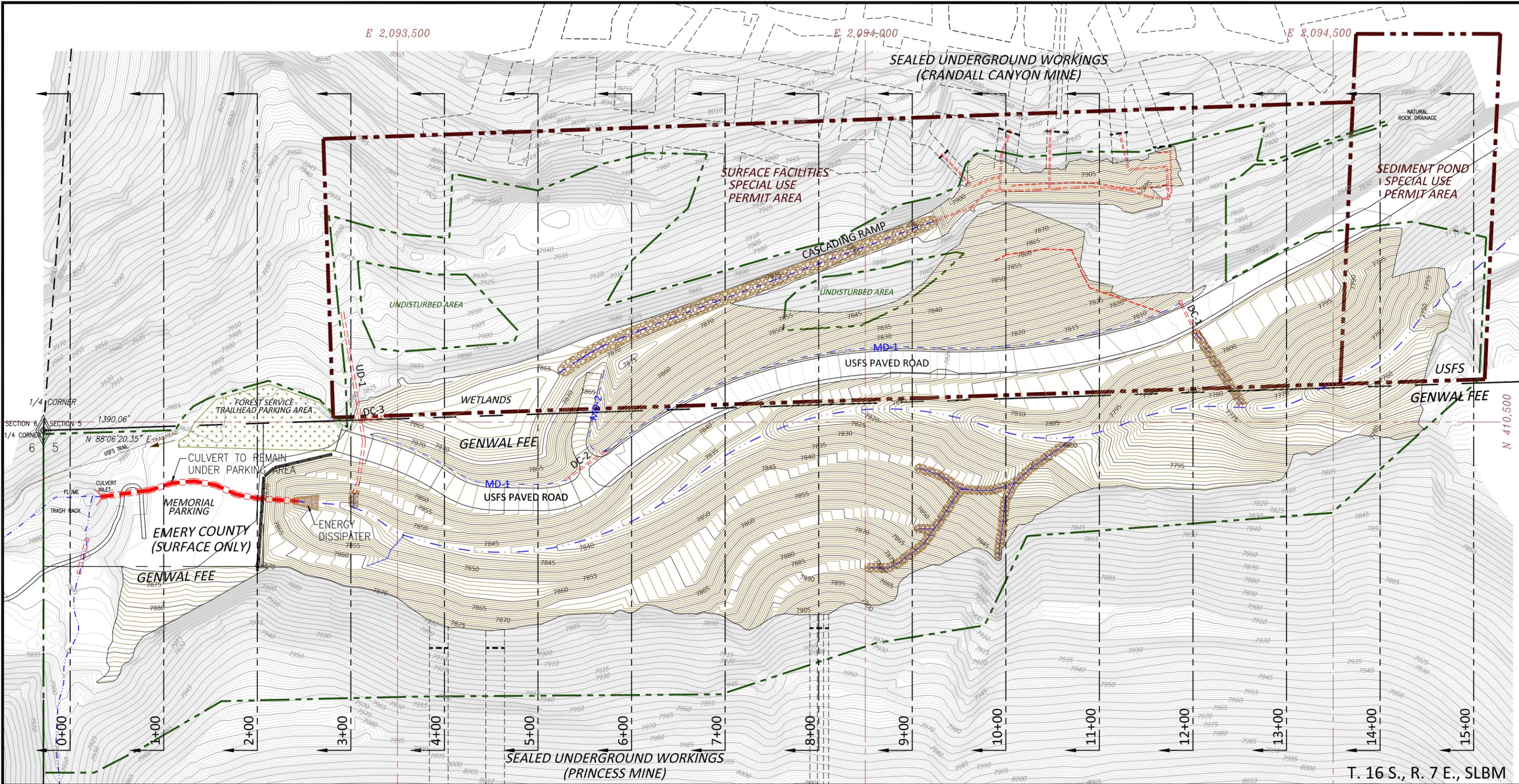
**RECLAIMED CONTOURS AND SURFACE FACILITIES - PHASE I**

**RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE**

<b>CRANDALL CANYON MINES</b>			
PERMIT NUMBER C015/032			
DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-16

794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520  
 P.O. BOX 910, PRICE, UTAH 84520  
 PHONE: (435) 888-4000 FAX: (435) 888-4002

T. 16 S., R. 7 E., SLBM



**NOTES:**

1. MAXIMUM SLOPE ON ALL RECLAIMED SLOPES TO BE 2 HORIZONTAL TO 1 VERTICAL UNIT.
2. SEE PLATES 5-17A THROUGH 5-17D FOR CROSS-SECTION PROFILES.

**RECLAIMED CONTOURS AND SURFACE FACILITIES - PHASE II**

**RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE**

**GENWAL™**  
RESOURCES, INC.

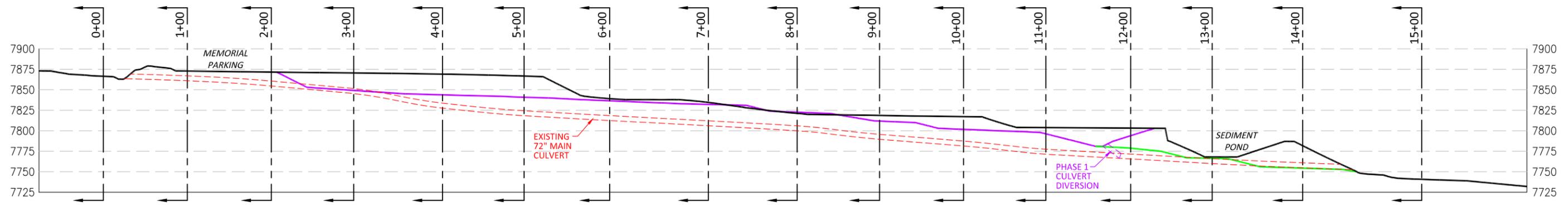
794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520  
P.O. BOX 910, PRICE, UTAH 84520  
PHONE: (435) 888-4000 FAX: (435) 888-4002

**CRANDALL CANYON MINES**

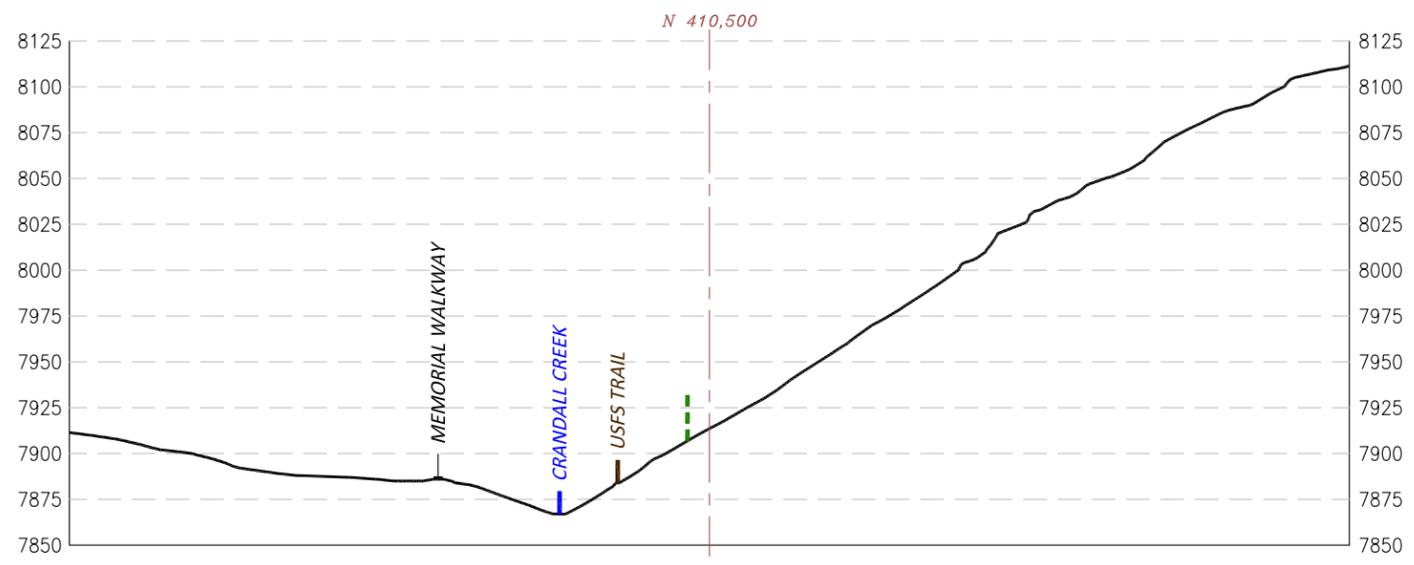
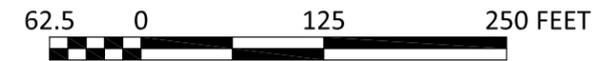
PERMIT NUMBER C015/032

DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-17

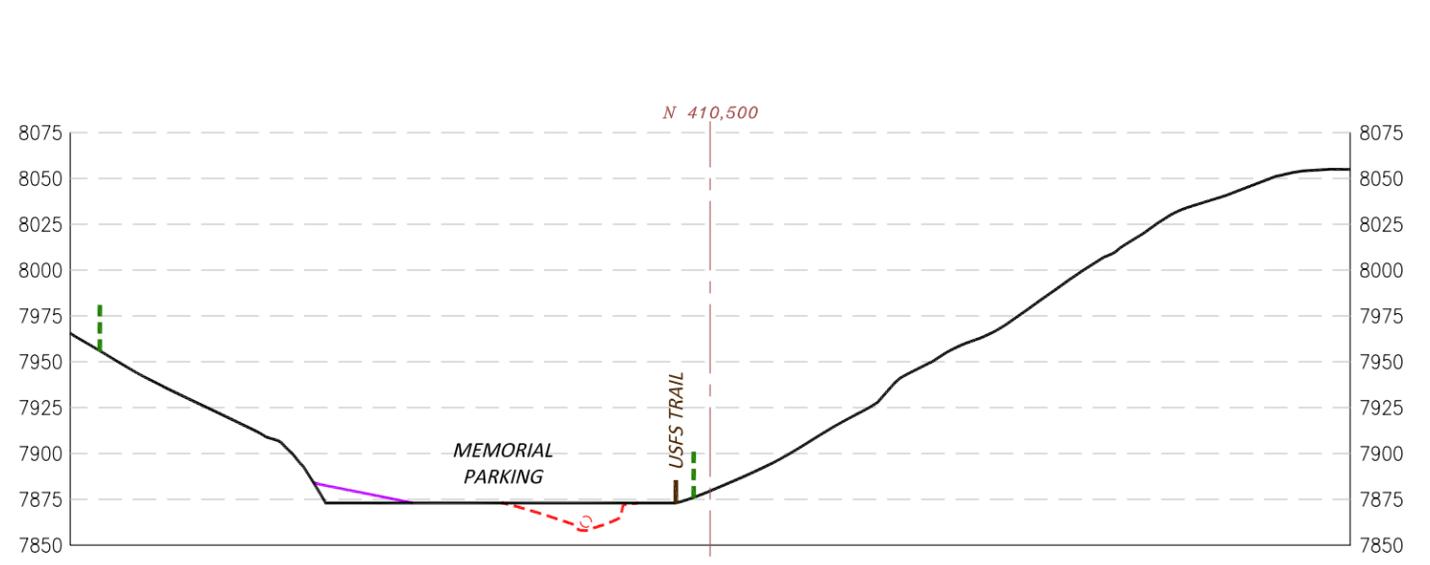
G:\Current Drawings\MRP Maps\Crandall Canyon\Reclamation Plan Update\Plate 5-17 - Reclamation Plan Phase 2.dwg, Reclaimed Contours Phase 2, 3/13/2017 10:05:44 AM, 1:1



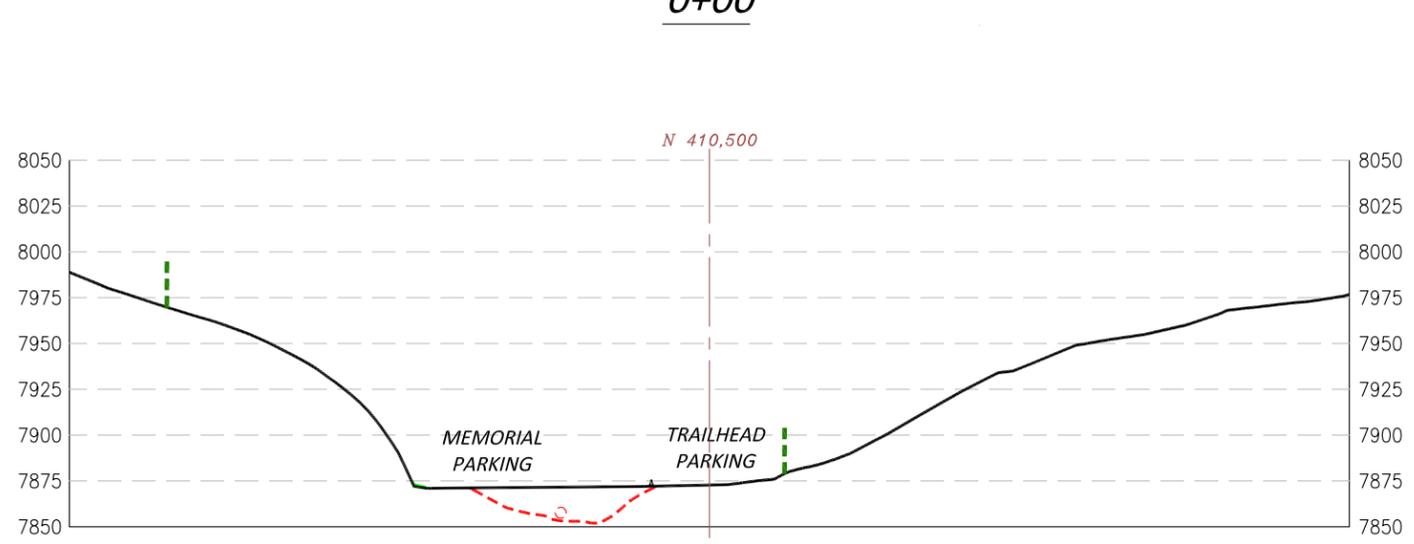
CRANDALL CREEK PROFILE



0+00



1+00



2+00

LEGEND

- EXISTING GRADE LINE
- PHASE 1 GRADE LINE
- PHASE 2 GRADE LINE
- - - ORIGINAL EXCAVATION FOR CULVERT
- o EXISTING 72" MAIN CULVERT
- - - EXTENT OF DISTURBANCE

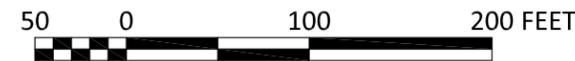


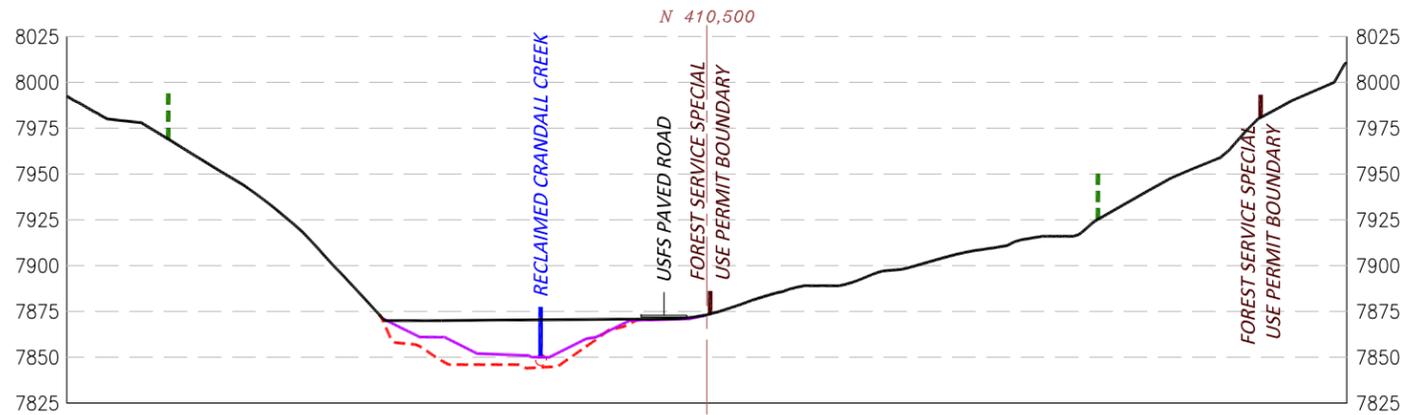
- NOTES:
1. CROSS-SECTION LOCATIONS ARE SHOWN ON PLATES 5-16 AND 5-17.
  2. EXISTING MAIN CULVERT IS BASED UPON AN ACTUAL SURVEY.
  3. SEDIMENT POND WILL REMAIN IN PLACE THROUGH PHASE 1 RECLAMATION.

**RECLAMATION PROFILES**

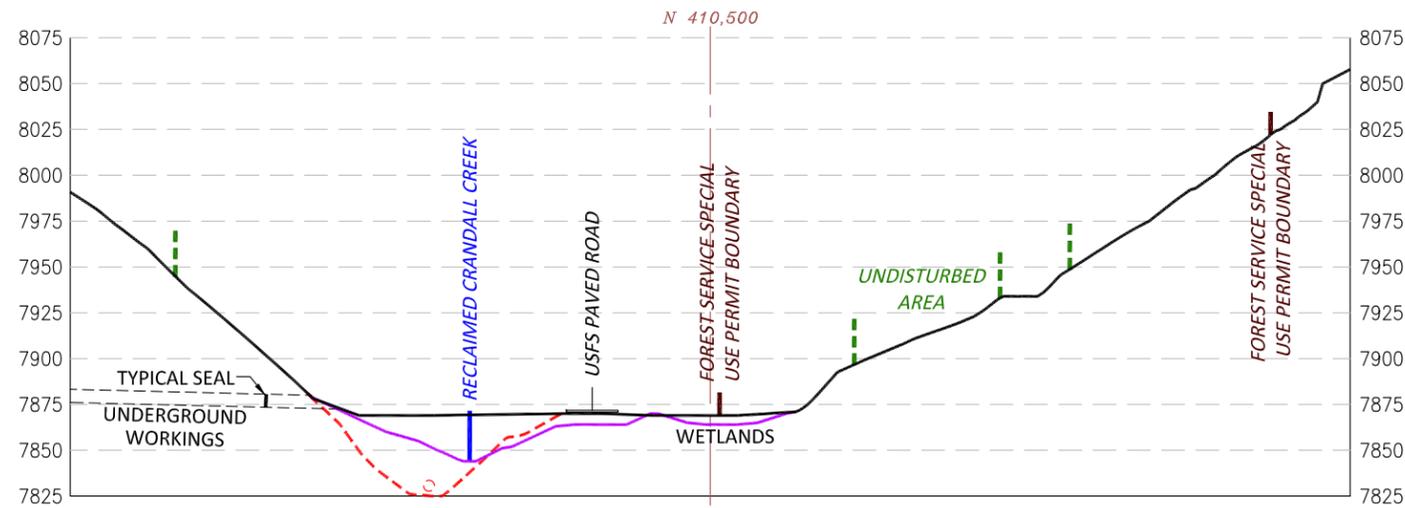
**RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE**

<b>GENWAL™</b> RESOURCES, INC.		<b>CRANDALL CANYON MINES</b>	
<small>794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520 P.O. BOX 910, PRICE, UTAH 84520 PHONE: (435) 888-4000</small>		<small>PERMIT NUMBER C015/032</small>	
DRAWN BY	PJ	SCALE	1" = 100' U.O.N.
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-17A

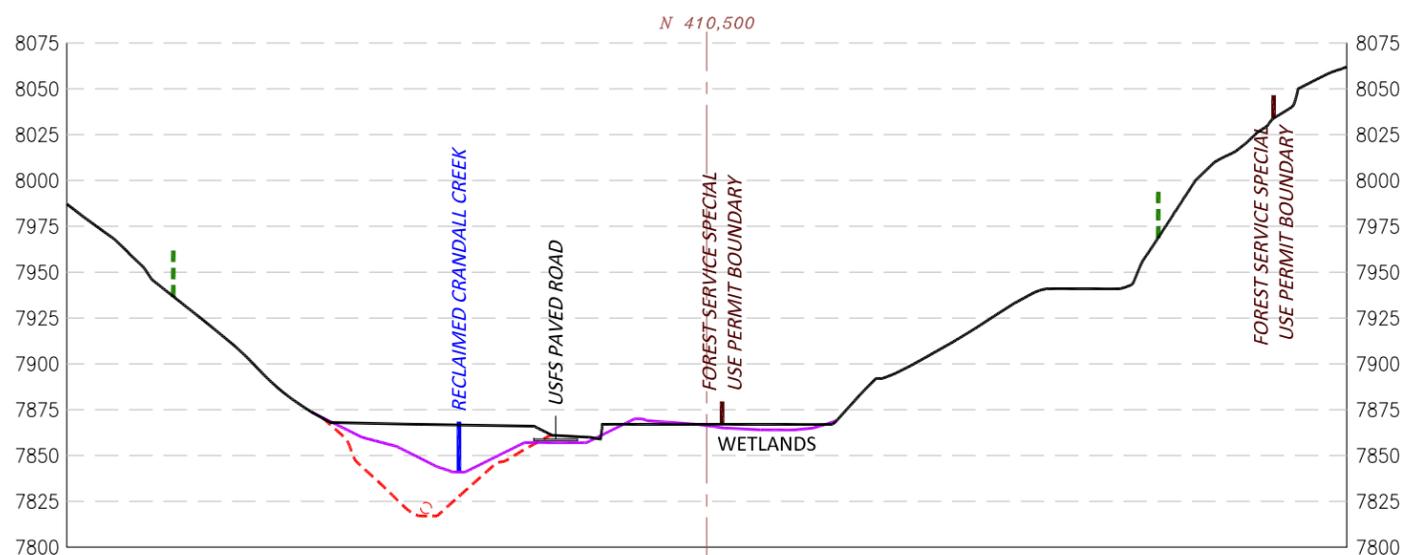




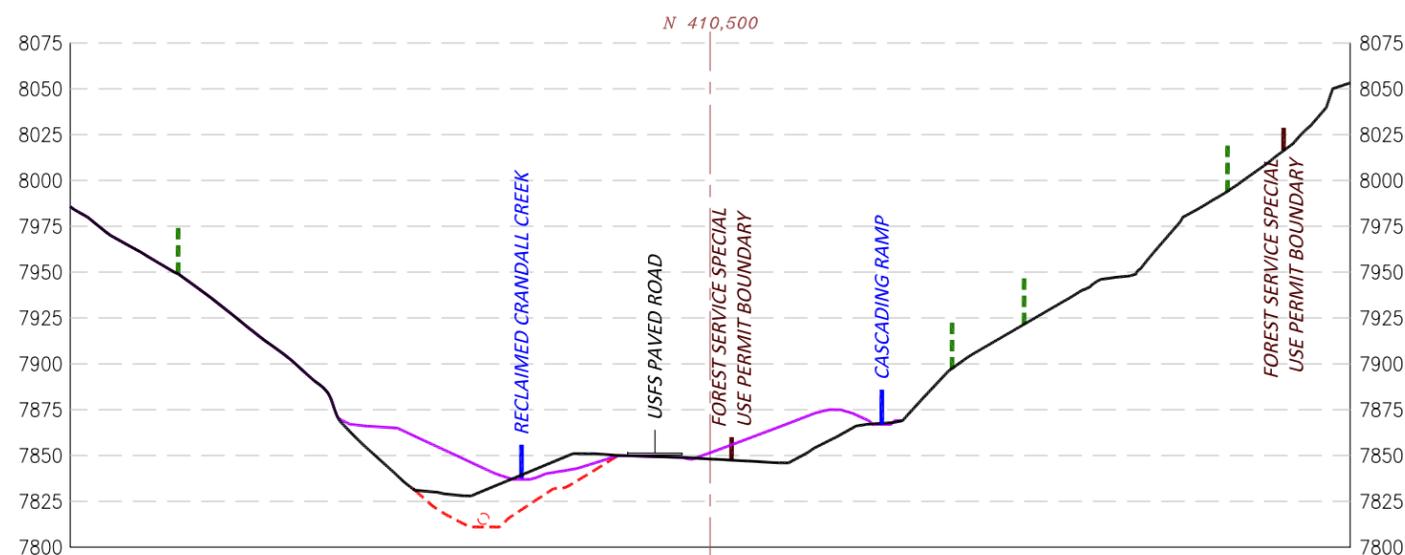
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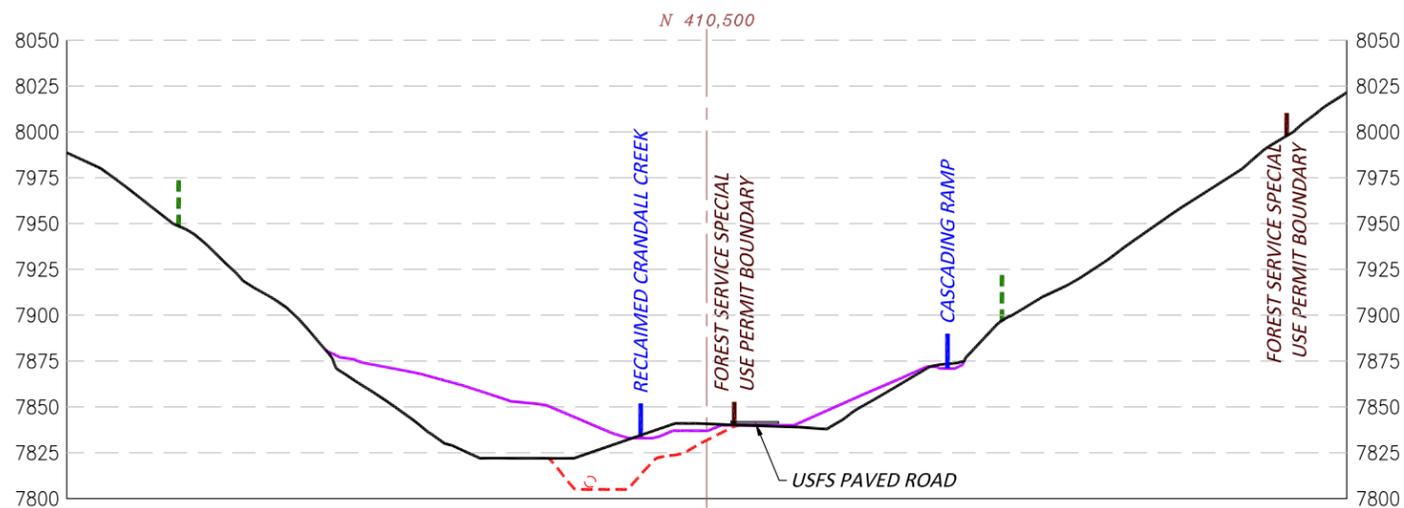
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5+00



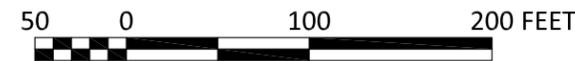
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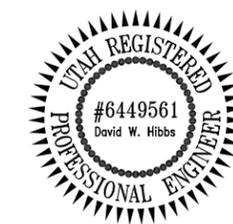
7+00

**LEGEND**

- EXISTING GRADE LINE
- PHASE 1 GRADE LINE
- PHASE 2 GRADE LINE
- - - ORIGINAL EXCAVATION FOR CULVERT
- EXISTING 72" MAIN CULVERT
- - - EXTENT OF DISTURBANCE



- NOTES:
- CROSS-SECTION LOCATIONS ARE SHOWN ON PLATES 5-16 AND 5-17.
  - EXISTING MAIN CULVERT IS BASED UPON AN ACTUAL SURVEY.
  - SEDIMENT POND WILL REMAIN IN PLACE THROUGH PHASE 1 RECLAMATION.



**RECLAMATION PROFILES**

**RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE**

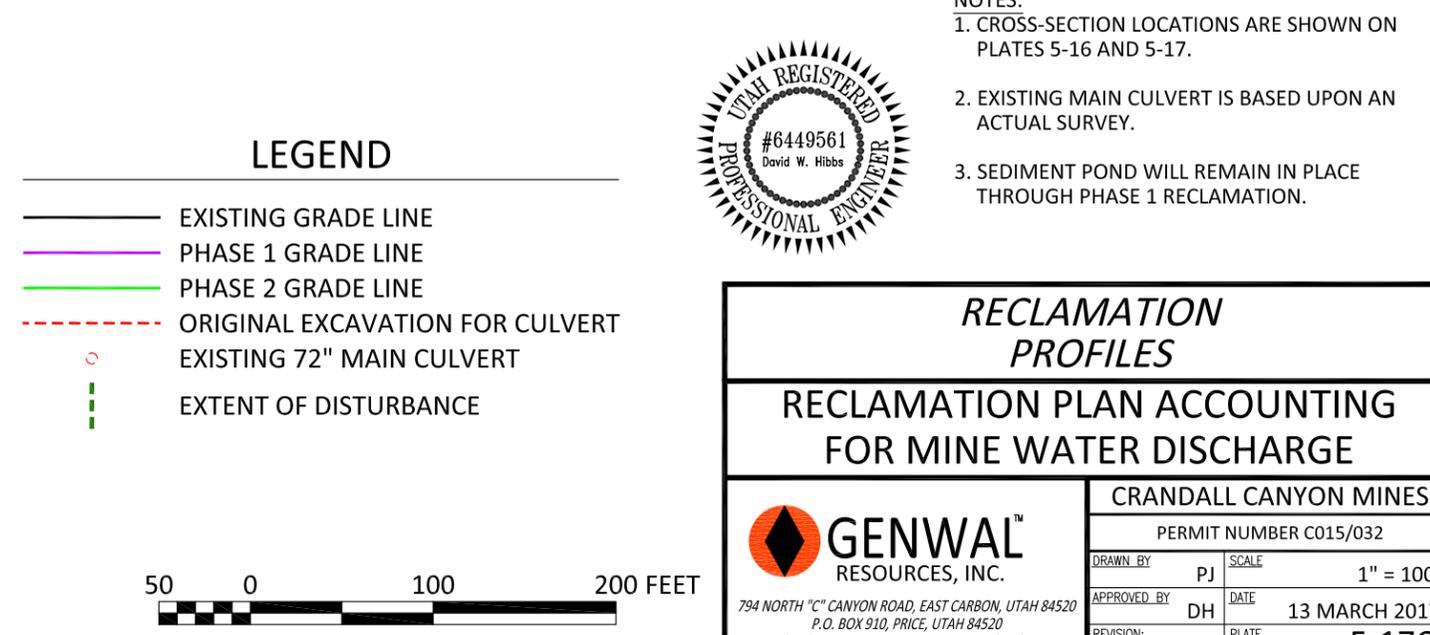
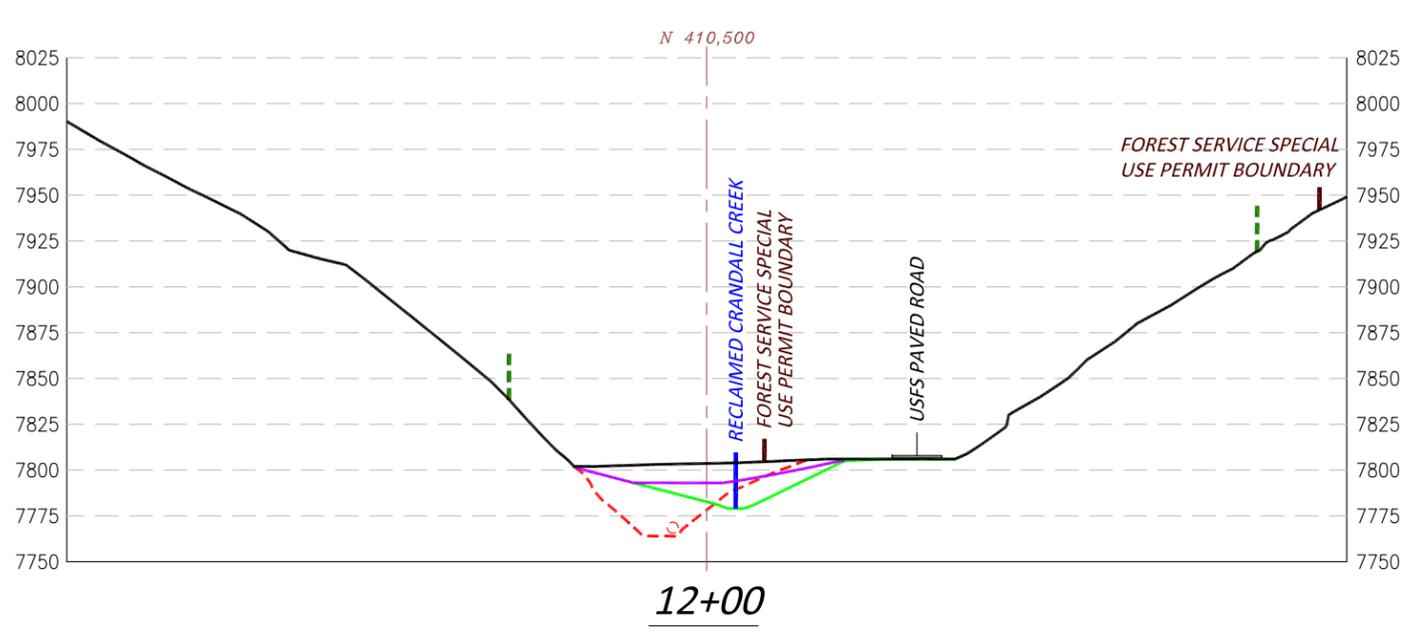
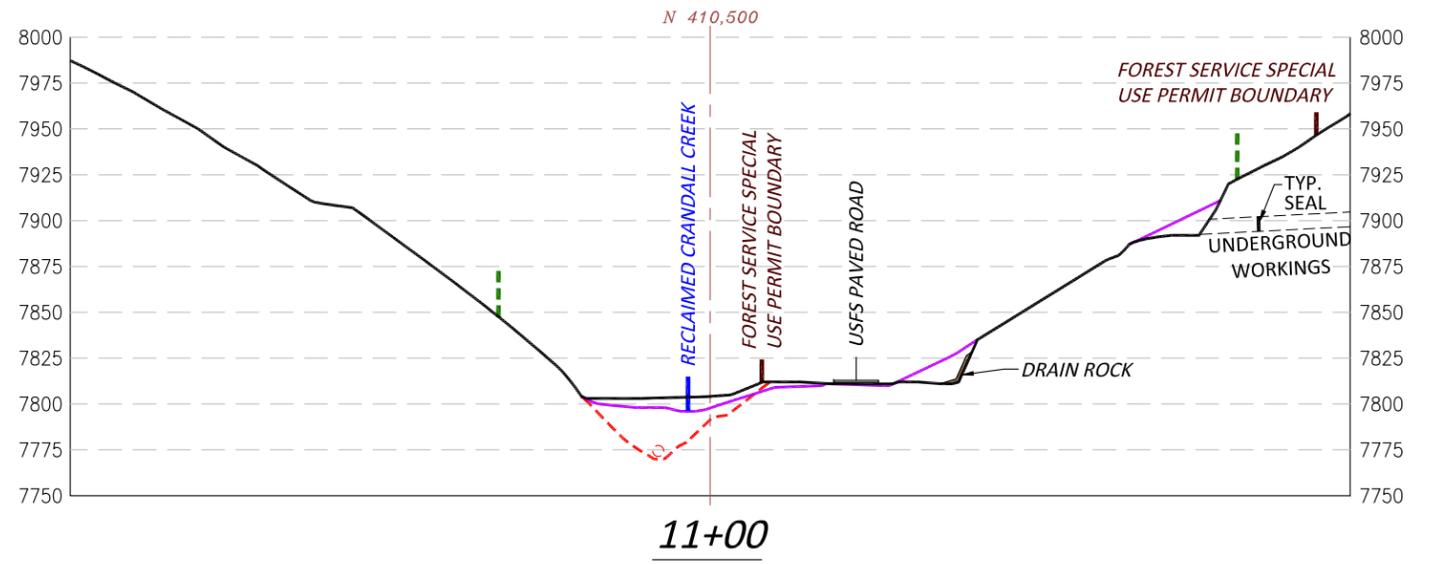
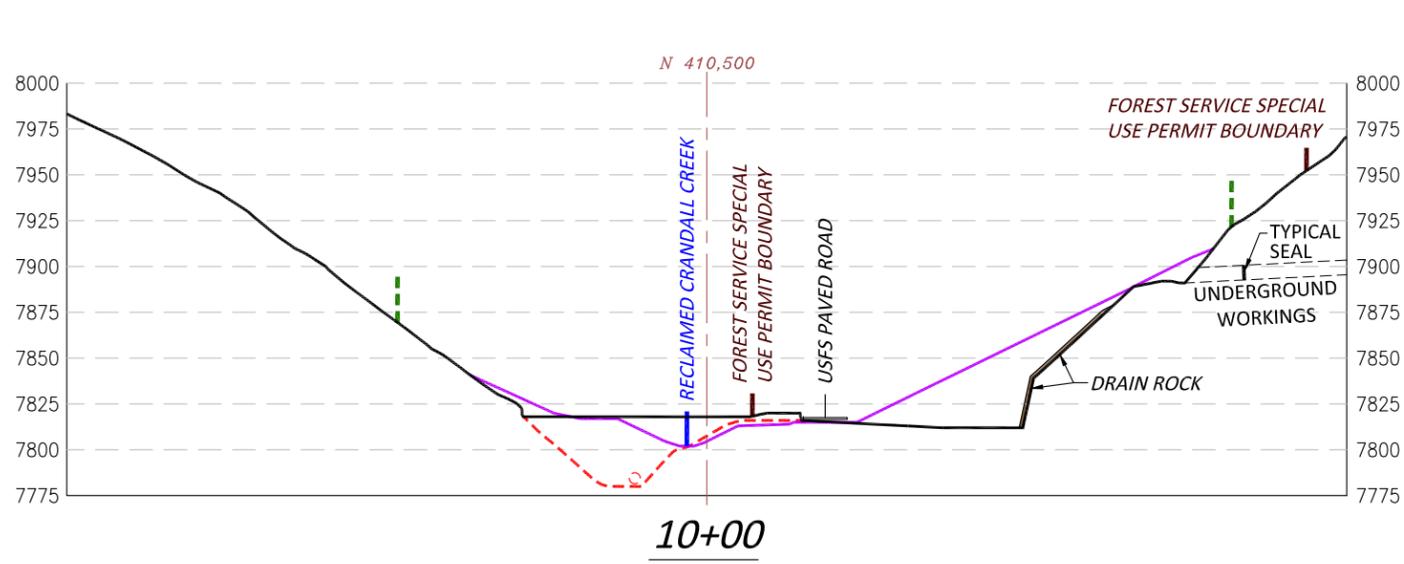
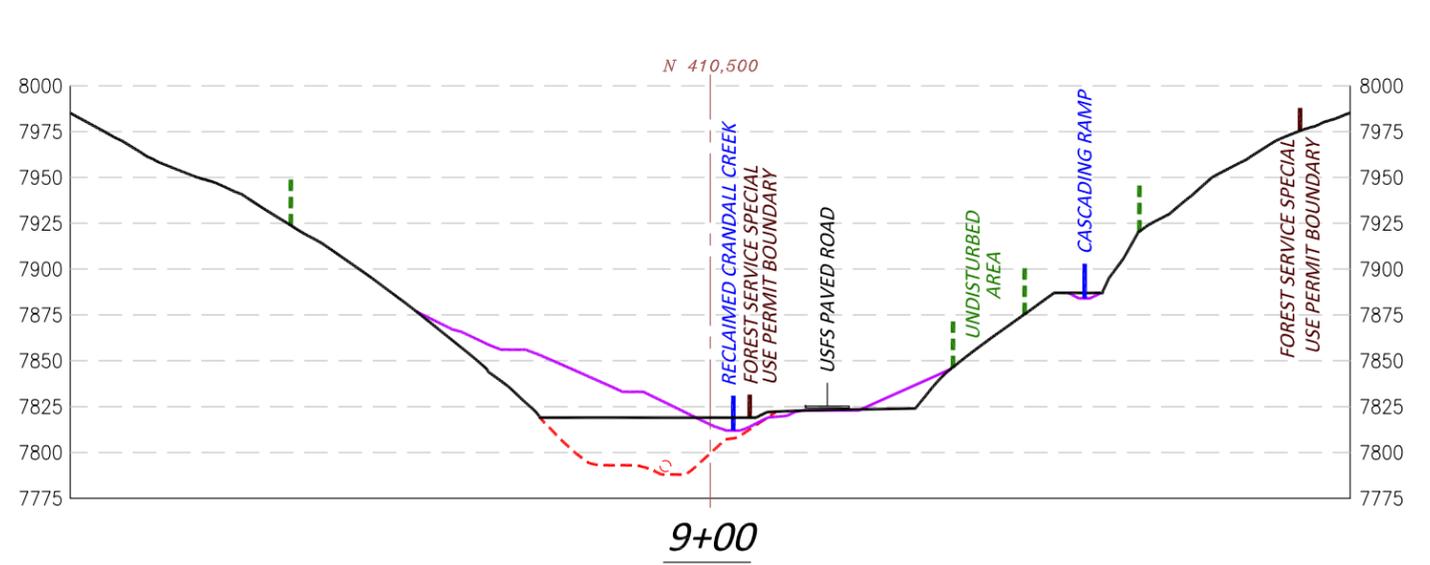
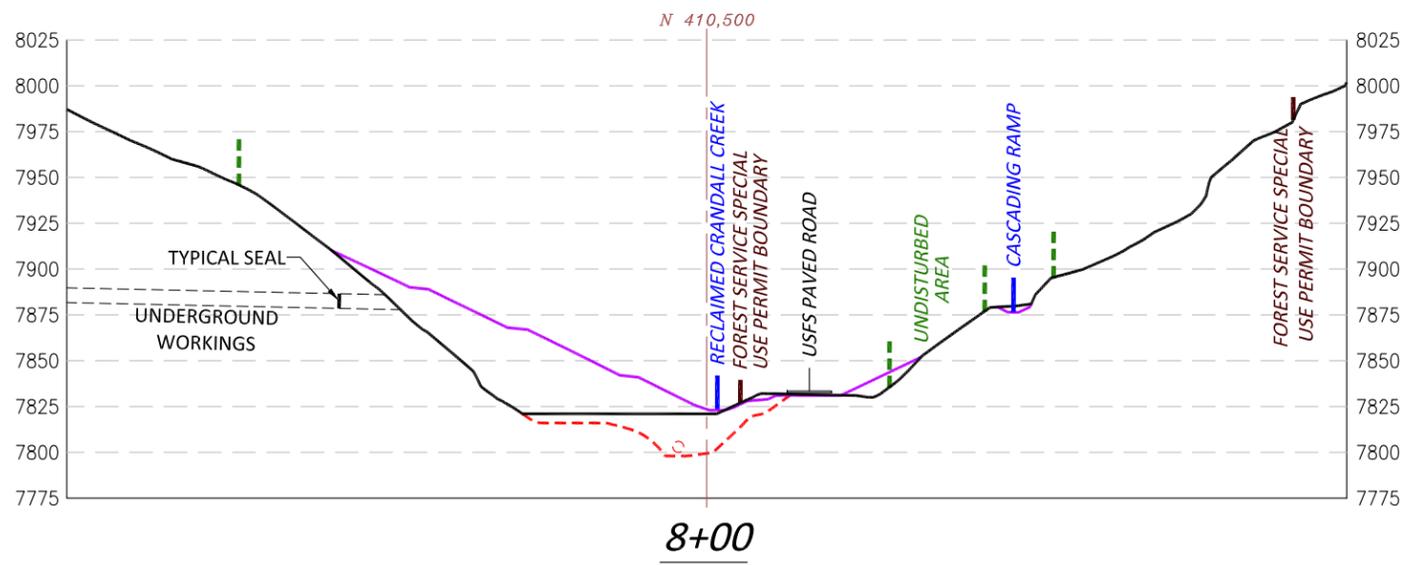
**GENWAL™**  
RESOURCES, INC.

794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520  
P.O. BOX 910, PRICE, UTAH 84520  
PHONE: (435) 888-4000 FAX: (435) 888-4002

**CRANDALL CANYON MINES**

PERMIT NUMBER C015/032

DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-17B



- LEGEND**
- EXISTING GRADE LINE
  - PHASE 1 GRADE LINE
  - PHASE 2 GRADE LINE
  - - - ORIGINAL EXCAVATION FOR CULVERT
  - EXISTING 72" MAIN CULVERT
  - - - EXTENT OF DISTURBANCE



- NOTES:**
1. CROSS-SECTION LOCATIONS ARE SHOWN ON PLATES 5-16 AND 5-17.
  2. EXISTING MAIN CULVERT IS BASED UPON AN ACTUAL SURVEY.
  3. SEDIMENT POND WILL REMAIN IN PLACE THROUGH PHASE 1 RECLAMATION.



**RECLAMATION PROFILES**

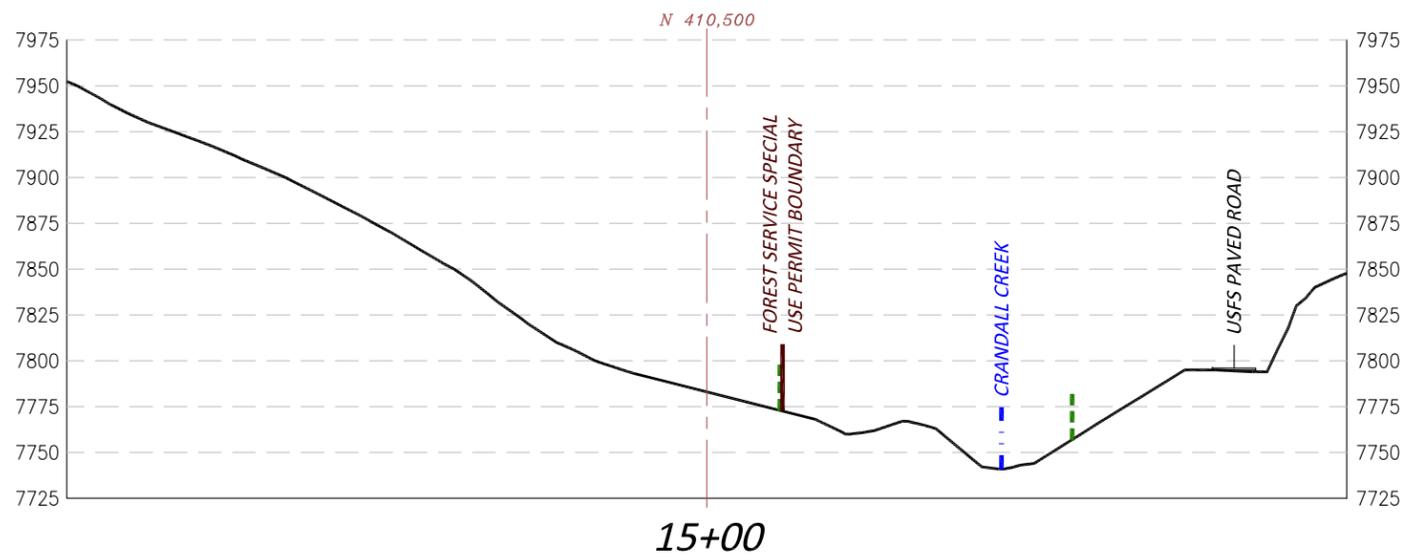
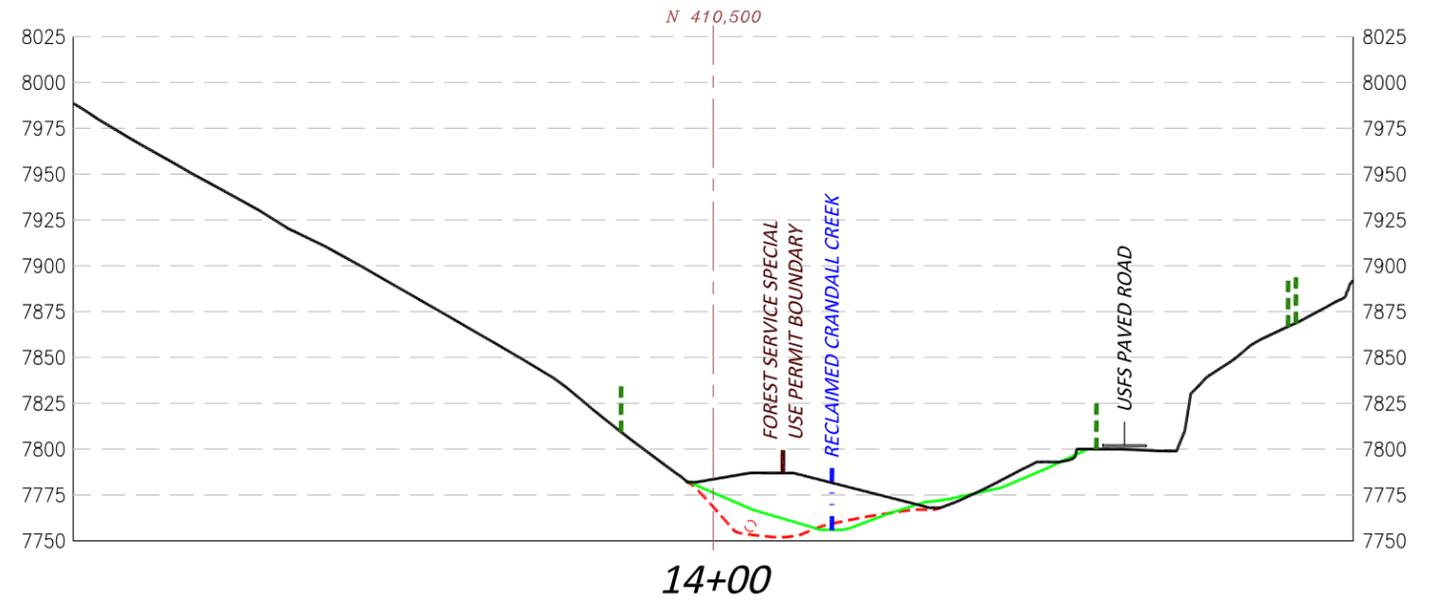
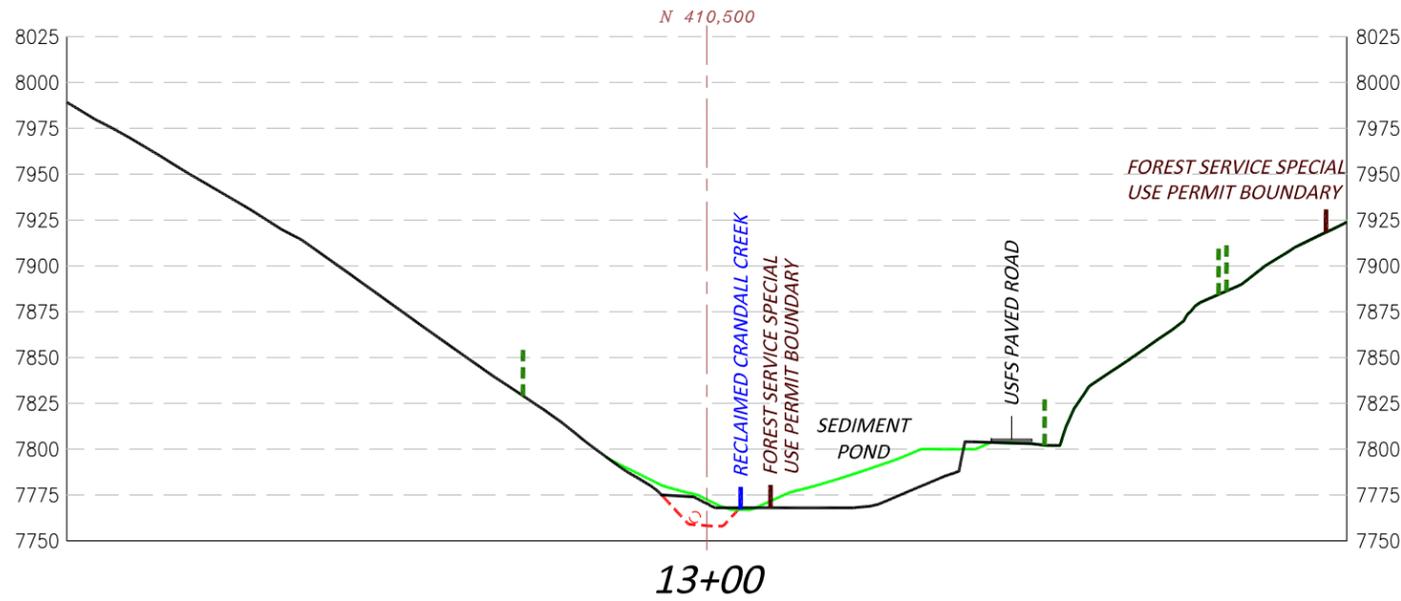
**RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE**

794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520  
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**CRANDALL CANYON MINES**

PERMIT NUMBER C015/032

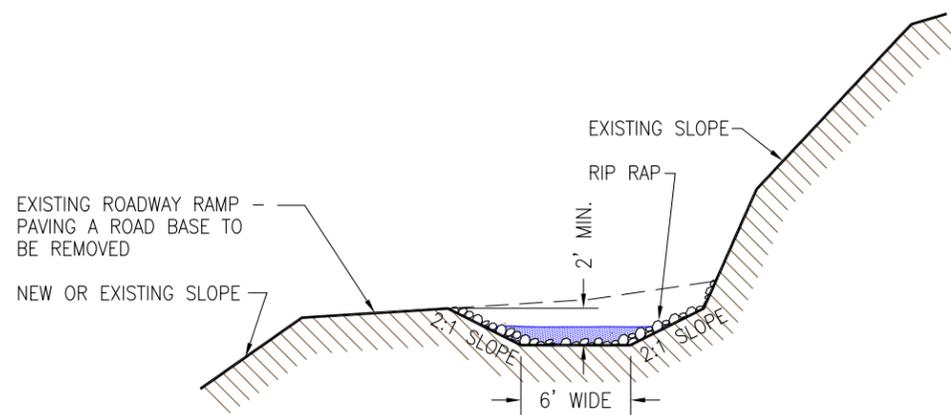
DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-17C



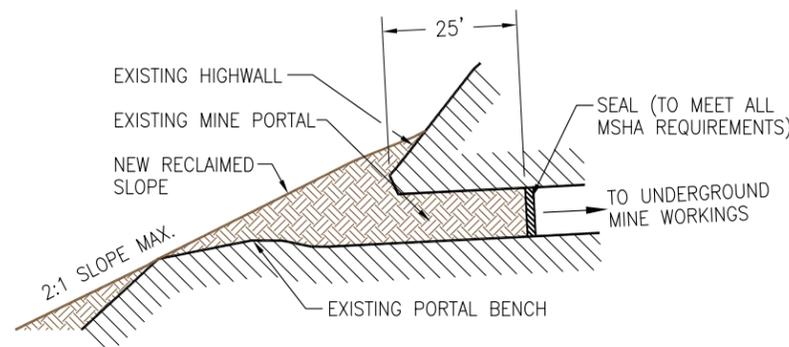
**LEGEND**

- EXISTING GRADE LINE
- PHASE 1 GRADE LINE
- PHASE 2 GRADE LINE
- - - ORIGINAL EXCAVATION FOR CULVERT
- EXISTING 72" MAIN CULVERT
- - - EXTENT OF DISTURBANCE

- NOTES:**
- CROSS-SECTION LOCATIONS ARE SHOWN ON PLATES 5-16 AND 5-17.
  - EXISTING MAIN CULVERT IS BASED UPON AN ACTUAL SURVEY.
  - SEDIMENT POND WILL REMAIN IN PLACE THROUGH PHASE 1 RECLAMATION.



**NEW INCISED CASCADING RAMP**  
NO SCALE



**TYPICAL RECLAIMED PORTAL**  
NO SCALE

<b>RECLAMATION PROFILES</b>			
<b>RECLAMATION PLAN ACCOUNTING FOR MINE WATER DISCHARGE</b>			
<b>GENWAL™</b> RESOURCES, INC. <small>794 NORTH "C" CANYON ROAD, EAST CARBON, UTAH 84520 P.O. BOX 910, PRICE, UTAH 84520 PHONE: (435) 888-4000</small>		<b>CRANDALL CANYON MINES</b>	
		PERMIT NUMBER C015/032	
DRAWN BY	PJ	SCALE	1" = 100'
APPROVED BY	DH	DATE	13 MARCH 2017
REVISION:	1	PLATE	5-17D