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INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

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Utah Division of Oil, Gas, and Mining
Coal Program
1594 West North Temple, Suite 1210
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February 12, 2019

Subject: Clean Copy Submittal for the Amendment to Update the MRP at the Completion of Final Reclamation, PacifiCorp, Cottonwood/Wilberg Mine C/015/0019, Emery County, Utah. Task ID 5844

PacifiCorp, by and through its wholly-owned subsidiary, Interwest Mining Company (as mine manager), hereby submits clean copies to the approved amendment to update the Cottonwood MRP to include information regarding the final reclamation of the mine site and the "As-Built" maps associated to such reclamation activities.

Included with this submittal are the clean copies of the amended pages, chapters, appendices, maps, etc. that have been revised and approved by the Division to show as-built conditions of the mine site. The approved revisions are as follows:

- Volume 1 – Introduction
- Volume 1 – Table of Contents
- Volume 1 – Part 2, pages 30 thru 56
- Volume 2 – Part 1, page 1
- Volume 2 – Part 4
- Volume 2 – Part 4, Maps 4A, 4B (1, 2, and 3 of 3 plus discussion of temporary sediment control), 4C (1, 2, 3, 4, 5, and 6 of 6), 4D
- Volume 2 – Part 4, Appendix A2, Soil Analysis and Sample Location Map
- Volume 2 – Part 4, Appendix F2, Sub-drainage RC-6 design
- Volume 6 – Map 3-16
- Legal and Financial Volume – Appendix G, page CTW-2

Please stamp approved on the above submitted inserts to the permit and return one copy. The original C2 for is attached to facilitate placing the clean copies into the MRP. Feel free to call if there is any addition comment or concerns with this submittal.

Sincerely,

Kenneth S. Fleck

Kenneth Fleck
Manager of Geology and Environmental Affairs

Encl

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: PacifiCorp

Mine: Cottonwood/Wilber Mine **Permit Number:** C/019/0019

Title: Amendment to Update the MRP at the Completion of Final Reclamation, PacifiCorp, Cottonwood/Wilberg Mine C/015/0019, Emery County, Utah

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Volume 1, Introduction, entire tabbed section
☐ Add	☒ Replace	☐ Remove	Volume 1, Table of Contents, replace entire TOC (see note below)
☐ Add	☐ Replace	☒ Remove	Volume 1, Part 1, Legal and Financial Compliance
☐ Add	☒ Replace	☐ Remove	Volume 1, Part 2, replace pages 30 thru 56
☐ Add	☒ Replace	☐ Remove	Volume 2, Part 3, replace page 1
☐ Add	☒ Replace	☐ Remove	Volume 2, Part 4, replact entire chapter
☒ Add	☐ Replace	☐ Remove	
☒ Add	☐ Replace	☐ Remove	Volume 2, Part 4, add "As-Built" maps - Plates 4A, 4B (3 maps + discussion of temporary sediment control revised plan), 4C ~~(2 maps)~~, and 4D (6 maps)
☒ Add	☐ Replace	☐ Remove	Volume 2, Part 4, Appendix A-2 add Soil Sample Analysis Results and map
☒ Add	☐ Replace	☐ Remove	Volume 2, Part 4, Appendix F-2, add RC-6 design after Figure 3
☐ Add	☒ Replace	☐ Remove	Volume 6, replace Plate 3-16
☐ Add	☒ Replace	☐ Remove	Legal and Financial Volume, Appendix G, replace page CTW-2
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	**Received by Oil, Gas & Mining**
Revision of the Table of Contents will be included with a clean copy .	

Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

Clean Copy Submittal for the Amendment to Update Permit to Include As-Built Conditions Post Final Reclamation Activities, Task ID 5844

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Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

Clean Copy Submittal for the Amendment to Update Permit to Include As-Built Conditions Post Final Reclamation Activities, Task ID 5844

<u>Volume 1, Introduction:</u>

Replace Entire Section

Introduction

PacifiCorp owns and leases certain fee coal lands, together with assigned federal coal leases, and controls approximately 22,500 acres of contiguous minable property located in Emery County, Utah. Geography, the area is known as East Mountain, a large, relatively flat plateau, containing three minable coal seams.

Coal was mined through three separate mines: Deer Creek Mine (currently under reclamation – 2018), Cottonwood/Wilberg Mine (final reclamation completed 3/2018), and the Des Bee Dove Mine (final reclamation completed 6/2003 and Phase III Bond Release was accepted 8/2014). Several federal coal leases are coincidental to both the Cottonwood/Wilberg and Deer Creek mines as the mines are superimposed. The description of the permit area for both mines is listed in their respective permits. Both mines are owned and operated by PacifiCorp.

Three coal seams existed in the Cottonwood/Wilberg mine area; Blind Canyon seam (upper), Cottonwood seam (middle), and Hiawatha seam (lower). The Deer Creek Mine was producing coal from the Blind Canyon Seam and in the North Hiawatha seam. The Cottonwood seam contained excessive in-seam temperature gradients and was determined as unmineable. The majority of coal produced from Cottonwood Mine was from the Hiawatha seam. The coal haulage system (beltline) of the Cottonwood/Wilberg Mine is located in this seam.

The permit boundary and approximate locations of faults that have affected the Cottonwood/Wilberg Mine plan are illustrated in Figure 1. Faults that have influenced mining are the Pleasant Valley Fault, Deer Creek Fault, and the Roan's Canyon Fault.

In the Cottonwood/Wilberg Mine, the Hiawatha seam is bounded on the north by the thinning of the seam below five feet in thickness. On the east, the seam is bounded by the Deer Creek Fault and the Pleasant Valley Fault. On the south and west, the seam is bounded by the coal outcrop and lease border, respectively.

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The Blind Canyon seam within the Cottonwood/Wilberg Mine lies approximately 100 feet above the Hiawatha seam. This seam is bounded on the north by the Deer Creek Mine workings. The east, south and west is bounded by the thinning seam of less than five feet in thickness.

Since part of the Cottonwood/Wilberg Mine was overlain by areas of the Deer Creek Mine, the upper seam was mined prior to mining the lower seam. In addition, mining plans were designed with a system of barriers to protect a 345KV power line.

Wilberg Mine

The Wilberg Mine was acquired by Peabody Coal Company in 1958. In March 1977, Utah Power and Light (UP&L) acquired the mine from Peabody Coal and was officially listed as the lessee on September 1, 1977. In 1982, UP&L successively bid the South Lease (U-47978) federal coal tract.

On July 1, 1985, the Wilberg Mine and the South Lease area were separated into two distinct mines; the Wilberg Mine (MSHA ID No. 42-00080) and Cottonwood Mine (MSHA ID No. 42-01944). Each mine operated independently of the other utilizing separate equipment and ventilation systems. The Wilberg portals were located on the north coal outcrop in Grimes Wash on the southern end of East Mountain. Mine personnel and coal transfer facilities were located at the Wilberg portal.

The Cottonwood portals were located on the south coal outcrop of the Grimes Wash. These portals provided for men and equipment access, underground conveyor belt coal haulage system, and mine ventilation. Although they were separate underground operations, the two mines shared common surface facilities, thus forming the Cottonwood/Wilberg complex.

On May 6, 1996, the Cottonwood/Wilberg Mine and its attached facilities were reassigned an MSHA identification number. The new identification number that was given to the mine was the Trail Mountain identification number (MSHA ID No. 42-01211). This number was assigned to

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the Cottonwood/Wilberg mine since all Trail Mountain coal was transported through this mine. In 2015, the Trail Mountain Mine was sold and transferred under a new ownership. In 2016, the MSHA ID for the Cottonwood/Wilberg Mine was abandoned.

Cottonwood/Wilberg Mine

PacifiCorp completed final reclamation of the Cottonwood/Wilberg Mine in March of 2018. Its surface facilities occupied approximately twenty acres of disturbed land at the confluence of the Left and Right forks of the Grimes Wash. The surface facilities included coal handling, electrical substation, equipment maintenance, material storage, parking areas and drainage and sediment control structures. Office, bathhouse and warehouse facilities are located underground. These facilities were demolished and the land surface regraded and revegetated.

Cottonwood/Wilberg, Des Bee Dove, and Trail Mountain Waste Rock Sites

Bureau of Land Management Right-of-Way UTU-37642: Located 1.5 miles south of the Cottonwood/Wilberg Mine, the original 48.62 acre site was designed as an open storage and truck loadout for the mine. The Right of Way (ROW) grant, UTU-37642 (east side of State Highway 57), was issued by the Bureau of Land Management (BLM) in 1977, but the development of a concrete storage silo for coal on site changed the need for the loadout. A modification was submitted to use this land for underground development waste storage in connection with underground development ongoing in the Cottonwood/Wilberg Mine. The ROW was modified to accommodate coal bed methane degasification conducted by Texaco Inc.

The modification included:

1) 1997 relinquishment of 1.08 acres (access to Texaco well 35-14).
2) 1999 relinquishment of 12.98 acres (Texaco well 34-80).

Total relinquishment of this ROW was 14.06 acres. Of the original 48.62 acre site, only 34.56 acres remained with 1.81 acres of it disturbed. Historically, the Cottonwood/Wilberg Waste Rock Site was located in the southern portion of this ROW. Phase III Bond Release was granted in July 22, 2009. In October 2015, 32.7 acres were accepted by the

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BLM for relinquishment with 1.86 acres to remain for rock and soil storage. This 1.86 acres area was also reclaimed in March of 2018. (Note: The BLM relinquishment notice states 1.86 acres remain however, PacifiCorp's disturbed calculations show 1.81 acres. This acreage is what is reported as disturbed for the rock and soil storage area)

Bureau of Land Management Right-of-Way UTU-65027: Located 1.7 miles south of the Cottonwood/Wilberg Mine is BLM ROW UTU-65027 (west side of State Highway 57). This 25.85 acre site was used for underground waste storage in connection with underground development ongoing in the Trail Mountain Mine. This site replaced ROW UTU-37642 as the primary waste rock storage facility as the old ROW reached design capacity. In 2015, the Trail Mountain Mine was sold and transferred under a new ownership. The sale included site.

This application and related information are intended to address the Cottonwood/Wilberg Mine complex and its affect on the surrounding area. However, several of the environmental resource studies such as vegetation, soils, and wildlife, apply to the applicant's total contiguous area and can be better evaluated as a whole as they refer not only to the specific mine but to the adjacent areas.

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Cottonwood/Wilberg Mine

C/015/0019

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<u>Volume 1, Part 2:</u>

Replace pages 30 thru 56

FISH AND WILDLIFE RESOURCES INFORMATION

As required by the regulations the application has consulted with the D.O.G.M., the D.O.W.R. and U. S. Fish & Wildlife Service. An on-site field investigation of each mine site was conducted. In addition, the applicant felt to properly mitigate wildlife concerns a consultant (Jarvis) was retained to provide both wildlife baseline information and, in consultation with the U. S. Fish & Wildlife Service, initiate any necessary studies and identify any possible conflicts between wildlife and mining operations. This report is included in this section. Notwithstanding Judge Flannery's decision, applicant feels that without baseline data a proper wildlife mitigation plan cannot be developed.

As the Jarvis report and the D.O.W.R. baseline data are for the most part redundant, applicant has chosen to include only the consultant's report in this application but has included the mitigation and impact avoidance procedures as recommended by the D.O.W.R. in the Fish & Wildlife Protection Plan. The applicant has the D.O.W.R. complete baseline studies on file and copies have been sent to all concerned state and federal management agencies.

Mine Plan Area

The PacifiCorp lease area covers the south half of East Mountain in the Wasatch Plateau. Life zones range from Upper Sonoran below the mines to Canadian on top. The three mines are located in steep rocky canyons on the south and east slopes of the mountain.

Wildlife Habitats

The habitats within the mine plan are rated as 1 and 2 by Bob Scott and others for coal lands of Utah (Scott, 1977). Around the mines the cliffs are considered raptor nesting habitat with the slopes below and the flat lands above the cliffs as raptor feeding areas. The lower slopes and alluvial fans below the mines are rated as deer winter range. All elk range is shown on Figure 1 in Map Packet 2-20.

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The habitats at the portals in Cottonwood Canyon, Cottonwood/Wilberg Mine and Des-Bee-Dove Mines are designated as pinyon-juniper with many open rock and cliff areas. At the Deer Creek Mine some riparian habitat exists along Deer Creek below the mine. The south facing slopes of this steep canyon are covered with pinyon-juniper -and the north facing slopes are covered with a

mixed conifer stand.

The habitat designations are listed below:

s	-	Sagebrush
G	-	Grassland
SD	-	Salt Desert Shrubs
R	-	Riparian
P-J	-	Pinyon-Juniper
MC	-	Mixed Conifer (includes Aspen Groves)

a. Sagebrush - All the sagebrush communities are situated between' 8,000 and 10,000 foot elevations along the top of the East Mountain plateau. They exist as short sage communities generally on ridge tops and flats. Aspen-groves are scattered through the sagebrush communities on the flats and along the edges. A few areas around springs still harbor small wet meadows.

b. Grassland - Two small areas on ridges in tributaries of Cottonwood Creek.

c. Salt Desert Shrub - This plant community is located on the lower slopes adjacent to the access road to the Des-Bee-Dove Mines.

d. Riparian - The streams are small and flow through steep narrow canyons. Consequently the riparian zone is very narrow often less than 30 yards wide. The vegetative composition varies from the broad-leafed trees and shrub plant community normally depicted as characteristic of riparian areas to many areas were--e there is only an increased density of conifers and/or aspen.

e. Pinyon-juniper - This pygmy forest is located on steep slopes and talus slides that are crowned by near vertical to vertical rock escarpments. In many areas especially on the south face of East Mountain the forest consists of scattered trees growing amidst huge rocky cliffs and rough rockpiles. Where steep canyons occur the pinyon-juniper forest is only found on south facing slopes or on rocky exposed ridges. In many areas where the pinyon-juniper grades into the mixed conifer stands a mountain brush plant community, exists as an ecotone between the two tree dominated plant communities. These areas are generally confined to a single slope of less than 200 acres.

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f. Mixed Conifer - The mixed community is spread all over East Mountain, on the top, the slopes, and in the steep side canyons. Below 8,000 feet elevation conifers are found only on north facing slopes in steep canyons. Fir species generally dominate the stands along with spruce and a scattering of aspens at the sagebrush interface.

Species of Special Significance

The species listed here and their habitat requirements are discussed in the following paragraphs. This list was derived from Utah Division of Oil, Gas and Mining's guidelines and from Utah Division of Wildlife Resources' status list (DOGM, 1980 and UDWR, 1979).

Table 1: Species List of the Wasatch Plateau

Species	Status	Habitat	Comments
Western Bluebird (Sialia mexicana)	Federal	MC, P-J	Probably occurs within disturbed area
American Peregrine Falcon (Falco peregrinus)	T&E	All	Does not occur, no sightings
Bald Eagle (Haliaeetus leucocephalus)	T&E	All	Winter visitor
Showshoe Hare (Lepus americanus)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area
Northern Flying Squirrel (Glaucomys sabrinus)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area
Red Bat (Lasiurus cinereus)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area
Utah Mountain Kingsnake (Lampropeltis pyromelana)	DWR Limited	R, P-J, MC	Probably occurs in the disturbed area
Utah Milksnake (Lampropeltis triangulum)	DWR Limited	MC	Probably occurs on permit area but not in disturbed area
Tiger Salamander (Ambystoma tigrinum)	DWR Questioned	R	Probably occurs on permit area but not in disturbed area

Threatened and Endangered

A letter from U. S. Fish and Wildlife Service dated November 6, 1980. "To the best of our knowledge, no endangered or threatened plant species or critical habitat for threatened, or endangered wildlife species occur in the disturbed areas of the subject mining operations."

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Effects of Mining Operations on Fish and Wildlife

The effects of mining on wildlife are being evaluated through various studies being conducted by the Mining Division. A major study was implemented at the Cottonwood Mine. The Cottonwood

Mine Escarpment Study, developed by the Mining Division, in cooperation with the BLM, USFS, and DOGM. The objects of the study were to develop a geotechnical model for predicting escarpment failure, identify impacts to resources and develop effective mitigation measures for identified impacts. Results of the study were reported annually as the study progressed. The primary habitat losses have been raptor nesting sites and deer winter range.

The lower open slopes are used by raptors on the escarpment face for hunting activities where an abundance of rodents and small birds provide a prey base. Wintering migrants also utilize these same habitats for hunting. The vehicle traffic and human presence appears not to have disrupted the natural hunting patterns. Data from the period prior to mining lacked to evaluate the present situation.

The traffic on the Mine access roads kills approximately eight (8) deer each year. This is not considered significant by DWR (personal communication with Larry Dalton). Mining impacts on golden eagles have been studied since 1986 in Newberry Canyon. No significant impacts have been identified to date. Nesting and production of young has continued uninterrupted (see Annual Monitoring Reports and Assessment of Mining Related Impacts in Newberry Canyon).

An assessment of deer use on the BLM portion of the permit area was initiated by the BLM in 1989. This investigation was continued as part of the Cottonwood Mine Escarpment study. Data collection and analysis was done in accordance with Interagency (BLM, USES, DWR) Guidelines.

Fish and Wildlife in Cottonwood Canyon

The portal area in the Cottonwood Canyon is in pinyon-juniper habitat. A number of important vertebrate species are typical of this habitat within the region. The sparse vegetation and steep, dry conditions present at the portal are less suitable for wildlife than are densely vegetated portions of pinyon-juniper habitat on gently sloping terrain south and east of the mine property.

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The mule deer is the most conspicuous large mammal in pinyon-juniper habitat in the mine vicinity. Other mammal species found in this habitat include black-tailed jackrabbit, mountain

cottontail, coyote, badger, striped skunk, deer mouse, pinyon mouse, least chipmunk, hoary bat, and western big-eared bat (Brown et al, 1958).

Typical birds in pinyon-juniper habitat include the mourning dove, pinyon jay, western bluebird, western kingbird, American kestrel, and chipping sparrow (Brown et al, 1958). Chukar partridge inhabit the rocky escarpment areas near the Cottonwood/Wilberg portal area.

Dry surface conditions and the absence of standing water virtually preclude the presence of amphibians from pinyon-juniper habitat in the vicinity of the mine, but several reptile species are common. The side-blotched lizard, eastern fence lizard, sagebrush lizard, racer, gopher snake, and western rattlesnake are representative species in this habitat type throughout the region (Stebbins, 1966).

Open stands of spruce-fir-Douglas fir forest with Douglas fir as a dominant species occur on sheltered north facing slopes at higher elevations within the mine property. Spruce-fir-Douglas fir and pinyon-juniper habitats intermingle in canyon bottoms and at intermediate elevations to form a transition zone between the two vegetation types. Aspen groves in the spruce-fir-Douglas fir communities offer excellent calving areas for elk (U.S. Forest Service, 1976). Mule deer, snowshoe hare, and blue grouse are important game species in forested areas. Non-game mammals which inhabit forest areas include bobcat, beaver, porcupine, red fox, coyote, mountain vole, deer mouse, hoary bat, and silver-haired bat.

Many bird species frequent the forested portions of the mine property. Conspicuous breeding birds include band-tailed pigeon, plain titmouse, Clark's nutcracker, raven, turkey vulture, great horned owl, red-tailed hawk, and golden eagle.

Amphibian species such as the chorus frog and western toad inhabit mesic areas of the site. Reptiles are probably not abundant, but the short-horned lizard, sagebrush lizard, gopher snake, and western terrestrial garter snake inhabit sagebrush and forests-sagebrush ecotones in the site region.

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Sagebrush and grassland habitat, and some mesic vegetation types occur on the relatively flat upper

benches of East Mountain. Meadow habitat is limited to small drainage areas and a few springs. These habitats, combined with the forest edge ecotonal areas, are suitable for elk, mule deer, sage grouse, ruffed grouse, blue grouse, and snowshoe hare.

Fishery

Cottonwood Creek within Cottonwood Canyon is considered a non-fishery until its junction with Straight Canyon four miles downstream from the project site where it is joined with waters from Joe's Valley Reservoir and is planted with fingerling trout.

Refer to Final Environmental Statement Emery Units 3 and 4.

Game Species

Mule Deer (odocoileus hemionus) - Mule deer range throughout all habitats on the mine property. Pinyon-juniper on the slopes of East Mountain is used as winter range. During other seasons deer concentrations are greater at high elevations. Although deer populations have declined over the past several years, the deer herd and habitat in the mine vicinity are in good condition (Dalton, 1977).

Elk (Cervus canadensis) - Elk inhabit the sagebrush, and forest areas at the upper elevations on East Mountain, but do not ordinarily range into pinyon-juniper habitat. The seven year average of elk censured on East Mountain (1970-1976) was 76 antlerless and two antlered individuals seen per year (Dalton, 1977). This census included larger groups only and does not reflect a total population estimate (Dalton, 1977).

Mountain Lion (Felis concolor) - This species inhabits rugged mountains and forest areas in the region and may occasionally occur on East Mountain (Dalton, 1977).

Snowshoe Hare (Lepus americanus) - This species occurs in forested portions of mountainous areas in the region. It inhabits higher elevations on East Mountain (Dalton, 1977).

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Mountain Cottontail (Sylvilagus nuttalli) – Mountain cottontails inhabit brushy areas and forests, particularly on rocky slopes throughout the mine region (USDI Bureau of Land Management, 1976).

Blue Grouse (Dendragapus obscurus) - Open conifer stands with brushy understory at higher elevations provide suitable habitat for this species. Blue grouse occur on East Mountain. The greatest density of the species in Utah is in the northern Wasatch Range (Rawley and Bailey, 1972).

Ruffed Grouse (Bonasa umbellus) - Bushy woodlands (aspens, willows, and conifers) near streams and springs are suitable habitat. This species occurs at higher elevations on East Mountain, but good populations are generally limited to the Wasatch Range northwest of the mine property (Rawley and Bailey, 1972).

Chukar Partridge (Alectoris graeca) - This species prefers steep, rock, semiarid slopes with low shrubs and rock outcrops. This species was introduced in Utah from 1951 to 1968. During this period 185,911 individuals were released at 191 different locations (Rawley and Bailey, 1972). The species is now widely distributed throughout Utah and other western states.

Mourning Dove (Zenaidura macroura) - This is an important game bird in many parts of North America. Mourning doves prefer open field and forest edge habitat, but occur over a broad range of vegetation types throughout the 48 conterminous United States. The species occurs in pinyon-juniper and forest edge habitat on East Mountain.

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Special Status Species

No federally listed endangered or threatened species are known to occur on the site property (USDI, Fish and Wildlife Service, 1976). The black-footed ferret (Mustela nigripes), a federally endangered species, has recently been reported near Ferron, several miles south of the site (Dalton, 1977). This species is not likely to occur on mine property because preferred habitat (a prairie dog town) (USDI Bureau of Land Management, 1972) is not present. American peregrine falcon

(Falco peregrinus anatum) has been observed with 25 miles of the site in the winter of each of the past three years (Dalton, 1977). It is probably a winter visitor in the area (USDI Bureau of Land Management, 1972b), although, historically peregrine falcon aeries existed in the San Rafael swell area 30 miles southeast of the site.

The State of Utah has defined the status of selected animal species (Utah Division of Wildlife Resources 1976), some of which are likely to occur on or near the Wilberg Mine property as:

> DECLINING:Any species of animal which, although still occurring in numbers adequate for survival, has been greatly depleted and continues to decline. A management program included protection or habitat manipulation, is needed to stop or reverse the decline.
>
> LIMITED:Any species of animal occurring in limitednumbers due to restricted or specialized habitat or at the perimeter of its historic range.
> STATUS QUESTIONED: Insufficient data area available to permit a reliable assessment of the status of the species. Special status species in Utah that might be found near the mine property are:
>
> Bobcat (Lynx rufus) Declining. Fur prices in recent years have resulted in high harvests. The species is presently under consideration for total protection until the current population trend is reversed. Bobcats probably occasionally use the habitats present on the mine property.
>
> Sandhill Crane (Grus canadensis) Limited. A few individual migrate through the region (Robbins et al, 1966).
>
> Fox Sparrow (Passerella iliaca) Status questioned. Suitable habitat for the species occurs at upper elevations on East Mountain on the mine property.
>
> Utah Mountain Kingsnake (Lampropeltis pyromelana infralabialis) Limited. Suitable habitat occurs on site. The species is in the region and may inhabit the mine area (Stebbins, 1966).

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LAND USE INFORMATION

Historically, man's first sustained use of the land was grazing by early settlers. Due to the inaccessible reaches of the coal seam in the Grimes Wash area, it is expected that coal mining of a serious nature occurred after the turn of the century in the form of a wagon mine for local

consumption. Wilberg derives its name from an early mine owner of federal record, Cyrus Wilberg, who mined this area briefly (1944).

Topography of the general area dictated its uses; i.e., the lower valleys provided year-round farming and ranching and the higher sediments of the Wasatch Plateau were utilized for summer grazing as it is today.

Grimes is a small canyon enclosed by steep barren cliffs with no access to the upper reaches of East Mountain. Two drainages are junctional at the mine site. The left and right forks compose what is known as Grimes Wash which flows across approximately five miles of Mancos Shale prior to its juncture with Cottonwood Creek.

Currently on the BLM lands in the permit area, the livestock use is spring grazing with cattle on the benches (April 1 - June 10). The East Grimes and West Grimes allotments are stocked at 19.4 acres/AUM and 16 acres/AUM for a total of 317 and 263 AUM's respectively. These allotments are judged in fair condition with a downward trend (BLM letter 6/24/82).

Very little grazing by cattle occurs on the steep slopes above the benches because of the difficult access and scarcity of forage.

The grazing of the USES lands is confined to East Mountain under an approved rest rotation system (USES, 1979). Nine permits graze 486 cattle from June 21 to September 10 for a total of 1,296 AUM'S. The range condition is judged "good" with a static to upward trend. The stocking rate is 11 acres/AUM.

Elk use East Mountain for summer range but winter on the western slopes in the Cottonwood Creek drainage. Mule deer also summer on the mountain and winter on the benches and slopes of the southern and eastern portion of East Mountain from the mouth of Cottonwood Creek around to Rilda Canyon in the Huntington Creek drainage. These ranges are rated as high priority winter range by Utah Division of wildlife Resources. Current herd management levels are one deer/20 acres of inter-range (UDWR, 1982).

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The total forage productivity of the pinyon-juniper range on the benches is 100-324 lbs/acre, dry weight. The pinyon-juniper range on the rock land soils of the steep slopes is lower, estimated 25-100 lbs/acre, dry weight. See Vegetation Section for productivity details.

The BLM also recognizes the sand and gravel resources on these benches and has designated specific areas for excavation and processing to aid in community expansion. The BLM visual resource management system rates the benches as Class IV and the cliff faces as Class III. Both of these classifications allow for modification of the land through man's activities. The USES also rates the south end of East Mountain as modification or partial retention, a scenic value similar to BLM's Class IV and III respectively.

The Land Use Plans for the Wasatch Plateau designate dispersed recreation and limited commercial timber on East Mountain in addition to big game range and protection of watersheds.

Six gas-producing wells have been developed in Cottonwood Canyon just west of the mine permit area. The wells are within the East Mountain Unit operated by Meridian Oil Co. The East Mountain Unit overlaps the mine permit area; therefore, future development by Meridian Oil Co. may take place within the mine permit area.

Prior mining consisted of a small wagon mine (Wilberg) 1944 through 1958. Coal was extracted from the Hiawatha Seam by conventional methods. Activities were confined to Lease SL-064900. An estimated 107,000 tons were removed.

Pre-mining use of the land was for livestock grazing and wildlife habitat with some occasional timber cutting on top of East Mountain (see Land Use Map 2-19).

Final reclamation of the Cottonwood/Wilberg Mine was completed in March 2018. No active mining occurred in the Grimes Wash area since portals were sealed in 2001.

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REFERENCES

Bureau of Land Management August 1988, San Rafael Draft Resource Management Plan. Moab District, Utah.

Emery County, Zoning Plat Books, Castle Dale, Utah

U.S. Forest Service 1986, Land and Resource Management Plan. Manti-LaSal National Forest, Price, Utah.

Utah Division of Wildlife Resources, May 1982, Utah Big Game Investigation and Management Recommendations 1981-1982, Publication #82-3.

Emery County Zoning

A-1	Agricultural Zone, contains the primary farming areas of the county.
RA-1	Residential-Agricultural Zone, this is the area with the communities and the adjacent or intermixed agricultural lands.
M&G-1	Mining and Grazing Zone, all of the county lands outside of the communities, farming areas and forest service boundary.
I-1	Industrial Zone, specific areas near communities and highways reserved for industrial development.
Ce-1	Critical Environmental Zone, general designation for all private lands within the forest boundary.
Ce-2	Critical Environmental Zone, specific designation for certain land parcels especially those adjacent to recreation site in the forest.

Land Use of the Portals in Cottonwood Canyon

The portal area in Cottonwood Canyon has been the site of an earlier coal mining operation, the Johnson Mine. This earlier mine was opened in 1945 and mining methods were conventional for that period. The Hiawatha coal seam was mined until 1955. The extent of the coal removed was not documented (personal communication, Neldon Sitterud, August 1979).

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The area across the canyon exists a coal mine, Trail Mountain Mine. Mining, stockpiling, and

shipping coal occurred on that site, however operations ceased at this site in 2001. The site is currently owned by Wolverine Fuels, LLC. The name of the mine was changed to Fossil Rock Fuels.

The land use preceding mining was wildlife habitat. The vegetation reestablished after mining is representative of the Pinyon-juniper sites with good reestablishment of local forage species.

Land in the vicinity of the portals in Cottonwood Canyon is used primarily for spring and winter range forage, wildlife habitat and mineral mining. Historically, the area has been used for wildlife habitat.

The present land use of wildlife habitat utilizes the surface lands at their highest capability in the Cottonwood Canyon area. Factors which support this conclusion are shallow, coarse textured soils, large amounts of rock outcrop, steep terrain (70-80%), low soil water-holding capacity and low amounts of total annual precipitation.

Vegetation sites on the lower canyon area vary from the semi-desert alkali flat (Greasewood - Soil pH 9.2) with a land classification of capability unit VII's - SX, to the semi-desert stoney loam (pinyon-juniper) range site also with the range site capability unit of VII's - *SX.*

A site specific investigation, conducted with the Soil Conservation Service Range Specialist in July 1979, indicated that the condition of the range and vegetation in the lower Cottonwood Canyon is fair. The capability level of this area varies. The Cottonwood Canyon portal area is covered under vegetation sites 1 and 2 and has the estimated capability of producing 1,000 pounds/acre with a presently estimated production level of 1,000 pounds/acre of forage.

The Carbon - Emery Soil Survey (USDA, SCS, 1979) expresses the capability unit VII's - SX the following way:

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> Permeability is moderate to rapid, and natural fertility is moderate to low. The susceptibility to sheet erosion is moderate; some gullies have formed. The soils retain about four inches of water but are dry most of the time.

These soils are used for range and are suited to that purpose. Reseeding of grasses and clearing of brush or other mechanical practices that would improve the range are not feasible.

There is Douglas Fir and White Fir on the portal site. The timber value of the trees in this area is minimal and classified non-commercial due to inaccessibility, size - class distribution and marketing conditions that limit the economic feasibility of commercial operation.

Note: The portals in Cottonwood Canyon were sealed in 2001. No active mining operations have occurred in the canyon since that time. The proposed fan portal area was reclaimed in 1999 and received bond release in 2009. The remainder of the disturbed area, namely the Trail Mountain Access (TMA) portal and belt portal areas were reclaimed in 2014.

PRIME FARMLAND INVESTIGATION

After investigating all the lands within the permit boundaries of the Wilberg Coal Mine it is determined that these lands do not qualify as "prime farmlands" for the following reasons:

1. Historically the lands prior to construction were not used as crop land.
2. The slopes of and surrounding the portal area exceed 10 percent.
3. There is no developed water supply qualifying as an irrigation source.

In keeping with the regulations, applicant requests the Division to make a negative determination. Applicant has contacted the Soil Conservation Service (Mr. Beardall) in Price, Utah. They are aware of the mining company's need for negative determinations for permitting. No soil mapping is published in the area of Utah Power & Light Company coal mines.

It was requested by Mr. Beardall that a map of the three mines, with a request for a soil survey, be submitted for determination. The findings would be forwarded to the Division.

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ALLUVIAL VALLEY FLOORS (785.19)

The statutory definition of alluvial valley floors is as follows: "'alluvial valley floor' means the unconsolidated stream laid deposits holding the streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet

erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits. "The surface facilities located at the Deer Creek, Wilberg, and Church underground mines are situated in relatively narrow canyons which slope up directly from the draining stream. The canyons lack any soil development and do not contain irrigatable land which could be used for agricultural purposes. The canyons in which the surface facilities are located contain deposits of mass movements, slope wash, debris erosion and sheet runoff. The area is classified as an upland and non-irrigation area and, therefore, cannot be considered as an alluvial valley floor. Furthermore, disturbance or interruption of aquifers within the underground mine complex will have no effect on downstream alluvial valley floors, insomuch as the water will eventually reach the downstream portions of the drainage system through one system or another.

HYDROLOGY AND GEOLOGY GENERAL REQUIREMENTS

The Cottonwood/Wilberg Mine area is located in the central portion of the Wasatch Plateau Coal Field in Emery County, Utah (Figure 2-1). Generally, this area is a flat-topped mesa surrounded by heavily vegetated slopes which extend to precipitous cliffs leading to the valley below. The plateau generally has a vertical relief of up to 2,500 feet, rising from Castle Valley below. The following discussion summarizes the structural geology, stratigraphy, hydrology, and economic coal deposits of the region and the Wilberg Mine area.

Data Collection

PacifiCorp has been collecting data regarding the Wilberg Mine area and adjacent properties since 1971. As a result, 118 exploration drill holes have been completed from the surface wherein data were collected regarding the coal seams and enclosing strata (see Map 2-1).

Nine of these holes were core drilled through the coal zone and all were geophysically logged. Generally, these surface holes are located on about 1/2 to 3/4 mile centers. In addition to these holes, approximately 475 holes have been drilled from within the mines which provide valuable data on as close as 500 foot centers.

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The coal seams exposed on outcrop and within the mine workings have been mapped in detail providing data which is valuable in understanding the coal geology.

The interpretations made herein are based on data collected from all of the above sources in addition to the published regional data. All of these data allow the construction of a geologic and hydrologic model which represents the conditions present in the area of the Cottonwood/Wilberg Mine and surrounding areas.

The applicant has made a practice of submitting to the BLM, each year, copies of both lithologic and geophysical logs of all drill holes, surface and underground, which were drilled within federal leases or on fee land. At the time the mine permit was completed, copies of all logs had been submitted to the BLM.

Structure

The geologic structure of the Cottonwood/Wilberg Mine area is fairly simple. The strata are gently down-folded in the area of the Straight Canyon syncline which is present in the northwest portion of the Cottonwood/Wilberg Mine area (see Map 2-2). Dips in the syncline range from two to six degrees with the north limb dipping the steepest.

The Hiawatha Seam generally strikes N60 E and dips one to three degrees in a northwest direction throughout the area of the current Cottonwood/Wilberg Mine workings. However, to the northwest of the Straight Canyon syncline both the Hiawatha and Blind Canyon Seam dip in a southeast direction at three to five degrees. The dip and strike of the coal seams can be better visualized on Map 2-2 which is included herein.

The strata within the property have been offset by a series of north-south trending fault zones. Generally, these faults are nearly vertical and do not have significant amounts of fault gouge or drag associated with them. One of the major faults present in the region, the Pleasant Valley Fault, has been intersected in the Wilberg Mine (refer to Map 2-2).

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The Pleasant Valley Fault consists of two parallel fractures which are about 150 feet apart (see Map 2-2 and cross sections 2-3). Its total displacement, where it was intersected in the Deer Creek Mine to the north is 150 feet with its downthrown side on the east. The displacement diminishes to less than one foot where it was intersected in the Wilberg Mine.

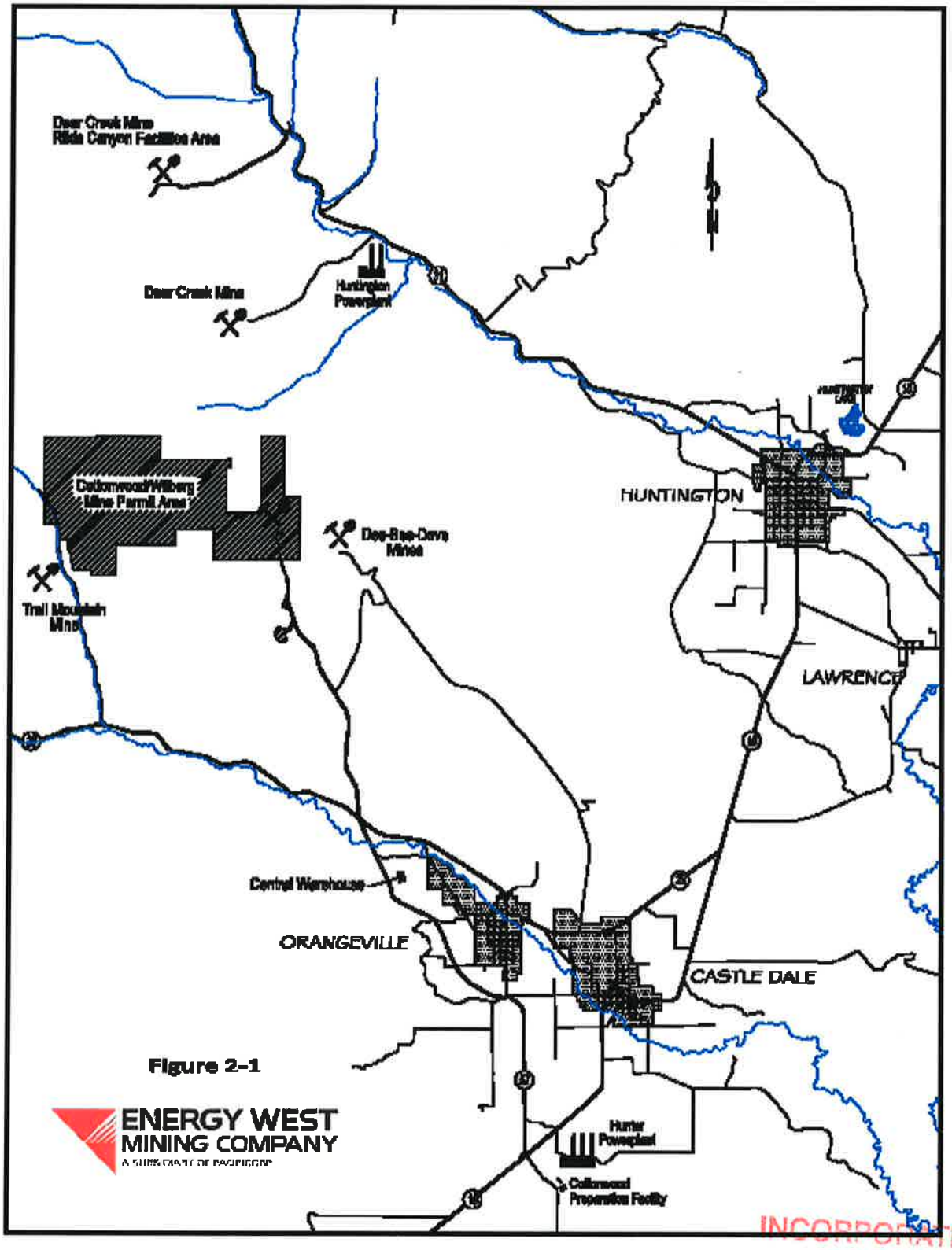

Figure 2-1

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Another north-south trending fault is present to the east of the Pleasant Valley Fault. This fault, the Deer Creek Fault, limits the eastward development of the Wilberg Mine. The displacement of the Deer Creek Fault ranges from 100 to 170 feet with the east block being downthrown.

A fault system has been identified within the Wilberg Mine area which trends in a northeast-southwest direction along the Straight Canyon synclinal axis (see Map 2-2). In the northeast corner of federal lease U-084923, this structure called the Roans Canyon Fault graben, consists of up to six normal faults with displacements up to sixty-five feet.

Stratigraphy

The rock formations exposed in the Cottonwood/Wilberg Mine area range from Upper Cretaceous to Tertiary in age (see Figure 2-2). These formations in ascending order are the Masuk shale member of the Mancos Shale, Starpoint Sandstone, Blackhawk, Castlegate Sandstone, Price River, North Horn, and Flagstaf Formations. The coal deposits are restricted to the lower portions of the Blackhawk Formation.

The Masuk Shale is the upper member of the Mancos Shale. It consists of light to medium gray marine mudstones. Usually this formation weathers readily forming slopes which are often covered by debris. This formation is generally devoid of water.

Starpoint Sandstone

Overlying and intertonguing with the Masuk Shale is the Starpoint Sandstone. In this area the Starpoint consists of three or more cliff-forming massive sandstones totaling about 400 feet in thickness. Generally, they are fine to medium-grained and moderately well-sorted. The upper contact of the Starpoint is usually quite abrupt and readily identifiable on the outcrop. Locally, the Starpoint Sandstone exhibits aquifer characteristics.

Blackhawk Formation

The Blackhawk Formation consists of alternating mudstones, siltstones, sandstones and coal. Although coal is generally found throughout the Blackhawk Formation, the economic seams are

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Utah Geological and Mineralogical Survey Monograph Series No. 3, 1972

Figure 2-2

Stratigraphy of East Mountain
(Doelling, 1972)

System	Series	Stratigraphic Unit		Thickness (feet)	Description
TERTIARY	Eocene	Green River Formation		-	Chiefly greenish lacustrine shale and siltstone.
		Wasatch Group	Colton Formation	300 -1,500	Varicolored Shale with Sandstone and limestone lenses, thickness to the north.
	Paleocene		Flagstaff Limestone	200 - 1,500	Dark yellow-gray to cream limestone, evenly bedded with minor amounts of sandstone, shale, and volcanic ash, ledge former.
			North Horn Formation (Lower Wasatch)	500 - 2,500	Varigated shales with subondinate sandstone, conglomerate and freshwater limestone, thickens to north, slope former.
CRETACEOUS	? Maestrichtian	Mesaverde Group	Price River Formation	600 - 1,000	Gray to white gritty sanstone interbedded with subordinate shale and conglomerate, ledge and slope former.
	Campanian		Castlegate Sandstone	150 - 500	White to gray, coarse-grained often conglomeratic sanstone, cliff former, weathers to shades of brown.
			Blackhawk Formation *MAJOR COAL SEAMS*	700 - 1,000	Yellow to gray, fine- to medium-grained sandstone, interbedded with subordinate gray and carbonaceous shale, several thick coal seams.
			Star Point Sandstone	90 - 1,000	Yellow-gray masive cliff-forming sandstone, often in several tongues separated by Masuk Shale, thickens westward.
	Santonian	Mancos Shale	Masuk Shale	300 - 1,300	Yellow to blue-gray sandy shale, slope former, thick in north and central platear area, thins southward.
			Emery Sandstone *COAL (?)*	50 - 800	Yellow-gray friable sandstone tongue or tongues, cliff former, may contain coal (?) in south part of platear if mapping is correct, thickens to west and south. Coal may be present in subsurface to west.
	Coniacian		Blue Gate Member	1,500 - 2,400	Pale blue-gray, nodular and irregularly bedded marine mudstone and siltstone with several arenaceous beds, weathers into low rolling hill and badlands, thickens northerly.
	Turonian		Ferron Sandstone Member *MAJOR COAL SEAMS*	50 - 950	Alternating yellow-gray sandstone, sandy shale and gray shale with important coal beds of Emery coal field, resistant cliff former, thickens to south.
	Cenomanian		Tununk Shale Member	400 - 650	Blue-gray to black sandy marine slope forming mudstone.
	Albian	Dakota Sandstone *MINOR COAL*		0 - 60	Variable assemblages of yellow-gray sandstone, conglomerate shale and coal. Beds lenticular and discontinuous.

Generalized section of rock formations, Wasatch Plateau coal field.

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restricted to the lower 150 feet of the formation. The sandstones contained within the Blackhawk Formation are fluvial and increase in number in the upper portions of the formation. Many of these tabular sandstone channels form local perched water tables. The total thickness of the Blackhawk Formation in the Cottonwood/Wilberg Mine area is about 750 feet.

Castlegate Sandstone

The Castlegate Sandstone generally caps the escarpment which surrounds the mine portal area. The Castlegate consists of about 250 feet of coarse-grained, light-gray, fluvial sandstones, pebble conglomerates, and subordinate zones of mudstones. Although this sandstone is very permeable, it lacks water because of insufficient recharge.

Price River Formation

The Price River Formation overlies the Castlegate Sandstone. The formation is about 500 feet thick and forms slopes which extend upward from the Castlegate escarpment. Fine-grained, poorly sorted, sandstones dominate the Price River Formation but some mudstones are present. The Price River Formation generally lacks water.

North Horn Formation

The North Horn Formation is about 850 to 900 feet thick in the Cottonwood/Wilberg Mine area. Mudstones dominate the rock types present. These mudstones are generally grey to light brown in color. Localized, lenticular sandstone channels are present in this formation throughout. These sandstone beds are more common near the upper and lower contacts of the formation and many times host localized perched water tables.

Flagstaff Formation

The youngest formation exposed in the area is the Flagstaff Formation. It consists of white to light-gray, lacustrine limestone. An erosional remnant of 100 to 150 feet of this formation remains forming a cap on the highest plateaus of the area. The formation is fairly well fractured allowing surface water to percolate down to lower strata.

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Economic Coal Occurrences

Three economic coal seams were present on the property which hosts the Cottonwood/Wilberg

Mine: the Hiawatha, Cottonwood, and the Blind Canyon Seams. All active mining operations occurred in the basal or Hiawatha Seam.

Hiawatha Seam

The Hiawatha Seam is of minable thickness in both the southern and extreme northern portions of the East Mountain property (see Map 2-4). This seam which rests directly on the Starpoint Sandstone ranges in thickness from 16 feet to less than 5 feet. The Hiawatha Seam is not present throughout a major portion of the property. This lack of coal is due to a major distributary river channel which flowed through the coal swamp in an easterly direction.

Blind Canyon Seam

The second major minable seam on the Cottonwood/Wilberg Mine property is the Blind Canyon Seam. This seam is located from 14 to 140 feet above the Hiawatha Seam (see Map 2-5). The average separation between these seams is 70 to 80 feet but does increase up to 140 feet in the southern portion of the property. The Blind Canyon Seam is of minable thickness through most of the permit area and in part is mined through the Deer Creek Mine (see Map 2-6). This seam ranges in thickness from 16 feet to less than 5 feet. The thickness of the seam thins to less than 5 feet in the southwest portion of the property.

Cottonwood Seam

The Cottonwood Seam is located stratigraphically between the Hiawatha and Blind Canyon Seams. This seam is located generally about 70 to 90 feet above the Hiawatha Seam (see Map 2-7) but is found in minable thickness only in the south half of lease U-47978.

Overburden

The coal reserves in the Wilberg Mine area within the Hiawatha Seam are covered by up to 2,300 feet of overburden. Because the topography of these lands displays much relief, the thickness of the overburden is highly variable (see Maps 2-10, 2-11 and cross sections 2-3). The overburden is the greatest in the western and northern portions of the property where the plateau is capped with the Flagstaff Limestone. In these areas the overburden ranges from 2,200 - 2,300 feet. However, the overburden above most of the coal is less than 1,800 feet.

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Chemical Composition

In the development of the Cottonwood/Wilberg Mines and associated surface facilities, some of the strata and alluvium covering the coal seam was excavated to accommodate the facilities. In order to better understand the chemical and physical characteristics of the rock material that was excavated, over 130 samples from both outcrop and core from drill holes were analyzed.

Four drill holes were selected as data points in which core samples were analyzed for their chemical and physical properties (see Figure 2-4). These core drill holes were selected to give the best representation of the same rock sequence which was excavated at the Cottonwood/Wilberg Mine portals and that which will be excavated during the mines life. Two of the holes were drilled from the surface of East Mountain (EM-12C and EM-23C), and two of the holes were drilled from within the Deer Creek and Wilberg Mines (A-25 and B-124).

Samples of rock core were collected from each lithologic unit that was penetrated within the selected drill holes. These samples consisted of a representative section of core averaging 0.3' in length usually taken from the center of each lithologic unit. Samples of rocks which were immediately overlain by minable coal seams were collected at the coal seam contact. The rock zones sampled and the sample numbers are shown on the core logs for each drill hole (see core logs in Appendix VI.)

In light of the recommendation made by the Office of Surface Mining (OSM) each sample was analyzed for the following:

pH	% Iron
EC (electrical conductivity)	% Zinc
% Calcium	% Sulfate
% Sodium	% Moylbdenum
% Magnesium	% Boron
SAR (Sodium Absorption Ratio)	Alkalinity (Equivalent $CACO_3$)

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All of the samples of carbonaceous mudstone that were collected were also analyzed for their percent pyrite/marcasite content. The samples collected from immediately below a minable coal

seam were analyzed for their clay content. In addition to these analyses, four or five representative samples of each of the rock types present, sandstone, siltstone, mudstone, interbeds (thinly laminated siltstone and mudstone), carbonaceous mudstone, and coal were tested for their physical properties. These samples were crushed to a size of -1/4" mesh and the product was screened for its percent sand, silt and clay content.

Front Range Labs, Inc., of Fort Collins, Colorado, was selected to do the analytical work because of their expertise in testing the chemical and physical properties of coal overburden and their ability to perform all of the required analytical work.

PacifiCorp had previously established an excellent data base regarding the coal quality within the East Mountain property. Since 1979, samples have been collected from within the Deer Creek and Cottonwood/Wilberg Mines on a daily basis. These samples were analyzed by Standard Laboratories, Inc., in Huntington, Utah prior to1987 and by CT&E, in Huntington, Utah since that time. Some of the data reported herein have been gleaned from this work.

The findings of these analyses are separated by formation, rock type and coal seam in Table A and the individual analysis are found in Appendix VI. For each rock type the mean and standard deviations have been calculated for each of the various chemical and physical parameters. In general, the chemical content within a rock type is moderately consistent as shown by the sandstones and siltstones are variable due to sulfate enrichment by groundwater in some of these rock types and not others.

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Table A

Analytical Summary Overburden Analysis

Lithology	Number of Samples: Chemical Tests	Number of Samples: Physical Tests	Chemical Tests: Ca Meg/L	Mg Meg/L	Na Meg/L	[1] SAR	Fe ppm	Zn ppm	SO_4-S ppm	Mo ppm	B ppm	pH (Paste)	E.C.[2] mhos/cm	Sat. %	Physical Tests: Pyrite FeS_2[3]	Sand %	Silt %	Clay %	Crushed Rock Texture
Blackhawk Formation:																			
Sandstone:	26	2																	Sandy
Mean			4.37	8.18	2.13	1.05	8874	11.47	409.6	.1	.06	8.0	1.55	21.7	-	84.5	11.0	4.5	Loam
S.D.			3.91	5.13	1.08	0.69	6672	9.7	353.1	0	.06	0.96	0.89	3.36	-	0.71	1.41	2.12	
Siltstone:	24	5																	Sandy
Mean			3.06	6.24	2.30	1.69	14512.88	38.26	464.41	.1	0.18	7.88	1.41	20.81	2.3	71.6	17.8	10.6	Loam
S.D.			2.63	7.23	2.78	3.72	8782.4	21.29	1222.63	0	0.16	1.08	1.72	1.82	0	23.5	16.57	7.7	
Mudstone:	24	4																	Sandy
Mean			3.12	3.13	4.70	4.28	11074.13	70.31	233.96	.1	0.28	8.0	1.10	23.99	-	71.5	20.5	8.0	Loam
S.D.			2.36	2.89	12.76	12.58	5350.17	79.99	275.10	0	0.23	0.31	1.12	4.88	-	13.77	15.2	3.56	
Interbeds:	15	3																	Loamy
Mean			4.34	7.98	2.79	1.30	10982.13	21.58	346.95	.1	0.12	8.05	1.58	20.56	-	75.33	17.00	7.67	Sandy
S.D.			3.13	6.37	1.85	1.36	6584.59	9.97	359.46	0	0.11	0.23	0.92	1.33	-	7.64	9.54	3.06	
Carb-mudstone:	25	3																	Loamy
Mean			6.19	6.51	3.7	2.4	9933.76	58.04	438.86	.1	0.42	7.53	1.54	34.76	2.3	73.33	18.00	5.67	Sandy
S.D.			4.85	8.42	4.85	3.98	6112.12	38.94	378.81	0	0.34	0.85	1.14	9.94	3.29	20.60	16.82	1.53	
															Sulfur %				
Coal (Blind Canyon)	8	0																	
Mean			1.55	1.81	1.68	1.63	2089.38	10.19	103.88	.1	.06	8.0	.36	60.66	0.44				
S.D.			0.59	2.88	1.35	1.27	2557.56	8.82	66.88	0	.05	0.25	.05	18.59	0.06				
Coal (Hiawatha)	2	0																	
Mean			1.52	2.85	1.41	1.58	2532.41	10.82	97.32	.1	0.12	7.95	0.34	60.24	0.51				
S.D.			0.66	3.64	0.95	1.18	2718.02	8.41	72.14	0	0.21	0.24	0.07	16.84	0.06				
Coal (Cottonwood) Mean	1	0	2.50	3.3	0.47	2.21	465	55.0	321.0	.96	0.43	7.40	1.40	21.86	0.49				
S.D.															0.07				
Starpoint Sandstone																Sand %	Silt %	Clay %	
Sandstone:	11	4																	Sandy
Mean			5.14	8.58	3.42	3.57	3798	9.47	1457	.1	0.11	6.76	2.49	30.46	-	90.75	4.75	4.50	Loam
S.D.			3.89	4.69	2.97	5.18	2965	6.98	2578	0	0.24	1.54	1.20	4.8	-	4.80	3.50	1.91	

1 SAR = Sodium Absorption Ratio
2 EC = Electrical Conductivity

NOTE: See Appendix VI for Raw Data

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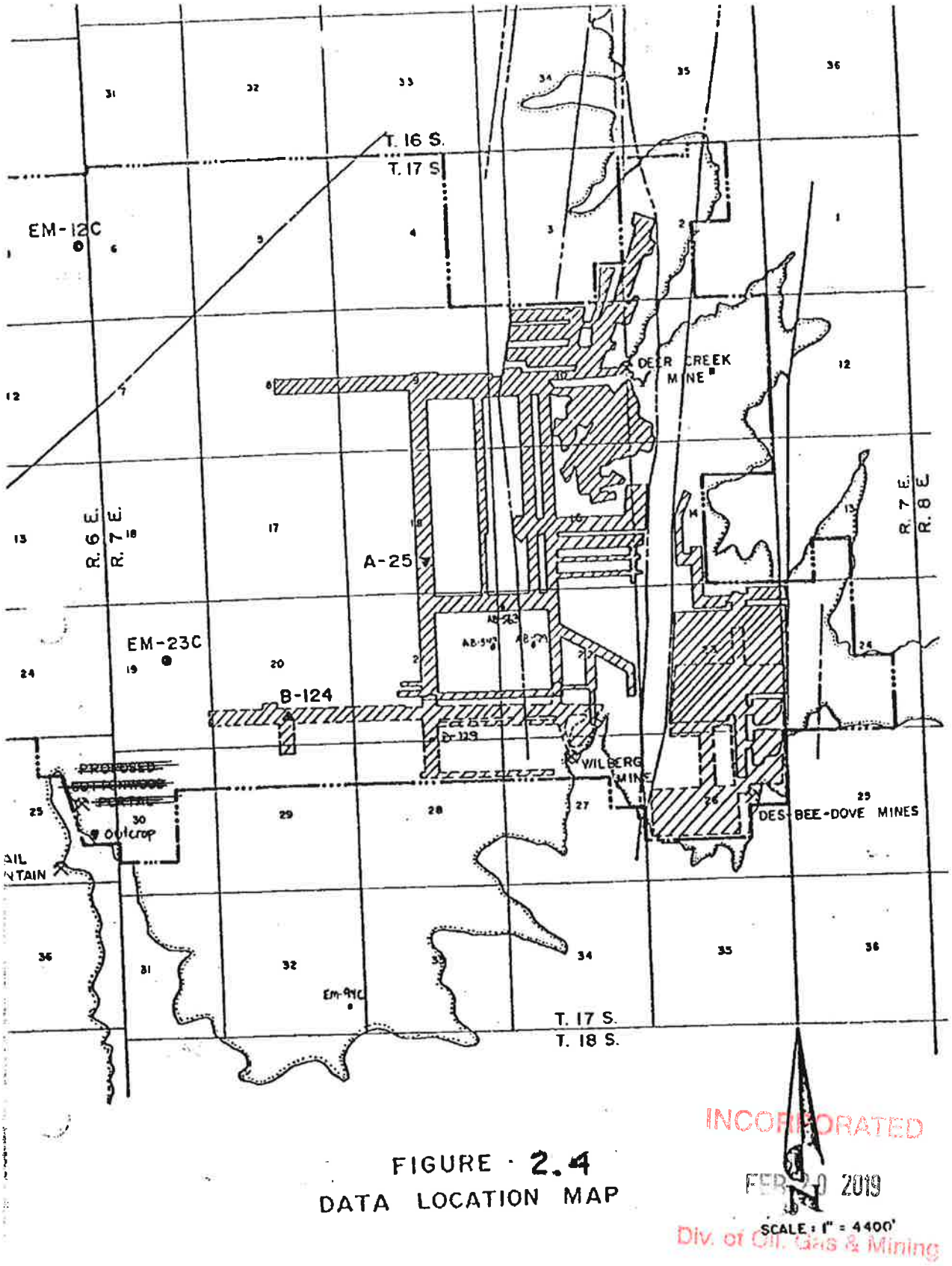

FIGURE 2.4
DATA LOCATION MAP

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The sulfur content of the Hiawatha, Cottonwood, and Blind Canyon Seams averages 0.52%, and generally ranges from 0.49% to 0.59%. Of this sulfur content, 79% is in the form of organic sulfur and 16 % is in the form of pyritic including marcasite. The remainder is in the form of sulfate.

Generally, the physical tests which were completed on these samples indicate that all rock types present have the tendency to resist reduction of grain size when excavated and reclaimed and only a minimum of clay-sized particles will be liberated. As may be expected, the coarser-grained rocks, sandstones and siltstones produced much less clay-sized particles when crushed. Generally, the dominant rock type in the area of the Cottonwood/Wilberg Mine is sandstone; therefore, any interpretations made should recognize this fact.

In addition to the aforementioned analyses that were made of the general overburden, the strata immediately above and below the coal seam were analyzed for their potential alkalinity and pyrite/marcasite content and the strata immediately below the coal was analyzed for clay content as well. The results of these tests are as follows:
(NOTE: See Appendix VI for Raw Data.)

Zone Sampled	# Samples	pH	% FeS Pyrite/Marcasite	% Clay	Potential Alkalinity Equivalent (mg/L CaCO3)
Hiawatha Seam Roof	3	7.8	3.3	-	281,400
Hiawatha Seam Floor	3	7.5	1.3	5.5	127,300
Cottonwood Seam Roof	2	7.8	0.5	5.2	222,200
Cottonwood Seam Floor	1	8.7	0.4	10.5	70,200
Blind Canyon Seam Roof	2	8.1	0.5	-	252,600
Blind Canyon Seam Floor	3	8.3	1.3	9.0	3,500

The analyses of the overburden samples tested clearly show that no toxic or hazardous materials are present. The material excavated near the portal site is slightly alkaline. Generally, the soils in this region which are derived from the strata tested are alkaline as well. The overburden material which has been excavated will not degrade the quality of the soils in the area or of the groundwater percolating through this material.

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The operator collected sample roof, floor and mid-seam material in active sections annually. A representative sample was taken in areas mined within a given year. The locations where the samples are taken were sufficient to include the various lithologies encountered during mining. The samples were analyzed for acid-and/or toxic-forming potential in accordance with the Divisions Guidelines for the Management of Topsoil and overburden. The laboratory analyses, including raw data, have been submitted to the Division annually.

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QUALIFYING STATEMENT OF MINE STATUS

The Cottonwood/Wilberg Mine has not produced coal since 1994. The depletion of reserves in this mine is the main factor. The mine operated as a coal transportation facility from 1994 to 2001 as coal produced from the Trail Mountain Mine was transported from its mine site in Cottonwood Creek Canyon to the Grimes Wash loadout. Coal was loaded into trucks at the Cottonwood/Wilberg facilities and hauled to the Cottonwood Preparation and Blending Facility to supply fuel the Hunter Power Plant. In 2001, PacifiCorp terminated production from the Trail Mountain mine and constructed permanent seals in all portals of both the Trail Mountain and Cottonwood/Wilberg mines. The two mine sites have been in a state of temporary cessation since that time.

In January 2011, PacifiCorp submitted an application to amend the Resource Recovery and Protection Plan (R2P2) of the East Mountain Logical Mining Unit (LMU) UTU-73336. This application demonstrated to the Bureau of Land Management (BLM) that certain federal leases within the LMU which were associated with the Cottonwood/Wilberg Mine contained no remaining recoverable coal reserves. The application indicated that conditions were "unmineable" and/or that it was uneconomic for PacifiCorp to recover any of the remaining coal reserves.

BLM agreed with PacifiCorp and approved the R2P2 in December 2012. The approval of the reserve status of the coal leases (of which included leases associated with the Cottonwood/Wilberg Mine) was based on achieving Maximum Economic Recovery (MER).

Therefore, because no mineable coal reserves remain in the Cottonwood/Wilberg Mine, PacifiCorp initiated reclamation activities at the Cottonwood/Wilberg facilities in both Cottonwood Creek Canyon and Grimes Wash. PacifiCorp completed final reclamation of all disturbed areas of the Cottonwood Creek Canyon in November 2014 and in Grimes Wash in 2018.

Based on the preceding discussion, all of the following information concerning the reserve base, mine plans, and operation of the mine facility should be considered historic information and not representative of current plans. All plans and drawing of facilities have been removed from the permit leaving only historic descriptions of the facilities.

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Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

Clean Copy Submittal for the Amendment to Update Permit to Include As-Built Conditions Post Final Reclamation Activities, Task ID 5844

<u>Volume 2, Part 4:</u>

Replace entire chapter

RECLAMATION PLAN

Note: Final reclamation of the Proposed Fan Portal area was completed in 1998, Cottonwood Canyon Trail Mountain Access (TMA) portals was completed in 2014, and the Grimes Wash facility of the Cottonwood/Wilberg Mine was completed in 2018. No other areas of the Cottonwood/Wilberg Mine are required for reclamation. The following plan has been left in it original "proposed" state. Additions have been made to include as-built conditions or products used during reclamation. All necessary drawing have been updated to include as-built conditions.

R645-301-200: Soils

240: Reclamation

Because the Cottonwood/Wilberg Mine was developed prior to the passage and establishment of SMCRA no topsoil was segregated during the development stage of the mine site. Therefore, the permittee proposes to segregate the upper 18" of the slope material prior to constructing final reclamation slopes. This will yield approximately 10,000 cubic yards of "substitute topsoil". Refer to Plate 4C in Maps Section for locations of substitute topsoil areas.

Prior to use of this as a topsoil source, samples shall be taken and analyzed to ensure suitability. Sample location and quality (refer to section 233) data shall be reported to the Division. This data (when collected) will be reported in Appendix A-2. The historical 1989 soil survey information for the Wilberg Mine is included in Appendix A-3. This soil information describes the soils of the fill pads constructed at the mine site. In 2001, these pads and other fills were sampled again to determine their suitability for use during reclamation. Refer to Appendix A-4 for the results of the sampling activities.

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In May 2016, PacifiCorp retained RB&G Engineering to conduct a geotechnical investigation and stability analysis of the materials that will be used to construct the slopes. At that same time, PacifiCorp collected soil samples at these sites. The purpose of the collection of these samples was to determine suitability of these materials for a soil base for vegetation growth and if any of

the materials were toxic or acid forming. Sample locations can be found in Appendix C-1 Figure 2. Sample evaluation analyzed the parameters found on Table 7 and Table 8 of the "Guidelines for Management of Topsoil and Overburden" (DOGM, 2008). Results of these sample are found in Appendix A-1.

At the time of reclamation, PacifiCorp will reduce the footprint of the Cottonwood/Wilberg mine site disturbed area by redistributing soil and spoil material to be consistent with the post mining land use and water drainage system. This will be accomplished by cutting and/or filling the existing mine site footprint in each of the two (2) disturbed canyons; Left Fork of the Grimes Wash and Right Fork of the Grimes Wash. These areas will be re-contoured as outlined on Plates 4B and 4C

Segregated topsoils will be stored in a location determined feasible by the reclamation contractor and protected so as not to be mixed with other soils or other contaminating materials. The topsoil piles shall also be stored in an area where the material is protected from compaction.

An additional topsoil source is located adjacent to the "old" Cottonwood/Wilberg waste rock site. Approximately 3,256 cubic yards is stored at this location (refer to Plate 4D in Maps Section). Prior to use as a topsoil source, samples shall be taken and analyzed to ensure suitability. Sample location and quality (refer to section 233) data shall be reported to the Division. This data is reported in Appendix A-2. The combination of this stored topsoil used with the salvaged substitute topsoil will add approximately 1¾ inches of additional topsoil for plant growth.

233: Topsoil Substitutes and Supplements

Because of the limited resources for topsoil, the suitability of topsoil substitutes will be determined. Fill material and/or overburden material shall be evaluated to determine its suitability as a topsoil substitute and to avoid surface placement of acid or toxic materials. Evaluation will analyze the parameters found on Table 7 and Table 8 of the "Guidelines for Management of Topsoil and Overburden" (DOGM, 2008). If analyses show that the acceptable criteria have not been met, then the extent of the toxic material will be determined and the entire volume of deficient material will be excavated and buried with at least four feet of an acceptable soil material. Results of these soil evaluations shall be made available to the Division and reported in Appendix A-2.

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As topsoil is spread evenly over the reclaimed surface and/or overburden material, field examinations shall be randomly made to assess whether the material is suitable for topsoil. Assessments shall utilize the Substitute Topsoil Field Sampling Program recording table found in Appendix A-2. Qualified staff shall record the date, sample ID, Hole #, Depth, pH, EC, and whether the collected sample was good, fair, poor, or unacceptable. Those soils meeting the criteria of being poor or unacceptable shall be removed and buried with four feet of and acceptable material.

Note: While sampling and field analyzing soils after final placement, PacifiCorp notice a drift in the testing equipment. After numerous recalibration efforts, it was decided to take the samples to the Brigham Young University Environmental Analytical Lab in Provo. The first set of samples took approximately two week to gain the results. Because of this time lag, it was decided to collect all the samples and take them to the lab in one lot. In all, 67 samples were taken from 25 sites throughout the reclamation site. These analyses can be reviewed in Appendix A-2.

242.100: Topsoil Segregation

The segregated topsoils removed from identified areas will be redistributed to achieve approximate uniformity of thickness of approximately 4 inches. Placement of the soils shall be completed to prevent compaction. Various rocks and boulders will be randomly positioned throughout the reconstructed surface area to enhance vegetation establishment, create micro habitats and to help provide a natural esthetic appearance.

Note: Substitute topsoil material was collected from the sites shown on Plate 4C. The soil was temporarily placed so they were not disturbed.

242.200: Topsoil Redistribution

Once the topsoils have been redistributed evenly over the reconstructed area, a weed-free alfalfa mulch shall be spread as outlined in R645-301-300: Biology. After mulching, deep gouges (pocks) shall be constructed as outlined in R645-301-500: Engineering. Pocks shall be placed in a random and continuous manner throughout the reconstructed surface area.

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The process of placing mulch and pocks throughout the reconstructed surface is a treatment that will reduce the potential for slippage of the redistributed material and promote root penetration.

Note: Once a rough slope was completed, the substitute topsoil was brought in and placed over the surface of the rough slope utilizing a dozer. The processes of placing the soil material allow for protection from compaction. Once placed, no equipment capable of compacting the soils (i.e. wheeled equipment) traveled over the surface. A track-hoe was used to randomly place boulders on the finished surface and roughen (pock) the surface.

243: Soil Nutrients and Amendments

Nutrients and soil fertilizers will be applied at the completion of the pocking process. As outlined in R645-301-300: Biology, fertilizer shall be applied at the following rate:

Ammonium Nitrate	30-50 lbs/acre
Triple Phosphate	30-40 lbs/acre

Once the fertilizer is spread uniformly, the approved seed mix shall be applied. Refer to R645-301-300: Biology for the approved final reclamation seed mix.

Note: At time the time of reclamation, the fertilizer used was applied as follows:

Premium Garden Fertilizer (16-16-8)	**40 lbs/acre**
Urea (46-0-0)	**50 lbs/acre**

The fertilizer was applied by mixing with the hydromulch and sprayed uniformly over a readied reclaimed area.

244: Soil Stabilizaton

All exposed surface areas will be protected and stabilized to effectively control erosion. After the seed is applied, the entire area will be hydromulched with a wood fiber mulch and will be applied

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at the manufactures recommended rate form the reclaimed slopes or that a minimum of 2,000 lbs/acre wood fiber mulch will be applied. A tackifier (plantago or other similar tackifier) will be added to the mulch and applied at a rate recommended by the manufacturer (typically approximately 150 lbs/acre). Mulch and tackifier will be applied simultaneously.

Note: At reclamation, the hydromulch applied was a basic wood fiber mulch at 2,000 lbs/acre. The tackifier applied was a guar tack and applied at 50 lbs/acre as recommended by the manufacturer.

244.300: Soil Stabilization of Rills and Gullies

Rills and gullies, which develop in areas that have been regraded and topsoiled, which disrupt the approved post-mining land use, or reestablishment of the vegetative cover, or cause or contribute to violation of water quality standards for receiving streams, will be filled, regraded, or otherwise stabilized; topsoil will be replaced; and the areas will be reseeded or replanted.

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R645-301-300: Biology

340: Reclamation Plan

341: Revegetation

To fulfill the requirements of the biological protection performance standards of the State Program, the permittee constructed test plot areas to determine the ideal revegetation strategy for final reclamation. These test plots were established on a fill slope at the mine site to test the final revegetation seed mix. The test plots were located in area W2-West (see Map 2-18 in Volume 5). Slope and vegetation test plots exposure are relatively constant throughout the area. Division approval was obtained prior to installation of the test plots. Observations indicated that moisture would be the primary factor affecting vegetation growth at the mine site. Therefore, the test plots were designed to test the final revegetation seed mix and plantings under various moisture conditions and mulch applications.

Because of the limited size of the slopes involved, the test plot sizes were limited. The plot layout and design is illustrated in Figure 3-1. The design provides for eight (8) seeding, mulch, and irrigation combinations.

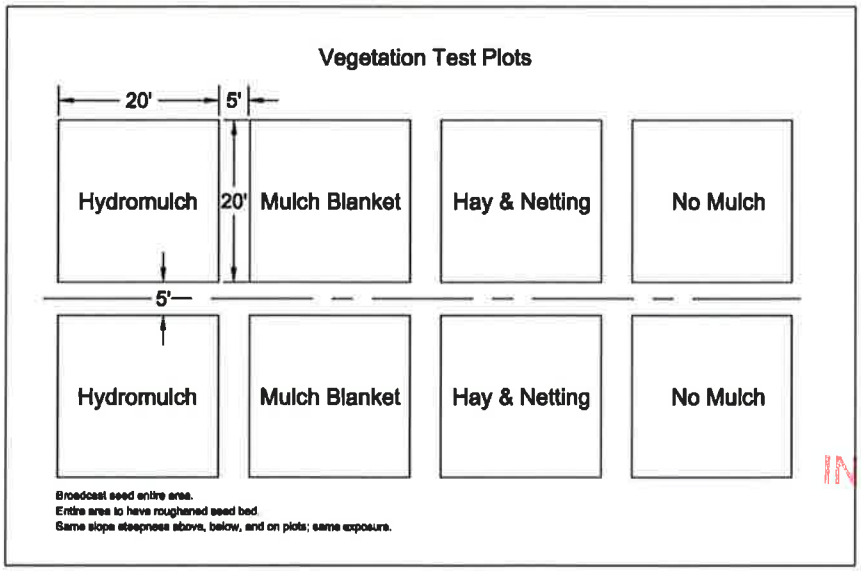

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Figure 3-1: Vegetation Test Plots.

The test plot areas were divided into eight (8) individual plots, each one 20 feet by 20 feet. Each plot was separated from adjacent plots by a buffer area five (5) feet in width. Each plot was

permanently staked and the entire test area was fenced. The test plots were installed in the fall of 1989 with seeding being done as late in the season as possible.

Prior to seeding, the test plot area was treated with Round-up herbicide per manufacturer's recommendations to remove existing vegetation. The soil surface was roughened using hand tools to prepare the seedbed.

The final revegetation seed mixture (detailed in the original final vegetation plan) was applied on all test plots. Following seeding, the fertilizer mixture was applied, per DOGM recommendations:

Ammonium Nitrate	30-50 lbs/acre
Triple Phosphate	30-40 lbs/acre

The plots were then hand-raked to cover the seed and fertilizer.

Following seed and fertilizer application, the various mulch treatments were applied as indicated in Figure 3-1. During the hydromulch application, adjacent plots were covered to prevent contamination due to overspray or wind drift. In the spring of 1991, containerized plants were planted.

Irrigation was applied during the first two (2) years (growing seasons) following seeding. After dicussion with the Division, irrigation was terminated after the second growing season. Irrigation began with the onset of spring and terminated at the first fall frost.

Irrigation was applied once per week unless determined otherwise based on soil moisture and plant vigor appearance. Soil moisture conditions were determined weekly by soil probing to a six (6) inch depth.

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Irrigation was supplied from a water truck using a hand-held sprayer attached to a hose. The amount of water applied was quantified. Water was applied to the point of surface saturation or penetration to six (6) inches on the control plot. All irrigated plots were watered equally. Irrigation

commenced in the early evening and completed by sundown.

Maintenance, monitoring and sampling methods and schedules were as specified in 342.220. A minimum of 15, 1/4 meter quadrants were evaluated per plot. Success standards were as specified for the reference area (refer to Volume 1, Part 2: Vegetation Information for the Wilberg Mine). Vegetation monitoring of this site was conducted between years 1989 through 1999. Both results of qualitative and quantitative analysis can be found in the Annual Reports between the said years.

The initial revegetation plan was designed using the results of the test plots that were installed in 1989 and monitored over several years. However, in 2015, during the rewrite of the Cottonwood/Wilberg Reclamation Plan, the Division, in cooperation with the United States Forest Service introduced a revised seed mix for planting the slopes of the reclaimed mine site. The revised seed mix is presented below in Table 3-3. All containerized plants were removed from the planting mix because of the poor success rates experienced on other similar projects.

341.100: Revegetation Timetable

Table 3-1 presents the timetable in which reclamation and revegetation will be conducted at the Cottonwood/Wilberg Mine site. Many of these listed operations will be conducted simultaneously. Reclamation activities will work from the upper elevations of the mine site to the lower elevations.

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Table 3-1: Cottonwood/Wilberg Mine Reclamation Schedule. Reclamation began in August 2017 and completed in March 2018. Note: The contractor moved construction activities to another location at the request of PacifiCorp between September and December 2017 and returned to the site in December 2017.

#	Project	Estimated Schedule (months)
1	Structure Removal	All structures removed June 2015
2	Portal Closure	All portals were sealed in May 2001/Backfilled June 2015
3	Soil Salvaging	
4	Hauling, Backfilling, Compaction, Grading	
5	Install Raprap Channels	
6	Seedbed Preparation (Includes topsoil, hay mulch, pocking)	
7	Fertilizing/Seeding	
8	Hydromulching/Tackifying	
9	Sediment Control Structure Removal*	

*The sediment pond will be removed at the completion of all other reclamation activities above the pond.

Notice in the table above that backfill and grading activities and seeding activities are occurring simultaneously. This will occur as work progresses down canyons. Hay application, pocking, seeding, hydromulching occurred throughout the entire project between August 2017 and March of the following year.

Table 3-2: Cottonwood/Wilberg 10 year Responsibility Period Schedule.

#	10 Yr Revegetation and Monitoring	1st 2019 Year	2nd 2020 Year	3rd 2021 Year	4th 2022 Year	5th 2023 Year	6th 2024 Year	7th 2025 Year	8th 2026 Year	9th 2027 Year	10th 2028 Year
1	Plant Monitoring Disease & Pest Control		X	X	X	X	X	X	X	X	X
2	Mine Water Discharge Monitoring*	X	X	X	X	X	X	X	X	X	X
3	Soil Stabilization Rills & Gullies		X	X	X	X	X	X	X	X	X
4	Contingent Seeding		X			X					
5	Revegetation Inventory for Bond Release				X				X	X	X
6	Maintenance (as needed)	X	X	X	X	X	X	X	X	X	X

*Monitoring of mine discharge will be conducted as required by the current UPDES permit (Outfall 001 in Cottonwood Canyon).

341.210: Seed Mixtures

Because all surface disturbances occurs within Forest Service land, the USFS has provided the Cottonwood/Wilberg Mine a final revegetation seed mix proposed for use (refer to Table 3-3). Plant species in the mix are currently in use by the Manti-LaSal National Forest and commonly occur on the Wasatch Plateau. The mix includes species, to establish a diverse, effective and permanent cover capable of achieving the post-mining land use.

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Wilberg Drain Field

Final revegetation at the drain field was completed in March 2015. This included roughening of the access road and reseeding it. The seed mix is shown below in Table 3-4.

Note: In 2017, the Division determined that the removal of the access road would not extend the responsibility period. PacifiCorp conducted its two years revegetation inventory for bond release in 2017 and 2018. The 2017 report found this area to be equal to or exceeding the set success standards, Once the 2018 report is finalized (by March 2019), PacifiCorp will apply for Phase III bond release for the area.

This seed mix and planting rate is as requested by the BLM and approved by the DOGM. The introduction of Crested Wheatgrass is at the insistence of the BLM and as requested by DOGM.

Table 3-3: Cottonwood/Wilberg Mine Site Final Seed Mixture.

Common Name	Scientific Name	Equivalent PLS Lbs/Acre
GRASSES		
Western wheatgrass	*Agropyron smithii*	2
Bluebunch wheatgrass	*Agropyron spicatum*	3
Indian ricegrass	*Oryzposis hymenoides*	2
Needle and thread grass	*Stipa comata*	1
Thickspike wheatgrass	*Agropyron dasystachyum*	3
Basin Wildrye	*Leymus cinereus*	2
FORBS		
Blueleaf aster	*Aster glaucodes*	0.5
Small burnet	*Sanguisorba minor*	2
Lewis flax	*Linum Lewisii*	1
Palmer's Penstemon	*Penstemon palmari*	0.5
SHRUBS		
Serviceberry	*Amelanchier Alnifolia*	2
Fourwing saltbush	*Atriplex canescens*	2
Shadscale saltbush	*Atriplex confertifolia*	0.5
Big Wyoming Sagebrush	*Artemisia tridentate*	0.5
TOTAL		22

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Table 3-4: Wilberg Drain Field Final Seed Mixture.

Common Name	Scientific Name	Equivalent PLS Lbs/Acre
GRASSES		
Western wheatgrass	*Agropyron smithii*	2
Indian ricegrass	*Oryzposis hymenoides*	2
Needle and thread grass	*Stipa comata*	2
Galleta	*Pleuraphis*	2
Crested wheatgrass	*Agronpyron cristatum*	1
FORBS		
Scarlet globemallow	*Sphaeralcea coccinea*	1
Yellow sweet clover	*Melilotus altissimus*	1
SHRUBS		
Fourwing saltbush	*Atriplex canescens*	2
Curlleaf mountain mahogany	*Cerocarpus ledifolius*	2
Ephedra Mormon Tea	*Ephedra viridis*	4
Vasey big sagebrush	*Artemisia tridentata var. vaseyana*	0.2
TOTAL		19.2

Reclamation of the Cottonwood Fan Portal Area – Cottonwood Canyon

Final reclamation of the Cottonwood Fan Portal in Cottonwood Canyon was completed in November 1998 and Phase III Bond Release was accepted on September 28, 2010 (refer to Volume 11). Approximately 1.86 acres of disturbance existed at this location. The disturbed area included the Trail Mountain Access (TMA) portal and belt portal, collectively called the Cottonwood Canyon Facilities. These facilities were demolished and final reclamation was completed in November 2014. Refer to R645-301-542.700 (Engineering Chapter) for a complete discussion of the sealing of the mine openings in this area. The approved seed mixture for this site is shown in Table 3-5.

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Table 3-5: Cottonwood Fan Portal Area Final Seed Mixture.

Common Name	Scientific Name	Equivalent PLS Lbs/Acre
GRASSES		
Western wheatgrass	*Agropyron smithii*	3
Bluebunch wheatgrass	*Agropyron spicatum*	3
Indian ricegrass	*Oryzposis hymenoides*	3
Needle and thread grass	*Stipa comata*	1
Thickspike wheatgrass	*Agropyron dasystachyum*	1
Great Basin Wildrye	*Elymus ciaereus*	2
FORBS		
Blueleaf aster	*Aster glaucodes*	0.5
Utah Sweet Vetch	*Hedysarum boreale*	1
Lewis flax	*Linum lewisii*	1
Globemallow	*Sphaeralcea coccinea*	0.5
Yarrow	*Achillea millefolius*	0.5
Palmer penstemon	*Penstemon palmeri*	1
SHRUBS		
Serviceberry	*Amelanchier alnifolia*	1
Fourwing saltbush	*Atriplex canescens*	2
Green Mormon Tea	*Ephedra viridis*	1
Wyoming big sagebrush	*Artemesia wyomingensis*	0.5
Big white rabbitbrush	*Chrysothamunus nauseosus*	0.5
TOTAL		22.5

Reclamation of the Soil and Rock Storage Area – North of Old Waste Rock Site

The rock and soil storage area was reclaimed in March 2018. Both the rock and soil was used at the Cottonwood Mine during reclamation. Final reclamation of this site included spreading a hay mulch and roughening the surface incorporating the hay mulch into the upper layers of the soil. The site was reseeded using the seed mixture found in Table 3-3. Because of the flatness of this area, pocking ~~is~~ was not used for sediment control.

342.220: Revegetation Methods

The following methods have been or will be utilized for revegetation activities at the Cottonwood/Wilberg sites.

1. Seedbed Preparation

Seeding will take place as contemporaneously as is practical following contouring/pocking of the area being reclaimed. Certified weed free alfalfa hay will be incorporated into the

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soil at a rate of 2 tons/acre. Fertilizer will be applied by hand and incorporated during this revegetation sequence. The rate of application will be 30-50 lbs/acre or as recommended by the manufacturer.

Note: Fertilizer was applied by mixing appropriate amounts with the hydromulch.

2 Deep Gouging or Pocking

Pocking techniques will mix the hay mulch into the upper portion of the soil. The pocks will be made using the bucket of a track-hoe or similar machine to roughen the disturbed area in a random and discontinuous fashion. Pockmarks created are approximately 3.0 to 6.0 feet square and 1.5 to 3.0 feet deep. The pockmarks are designed to capture and trap precipitation, influencing infiltration. Gouging/pocking controls erosion through water retention, thus enhancing vegetation growth.

3 Seeding

The seed mixture (refer to table above) will be broadcast using a "hurricane spreader" or applied using a hydro seeder. If the seed mixture is broadcast, seeding will take place immediately after pocking. If the seed mixture is hydro seeded, a small amount of wood fiber mulch will be added to mark the area of coverage during application.

Note: Seeding was applied by hand spreading applications.

4 Mulching

After the seed is applied, the entire area will be hydromulched with a wood fiber or other acceptable mulch and will be applied at a rate of at least 1500 lbs/acre for cover and protection. A tackifier (plantago or other similar tackifier) will be added to the mulch and applied at a rate recommended by the manufacturer (typically approximately 150 lbs/acre). Mulch and tackifier will be applied simultaneously.

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Note: The approved rate for hydromulch was used throughout the mine site reclaimed areas. A Guar tackifier was applied at a rate of 50 lbs/acre as recommended by the manufacturer.

Maintenance and Monitoring

1. Signs will be placed around the planted slopes for their protection.

2. Weed control will not be undertaken unless it is determined necessary due to weed dominance and delayed rate of succession. Studies indicate that competition from weeds, including Salsola kali, is greatly reduced within three (3) years after revegetation. Preliminary on-site studies support published reports on this matter. All noxious weeds will be eradicated if they become established on the site.

3. Rodent damage on revegetated areas will be assessed and species specific control measures will be implemented as necessary.

4. A site visit will be scheduled each spring to check on fitness of the sites and to check progress of the plant growth.

5. Annual monitoring will also include inspection for rills and gullies. Should these be present, they will be filled and the soil reseeded. Rill and gully repair will follow the regulations set forth in the Coal Rules R645-301-357.360 through R645-301-357.365. As needs for repairs is recognized, the Division will be notified and the affected area will be reported in the annual vegetation report.

6. Maintenance and monitoring activities will be reported in the Annual Vegetation Monitoring Report.

341.250: Measures Proposed to be used to Determine Revegetation Success.
Sampling for Ten Year Responsibility Period and Bond Release (refer to Table 3-2)

1. All sampling will be undertaken by a qualified person in the late summer for maximum plant growth.

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2. The line intercept or ocular estimation methods will be used to measure cover and species composition.

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3. The point-center quarter method or other acceptable method will be used to measure shrub and tree density.

4. Sample size for ground cover and shrub density will be tested at a 90 percent confidence level using a one-tail "t" test with a 10 percent change in the mean.

5. Productivity measurements will be a double sampling procedure of clipped plots and ocular estimates. Rectangular plots (1 square meter) will be randomly located in reference areas and revegetation sites. Sampling will be at the 90% confidence level.

6. The reference areas will be checked to detect any changes from man-induced activities and to verify they are in fair or better condition.

7. Revegetation Success:

All vegetation sampling will be undertaken in the late summer for maximum plant growth. The line intercept or ocular estimation methods will be used to measure cover and species composition. The point-center quarter method will be used to measure woody plant density.

Productivity measurements will be a double sampling procedure of clipped plots and ocular estimates. Rectangular plots (1 square meter) will be randomly located in reference areas and revegetation sites. Sampling will be at the 90% confidence level.

The reference area will be checked to detect any change from natural or man-induced activities and to verify they are in fair or better condition. Sampling of the reference sites at the time of bond release will be conducted concurrently with final reclamation sampling, using the same methodology used to sample the reclaimed areas.

The standards for success to be applied for ground cover and production of living plants on the reclaimed areas will be at least equal to 90% (with a 90% confidence level) to that of the respective

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reference area at the time of bond release. Cover in the reclaimed areas will not be less than that required to achieve the approved post-mining land use.

Because woody plant density success standards apply where the post-mining land use is grazing and/or fish and wildlife habitat, minimum stocking and planting arrangements will be specified on the basis of local and regional conditions and after consultation with and approval by Utah agencies responsible for the administration of wildlife programs. Therefore, at time of reclamation, consultation shall be made with the appropriate Utah agencies to set a standard for minimum woody plant densities. During the 4th and 8th growing seasons, consultation shall again be made for any adjustment of the woody plant densities.

During the 4th year after revegetation, the point-center quarter or other accepted method will be used to determine the woody plant density in the reclaimed areas. Locations of monitoring will be random within each of the reclaimed areas and recorded. This process will be repeated in the 8th year.

At time of bond release, woody plant densities of the reclaimed area shall be equal to 90% (with a 90% confidence level) of the adjusted standard. At least 80% of the woody plants will have been in place for a least 8 growing seasons, and the woody plants are alive and healthy.

All vegetation monitoring data will be reported annually. This report will contain a narrative of the actual monitoring methods used, results, and a discussion of the overall success or failure of each area. Raw data sheets will also be included in the annual reports. Standards attained at the time of bond release will be approved by the Division of Oil, Gas and Mining.

342: Fish and Wildlife

The portal facilities of the Cottonwood/Wilberg Mine are located in the lower reaches of a mountainous drainage called Grimes Wash (portal facilities demolition commenced in November 2014 and was completed in June 2015). This area consists of approximately 20 acres and is physically separated from the remaining undisturbed permit area by imposing and inaccessible cliffs that rise over 1,600 feet vertically from the portal area.

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The east escarpment face of the Wasatch Plateau that includes the Cottonwood/Wilberg portal facilities is used extensively by nesting raptors. Most of the escarpment face is naturally inaccessible to humans so the birds are undisturbed by man. Nest sites in Grimes Wash are in inaccessible cliffs (refer to Annual Raptor Reports on file for raptor activity and nest status).

Excepting the occasional use for exploration, the wildlife inhabitants on top of East Mountain were unaffected during the mining operation and will require no special plans other than the hydrological and subsidence monitoring.

There are no prime fisheries located on the East Mountain plateau within the permit area.

A 69 KV line served as the power source of the Cottonwood/Wilberg complex. Mostly single pole and suspension insulators, this transmission line provided sufficient phase to phase and phase to ground clearance to preclude electrical contact of raptors including eagles. The power line structure types are approved as eagle-safe by USFWS by letter dated November 26, 1982 from the DOGM. This power line was removed by Rocky Mountain Power in March 2015.

Although Grimes Wash is not a fishery (considered an ephemeral drainage), it is a tributary to Cottonwood Creek (Straight Canyon) which is a limited fishery.

Protection from coal dust and increased sediments to these waters were by diversion of the natural flowing waters throughout piping systems past the mining area proper. Two sedimentation ponds were installed for control of sediment and coal dust from storm runoff waters within the portal facilities area. After reclamation, protection from increased sediments to the downstream waters will be by retention of sediment and precipitation on the slopes through the use of deep gouging techniques. The pocks are designed to capture and trap precipitation, influencing infiltration. Gouging/pocking serves to control erosion through water retention, thus enhancing vegetation growth. Refer to the Hydrology Chapter for a complete discussion of the sediment control plan.

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During breeding seasons, disturbance by man can negatively affect the number of breeding territories for some species of wildlife. Disturbance can also interrupt courtship displays and preclude timely interaction between breeding animals. This can result in reduced reproductive success and ultimate reductions in population levels.

Early in the rearing process, young animals need the peace and tranquility normally afforded by remote wildlands. It is also during this crucial period that young animals gain the strength and ability to elude man and other predators.

This especially applies to raptors which may be attracted to the cliff sites adjacent to the mine for a nest site. These species readily abandon nesting and rearing efforts if intruded upon by man. Any nest initiated adjacent to the existing facilities would not require cessation of operations because this nesting action signifies acceptance of the present situation. All raptor nests will be reported to UDWR in Price.

PacifiCorp will conduct raptor monitoring prior to commencing with earthwork activities at the Cottonwood/Wilberg mine. If a nest is found to be occupied and/or tended, PacifiCorp will consult with the United States Forest Service – Manti-LaSal Forest, DWR and the Division to determine appropriate protection measures for ensuring chick survival. PacifiCorp will follow the recommendations provided by these agencies.

Note: No Raptor monitoring was required since reclamation did not start until August 2017.

Information regarding mule deer seasonal distribution and numbers within the permit area is not available due to the dynamic characteristics of the deer herds involved. UDWR personnel indicate such information would not truly be representative of the demographics of the deer population; therefore, it is not available from the UDWR.

The final reclamation as planned will restore the stream channels and revegetate the disturbed sites. The planting mix of forbs, grasses, and shrubs is similar to the adjacent native plant communities and will provide food and cover for wildlife.

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350: Performance Standards

Refer to 341.250 as outlined previously.

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R645-301-400: Land Use

412: Reclamation Plan

Geographically, the site of the Cottonwood/Wilberg portals (surface operations) is restricted by a narrow canyon headed with two drainages, the Left and Right forks of Grimes Wash. Both tributaries are non-accessible beyond the portal site, limiting uses except for wildlife use.

Following mining, the plan is to restore the area affected by the mining operation to its pre-mining state. Principal land use after reclamation will be grazing and wildlife habitat. Grazing permits are presently issued for areas surrounding the disturbed area by both the US Forest Service and the Bureau of Land Management. Both agencies have stated that there are no foreseeable changes to land use.

According to the Manti-LaSal National Forest Land and Resource Management Plan (1986), the main portal area is within the Forest Service MMA classification. This classification emphasizes Leasable Mineral Development and includes areas where land surface is, or will be, used for mineral development facilities. The surrounding area is classified GWR, General Big Game Winter Range. The portal area is inaccessible from the top of East Mountain but will probably be utilized by BLM grazing permittees whose cattle would naturally migrate north into the portal area from the adjacent BLM allotments. This area will be re-established to meet the requirements of grazing and wildlife.

The Cottonwood Fan Portal site in Cottonwood Canyon is located on fee land within Forest Service grazing allotments. Postmining land use is basically wildlife habitat. Due to the steep slopes and exposed hard rock surfaces that are now present, the probability of range grazing is minimal. Approximately 7.47 acres of the total disturbed area of 9.33 acres were reclaimed (completed 1998) and Phase III Bond Release was granted on September 28, 2010 (refer to Volume 11).

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Regarding the remaining 1.86 acres of disturbance (belt and intake portals), the land has been reclaimed (final reclamation completed in November 2014) to its approximate original slopes, drainages re-established, and vegetation planted to meet the reference area's cover, species density, and productivity as measured during reference area monitoring. Based on past experience with

reclamation projects, ten years following reclamation (bond period) is sufficient time to manage the vegetation establishment of growth to meet the requirements of the post mine land use as stated.

PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES

No public parks are located in or adjacent to the permit area. Cultural resource information contained in this application was based on field surveys contracted to AERC (Archeological Environmental Research Corporation) and conducted under the auspices of Richard Hauck.

Several separate surveys were conducted. Prior to the construction of the Wilberg Mine portal site and associated offsite facilities, archeological surveys were conducted. Results of these surveys disclosed several sites adjacent to Grimes Wash. These reports are included in the Environment Section in Volume 1.

During the planning of the Cottonwood Fan Portal site (site reclaimed in 1998, Phase III Bond Release in 2010) and utility corridor, an archeological survey was conducted. It also identified several sites. Although this project has since been reduced to only the fan portal area, this report is also included.

The delineated Old Johnson Mine area is outside the reclamation area of the Cottonwood Fan Portal site disturbance, and was protected from any disturbance. The roadway in front of the old portal was utilized for access into the disturbed area for reclamation of the Cottonwood Fan Portal. Final reclamation of the Cottonwood Fan Portal was completed in November 1998. A berm was established along the outside slope above the Johnson Mine weigh shed and other historic sites to provide protection and keep any material or rocks from entering the potential historic site area. The roadway was reclaimed as close to pre-existing conditions as possible.

For lands within the permit area not covered by planned surface disturbances, but yet could be affected by subsidence, a general 15 percent random archeological survey was conducted. The basis of this survey was extrapolated from requirements mandated by OSM for authorization to mine coal from the adjacent Des Bee Dove Mine (final bond release approved April 2013). Results of this survey are contained in the report found in the Environment Section in Volume 1.

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R645-301-500: Engineering

541.300: Structure Removal

Once mining ceased, the surface facilities were dismantled and removed from the permit area. Starting at the mine portals, all belt lines, crushing and screening systems, electrical systems, truck loadouts, surface buildings and fan installations were removed and hauled from the permit area.

The concrete silo was demolished, broken up and buried against the east highwall cut in the lower parking lot. All other concrete foundations that would be above final grade were removed and stockpiled with the silo material or used to backfill portals. Refer to Items 1-A through 2-A in Appendix H for demolition of the structures at the Cottonwood/Wilberg Mine.

Note: Demolition was completed in June 2015.

During construction of the facility, for safety reasons it was found necessary to install shotcrete on certain areas of the rock outcrop. In some cases it was necessary to secure loose boulders of the cliff face with chain link fencing prior to coating with shotcrete. During demolition, attempts were made remove the shotcrete from the cliff faces. This process could not be completed safely and without compromising the integrity of the cliff. Therefore, the shotcrete was left in place. Leaving the shotcrete in place does not affect the post mining land use described as grazing, wildlife, and recreation.

542: Narratives, Maps, and Plans

As depicted in R645-301-300: Biology, a timetable has been developed to show each major step for completing final reclamation of the Cottonwood/Wilberg Mine. This schedule is shown again below in Figure 5-1. A typical cross-section drawing illustrating the sequence of reclamation is found in the Maps Section as Plate. 4A.

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Table 5-1: Cottonwood/Wilberg Mine Reclamation Schedule. Reclamation began in August 2017 and completed in March 2018. Note: The contractor moved construction activities to another location at the request of PacifiCorp between September and December 2017 and returned to the site in December 2017.

#	Project	Estimated Schedule (months)
1	Structure Removal	All structures removed June 2015
2	Portal Closure	All portals were sealed in May 2001/Backfilled June 2015
3	Soil Salvaging	
4	Hauling, Backfilling, Compaction, Grading	
5	Install Raprap Channels	
6	Seedbed Preparation (Includes topsoil, hay mulch, pocking)	
7	Fertilizing/Seeding	
8	Hydromulching/Tackifying	
9	Sediment Control Structure Removal*	

*The sediment pond will be removed at the completion of all other reclamation activities above the pond.

542.200: Backfilling and Grading Plan

Note: Reclamation design maps are found in the Maps Tab. As-builts are included with the design maps.

In general, the backfilling and grading of the disturbed areas will consist of removing the fill pads and backfilling the cut areas. The work will start in the upper areas of the disturbed area and systematically work downslope to the entrance gate. Prior to any earth moving to reconfigure the surface to the designs shown, the topsoil, as described in R645-301-200: Soils, shall be removed and stored for future use. Approximately 10,120 cubic yards of topsoil has been identified for use. Locations include those areas shown on Plate 4C and the Soil and Rock Storage Area located below the mine (refer to Plate 4D in the Maps Section).

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Note: During reclamation this topsoil was removed, stored, and protected. These soils were used at the pond and main mine access road areas.

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Also shown on Plate 4C are the cross-sectional areas for cuts and fills. There are approximately 176,455 bank cubic yards (BCY) of material to be cut and approximately 155,830 BCY of material will be backfilled and graded within the disturbed areas. All fill slopes have been designed to be no greater than a 2 horizontal to 1 vertical gradient. Mass balance calculations of the cuts and fill show a difference of 12% between the cut and fill estimates, leaving approximately 20,625 BCY

of extra material. This material will be used in areas where more fill could enhance the slope, or will be blended into the reclaimed slopes. Plate 4B displays the final topography of the reclaimed slopes. This plate also shows the final configuration of the designed channel in the Left and Right forks of the Grimes Wash. Detailed channel design is discussed in R645-301-700: Hydrology.

Note: The actual cut and fill quantities are as follows: Cut = 127,318 cubic yards, Fill = 106,108 cubic yards.

Rip-rap Installation and Drainage Structure Removal

During the backfilling and grading cycle, rocks suitable for rip-rap will be sorted from the excavation and placed in the restructured drainage channel. The majority of the material was originally taken from rock cuts; therefore, sufficient material for rip-rap is available.

As the backfilling and grading progresses and the drainage structures (culverts, etc.) are exposed they will be removed and disposed of off the permit area.

The ponds will be the last major structures to be removed during backfilling and grading operations. Justification for pond removal is discussed in R645-301-700: Hydrology. The access road will be completely removed and recontoured to the entrance gate.

There will be no facilities or permanent structures remaining after the completion of reclamation. The reclamation plan was design to comply with the post-mining land uses described in R465-301-400: Land Use.

542.600: Roads

The asphalt from the service road, truck turn around, upper parking lot, portal bench, south Wilberg portals, and south Wilberg storage pad will be removed and disposed of off-site to an approved landfill or reclaimed to be utilized for other off-site road construction projects. Refer to Appendix H, Item 1-DD for quantities removed. No asphalt will be buried within the reclamation area.

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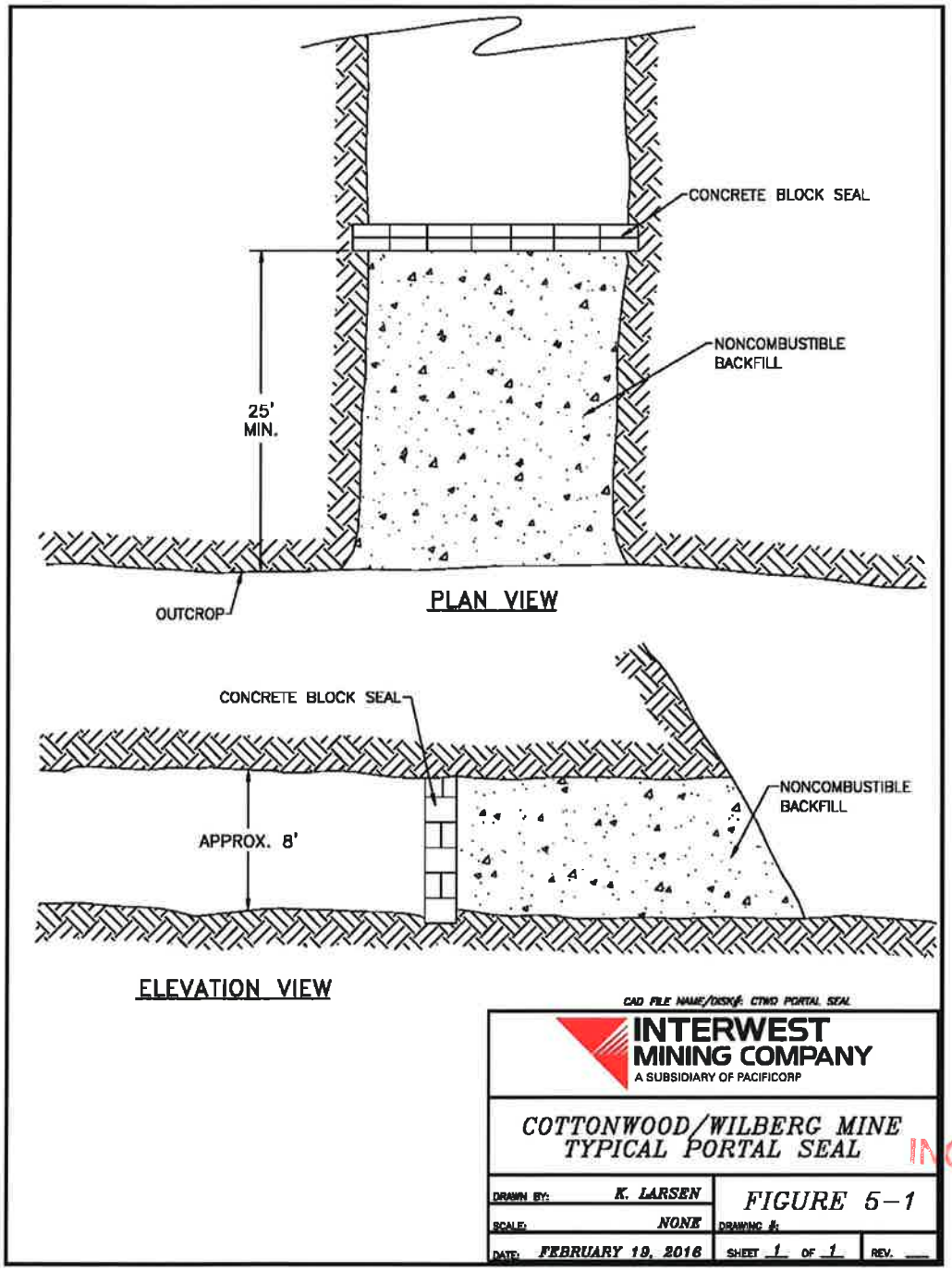
Note: All asphalt was hauled and disposed at the Emery County Land Fill.

542.700: Final Abandonment of Mine Openings and Disposal Areas

Mine Openings

The Cottonwood/Wilberg portals and breakouts were completely sealed in 2001. The portals at the main Cottonwood/Wilberg site are all up-dip of the underground workings and require no drains or special hydrological containment seals (see Protection of the Hydrological Balance section in Volume 9). Seals were installed as shown on Figure 5-1 below.



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Due to the natural dip of the strata, the Trail Mountain Access (TMA) portal in Cottonwood Canyon (final reclamation in November 2014) is the lowest within the existing Cottonwood/Wilberg mine permit area. Groundwater intercepted during the development of the TMA development entries flows to the TMA portal. To prepare for the permanent discharge, PacifiCorp installed a series of three sediment traps located 100 feet apart within the mine to settle out particles prior to discharge. Refer to the as-built drawing of the system in Appendix I. A solid block seal (built to MSHA requirements) was constructed 25 feet inby the portal entrance. A French drain system was installed with 6" perforated PVC pipe behind the seal. A secondary decant pipe was installed at the bottom of the seal along with a backup decant line installed 2 feet from the roof. Each line was fitted with a shut-off valve. Durable drain rock of 2-4 inch sizing was placed over the perforated drain line. Pea sized gravel was placed over the drain rock as a filtering system. The thickness of the filtering system is approximately 4 feet thick.

Mine water is discharged through the seal into a 6 inch buried PVC that parallels the Emery County Road 506 for approximately 200 feet below the portal. The pipe drops into a 36 inch bypass culvert which discharges into the Cottonwood Canyon Creek. Since 2001 the discharge of mine water has averaged approximately 21 gpm. This discharge is considered permanent for post-mining land use. PacifiCorp currently possesses a UPDES permit (#UT0022896-001) for this site and monitors the quality and quantity on a monthly basis at the inlet of the 36" bypass culvert. At reclamation, Emery County Road Department requested that the 6 inch buried PVC line be left in place to keep ice from potentially building up in a road ditch in the winter and pushing ice onto the road. In a letter dated February 2015, Emery County Road Department committed to maintaining the line within their right of way. See Appendix I to review the letter from Emery County and the updated design drawing from 2001.

Disposal Areas

Old Waste Rock Site: Located 1.5 miles south of the Cottonwood/Wilberg Mine, this 48.62 acre site was originally designed as an open storage and truck loadout for the Cottonwood/Wilberg Mine. The Right-of-Way grant (UTU-37642) was issued by the Bureau of Land Management in 1977 but subsequent developments, specifically construction of a concrete storage silo for coal storage at the mine, changed the function of this site. A modification was submitted to use this

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site for storage of waste rock produced by underground development mining in the Cottonwood/Wilberg Mine.

The Right-of-Way UTU-37642 has also been modified to accommodate coal bed methane degasification activities conducted by Texaco Inc. Listed below is a list the acreage descriptions of the Right-of-Way including original grant, modifications and disturbance associated with the facility:

BLM Right-of-Way UTU-37642	
Original Grant (1997)	48.62 acres
1997 Relinquishment (Texaco Well 35-14)	1.08 acres
1999 Relinquishment (Texaco Well 34-80)	12.98 acres
TOTAL RIGHT-OF-WAY UTU-37642	34.56 acres
Reclaimed Area (Phase III Released July 2009)	13.81 acres
2015 Relinquishment	32.7 acres
ROW and Disturbed Area Remaining	**1.86 acres**

Approximately 13.81 acres of the old waste rock site has been reclaimed. Material to cover the waste rock was taken from the perimeter berms. Phase 1 bond release was approved on July 22, 1999. Phase III bond release was approved July 22, 2009. In October 2015, the BLM approved relinquishment of 32.7 acres bringing the total right of way held by PacifiCorp to 1.86 acres.

The remaining 1.86 acres has been retained as a soil and rock storage area. This soil, which is native topsoil and subsoil from the Cottonwood Fan Portal area, will be used for topsoil for the Cottonwood/Wilberg mine site (refer to R645-301-200: Soils). Boulders will be used for riprap construction of the reconstructed channel, if needed. The soil quantity is approximately 120 cubic yards.

Once this material is removed from the site, the area will be roughened and reseeded as outlined in R645-301-300: Biology.

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Note: Reclamation of the rock and soil storage area was completed in March 2018.

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542.730: Disposal of Coal Mine Waste

Coal mine wastes that are uncovered during earthmoving activities shall be segregated and buried in fill areas and covered to ensure that the fill area is suitable for reclamation and revegetation compatible with the natural surroundings and the approved post-mining land use. All coal mine wastes will be covered with at least four feet of suitable fill.

542.740: Noncoal Mine Wastes

During the demolition of the mine site, all recoverable noncoal waste materials were collected and disposed of. Any noncoal waste recovered during earthwork activities will be collected and disposed off-site in an approved landfill.

Note: All non-coal mine wastes were hauled to the Emery County Landfill and disposed.

550: Reclamation Design Criteria

Reclamation design criteria have been discussed in the previous section of 542. Any additional criteria will be discussed in the following sections.

552: Permanent Features

Small depressions, in the form of pocks (refer to R645-301-700: Hydrology for a complete discussion for sediment control measures) shall be constructed on all areas of the Cottonwood/Wilberg mine site reclaimed area. These pocks will retain moisture, minimize erosion, create and enhance wildlife habitat, and assist revegetation. The area for which these pocks will be developed is shown on the RUSLE map (Plate 4E) in the Maps Section.

Other features such as boulders and clusters of boulders will be randomly placed throughout the reclaimed surfaces to create habitat for small mammals, birds, and raptors. Boulders will be gathered on-site for this purpose during backfilling and grading activities.

553.100: Approximate Original Contour

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The strategy of the reclamation plan is to design the final reclamation contours to achieve approximate original contour (AOC) criteria. Rock outcrops will be exposed to blend in with the

natural topography of the area.

Fill slopes will be constructed to no greater than a 2 horizontal to 1 vertical gradient. Cut slopes will be created with that same criteria.

553.120: Highwall Elimination

Final reclamation of highwalls at the Cottonwood/Wilberg mines is accomplished in three phases; demolition, earthwork, and revegetation. These phases follow strict requirements set forth by the Utah Coal Rules R645-301-100 through 800. Highwalls at the Cottonwood/Wilberg mines were inventoried by Office of Surface Mining and the Division of Oil, Gas and Mining in 1997. Eighteen (18) areas of concern were identified and are listed in Appendix B. Eight (8) of the areas considered highwalls were constructed prior to the ruling (May 3, 1978) of the Surface Mining Control and Reclamation Act (SMCRA). Seven (7) portal highwalls were constructed after that date. Three (3) of the areas of concern have no associated highwalls. Sites constructed prior to May 3, 1978 need only to eliminate highwalls to the extent practicable using all reasonably available spoil. All post-SMCRA sites are required to completely eliminate highwalls. Appendix B exhibits the extent of backfill that will be used to eliminate as practicable or eliminate completely these highwalls. This is shown in a photo essay for each of these portals. All highwalls at the Cottonwood/Wilberg mines will be eliminated concurrently with final reclamation activities. A detailed cost estimation for all reclamation activities is located in Appendix H.

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Table 5-2: Status of Cottonwood/Wilberg Portals.

Cottonwood/Wilberg Mines List of Portals (refer to Highwall Survey: Part 4 Appendix B)		
Location (Number of Portals)*	**Development Date**	**Status**
Grimes Wash		
Wilberg Mine Fan (1)	Prior to 1973	Sealed May 2001 Reclaimed in 2018
Wilberg Fan Portal (1)	1978	Sealed with cement plug in 1985 Reclaimed in 2018
Wilberg Belt Portal (1)	Prior to 1973	Sealed May 2001 Reclaimed in 2018
Wilberg Intake Portal (1)	Prior to 1973	Sealed May 2001 Reclaimed in 2018
Underground Offices (4)	1975-1976	(not a portal) Area backfilled in 2015 Reclaimed in 2018
Shop Portals (1)	Prior to1973	(not a portal) Area backfilled in 2015 Reclaimed in 2018
Old Portals behind water tank (2)	Prior to 1973	Sealed May 2001 Reclaimed in 2018
Wilberg Intake Portals (3)	May 1977	Sealed with cement plug in 1985 Reclaimed in 2018
Mine Access to Cottonwood (2)	1982	Sealed May 2001 Reclaimed in 2018
Cottonwood Intake Portals (2)	1985	Sealed May 2001 Reclaimed in 2018
Cottonwood Fan Access Tunnel (2)	1982	Sealed May 2001 Reclaimed in 2018
Cottonwood Fan Portal (1)	1984	Sealed May 2001 Reclaimed in 2018
Cottonwood Belt Portal (1)	1984	Sealed May 2001 Reclaimed in 2018
Cottonwood Canyon		
Cottonwood Diesel Roadway (1)	1995	Sealed May 2001, Reclaimed Nov 2014
Cottonwood Belt Portal (1)	1995	Sealed May 2001, Reclaimed Nov 2014
Miller Canyon (3) (Reclaimed 6/1999)	1981	Reclaimed in 1999 Phase III Bond Release Accepted on October 4, 2010
Channnel Canyon Intakes (2) (Reclaimed 8/1997)	1989	Reclaimed in 1997 Phase III Bond Release Accepted March 1998

* Refer to Item 2-A in Appendix H.

553.130: Slope Stability

A slope stability analysis was performed by Johansen and Tuttle Engineering in 1989. The purpose of the study was to provide a maximum slope recommendation to which the borrow material could be constructed to achieve a safety factor of 1.3. The following is a summary of the results of the recommendation.

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Maximum Height of Fill (H) = 60'

C = 0

γ = 120 pcf

Slope = 1.5H:1V

$\emptyset = 40^{o}$ (min) SF = 1.3

Roberts & Schaefer specifications for Class C fills will be used.

(See information in Part 3, page 53 - Structural Stability)

In 2016, RB&G Engineering Inc. (RBG) performed a geotechnical investigation and slope stability analysis for the cut and fill slopes planned for construction at reclamation of the Cottonwood/Wilberg Mine site (refer to the full report in Appendix C). The geotechnical investigations required field work. A series of 7 test pits were excavated to depths up to 17 feet. Soil samples at various depths were collected and analyzed. Geotechnical properties of the collected samples were obtained by laboratory analysis according to the Unified Soils Classification System. In-place density tests were performed in the field using a nuclear density gauge. The results of lab and field investigations are found in Appendix C.

Based on the results of the slope stability analysis RBG recommends that all cut and fill slopes be constructed no steeper than 2H:1V. Lifts shall be placed at depths no greater than one foot and all rocks greater than 8" should be removed prior to compaction. Lifts should be compacted to at least 90% of the maximum laboratory density as determined by ASTM D 1557. At a minimum, Proctor tests should be performed for each 50,000 cubic yards of placed fill. PacifiCorp will retain a geotechnical engineer to ensure the recommendations by RBG are followed during the backfilling acitivities. This engineer will perform field test to ensure proper compaction of all backfilled material. Refer to the full report in Appendix C.

Note: A full time field technician was stationed at the Cottonwood Mine during all bacfilling activities. Tests were completed on all backfilled slopes. Field test results are attached to Appendix C

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Pocking was also investigated as part of the slope stability analysis. The purpose of placing pocks on the surface of the constructed slopes is to capture runoff to prevent erosion of the reclaimed surfaces. There have been concerns expressed by the Division that the roughened surfaces may become unstable during wet conditions. RBG evaluated saturated slopes using an infinite slope stability approach as described in Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (see citation in Report). Using this approach, RBG found that because of the strict compaction measures recommended, strength parameters results in a calculated factor of safety of 1.32 against slope instability.

RBG concluded that although a level of confidence in the results of the investigations proved satisfactory, RBG recommends that the slopes be constructed in consultation of geotechnical engineer. Field testing should be completed under his or her direct supervision will comply with this recommendation and insure that a qualified geotechnical engineer be present on-site during slope construction.

A similar slope stability analysis was performed by RBG in 2001 for the soils of the former Des Bee Dove Mine site. The Des Bee Dove Mine site is located in close proximity to the Cottonwood/Wilberg Mine site and with a similar south facing aspect. RBG found that the soils of the study site consisted of silty gravel with sand, cobble and boulder sized rocks similar to the Cottonwood/Wilberg Mine site. A copy of this report is included in Appendix C.

RBG concluded that existing fill material was acceptable for slope restoration. Material (<4"-8") should be placed in lifts not exceeding one foot in thickness. The fill should be compacted to an in-place unit weight equal to at least 90% of the maximum laboratory density as determined by ASTM D 1557-91. These fills should achieve a safety factor of 1.3 when placed at a slope of 2H:1V.

Rock fills (>+4"-8") should be placed in lifts not exceeding three feet thickness. Rock fills should be track-walked using at least 4 passes of a D-9 or equivalent dozer. These fills should achieve a safety factor of 1.3 when placed at a slope of no greater than 1.25H:1V.

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The technical staff at PacifiCorp has been involved in the construction and reclamation of similar slopes designed for the Cottonwood/Wilberg Mine. Various reclamation projects have been conducted at the Deer Creek Mine, Cottonwood/Wilberg Mine, and former Des Bee Dove Mine. No slope failures have ever been reported for any slope using the designs described above.

PacifiCorp has found that the sediment control measures described above and described in detail in the Hydrology Chapter have not only been successful from an erosion control standpoint, but using these techniques has quickened the growth of vegetation to a point where the vegetative performance standards on these sites surpass that of their respective reference areas.

560: Performance Standards

The reclamation operations conducted at the Cottonwood/Wilberg Mine will be carried out in accordance to the approved permit and the requirements of R645-301-510 through R645-301-553.

Note: In the performance of reclamation operations it was necessary to extend outside the historic disturbed boundary to effectly blend the reclaimed surfaces to the undisturbed surfaces. The total disturbed area of the Cottonwood/Wilberg Mine Site increased to 22.0 acres from 20.46 in part as a result of the reclamation activities. The main reason however, is that an aerial survey of the site was conducted in 2018 using high resolution photogrammatic imagery. The disturbed area boundary was digitized using the ortho photo in AutoCAD where a flat plane area was calculated.

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R645-301-700: Hydrology

761: General Requirements

Within the disturbed area of the Cottonwood/Wilberg Mine are two ephemeral drainages: Left Fork Grimes Wash, and Right Fork Grimes Wash. The Left Fork is by far the largest drainage. Both drainages drain an area of at least one square mile. The channels in these drainage systems will be restored to their original location as close as possible. The two drainage systems converge within the planned reclamation area of the Cottonwood/Wilberg Mine (refer to Plate 4B).

Construction of the mine site has created two large fill structures that were used for parking, material storage, and other necessary mining operation facilities. Reclamation consists of backfilling and regrading these fill structures to create stable reclaimed slopes and constructing a channel the follows the natural flow of the canyons.

Design, location, construction, and materials are carefully chosen to ensure a stable channel. As illustrated on Plate 4A, final reclamation activities will follow a reclamation sequence. The channels of the Left and Right forks of the Grimes Wash will be reconstructed utilizing a riprapped trapezoidal permanent channel design of sufficient size to accommodate a 100yr/24hr storm event. Regulation require a design for only a 100yr/6hr storm event.

As outlined in the previous discussions, the CMP culverts in the Left and Right forks of Grimes Wash will be removed in sections (refer to Plate 4A) as reclamation continues downslope. Although the canyon is considered ephemeral, flow typically occurs during large storm events. If during reclamation, flow is found to occur in either canyon, the water will be diverted through a sediment trap prior to entering the culvert. The sediment trap will treat storm water to protect from degrading the water quality downstream.

Sediment Control Measures for Reclamation as pertained to R645-301-752

All drop drains, culvert inlets, etc. that divert disturbed runoff to the sedimentation ponds which are located below areas where earthwork activities are being performed, shall be left in place so as to protect off-site areas from sedimentation. The use of straw bales, wattles, siltation fence, or other appropriate sediment control devices may be necessary to temporarily control sedimentation.

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Once earthwork activities are completed in an area, permanent sediment control measures will be implemented. Permanent sediment control includes constructing a stable soil surface to establish a diverse, effective and permanent vegetative cover capable of achieving the postmining land use. A stable soil surface is established first by incorporating and mixing hay into the topsoil, deep gouging, seeding, and finally, applying an effective hydromulch and tackifier. Using these techniques, PacifiCorp has experienced outstanding success in establishing vegetation on its reclaimed sites.

742: Sedimentation Control Measures

The mining company contracted the development of a reclamation plan for the site in the 1980's. At the time, sediment ponds were considered best technology currently available (BTCA). In this previously developed reclamation plan, sediment control was provided for by the use of contour and collection ditches reporting to a sediment pond. Because of the high risk associated with ditch failures on steep slopes combined with bedrock exposures in the channel with exposed drops, PacifiCorp concluded that contour and collection ditches were not the best alternative for controlling runoff from reclaimed slopes. Ditch failure was predicted to be the result of concentrated flows leading to head cutting in the collection ditches and/or breaching of the contour ditches. Because of the presence of large drops of the natural bedrock within the disturbed areas, equipment access to repair these failed areas would likely be impossible.

As an alternative (and a present day industry standard for sediment and erosion control at mine sites) to constructing contour and collection ditches PacifiCorp proposes to utilize deep gouging/pocking techniques as the BTCA for sediment control measures. PacifiCorp and others have reported excellent success using this technique. Sediment transport models show that in using this technique the disturbed or reclaimed areas produce a reduced sediment load lower than that of the undisturbed or background areas. Modeling data utilizing RUSLE is shown in the Appendix E for the areas of the Cottonwood/Wilberg Mine. This data shows that sedimentation within the disturbed area is controlled through deep gouging, mulching, and tackifying practices, and produces similar or lesser amounts of sediment than the undisturbed areas.

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The existing sediment ponds at the Cottonwood/Wilberg Mine are situated in the narrow canyon of the Grimes Wash at the lower ends of the disturbance. The ponds take up nearly the entire width of the canyon bottom in this area. Because of the ditch failure concerns mentioned above, PacifiCorp proposes to revise its practices for controlling sediment for final reclamation from utilizing a sediment pond to treat runoff from the disturbed areas (as initially proposed in the 1980's version) to more progressive, efficient, and effective techniques for controlling sediment and erosion. These techniques have been briefly mentioned in the preceding text. A complete and detailed discussion for on-site sediment and erosion control is included below. PacifiCorp considers these techniques an interim control measure during the establishment of a permanent vegetative cover. Refer to R645-301-300: Biology for vegetation requirements.

742.110: Sediment Control Measures Utilizing Best Technology Currently Available (BTCA)

Sediment transport will be controlled as required by R645-301-553 and R645-301-742 of the Utah Coal Regulations. Sediment control measures are designed using the BTCA. Two BTCA techniques for controlling erosion on-site and preventing sedimentation of the downstream areas off-site are possible and will be used at the Cottonwood Mine site; 1) control utilizing the current sediment control structures, and 2) control utilizing extreme roughening of the reclaimed surface. Each technique is discussed below.

Sediment Control Structures

Two sediment ponds exist which were constructed in support of the active mining and coal processing operations and are located below the mine site; north pond and south pond. The north pond collects runoff from the disturbed areas for the mine site through drop drains and buried culverts. At a certain level or volume, the north pond discharges, via a vertical stand pipe, into the south pond. The south pond, which provides a retention time for settling out solid particles, discharges into the main undisturbed culvert. At that point, runoff has been treated and discharges into the Grimes Wash. A Utah Pollutant Discharge and Elimination System (UPDES) point is retained for the discharge of the south pond (UT0022896-003). Both ponds together have a volume of 4 acre feet.

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As mentioned above, reconstruction of the slopes in the disturbed areas and reclamation of

drainage channels will begin at the northern and uppermost extents of the mine site and work downhill toward the sediment ponds. Reconstruction will occur in stages; i.e. as construction activities are occurring in one area, the area immediately below shall be established to collect runoff into the existing culverts and routed to the sediment ponds. The sediment ponds will remain in-place to treat runoff from the disturbed areas until those reclamation activities reach the ponds. However, a section of the undisturbed bypass culvert will be excavated and removed (refer to plan in Plate 4B Sheet 3 of 3) approximately 105 feet upstream the North pond. A lined ditch will be constructed from this culvert outlet to the North pond. All runoff from the Left Fork of the Grimes Wash will be routed into the pond. Overflow from the North pond is routed through the existing system into the south pond. Runoff exceeding the capacity of the South pond shall flow into the primary spillway (vertical culvert) first, then (if necessary) into the emergency spillway. The emergency spillway is a 36" culvert that is constructed from an elevation on the dam of 7,338 feet down to an elevation of 7,310 feet and then drop into the existing 90 inch undisturbed bypass culvert. This modified sediment control system will pass up to 205 cfs through the emergency spillway and 31 cfs (refer to Volume 7, Appendix XIII) through the primary spillway. This system will be left in-place until all other reclamation work is completed and this area is ready for recontouring. At this time, all structures shall be removed and the area recontoured as outlined on Plate 4C. Final reclamation slopes (slopes that are pocked, mulched, seeded, hydromulched, and tackified) will utilize extreme roughening (pocking) as the primary means for sediment control. These methods are described in detail below.

Note: The process for sediment control above was revised during reclamation work. Refer to Plate 4-B, Sheet 3.

When the stages of final reclamation has reached the sediment ponds, the ponds will be removed and the land on which they were located will be recontoured as outlined on Plate 4C. Prior to sediment pond removal, temporary sediment control will be placed below this area to protect downstream areas. Temporary sediment control will utilize silt fence, straw bales, or wattles, etc. at the bottom of slopes to treat any runoff that may occur. The permanent channel through this area will be constructed. Construction terminates in the natural channel at the southern extents of the disturbed area. Final reclamation will be performed on the recontoured slope surfaces. Once

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completed, temporary sediment control will be removed and reclamation of the Cottonwood/Wilberg Mine will be complete.

Extreme Roughening (Deep Gouging or Pocking)

Deep gouging (pocking) techniques encourage water retention and enhances plant growth. These protective measures are designed to prevent additional contributions of sediment to the streamflow or runoff outside the permit area and are used as an "interim" control measure in lieu of siltation structures until the establishment of a permanent vegetative stand. This sediment control method is termed "interim" since the pocks are developed to trap precipitation and runoff on the reclaimed slopes reducing the sediment transport capacity of overland flow. Precipitation, runoff, and sediment are trapped in the pocks where vegetation utilizes these sources for water and nutritional needs. Once established on the reclaimed slopes (usually between two to four years), vegetation becomes the permanent sediment control measure.

Three mechanisms of sediment transport will occur within the confines of the reclaimed mine site: 1) sheet flow onto the reclaimed site from above the reclaimed slopes; 2) off-site flow in side channels that intersect the reclaimed site; and 3) runoff from the watershed above the site diverting its flow in the main ephemeral channels of the left and right forks of the Grimes Wash.

A fourth mechanism, sheet flow on the reclaimed slopes, has the potential to occur. However, the BTCA to control this mechanism is pocking the reclaimed surface to limit or eliminate sheet flow. Pocking of the reclaimed slopes is discussed in detail below.

Discussion of Pocking as a Sediment Control Measure

Design of sediment control measures are based on four known physical processes which cause erosion; raindrop impact, sediment transport by overland flow, overland flow detachment, and deposition (OSM, 1983).

Raindrop impact is the process when, during precipitation event, raindrops falling on the disturbed soils at such an intensity to cause soil particles to detach from the soil mass. These detached particles are free to be transported by either wind or water.

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As more rainfall hits the soil surface, it begins to infiltrate this soil surface. If rain falls in excess of the infiltration rate of the soil, overland flow is produced. The transport capacity of the overland flow depends on two hydraulic conditions, velocity and flow depth. Velocity is dependent on slope steepness and slope roughness. Flow depth is dependent on the infiltration capacity of the soil and rainfall excess. If the sediment transport capacity of the flow exceeds the supply of sediment from raindrop detachment, then overland flow will tend to erode additional sediments from the soil surface. Non-cohesive soils will erode with less force produced by overland flow than cohesive soils. Once the force is greater than the cohesiveness of the soil mass, detachment occurs and the erosion process begins (OSM, 1983).

The fourth process is deposition. Deposition occurs when the transport capacity of the overland flow is reduced. Deposition of a sediment particle is dependent on the weight and size of the particle. As the sediment transport capacity decreases, the largest particles will settle out first. If the sediment transport capacity of the overland flow continues to decrease, the size of the remaining particles continues to decrease (Haan, et.al 1994). The weight and size of a particle is referred to as its resisting force. The applied force, as described above, results from the hydrodynamics of the flow.

The theories and concepts behind deep gouging (pocking) are to control the applied hydrodynamic forces to promote deposition. Pocking allows for this in numerous ways. Pocks reduce the length that overland flow will travel, reduce the overall velocity of overland flow, eliminate or greatly reduces the potential for concentrated flow to form by intercepting its flow path, reduce the overall transport capacity of the overland flow, promote infiltration on the slope verses allowing the flow to run off-site, and promotes deposition on the slope versus allowing sediment to be transported down slope. The latter two offer vegetation the needed water and nutrients to vigorously grow and establish. A deeper root penetration for plants provides stability to the slope that creates a long lasting stable slope.

Hydrologic Cycle and Pocks

Figure 7-1 illustrates the typical hydrodynamic process of precipitation falling on a reclaimed slope with a gradient of 2 horizontal and 1 vertical. When a raindrop hits the upper portion of the slope,

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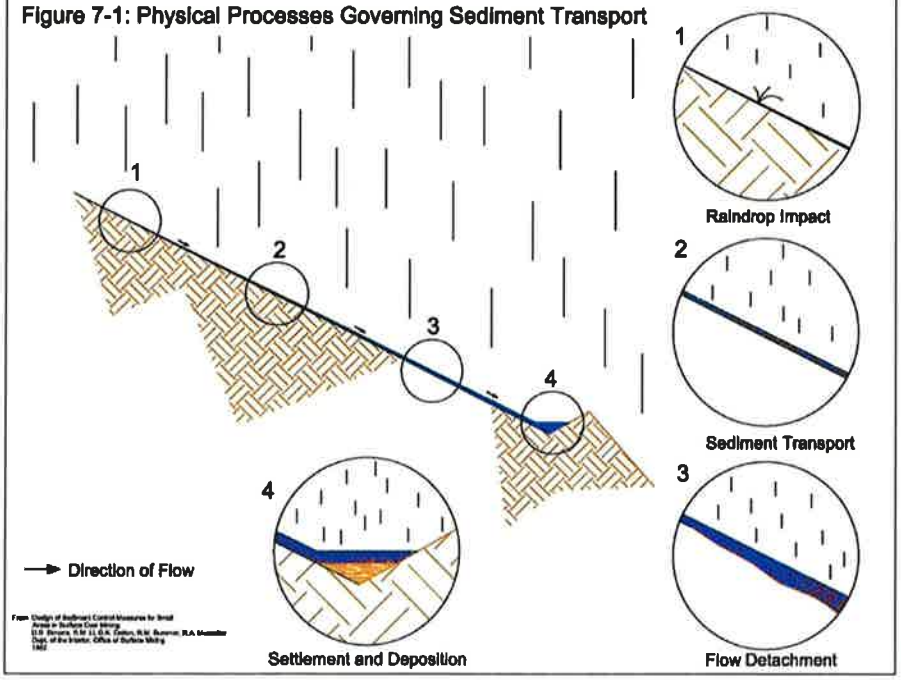
noted by (1), the raindrop impact causes the detachment of soil particles. As the precipitation event continues and exceeds the infiltration rate of the soil mass, overland flow occurs and begins to transport the detached soil particles (2). As the flow continues down slope, the hydrodynamic forces applied cause detachment of soil particles of the soil mass (3). This detachment is where the rilling and concentrated flow regimes begin. The longer the slope is, the higher the velocity potential for flow, increasing its erosional force potential. Ideally, at some point on a slope, hydrodynamic forces are reduced and deposition occurs (4).

Figure 7-2 represents the same 2H:1V gradient slope. However in this example, pocks are placed in a random and discontinuous manor. The uppermost pocks collect overland flow from the undisturbed areas above the site. Any precipitation that falls in the disturbed area is captured within the pocks. Detached sediment particles originating from rainfall impact are also carried by sediment transport to the bottom of pocks where deposition occurs. Theoretically, flow detachment and erosion are eliminated. Water and sediment remain on the slope where they are utilized for plant growth.

Figure 7-1: Physical Processes Governing Sediment Transport



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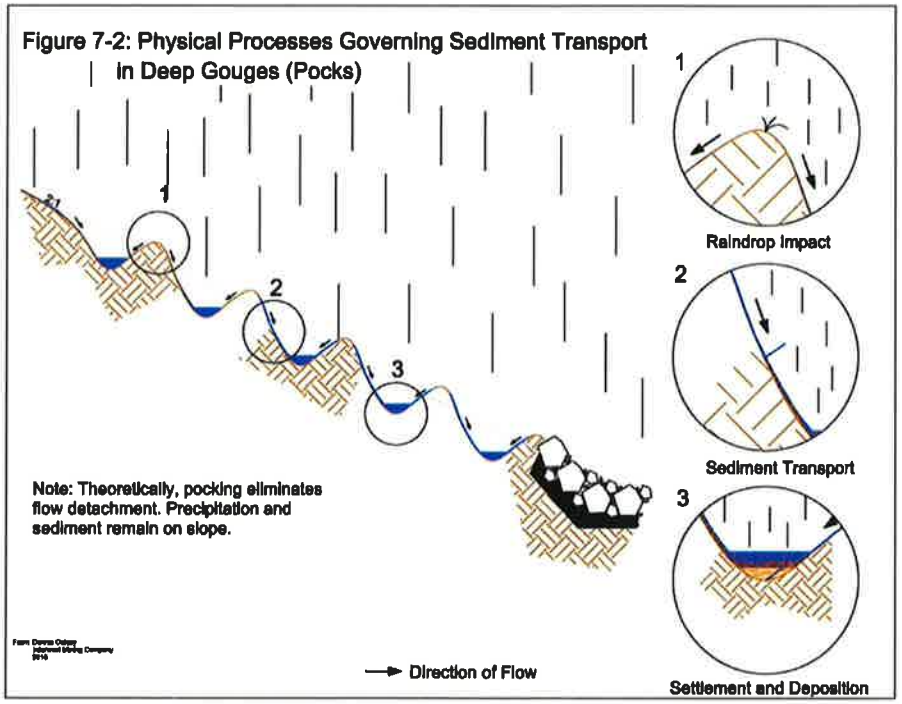
Deep Gouging Standards

In April 2016, PacifiCorp's technical staff looked at the design hydrology of the site to determine whether a typical sized pock could contain the quantity of rainfall produced by a 100yr/6hr precipitation event. The pock design modeled the control of runoff using an inverted/truncated pyramid shaped figure. This shape is made as a track-hoe extends its bucket, stabs straight down, curls the bucket in creating the divot and then curls the bucket out to finish out the pock. Because of the 2:1 gradient of the hillslope, the inside wall of the pock will be greater than 2:1. However, past field experience has shown no issues with slope stability. The remaining three sides of the inside of the pock form to the angle of repose.



While an inverted pyramid is not the exact shape of the inside of a pock, Interwest believes that this is a close representative shape of the pock created by the bucket of a track-hoe. Appendix D-4 contains calculations for surface runoff based on various storm events including the runoff of a 100yr/6hr precipitation event.

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The design standard for deep gouging is generally as stated in DOGM's reclamation guide. The insert in Figure 7-3 is taken directly from Utah Division of Oil, Gas, and Mining, Practical Guide to Reclamation in Utah.

Field experience indicates that the individual pocks have an approximate surface diameter of 3 to 6 feet and depths of 1.5 to 3 feet when constructed with a back-hoe. Pocks are excavated in a random, overlapping pattern. This pattern eliminates any potential flow path from developing on the slope. Additionally, after seeding the newly formed surface, a wood fiber hydromulch with tackifier is sprayed at a rate of approximately 1 ton per acre. The soil surface is nearly completely covered. Particle detachment is greatly reduced utilizing this hydromulching method.

Basic Design and Construction

Use a backhoe or trackhoe shovel to create microbasins for extreme surface roughening. The trackhoe shovel is used to dig, poke, or push basins with a minimum depth of eighteen inches. These basins should be 1 ½ to 2 feet deep and have the width of the bucket. This allows the basins to be up to four feet wide. The most common construction method is to dig a bucket load of soil and then drop it 2 to 3 feet above the soil surface. Repeat this process in a random and overlapping pattern, making it impossible for water to flow down slope. Finished roughened soils should be difficult to walk over. On poor, shaley sites, such as the Mancos Shale, the pocks can fill with sediment within a short time period. Therefore, the pocks should be as large as possible on these soils. Conversely, on-sites with adhesive soils, the pocks should not be too large, because they would not fill in with sediment over time. Straw, alfalfa, or hay can be spread during roughening and anchored to the soil surface by jabbing the materials into the soil surface or tacking them with a hydromulch slurry.

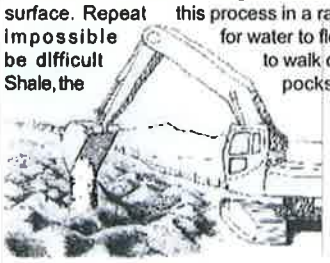

Figure 1.2: A trackhoe is used to create micro-basins. Drawing by Jenny Suflita.

Because a drill seeder cannot be used on such rough surfaces, seed must be broadcast (Chapter 4, Section 2). In areas with extremely dry and loose soil, it may be advantageous to wait until the soil has settled before starting the seeding process. One method is to broadcast half the seed immediately and broadcast half the seed after the soil settles.

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Figure 7-3: Page 106 of UDOGM, Practical Guide to reclamation in Utah.

As discussed previously in the Engineering Chapter, concerns have been expressed that the roughened surfaces may become unstable during wet conditions. RB&G Engineering (RBG) has evaluated saturated slopes using an infinite slope stability approach as described in Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California (see citation in Report). Using this approach, RBG found that because of the strict compaction measures recommended (refer to slope stability in

Engineering), strength parameters result in a calculated factor of safety of 1.32 against slope instability. Refer to Appendix C-1 for the full report for slope stability for the Cottonwood/Wilberg Mine.

Design Storm and Pocks

Several assumptions must be made when estimating volume of the captured precipitation from a 100yr/6hr event (see Appendix D-1). The following assumptions are used:

1. Pocks are generally the shape of an inverted pyramid.
2. The designed storm falls consistently throughout a 6 hour period.
3. The amount of rainfall trapped in the trough is dependent on area of the plane where rain enters.
4. Physical properties of the soil are uniform throughout the depth.
5. Infiltration rates are constant throughout time with respect to a hydrologic soil group C (0.05 – 0.15 in/hr (Haan, et.al. 1994)).

As illustrated in Figure 7-4, a pock is similar to the geometric configuration of an inverted pyramid. Using the dimensions of a=3', b=1.5', h=1.5, the total holding capacity (volume) is equal to 7.9 cubic feet. A large pock with the dimensions of a=6', b=3', h=3', has a volume of 63.0 cubic feet.

$$V=\frac{(a^2+ab+b^2)h}{3}$$

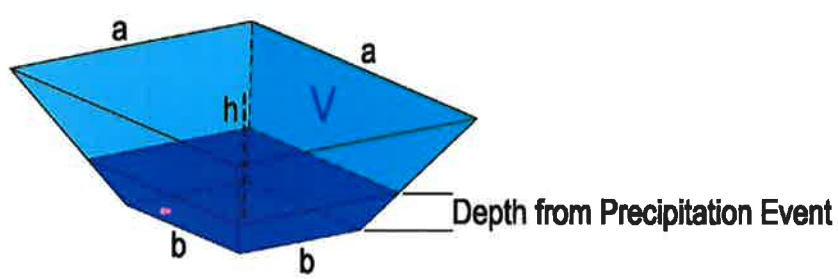

Figure 7-4: Modeling a pock using a truncated pyramid figure.

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The 100yr/6hr event produces 2.25" (0.19') of rainfall in 6 hours[1]. Evaluating the area where rainfall (2.25") would intersect the top plane of the trough and multiplying by the depth of rainfall gives a volume of 1.69 cubic feet that accumulates in the bottom of the 3 foot trough (refer to calculations in Appendix D-2). The volume retained if assuming an infiltration rate of 0.05 inches per hour (most conservative estimate in Soil Group C) for 6 hours equates to approximately 1.39 cubic feet or 13.7% of the total capacity of the trough. The volume of the storm event accumulating in the larger 6 foot trough would be approximately 6.75 cubic feet or 7.8% of its entire holding capacity (assuming the same infiltration rate). Finding the depth (d) of water requires solving iteritively. As shown in Appendix D-2, the depth of water using the scenario of the 3 foot trough shows d = 0.54' or 6.5". The depth of water in the 6 foot trough using this same scenario shows d = 0.62' or 7.4".

Observing the cross-sectional view of the pock in Figure 7-5 and comparing it to the pock model, we observe that the volume of water remaining in the pock at the end of the 100yr/6hr storm event is entirely retained in pock and remains on the slope. Therefore, theoretically, there will be no runoff produced off a 2H:1V gradient slope from a 100yr/6hr storm event if all pocks installed on this slope are constructed as outlined.

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1 Note: rainfall amount was determined using the latest data supplied by the NOAA Atlas 14 Point Precipitation Frequency Estimates (see Appendix D-1). Estimates used for the main channel design utilized the NOAA Atlas 12 in which the data estimated a 100yr/24hr storm event at 3.5". Refer to Appendix F to review the hydrograph

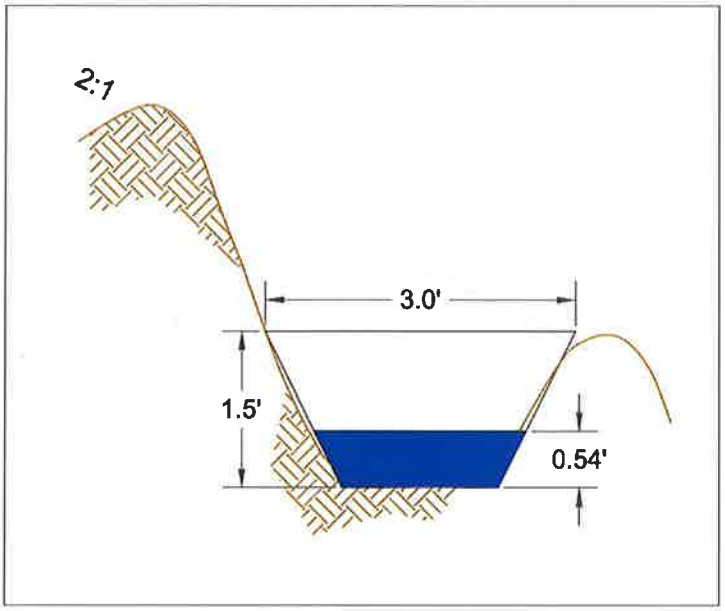

Figure 7-5: Theoretical Water Holding Capacity of a Standard 3' Pock.

Note: Although the small slope on the inside of the pock is greater than 2:1, real construction results (noting from successful reclamation projects in the same general area as Cottonwood Mine) have demonstrated that the slope stability of the entire slope is not compromised. Slopes have remained stable and allowed for enhanced vegetation growth.

RB&G Engineering Inc. (RBG) evaluated the potential for instability issues utilizing deep gouging techniques on the proposed Cottonwood/Wilberg Mine reclaimed slopes. RBG recommended that fill slopes are constructed no greater than 2:1, rocks larger than 8" be removed, moisture conditioned, and compacted to at least 90 percent of the maximum laboratory density as determined by ASTM D 1557 and using equipment weighing at least 10 tons. The RBG report can be reviewed in Appendix C-1.

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Overland Flow onto Site

Another source contributing to potential overland flow to the disturbed slopes is the runoff from the undisturbed areas above the site. The Division of Oil, Gas, and Mining expressed concerns about the areas where overland flow above the reclaimed surface could potentially impact these surfaces through channelized flow and erosion. PacifiCorp considers this a transitional area where pocks could be used to control these overland flow regimes. Runoff is modeled utilizing the Curve Number Method for estimating peak runoff rates for the area immediately above the reclaimed

surface where overland flow transitions from undisturbed flow to disturbed flow. Runoff was simulated from a typical area above the disturbed area as shown below in Figure 7-6 and on Plate 4E. The illustrated area is an inter-basin area where sheet flow would flow directly onto the site and not into the side channels or gullies. EarthFax Engineering has evaluated five inter-basin areas above the disturbed area of the Cottonwood/Wilberg Mine site. Their report is found in Appendix D-4.

The results of these evaluations show that the undisturbed area contributes 0.34 inches of excess precipitation. This translates to a total volume (rainfall excess) which will flow into the disturbed area after infiltration is accounted for. The largest pock has been shown a total capacity of 63 cubic feet. Each inter-basin area has a boundary length (interface of the transition areas) that can contain a certain number of large pocks constructed along this border. Table 1 in the "*Adequacy of Reclamation Gouges at the Cottonwood Mine for Intercepting Runoff and Sediment from Adjacent Undisturbed Areas*" shows the runoff volume from each inter-basin area, number of rows needed to contain runoff (in both a truncated sphere and a truncated pyramid), and the time to fill one row of gouges with sediment.

When modeling the control capacity using a truncated pyramid shaped gouge, the report shows that runoff from the above inter-basin areas can be controlled by constructing one row of large gouges or pocks. Therefore, we can conclude that runoff flowing from the undisturbed areas above the disturbed areas will not cause impact or damage, and the disturbed areas will contain the overland flow from the design storm.

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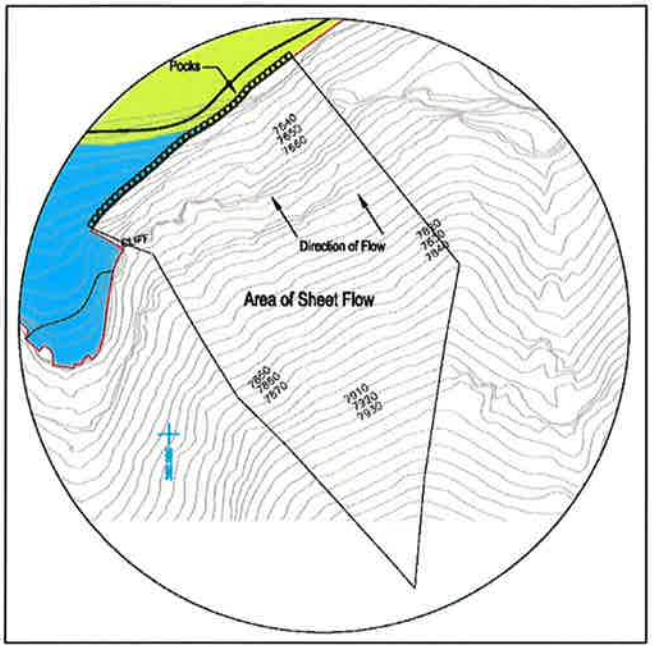

Figure 7-6: Model plot for evaluating runoff from the undisturbed area (refer to Plate 4E).

Observations from other sites utilizing deep gouging as the primary sediment control measure support the conclusion that pocking controls runoff and erosion on-site as well as controlling the runoff flowing onto the site from the undisturbed areas above. Although these other sites did not differentiate pock sizes along the transition area, there is no evidence of negative impacts. Pock size distribution for the Cottonwood/Wilberg reclamation will utilize the larger size pocks at this boundary as a superior protective measure.

742.111: Sediment Loss

Because the permittee is required to "prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area," the BTCA techniques used for controlling sediment and erosion in the disturbed area must be proven.

Sediment loss was calculated using the Revised Universal Soil Loss Equation (RUSLE) to determine if reclamation practices would cause or contribute to the degradation of downstream water quality. RUSLE is a set of mathematical equations that estimates soil loss and sediment yield resulting from rill and interrill erosion. The equation uses the factors as follows:

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A=RKLSCP

Where:

A	=	Average annual soil loss in tons per acre per year
R	=	Rainfall/runoff erosivity
K	=	Soil erodibility
LS	=	Hillslope length and steepness
C	=	Cover management
P	=	Support practice

Sediment loss for the Cottonwood/Wilberg mine site was determined by calculating the sediment loss from a detailed area of the proposed mine site reclamation; two slope profiles in the disturbed area and one profile in the undisturbed area. Plate 4E shows these areas where each profile and corresponding calculations were made. Each profile was identified by location (LS-1, LS-2, or LS-3). A horizontal slope length and slope gradient was determined using AutoCAD.

Using RUSLE2, the area selected to calculate sediment loss is considered representative for the entire disturbed drainage area. In other words, the average loss is determined from the reclaimed areas and then multiplied by an acreage factor. Two locations from the disturbed area used to model sediment yield were representative of all areas within site with respect to slope gradient. The RUSLE summary sheet is presented in Appendix E-2 that shows the results of the modeling exercise. Also included are the various inputs (slope length, control practice, soil complex, etc.) which were used to run the model (refer to Appendix E-2). The RUSLE equation factors mentioned above are discussed below as explained by Foster and Toy, 2003.

R values in RUSLE2 are obtained from the Climate Worksheet in Appendix E-2. The R-factor is the expression of the erosivity of rainfall and runoff. The numeral value used for R in RUSLE2 must quantify the effect of raindrop impact and must also reflect the amount and rate of runoff likely to be associated with the rain. RUSLE2 considers how erosivity varies during the year by having an R value calculated for each month. A storm's erosivity index is the product of the storm's energy (E) and the maximum 30 minute intensity (I). The R value is the annual sum of

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these storm EI values. The R value used for the Cottonwood/Wilberg mine site is 13.

The K-factor is an expression of the inherent erodibility of the soil or surface material. The soil erodibility factor is the average long-term soil and soil profile response to the erosive powers of rainstorms (NRCS 1998). Although soil sampling and testing were not conducted at the Cottonwood Mine to create a site specific K-factor, the local Soil Survey conducted by the NRCS was used to determine the typical soils in the area of the Cottonwood Mine and choosing a similar soil within the RUSLE2 database. The Gerst-Strych-Rock Outcrop complex, with 30 to 65 percent slopes was chosen for this exercise. This complex compared well with the soil texture and slopes as found in the NRCS Soil Survey data set.

Topography was taken into account when calculating the LS-factor. This factor takes the hillslope length (L) and gradient (S) as contributing to erosion. If either one of these factors increase, total soil loss per unit area will also increase. The three slope profiles used were representative of the cut slopes and fill slopes for the entire disturbed site and the vegetation reference area outside the disturbed boundary.

The cover-factor (C) was determined for the soil in a disturbed state. A "disturbed state" in this case is the condition of the soil immediately after reclamation. In this condition, there is no effective root mass, no canopy cover and no height in which a raindrop can fall from or be intercepted by vegetation. Other ground cover entries were also used such as rock fragments and vegetative residue (i.e wood fiber mulch, tackifier). These entries were conservatively used since no data has been established relative to the pocking techniques.

The support practice (P) factor is probably the most important input when calculating sediment yield for the disturbed area. Although RUSLE2 does not include deep gouging practices in its database, it does allow credit for various roughness factors, terraces, and basins. The roughness of the RUSLE slope considers a maximum roughness of approximately 3 to 6 inch ridges contoured horizontally across the slope. The roughness factor used for modeling in RUSLE2 considers a roughening practice using a 10 inch moldboard plow. Three level terraces in the middle of the slope were also used to conservatively mimic the protection of pocking. PacifiCorp

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concludes that because RUSLE2 does not support deep gouging practices for modeling sediment yield, the results are very conservative in terms of total sediment yield from the site. In other words, RUSLE2 over-estimates the sediment production from the site.

As an example, site LS-2 in Appendix E-1 shows the slope profile using three supporting management practices; 1) bare ground only, 2) 10" moldboard plow roughness, and 3) a 10" moldboard plow roughness with three level terraces in the middle. With each practice used, the sediment yield is reduced substantially. The practice utilizing the roughness and terraces provides the highest protection to the slope (least sediment production).

A summary of the sediment yields for LS-1, LS-2, and LS-3 is presented in Appendix E-2. The summary shows that for the modeled slope profiles LS-1 and LS-2 utilizing the supporting practices for sediment control and comparing to the undisturbed slope profile, LS-3, protection was sufficient and would not cause or contribute to the degradation of downstream water quality. Regarding gouging/pocking, PacifiCorp concludes that unless there are failures of the pocks (risk is considered minor based on past experience and geotechnical considerations) on the slope, all sediment and water will be retained on the slope.

Systematic Reclamation Procedures

Backfilling and grading will be conducted by starting in the upper elevations of the disturbed areas and then working down canyon. After each section is backfilled, compacted, and topsoiled, the area will be covered with a hay mulch at a rate of 2000 lbs/acre. Once the mulch is evenly spread over the surface, deep gouging (pocking) techniques for sediment control will be used. These techniques require a track-hoe or similar machine to roughen the disturbed area in a random and overlapping fashion using its bucket. Pockmarks created are approximately 3.0' feet wide x 3' long x 1.5' feet deep.

Once pocking is completed in an area, the area will be seeded (refer to R645-301-300: Biology) and sprayed with a wood-fiber mulch at a rate of at least 1500 lbs/acre. A tackifier will be added to the hydromulch at a rate of approximately 500 lbs/acre to stabilize the soil surface to minimize raindrop impact and erosion.

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Note: Refer to as-built application rates in R645-301: Biology.

If, while re-establishing the slopes, a storm event occurs storm water runoff will be controlled and treated prior to leaving the site or entering the sediment pond. When the undisturbed area culverts are removed, the remaining ends of the culverts will be left in an open state. A small sediment basin will be constructed at the inlet of the culvert so that runoff will be treated before entering the undisturbed culvert. A sediment fence spillway will be constructed at the outlet end of the basin. Disturbed area culverts will be treated similarly. This will keep most of the sediment from unprotected slopes out of the ponds. Runoff from the disturbed areas will be treated again by the sediment pond. As reclamation of the slopes and channels reach the location of the ponds, the ponds will be removed starting with the North Pond and finishing with the South Pond. Once these ponds are removed, sediment control will be maintained by the deep gouging/pocking, mulching and tackifying techniques (mulching and tackifying are described in R645-301-300: Biology).

The intent of the presented sediment control measures is to prevent, to the extent possible, additional contributions of sediment to the ephemeral channel outside and downstream of the disturbed area. PacifiCorp has shown that the measures proposed will provide the protection needed in order to comply with the Utah Coal Regulations and Utah Water Quality Regulations.

Sediment control structures (silt fences, straw bales, straw wattles, etc.) used to control sediment during the reclamation phase will be removed as they are no longer needed.

Note: The sediment control design utilizing the ponds as a sediment control devise for the upgradient slopes was revised from what is discussed in the preceding paragraphs. Refer to the discussion and design on Plate 4-B.

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742.300: Diversions

The 20 acre disturbed area lies within the confines of the Left and Right forks of the Grimes Wash. These drainages each drain an area greater than one square mile in size. The main drainage of each fork was diverted using corrugated metal culverts to by-pass ephermal flow below the

disturbed area of the mine site. The flows within the disturbed area (surface flow) and/or onto the disturbed area (flow from above site) was controlled by routing all runoff to disturbed culverts and collected in two ponds, fines settled out, and discharged into the receiving stream below. This section addresses the design of diversion channels which drain a watershed of at least one square mile and less than one square mile.

742.320: Diversions of Perennial and Intermittent Streams and Ephemeral Streams that Drain a Watershed of at Least One Square Mile

During reclamation, buried diversion piping in the Right and Left forks of Grimes Wash will be excavated and removed in stages as described in the previous sections.

The concept to address hydrological concerns during reclamation will involve removing the buried diversion culverts and returning the channels to their natural configurations; bedrock channel with rifts, pools, and drops. Large boulders will be placed to mimic the ephemeral characteristics of the channel as found in the native areas above and below the disturbed area. Channels proposed on fill slopes shall include a riprap channel designed and built to endure the expected flow.

Channel design is based on safely passing a 100 year/24 hour storm event with 3.5 inches (NOAA Atlas 12) of precipitation as compared to the federal and state minimum requirements of 100 year/6 hour storm event. Refer to the Hydrologic calculations for final reclamation in Appendix F-1.

The drainage pattern consists of the main branch of Grimes Wash (Left Fork) and the Right Fork. Both drainages have steep gradients and side slopes and have scoured the channels to bedrock. At their confluence the grade downstream flattens rapidly allowing channels to be regraded to a moderate slope.

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A rip-rapped channel designed to carry the peak flows calculated for both east and west (see watershed characteristics in Table 7-1) watersheds will be constructed as shown on Plate 4F. Although Plate 4F (and others) show a continuous riprapped constructed channel, the riprapped channel will only be constructed in those areas where the bedrock is not located (i.e. transition areas). It would be impossible to predict, without extensive subsurface investigation, where the

bedrock will be intersected during channel reconstruction. Therefore, the design calls for a riprap channel along the entire length of the drainage. Watershed runoff characteristics are depicted in Table 7-1. The curve number derivation is shown in Table 7-2, where height, flow, and velocity are summarized for various channel slopes in Appendix F-1. Hydrological procedures and calculations are described in the Appendix. Watersheds are depicted on the drainage map Plate 4F.

Table 7-1: Wilberg Mine Watershed Characteristics.

Cottonwood/Wilberg Mine Watershed Characteristics					
Watershed	Subdrainage	Area (acres)	Curve Number	Slope (%)	Drainage Density
Wilberg West		1476			
	Ia	59	95	34	75.9
	Ib+c	1419	67	11	6.9
	Ib	798	54		
	Ic	621	64		
Wilberg East		1280			
	IIa	100	95	57	42.0
	IIb+c	1180	76	9	11.9
	IIb	480	84		
	IIc	700	71		

In the areas where bedrock is located and fill extends to the base of the channel, reconstruction will consist of a trapezoidal design using bedrock as a base with both filter and rip-rap sides whose slope will not be steeper than 2H:1V, refer to Figure 7-7 and the channel design in Appendix F.

Where the historic flows have carved a channel in the bedrock, no riprap shall be used in the side slopes. Where the channel consists of fill in the base and side slopes, both filter and riprap channel construction will be used. The following describes the specifications of the filter and riprap channel construction.

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Table 7-2: Wilberg Mine Curve Number Derivations

*Vegetation type and cover estimates based on personal communications, 1980 and on-site observation.

Cottonwood/Wilberg Mine Curve Number Derivations			
Subdrainage	Curve Number	Description*	Hydrologic Class
Wilberg West			
Ia	95	Excessively steep slopes with 20% Juniper/Grass cover	D
Ib+c	67	Composite value for Ib + Ic	
Ib	54	N-Aspect, moderate slope with 60% Ponderosa Pine cover	B
Ic	84	S-Aspect, moderate steep slope with 20% Juniper/Grass cover	C
Wilberg East			
IIa	95	Excessively steep slopes with 20% Juniper/Grass cover	D
IIb+c	76	Composite value for IIb + IIc	
IIb	84	S-Aspect, Moderate steep slope with 20% Juniper/Grass cover	C
IIc	71	West-Aspect, moderate slope with 40% cover	C

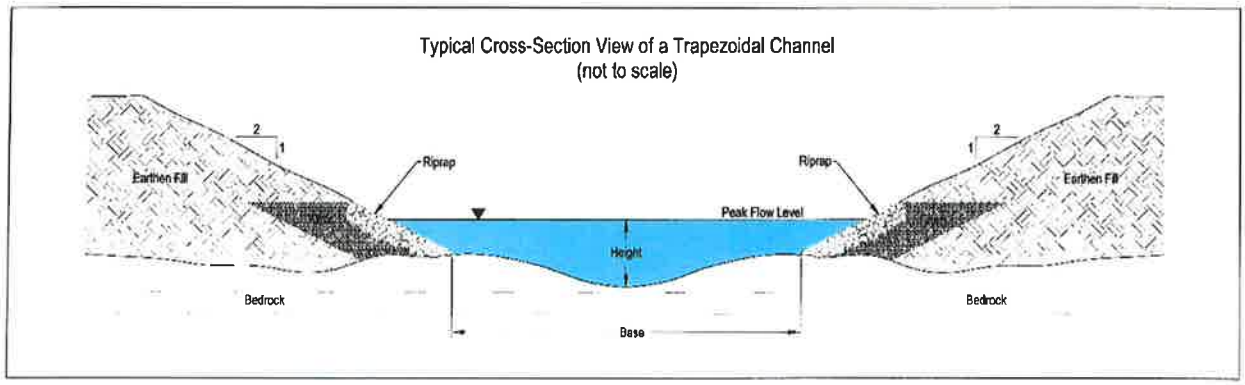

Figure 7-7: Typical Trapezoidal Channel with Bedrock Bottom.

Filter and rip-rap gradation (see Appendix F-1) will consist of aggregate materials with weight and size approximating the following ratios:

1)

$$\frac{D_{50}\ \text{Filter}}{D_{50}\ \text{Base}} < 40 \quad \text{also} \quad \frac{D_{50}\ \text{Rip-rap}}{D_{50}\ \text{Filter}} < 40$$

2)

$$\frac{D_{15}\ \text{Filter}}{D_{15}\ \text{Base}} < 40 \quad \text{also} \quad 5 < \frac{D_{15}\ \text{Rip-rap}}{D_{15}\ \text{Filter}} < 40$$

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3)

$$\frac{D_{15}\ \text{Filter}}{D_{85}\ \text{Base}} < 5 \quad \text{also} \qquad \frac{D_{15}\ \text{Rip-rap}}{D_{85}\ \text{Filter}} < 5$$

Granular size gravel smaller than 3" and larger than #4 sieve. Sand smaller than #4 and larger than #200.

Rip-rap shall be composed of graded mixtures down to the one inch size particle such that 50 percent of the mixture by weight will be larger than the D_{50} size. This mixture will contain sufficient gradation to fill the void when placed. The diameter of the largest stone will be 1.25 x D_{50} and the rip-rap thickness will not be less than 1.5 times the largest stone diameter. Rip-rap D_{50} maximum will not exceed one-third the bottom width of the channel bottom.

RIP-RAP GRADATION

	Steep Slopes	Mild Slopes
D_{Max} / D_{50}	1.25	2
D_{50} / $D_{10\text{-}20}$	2-3	2-3

Determination of the mean rip-rap diameter (D_{50}) was based on maximum shear stress using the methodology presented by Anderson, et. al., (1970) as follows:

$$T_{max} = 5D_{50} \qquad (1)$$

$$T_0 = c\ 62.4\ d\ S \qquad (2)$$

where,

T_{max} = the maximum shear stress than the rip-rap can sustain in pounds/sq. ft.

T_0 (T 0) = the actual shear stress on the channel in pounds/sq. ft.

D_{50} = the mean rip-rap diameter in feet

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D = the flow depth in feet

S = the channel slope (ft/ft)

62.4 = the unit weight of water in pounds/cu.ft.

C = the channel shape coefficient (see following table)

Channel shape coefficients for sides of trapezoidal shaped channel with 2:1 side slopes:

Bottom width/depth	C
1.0	1.3
2.2	1.2
4.3	1.1
6.3	1.0

Two constraints associated with the use of equations 1 and 2 are:

1. T_{max} should be less than 15 pounds/sq.ft.
2. the maximum rip-rap size, D_{max}, should not exceed approximately 1/3 of the channel width.

Both constraints limit the mean rip-rap diameter to three feet for the channel conditions at the Wilberg site (assuming a 10-foot bottom width for the channel). By combining equations 1 and 2 with the Manning equation and assuming one dimensional flow, the following equation is obtained:

$$D_{50} = 9.8\ C\ (nq)^{0.6}\ S^{0.7} \qquad (3)$$

where the additional variables are:

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n = Manning's roughness coefficient

q = discharge per unit width of channel

Equation 3 shows that with the rip-rap diameter fixed and the roughness and flow conditions

established, the slope of the channel is the only variable that can be adjusted to meet rip-rap stability requirements.

Therefore, Equation 3 was used to establish criteria for maximum slope conditions along the channel reach, assuming a D_{50} of 3 feet. The difference between the actual slope conditions and the maximum allowable slope will be the fall that will have to be incorporated into drop structures along the channel profile. The fall will take place over natural ledges along the channel profile which will be excavated in bedrock during channel restoration.

Channel slope data, channel hydraulic data, and channel profiles for the Left Fork, Right Fork and Main channels are presented on Maps 4B.

Sidewall construction of the rip-rapped channel will incorporate a 9-inch granular filter on which a 4.50 foot thick rip-rap protective covering will be placed. Construction and placement of the rock will, where possible, enhance pooling and energy dissipation.

Note: Channels were constructed utilizing the design as outlined above in both the left and right forks of the Grimes Wash. All riprap and filter rock use for channel construction was processed on site with native sandstone. There were no rocky outcrops as originally speculated. Each channel was riprapped its entire length.

742.330: Diversion of Miscellaneous Flows

As cited by R645-301-742.331, diversion of miscellaneous flows "consists of all flows except for perennial and intermittent streams and ephemeral streams that drain a watershed of at least one square mile, maybe diverted away from disturbed areas if required or approved by the Division." These flows "include ground-water discharges and ephemeral streams that drain a watershed of less than one square mile." At the Cottonwood Mine, side channels above the disturbed will be routed through a diversion channel into the main drainage channels of the Left and Right Forks of the Grimes Wash.

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As required by the Division, diversion channels have been designed for those side channels that drain through the reclaimed areas of the Cottonwood Mine from the undisturbed areas above the

site. In 2016, EarthFax Engineering Group was retained to develop this design (refer to "*Cottonwood/Wilberg Mine Reclamation Side Channel Design*" in Appendix F-2). EarthFax has indicated that there are six side channels that drain through the site. The watersheds for these side channels are identified as RWS-1 thru RWS-6 and the channels are identified as RC-1 thru RC-6. Although R645-301-742.333 requires these side channels be designed based on a peak flow from a 10yr/6hr storm event, the side channels at the Cottonwood Mine have been designed based on a peak flow from a 25yr/6hr storm event.

Results of the design work show RC-1 thru RC-6 utilizing a 6 inch filter blanket with a d_{50} of 3 inches and the channel riprap sized for a d_{50} of 15 inches. Because the velocity of the flow, the designer incorporates a 3 foot diameter boulder every 10 to 15 feet along the channel bottom. This "obstruction" adds to the roughness of the channel to retard the velocity of the runoff.

Construction of the side channels will be conducted using the following processes:

At reclamation, all undisturbed and disturbed culverts will be removed. Slopes shall be constructed as outlined in the Engineering Section and on Plates 4B and 4C. Concentrated flows above the reclaimed site that route through side channels will be diverted over the reclaimed slope by constructing armored channels. These channels have been designed and are similar to the main channel design using a sized filter blanket and riprap protection. However, these channels will be constructed such that they blend in with the contributing natural subdrainage channel. The filter blanket and riprap will be placed as shown in the design in Appendix F-2, covered with soil, seeded, hydromulched, and tackified. Past experience with the Des Bee Dove Mine reclamation project has shown successful results utilizing this method. A temporary sediment control structure will be placed at the bottom of these reclaimed side channels to remove sediment protecting downstream waters. Maintenance of these sediment control structures will be conducted on an "as needed" basis throughout the responsibility period. Once it has been determined that the vegetation is sufficiently established to control erosion and sedimentation, these structures will be removed.

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Note: Subdrainages RC-1 through RC-6 were constructed as designed. All riprap and filter rock use for channel construction was processed on site with native sandstone. The

subdrainage in the right fork (RC-6) was lengthened into the undisturbed area because the area was not delineated correctly during the planning stages. Because of the steep slope added to this subdrainage channel the extended reach had to be designed. The permittee reached out to EarthFax Engineering Group to provide the design for this area. The design of this extended reach of RC-6 is included in Appendix F-2.

750: Performance Standards

Discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

The regulations in 40 CFR Part 434 apply to all mines where extraction of coal is or has taken place. Specific to the Cottonwood/Wilberg Mine is Subpart H – Western Alkaline Coal Mining operations. Western coal mining operations are surface or underground coal mining operations located in the interior United States, west of the 100th meridian west longitude, in an arid or semiarid environment with an average annual precipitation of 26 inches or less.

As stated in 40 CFR Part 434 Subpart H, drainage from the mine reclamation areas, brushing and grubbing areas, topsoil stockpiling areas, and regraded areas, shall meet the following requirements, before any treatment:

pH is equal to or greater than 6.0
Dissolved iron is less than 10 mg/L, and
Net alkalinity is greater than zero

Subpart H specifically requires operators to submit a site specific Sediment Control Plan to the permitting authority (in this case, the Utah Division of Oil, Gas, and Mining) designed to prevent an increase in the average annual sediment yield from pre-mined, undisturbed conditions. This Sediment Control Plan shall use a watershed modeling program to demonstrate the performance of those measures taken to control sedimentation and erosion at the site.

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As outlined in **742: Sediment Control Measures**, PacifiCorp has proposed a plan to prevent an increase in the sediment yield at the outlet boundary of the disturbed area below the main mine site. Pocking has been proposed as the BTCA for controlling sediment and erosion of the reclaimed slopes. The RUSLE2 sediment modeling program has been utilized to estimate the expected yield from the reclaimed slopes. This data is compared to the expected yield (1.5 tons/acre/year) from pre-mined, undisturbed (baseline) slopes. This yield will become the baseline effluent limitation for the mine.

To monitor the performance of the proposed sediment control measures in the Sediment Control Plan, PacifiCorp will install (on an experimental basis) remote storm water samplers above the mine reclamation site in both the Left and Right Forks of the Grimes Wash (for collection of undisturbed storm water runoff), and below the reclamation site (for collection of undisturbed and reclaimed storm water runoff). This placement will allow observations of the contributions from runoff and sediment from the undisturbed upland watershed areas as well as potential runoff and sediment contributions from the reclaimed areas. Sampler results can be used to compare sediment production contributions to the predictive model (RUSLE2) results for both the undisturbed and reclaimed lands. Results from the study will permit verification of the predictive models and future reclamation plans utilizing alternative BTCA practices for sediment control.

Because of the ephemeral condition of the channels, the samplers will be set to automatically collect a storm water samples when a transducer (placed in the stream channel) detects flow. Data stored will be time, date, depth of flow, and flow velocity. The sampler will collect one sample for each recorded event. When necessary or at least once each quarter (samplers will be removed from November to March), sample bottles will be collected and the sediment production of the sample will be analyzed. Data collected will be reported to the Utah DOGM during the active quarters for two years or until vegetation is established on the site. The operator shall have the option at that time to leave the samplers in place to continue collecting data until bond release.

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Each sampler will be battery powered with a solar panel recharge capability. Maintenance to the system will be at least quarterly or as needed to keep the system functioning properly.

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Quantitative and Qualitative analysis will be performed on the data to monitor the performance of the pocks. Quantitative analysis will gather data from selected pocks by monitoring the rain fall, sediment production, erosion, and plant growth from both 6' and 3' pocks. Quantitative analysis will also be performed on a hillslope. This will be accomplished by delineating a transect along a hillslope profile. Identical data will be collected for the length of the transect as is collected for the individual pocks.

Qualitative data will be collected by photo documentation of the individual pocks and at certain distances along the length of the transect. Refer to Appendix G for a complete description of procedures that will be used to install data collection devices as well as the monitoring procedures that will be followed. Data will be collected once per quarter (April through October) and reported in the Annual Report.

A Geonor T-200B precipitation gage or similar measuring gage will be located centrally to the mine disturbed area to evaluate rainfall data as each storm relates to sediment production. Along the Wasatch Plateau, storm events can be very localized. A storm event can occur high above the site and send a tremendous amount of runoff and sediment flowing through the site. Likewise, a storm can occur generally over the disturbed area that may record higher sediment yields than the background yields skewing the data. The data from the T200B will also be reported in the Annual Report.

Note: All planned monitoring stations were installed in the fall of 2018. Actual monitoring data will be collected and report beginning in the 2nd quarter of 2019.

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762.200: Reshaping Slopes to be Compatible to the Post-mining Land Use

In general, the backfilling and grading of the disturbed areas will consist of removing the fill pads and backfilling the cut areas. The work will start in the upper areas of the disturbed area and systematically work downslope to the entrance gate. There is approximately 176,455 bank cubic yards (BCY) of material to be cut and approximately 155,830 BCY of material will be backfilled and graded within the disturbed areas. There is a difference of 12% between the cut and fill estimates, leaving approximately 20,625 BCY of extra fill material. This material will be used in

areas where more fill could enhance the slope, or will be blended into the reclaimed slopes. See Plates 4A, 4B, and 4C in Maps Section for plan and cross-sectional views of the proposed reclamation contours. The ponds will be the last major structures to be removed during backfilling and grading operations. The access road will be completely removed and recontoured to the entrance gate.

Note: Refer to R645-301-500: Engneering for "As-Built" cut and fill quantities.

The BTCA practices utilized in the reclaimed areas of the Cottonwood/Wilberg mine site provide for reduction and/or elimination of sheet flow on slopes, reduction and/or elimination of sediment contributions to stream flow, enhanced availability of water for plant growth, and slope stability through the use of mulches and soil binding tackifiers. All these practices work in concert to protect the downstream resources and enhance the probabilities for the disturbed lands to return to their pre-mining uses. Demonstrations have been made above and at existing reclamation projects which prove their effectiveness to deliver these stated protections.

763: Siltation Structures

The two siltation structures (sediment ponds) will be removed when all other reclamation above them has been completed. Because of the reclamation techniques used, sediment will be retained within the disturbed area and therefore, no siltation structures will be needed. Undisturbed drainage will pass through the site unaltered.

The sediment control measures to be utilized at the Cottonwood/Wilberg mine for final reclamation integrate an alternative BTCA for sediment and erosion control other than siltation structures.

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The permittee has demonstrated throughout this chapter a superior, more practical approach for controlling erosion on the site and preventing additional contributions of sediment to stream flow or to runoff outside the permit area. These sediment control measures have been designed using the best technology currently available. Deep gouging is shown to eliminate sheet flow on slopes, provide for water retention on the slopes, reduce the overall sediment load as compared to

background levels, and stabilize the surface for creating a robust vegetative stand.

The analysis presented in this chapter shows the science behind the deep gouging technology and has demonstrated that protection to the site as well as prevention of sediment to stream flow or to runoff outside the permit is possible. However, this technology is not new. The Coal Industry and the State, while conducting reclamation operations in Utah, has been practicing this technology for a number of years and has numerous existing successful sites as an example of the protection it affords.

Therefore, because of the impracticality for the use of siltation structures at the Cottonwood/Wilberg Mine, the demonstrations made in this chapter for an alternative sediment control measure as a BTCA, and the success of past reclamation projects using this technology, the permittee has presented that deep gouging techniques coupled with a well-designed mulching and revegetion program is the BTCA for the Cottonwood/Wilberg Mine and other mines with similar characteristics and conditions.

764: Structure Removal

A timetable has been generated for the removal of the siltation structures at the Cottonwood/Wilberg Mine. Included in the table is the sediment pond. See R645-301-300: Biology for more information.

Note: The pond was not removed until all areas up slope of the pond had been reclaimed.

765: Permanent Casing and Sealing of Wells

There are no wells that require casing or sealing activities.

Surface Exploration Drill Holes

Initial stages of development required surface exploration drilling. From 1976 through 2001 (date of portal sealing) PacifiCorp drilled approximately 175 exploration holes.

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Authority to conduct such activities was granted by the State of Utah, US Geological Survey and the US Forest Service and BLM. Privately-owned surface was secured separately.

All surface drilled exploration holes were reclaimed according to the US Geological Survey's published Drill Hole Plugging Procedure in the form of stipulations for approval.

Each exploration drill site has been reclaimed and approved by the appropriate agency.

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R645-301-800: Bonding

PacifiCorp has provided cost estimates for reclamation of the Cottonwood/Wilberg Mine site. These estimates are found in Appendix H.

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Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

Clean Copy Submittal for the Amendment to Update Permit to Include As-Built Conditions Post Final Reclamation Activities, Task ID 5844

<u>Volume 2, Part 4:</u>

Add "As-Built" maps - Plates 4B (3 maps plus discussion of temporary sediment control revised plan), 4C (6 maps), and 4D

Environmental Analytical Laboratory
soil–water–wastewater–biosolids–tissue
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801-422-2147 801-422-0008 (fax)
eal@byu.edu http://eal.byu.edu

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Name: Interwest Mining Company
Address: 15 N. Main Street
City, ST, ZIP: Huntington, UT 84528
Date: December 12, 2018
EAL Work Order: 1631

Customer Sample ID	Lab #	% OC	pH	EC dS/m	%Sand	%Clay	%Silt	Texture Classification	ppm Ca-SAR	ppm Mg-SAR	ppm Na-SAR	SAR	% Moisture Sat.	%$CaCO_3$
CTW0117 0-36"	Q8 650	2.8	7.4	3.1	64.9	18.4	16.7	Sandy Loam	535	243	237	2.1	35.1	27.2
CTW0217 0-36"	Q8 651	5.5	7.5	3.1	48.9	20.4	30.7	Loam	577	383	163	1.3	39.7	28.8
CTW0317 0-36"	Q8 652	2.8	7.5	3.7	66.9	16.4	16.7	Sandy Loam	544	261	347	3.0	37.5	30.8
CTW0417 0-36"	Q8 653	2.3	8.1	3.4	62.9	18.4	18.7	Sandy Loam	66	26	914	24.1	22.7	27.0
CTW0517-1 0-12"	Q8 654	1.6	7.8	4.1	64.9	16.4	18.7	Sandy Loam	325	306	555	5.3	30.3	29.1
CTW0517-2 12-24"	Q8 655	1.2	8.2	3.1	66.9	16.4	16.7	Sandy Loam	215	151	480	6.1	30.4	31.1
CTW0517-3 24-36"	Q8 656	1.7	8.0	3.1	58.9	16.4	24.7	Sandy Loam	193	102	669	9.7	33.0	27.4
CTW0617-1 0-12"	Q8 657	1.2	7.7	3.9	58.9	16.4	24.7	Sandy Loam	512	264	455	4.1	30.6	27.7
CTW0617-2 12-24"	Q8 658	1.7	7.8	3.0	58.5	16.4	25.1	Sandy Loam	288	90	431	5.7	29.4	31.2
CTW0617-3 24-36"	Q8 659	2.7	7.8	3.5	58.5	16.4	25.1	Sandy Loam	474	138	587	6.1	35.8	29.9
CTW0617-4 36-48"	Q8 660	3.1	7.9	3.3	56.5	16.4	27.1	Sandy Loam	493	174	387	3.8	37.2	32.4
CTW0717 0-48"	Q8 661	1.1	7.6	3.4	62.5	16.8	20.7	Sandy Loam	422	176	492	5.1	31.4	27.3
CTW0817 0-48"	Q8 662	1.5	7.6	3.8	58.5	16.8	24.7	Sandy Loam	522	238	316	2.9	32.7	29.7
CTW1217-1 0-12"	Q8 663	1.4	7.8	1.6	58.2	18.8	23.1	Sandy Loam	154	139	246	3.4	30.3	29.1
CTW1217-2 12-24"	Q8 664	1.2	7.9	2.2	58.2	16.8	25.1	Sandy Loam	242	135	402	5.1	35.7	29.5
CTW1217-3 24-36"	Q8 665	0.4	7.9	1.6	66.2	14.8	19.1	Sandy Loam	126	62	403	7.3	23.8	31.0
CTW1217-4 36-48"	Q8 666	0.9	7.8	2.2	64.5	14.8	20.7	Sandy Loam	118	59	620	11.6	22.1	31.8
CTW1317 0-14"	Q8 667	1.0	7.9	2.8	62.9	16.8	20.4	Sandy Loam	240	181	530	6.3	28.1	26.9
CTW1417-1 0-12"	Q8 668	1.4	8.0	4.1	58.2	23.1	18.7	Sandy Clay Loam	67	27	1490	38.8	22.1	24.2
CTW1417-2 12-24"	Q8 669	1.3	8.3	5.3	58.2	19.1	22.7	Sandy Loam	164	44	2066	36.8	23.3	23.6
CTW1417-3 24-36"	Q8 670	2.2	8.1	5.1	56.2	21.1	22.7	Sandy Clay Loam	102	36	1914	41.3	24.7	25.5
CTW1417-4 36-48"	Q8 671	2.4	8.5	4.0	52.2	21.1	26.7	Sandy Clay Loam	129	67	1532	27.1	30.2	25.9
CTW1517-1 0-12"	Q8 672	1.9	7.7	6.0	56.2	21.1	22.7	Sandy Clay Loam	188	89	2291	34.4	24.1	27.9
CTW1517-2 12-24"	Q8 673	1.9	7.8	5.4	58.2	21.1	20.7	Sandy Clay Loam	140	65	1800	31.4	25.8	28.9
CTW1517-3 24-36"	Q8 674	1.9	7.7	7.0	55.2	20.4	24.4	Sandy Clay Loam	197	91	2307	34.0	27.4	29.1
CTW1517-4 36-48"	Q8 675	2.4	7.6	8.0	54.9	20.4	24.7	Sandy Clay Loam	420	200	2800	28.1	31.2	28.6
CTW1617 0-12"	Q8 676	0.7	7.7	7.0	58.9	19.4	21.7	Sandy Loam	782	905	925	5.3	30.6	36.2
CTW0118-1 0-12"	Q8 677	3.5	7.3	6.0	54.9	20.4	24.7	Sandy Clay Loam	718	520	1242	8.6	34.0	36.2
CTW0118-2 12-24"	Q8 678	2.4	7.6	7.5	54.9	20.4	24.7	Sandy Clay Loam	433	214	2758	27.0	31.2	37.2
CTW0118-3 24-36"	Q8 679	3.2	7.7	7.0	54.9	19.4	25.7	Sandy Loam	546	266	2338	20.4	32.7	36.4
CTW0118-4 36-48"	Q8 680	3.0	7.6	6.8	54.9	18.4	26.7	Sandy Loam	563	289	2134	18.2	32.6	35.4
CTW0218-1 0-12"	Q8 681	1.9	7.8	3.4	58.9	18.8	22.4	Sandy Loam	153	64	1041	17.7	27.1	35.7
CTW0218-2 12-24"	Q8 682	1.8	7.8	3.1	60.9	18.8	20.4	Sandy Loam	203	90	1890	27.6	29.1	25.3
CTW0218-3 24-36"	Q8 683	1.7	7.9	3.2	60.9	16.4	22.7	Sandy Loam	100	54	997	19.9	26.6	25.6
CTW0218-4 36-48"	Q8 684	1.6	7.9	3.1	60.9	16.4	22.7	Sandy Loam	104	73	959	17.5	28.5	23.6
CTW0318-1 0-12"	Q8 685	1.5	7.8	2.0	58.9	18.8	22.4	Sandy Loam	188	100	435	6.4	27.9	25.7
CTW0318-2 12-24"	Q8 686	2.6	7.7	1.3	68.9	16.4	14.7	Sandy Loam	192	58	147	2.4	29.6	25.6
CTW0318-3 36-48"	Q8 687	2.8	7.5	0.7	62.9	16.4	20.7	Sandy Loam	127	25	60	1.3	31.6	22.6
CTW0318-4 36-48"	Q8 688	3.6	7.9	0.9	68.9	14.4	16.7	Sandy Loam	199	47	77	1.3	33.7	23.0
CTW0418-1 0-12"	Q8 689	1.9	8.2	1.3	68.9	14.4	16.7	Sandy Loam	188	43	146	2.5	28.6	28.7
CTW0418-2 12-24"	Q8 690	1.3	7.5	1.6	60.9	16.4	22.7	Sandy Loam	181	87	215	3.3	30.1	24.5
CTW0418-3 24-36"	Q8 691	1.2	7.6	1.3	64.9	16.4	18.7	Sandy Loam	158	71	148	2.5	29.7	25.2
CTW0418-4 36-48"	Q8 692	1.3	7.5	1.5	64.9	18.4	16.7	Sandy Loam	175	81	218	3.4	27.9	27.8
CTW0518-1 0-12"	Q8 693	2.6	7.4	4.9	66.9	16.4	16.7	Sandy Loam	523	193	1042	9.9	32.2	25.3
CTW0518-2 12-24"	Q8 694	2.6	7.5	6.8	66.9	16.4	16.7	Sandy Loam	620	248	1490	12.7	31.3	25.3
CTW0518-3 24-36"	Q8 695	1.8	7.5	5.3	66.9	16.4	16.7	Sandy Loam	539	203	1193	11.1	31.0	27.1
CTW0518-4 36-48"	Q8 696	2.2	7.6	5.0	66.9	16.4	16.7	Sandy Loam	516	183	1127	10.8	34.0	26.1
CTW0618-1 0-12"	Q8 697	1.9	7.8	2.8	64.9	14.4	20.7	Sandy Loam	140	47	639	11.9	31.6	34.8
CTW0618-2 12-24"	Q8 698	2.1	7.9	2.9	62.9	16.4	20.7	Sandy Loam	125	57	679	12.6	31.8	25.6
CTW0618-3 24-36"	Q8 699	0.6	8.1	2.7	62.9	18.4	18.7	Sandy Loam	75	45	636	14.3	29.3	29.2
CTW0618-4 36-48"	Q8 700	1.0	8.0	3.3	60.2	18.4	21.4	Sandy Loam	101	73	820	15.1	28.6	25.3
CTW0718-1 0-12"	Q8 701	1.8	7.6	3.9	56.2	20.12	23.7	Sandy Clay Loam	500	341	407	3.4	33.2	21.3
CTW0718-2 12-24"	Q8 702	2.1	7.7	7.1	56.2	18.4	25.4	Sandy Loam	607	325	1372	11.1	34.9	25.2
CTW0718-3 24-36"	Q8 703	0.9	7.8	6.5	58.2	17.12	24.7	Sandy Loam	327	196	1362	14.6	30.3	27.4
CTW0718-4 36-48"	Q8 704	0.4	8.1	5.4	60.4	17.12	22.4	Sandy Loam	142	128	1197	17.5	30.6	25.4
CTW0818-1 0-12"	Q8 705	1.4	7.7	3.7	57.8	19.12	23.1	Sandy Loam	530	336	313	2.6	34.0	23.8
CTW0818-2 12-24"	Q8 706	1.1	7.7	3.0	64.2	13.12	22.7	Sandy Loam	543	214	255	2.3	30.3	33.2
CTW0818-3 24-36"	Q8 707	0.6	7.9	1.3	55.4	21.12	23.4	Sandy Clay Loam	117	40	191	3.9	26	37.6
CTW0818-4 36-48"	Q8 708	2.8	7.9	1.0	70.2	13.12	16.7	Sandy Loam	67	15	240	6.9	26	31.7
CTW0918-1 0-12"	Q8 709	1.7	8.3	2.8	78.2	14.4	7.4	Sandy Loam	36	16	714	24.9	30	36.9
CTW0918-2 12-24"	Q8 710	1.9	8.1	4.6	78.2	16.4	5.4	Sandy Loam	32	13	548	20.7	26	29.0
CTW0918-3 24-36"	Q8 711	2.6	7.9	6.2	64.9	14.4	20.7	Sandy Loam	136	42	1600	30.7	31	24.6
CTW0918-4 36-48"	Q8 712	0.6	7.8	8.0	72.2	13.12	14.7	Sandy Loam	594	86	1806	18.3	32	11.4
CTW1018-1 0-12"	Q8 713	1.6	7.8	3.3	58.2	18.4	23.4	Sandy Loam	292	414	336	3.0	31	29.8
CTW1018-2 12-24"	Q8 714	0.3	8.2	0.7	62.2	17.12	20.7	Sandy Loam	41	70	48	1.0	29	27.2
CTW1018-3 24-36"	Q8 715	0.2	8.0	0.6	60.2	16.4	23.4	Sandy Loam	34	62	39	0.9	27	26.3
CTW1018-4 36-48"	Q8 716	0.4	7.9	0.9	66.2	17.12	16.7	Sandy Loam	53	91	72	1.4	30	25.9

Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

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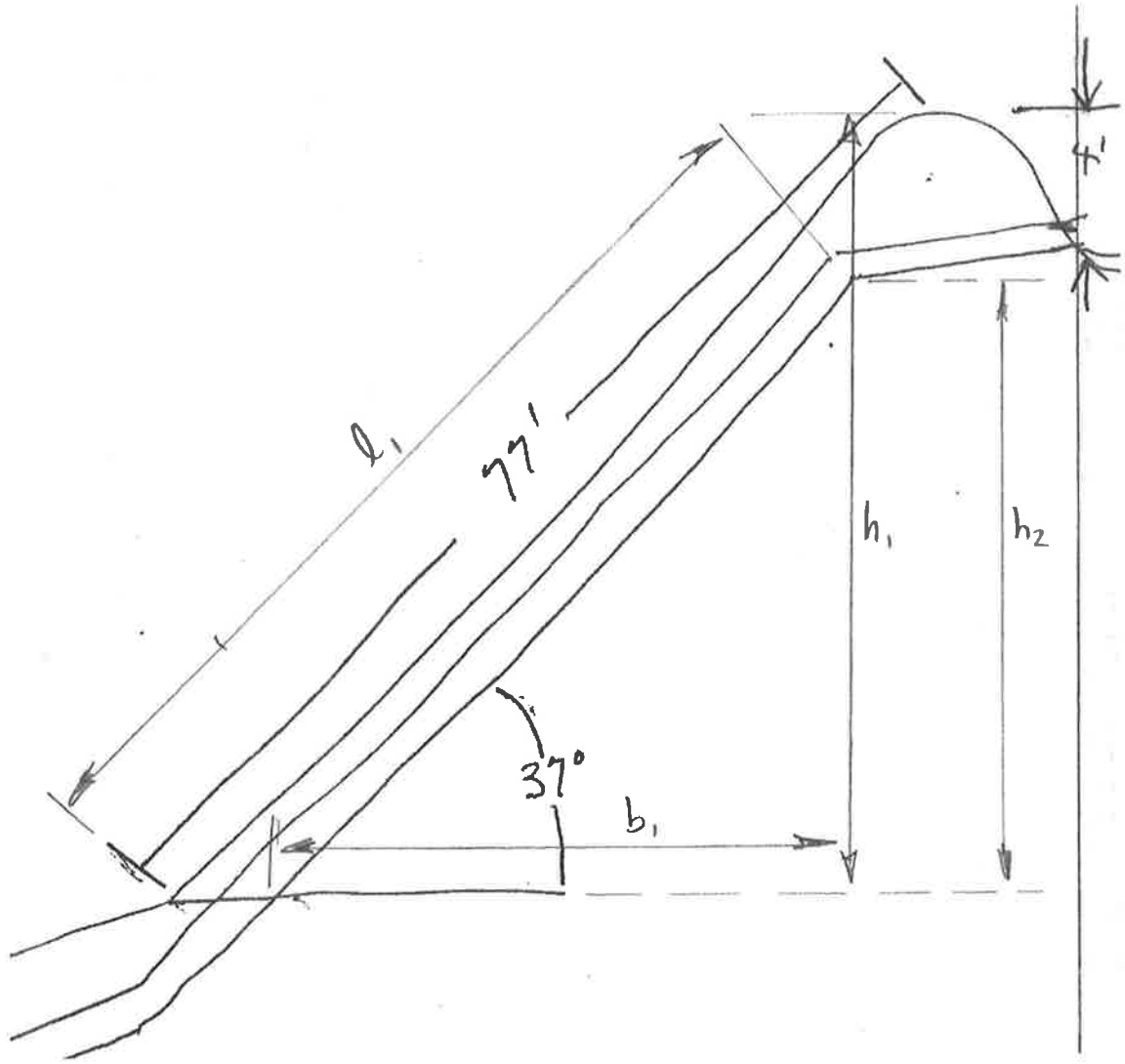
<u>Volume 2, Part 4, Appendix F-2:</u>

Add RC-6 design after Figure 3

DESIGN OF RC-6 EXTENSION

Existing Condition



h_1 = (77)(sin[37°]) = 46 ft

h_2 = 46 - 4 = 42 ft

b_1 = 42/(tan[37°]) = 56 ft

l_1 = 42/(sin[37°]) = 70 ft

Existing channel slope = (42/56)(100)
= 75%

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Extension Design

RC-6 was designed based on a channel slope of 50%. With the extended channel section having a slope of 37° (i.e., 75%, which is near the angle of repose for riprap), it will be necessary to install a series of steps to lose the necessary elevation while keeping the channel sections at a slope of 50% to achieve the prior design for RC-6.

With a base length of 56 ft, only 28 ft of elevation loss can occur in the channel to keep the channel slope at $\leq$ 50%. Therefore, with a total current elevation change of 42 ft within the extended section, at least 14 ft of elevation must be lost in the steps.

Steps were designed based on the guidelines of the Federal Highway Administration.[1] The desired elevation loss can be achieved with three steps, with the upper step at the upstream edge of the existing culvert and the remaining two steps placed at distances of 20 to 25 feet and 40 to 50 feet downstream from the upper step. Design cross sections for the steps are provided in Figures 1 and 2. The channel in between the steps should slope at a maximum of 50% and comply with the design of RC-6.

Construction Guidelines

The following guidelines apply to the steps:

- Soil should be excavated from the base to the minimum depth shown on Figures 1 and 2. Soil at the bottom of this excavation should be compacted using a roller attachment on the excavator or another appropriate means. A minimum of 12 inches of crushed rock with a median diameter of 3 inches (i.e., equivalent to the filter material placed beneath the riprap in channel RC-6) should then be placed in the bottom of the excavation. The surface of the crushed rock should slope at least 5% towards the back of the excavation.

- Rock used in step construction should be hard, angular, and durable. These rocks should be roughly rectangular, tabular, or cubic in shape. Rounded rocks and cobbles should be avoided. The rocks should consist of intact blocks without open fractures, foliation, or other planes of weakness.

- If irregular rocks with steeply pitched edges must be used, they should be matched with other irregular rocks such that generally level bearing surfaces are formed with a gradual backward tilt into the cut.

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[1] Mack, D.A., S.H. Sanders,W.L. Milhone, R.L. Fippin, and D.G. Kennedy. 2006. Rockery Design and Construction Guidelines. Report No. FHWA-CFL/TD-06-006. Federal Highway Administration, Central Federal Lands Highway Division. Lakewood, Colorado.

- All rocks, including the base rocks, should be placed with the longest rock dimension perpendicular to the face of the rockery. The second largest dimension should be parallel to the layout line of the rockery, and the smallest rock dimension should be its vertical dimension. The base rocks should be placed such that the tops of the rock are sloped back at least 5% towards the back of the rockery.

- If possible, rocks should be placed using a hydraulic excavator with a rotating clamshell attachment. If a clamshell attachment is not available, rocks can be placed using an excavator with a thumb as long as the above rock orientation is achieved.

- Base rocks should be 3 ft $\pm$ 6 inches wide and within 6 inches of the vertical and horizontal dimensions shown on Figures 1 and 2. However, two or more consecutive base rocks should be not be placed with dimensions less than specified. The overall use of base rocks with dimensions less than indicated should be minimized.

- The face batter of each step should vary between 4V:1H and 6V:1H (see Figure 3).

- Rocks should be placed according to the following guidelines:
    - Each rock should bear on at least two other rocks.
    - Each rock should have at least three bearing points—two in front and one in back.
    - The front-most bearing points for each rock should be within 6 inches of the average face of the rockery.
    - The tops of each rock should be sloped back towards the back drain.

- There should be no vertical columns of rock or continuous vertical joints running through the rockery. The rocks should be selected and stacked such that most of the rocks in a given row are approximately the same size and gaps between rocks are minimized. Rocks with shapes that create voids with a linear dimension greater than 12 inches should be placed elsewhere to obtain better fit. If gaps larger than 6 inches cannot be avoided, they should be chinked (filled) with smaller rocks. However, chinking rocks should not provide primary bearing support for overlying rocks.

- A minimum of 12 inches of crushed rock, with a median diameter of 3 inches, should be placed in the void between the back cut and the rear of the facing rocks. This crushed rock should be capped by at least 12 inches of compacted impermeable soil at the ground surface to prevent infiltration of surface water behind the rockery. During placement of the crushed rock behind the partially completed rockery, care should be taken that the crushed rock does not spill onto the top of the adjacent facing rocks.

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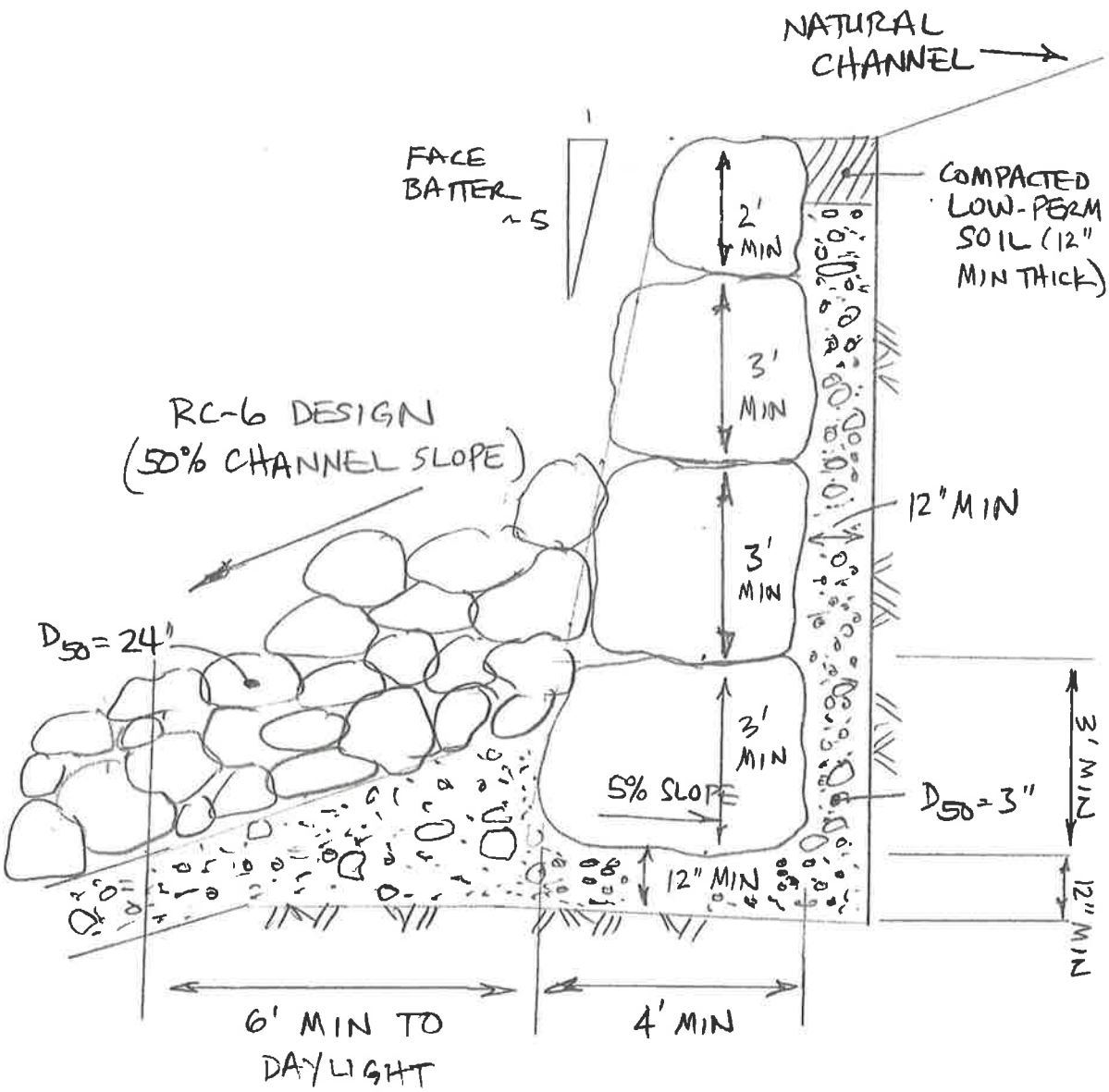

FIGURE 1. UPPER STEP CROSS SECTION.

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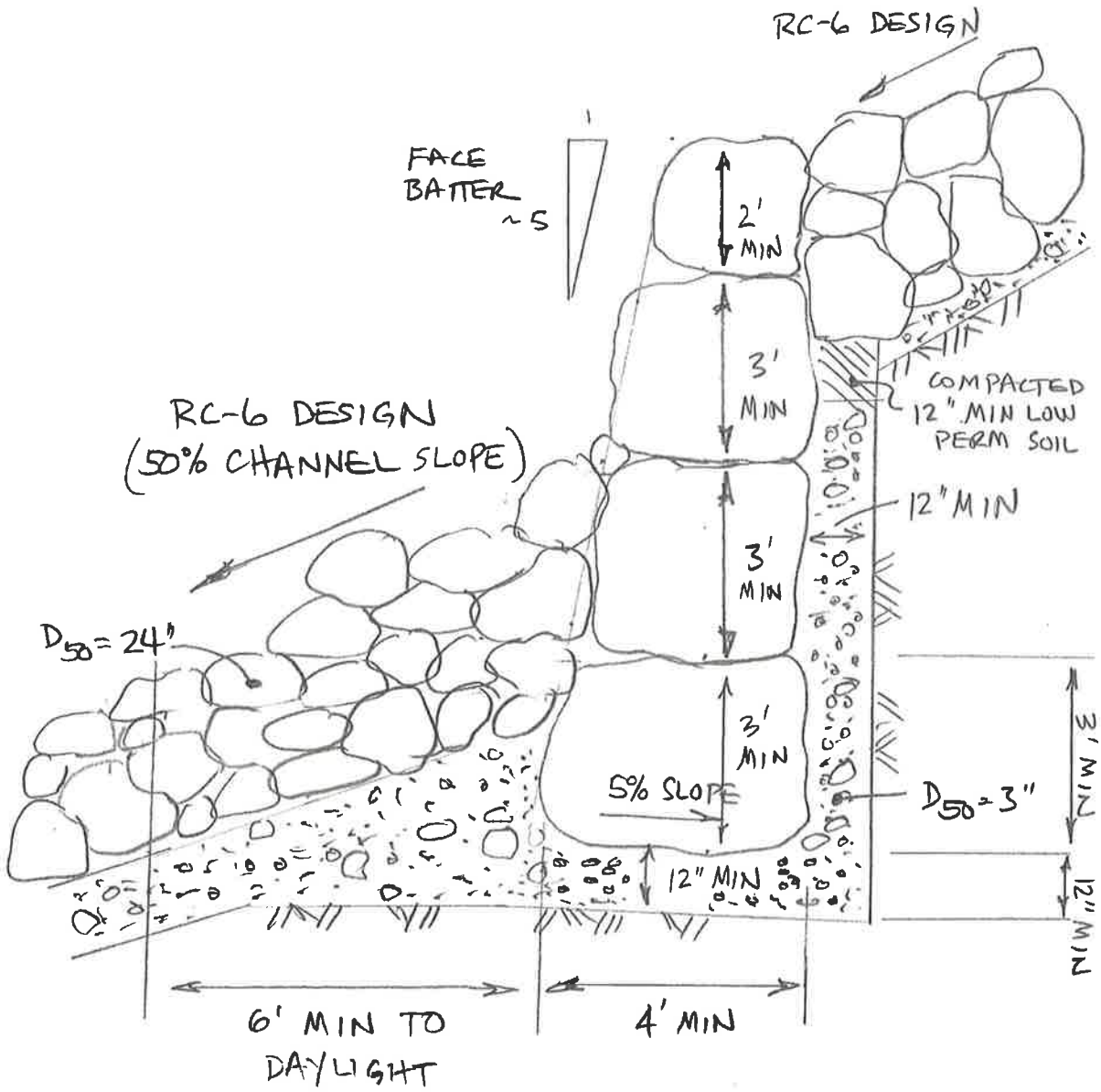

FIGURE 2. MIDDLE AND LOWER STEP CROSS SECTION.

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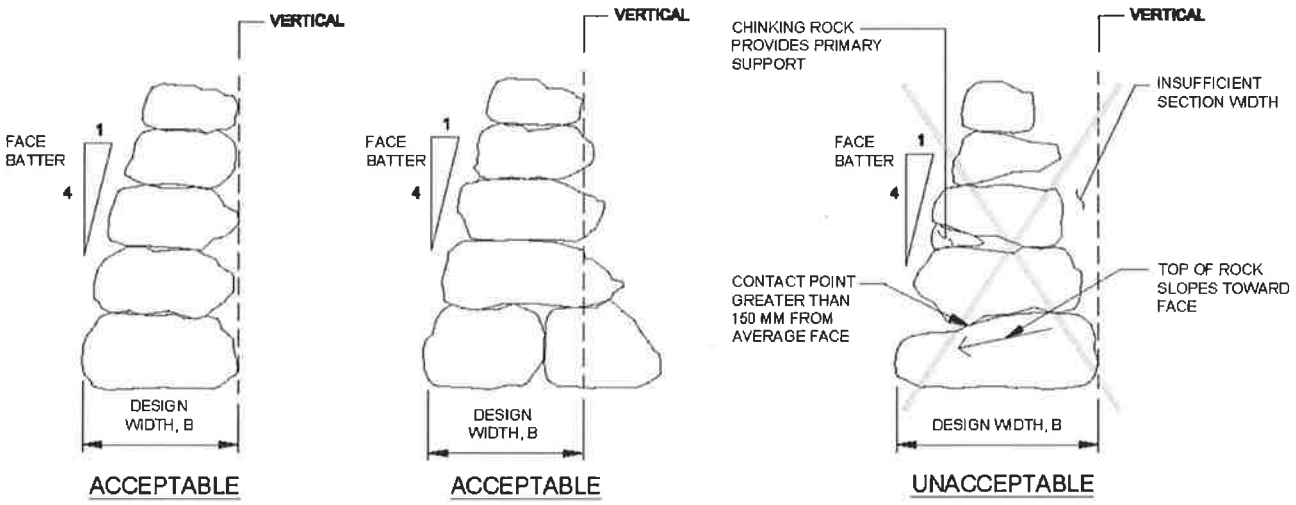

FIGURE 3. EXAMPLES OF ACCEPTABLE AND UNACCEPTABLE ROCKERY ALIGNMENT.[2]

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[2] From Mack et al. (2006) - See Footnote 1.

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Volume 6:

Replace Plate 3-16

Interwest Mining Company

Cottonwood/Wilberg Mine

C/015/0019

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<u>Legal and Financial Volume, Appendix G:</u>

Replace page CTW-2

Cottonwood/Wilberg Permit Boundary Description

	N1/2NW1/4	80.00
	SW1/4NE1/4 (USFSSUP)	40.00
Sec 28:	E½NE¼NW¼	20.00
	S½NE¼	80.00
	E½SE¼NW¼	20.00
	N½NE¼	80.00
Sec 29:	NW¼NE¼	40.00
	N½NW¼	80.00
Sec 30:	Lots 1, 5, and 6	63.00
	N½NE¼	80.00
	SW¼NE¼	40.00
	NW¼SE¼	40.00

Sec 34:

Sewer Absorption Field: Beginning S52°06'48"W, 1664.59 ft. from the Sec. corners of 34, 27, 26, and 35, thence, S15°23'50"E, 193.05 feet; thence, N69°13'28"W, 354.72 feet; thence, N14°04'20"W, 185.61 feet; thence, N29°53'51"E, 488.38 feet; thence, N00°47'31"E, 474.97 feet; thence, E, 30 feet; thence, S00°47'31"W, 421.50 feet; thence, S04°55'10"E, 598.80 feet, to the point of beginning.
Said parcel contains 3.70 acres more or less.

3.70

Rock and Soil Storage Area: Beginning at a point S08°10,26"E, 758.72 feet from the east 1/4 corner of section 34, T. 17S., R.7E., SLB&M; thence, S46°00'31"W, 377.65 feet; thence, N45°52'24"W, 139.17 feet; thence, N32°54'05"W, 74.56 feet; thence, N23°41'14"E, 40.14 feet; thence, N50°27'20"E, 295.51 feet; thence, N69°41'04"E, 36.66 feet; thence, S44°45'52"E,189.90 feet to the point of beginning. Said parcel contains 1.81 acres more or less.

1.81

Total for Township 3,188.28

Total Permit Acres **4,092.00**

The Cottonwood/Wilberg Permit Area contains the areas as described above. The area within the described boundary is approximately 4092.00 acres. The total disturbed area at the mine is 29.37 acres. The disturbance is distrubuted as follows:

Disturbed Area Reconciliation Table

Type Area	Area Name	Reclamation Completion Date	Original Disturbed Acreage	Phase I Bond Release Date	Phase II Bond Release Date	Phase III Bond Release Date	Remaining Disturbed Acreage**
Mine Site	Cottonwood/Wilberg Main Mine	N/A	20.46				22.00
Mine Site	Leach Field	N/A	3.70				3.70
Storage Area	Rock and Soil Storage Area - AKA Cottonwood/Wilberg/Trail/DesBee Dove Old Waste Rock Site		15.62	Jul-99	Jul-09	Jul-09	1.81
Remote Portal	Cottonwood Canyon Area - AKA Fan Portal Area	Nov-98	9.33	Mar-04	Sep-10	9/28/2010*	1.86
Remote Portal	Miller Canyon Portal Area	Jun-99	0.02	Jun-02	Oct-10	Oct-10	0.00
Total			**49.13**				**29.37**

Refer to Surface and Subsurface ownership maps in Volume 3.
*Phase III Bond Release on the area of the CFP and access road only. Area remaining is the historic soil storage, TMA portal, and belt portal. Final reclamation of this area was completed in November 2014.
** The total disturbed area of the Cottonwood/Wilberg Mine Site increased to 22.0 acres from 20.46 acres in part as a result of the reclamation activities. The main reason however, is that an aerial survey of the site was conducted in 2018 using high resolution photogrammetic imagery. The post reclamation disturbed area boundary was digitized using the ortho photo in AutoCAD where a flat plane area was calculated.
Final reclamation of the mine site area was completed in March 2018.

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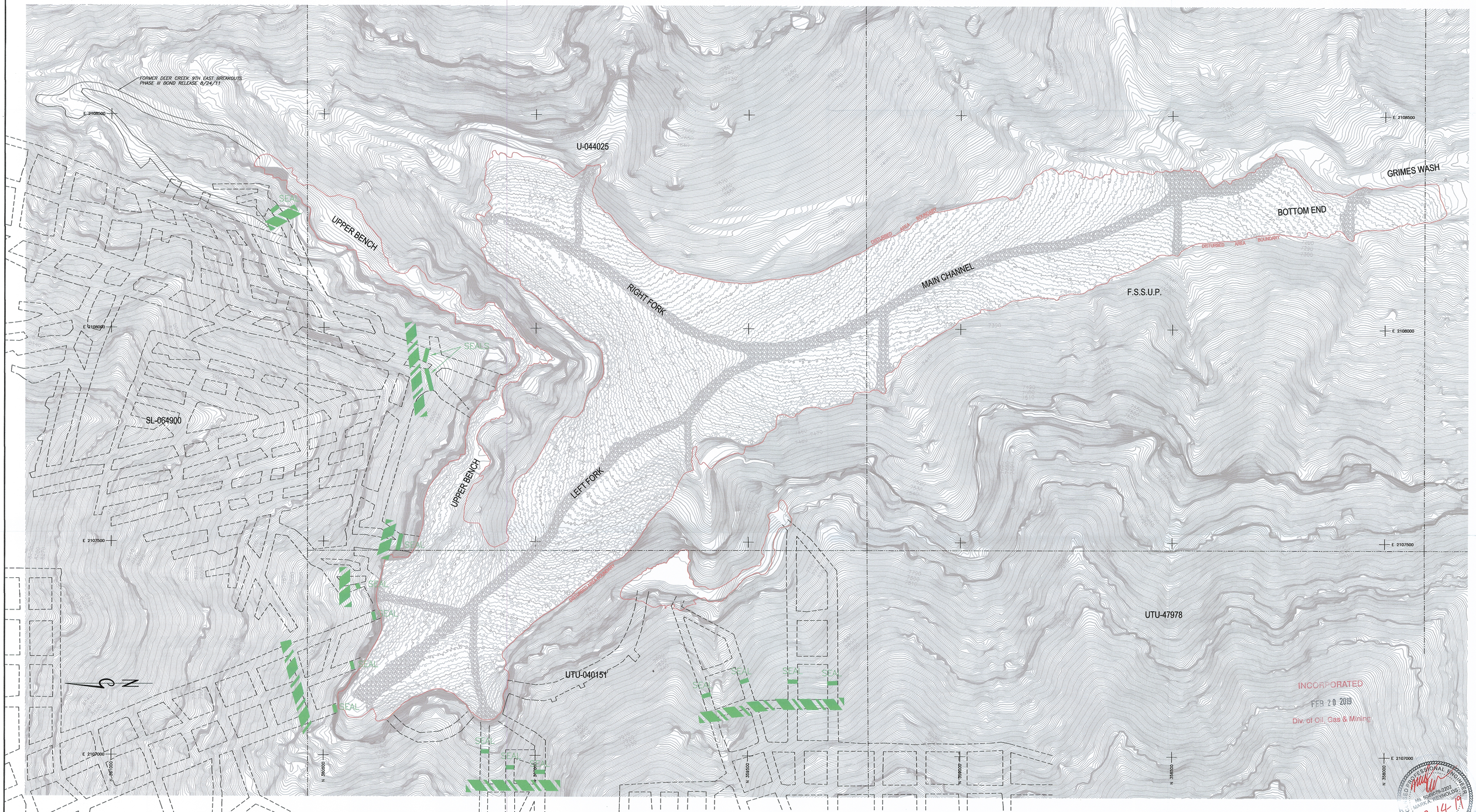


LEGEND

COAL LEASE BOUNDARY

DISTURBED AREA BOUNDARY

HIAWATHA SEAM MINE WORKINGS

SEAL

LICENSED PROFESSIONAL ENGINEER
MARK A. REYNOLDS
5049079-2202
STATE OF UTAH

aero-graphics

GEOSPATIAL SERVICES
40 West Oakland Ave., Salt Lake City, Utah 84115
Telephone (801) 487-3273, Fax (801) 487-3313
www.aero-graphics.com

CONTOUR INTERVAL: 2'

DATE OF PHOTOGRAPHY: MAY 17, 2018

DATE	REVISIONS	BY	CHK
1-3-19	REVISED DISTURBED AND RIP RAP BOUNDARIES	CAS	
10-5-18	REDRAWN TO REFLECT FINAL RECLAMATION AS-BUILT CONDITIONS	KJL	
8-7-16	REMOVED ALL STRUCTURE TO REPRESENT EXISTING CONDITIONS	KJL	
1-6-14	UPDATED UTILIZING TOPOGRAPHY FROM AEROQUEST MAPPING	KJL	
10-31-11	ADDED 9TH EAST BREAKOUT PHASE III BOND RELEASE DELINEATION	KJL	
12-21-10	REVISED ASCA LEGEND TO REMOVE 9TH EAST PORTAL NOTATION	KJL	
4-20-09	REVISED AND UPDATED BERM LOCATIONS AND ADDED LOADING/UN-LOADING AREAS	KJL	
11-18-02	REVISED SILT FENCES, RIPRAP DRAINAGE & DISTURBED BOUNADRY ADDED STRAW BALES (2 PLACES) & DIRT BERM AROUND PONDS	KJL	
7-26-02	ADDED SILT FENCES AND REVISED DISTURBED BOUNDARY	KJL	
11-30-00	REVISED DISTURBED AREA BOUNDARY SOUTH OF SEDIMENT PONDS	KJL	
12-13-99	REVISED ASCA NOTATIONS, ADDED ACCESS BRIDGES AT PONDS, REVISED SURFACE DRAINAGE, ADDED D.C. 9TH EAST RECLAMATION	KJL	
4-19-96	ADDED FAN MOTOR BASE & POWER POLES/REMOVED STORAGE BIN	KJL	
3-14-96	ADDED 4" AND 6" SEWER LINES FROM TRAIL MOUNTAIN MINE	KJL	
9-30-93	REMOVED SLOTTED DRAIN BY DIESEL MAINT. BLDG.	PKB	
3-15-93	ADDED 48" BYPASS BELT AND HOPPERS	PKB	
8-13-91	REVISED TO REFLECT CURRENT CONDITIONS	KJL	
5-21-91	REVISED TO REFLECT CURRENT CONDITIONS	KJL	
3-26-91	GENERAL REVISIONS TO SURFACE FACILITIES AND DRAINAGE	KJL	
9-28-90	ADDED SEDIMENT TRAPS AND MANHOLE AT TRUCK LOADOUT	KJL	
1-17-90	ADDED AUTOMATED PROPERTY ACCESS GATES	KJL	
1-10-90	ADDED ASCA AREAS 1-5 AND ASCA LEGEND	KJL	
11-13-89	REVISED TO REFLECT AS BUILT CONDITIONS	KJL	
6-24-87	ADDED CONTOUR LINES	KJL	

2' Contour Intervals

PLATE 3-16

CAD FILE NAME/DISK#: PLATE 3-16 AS-BUILT

LICENSED PROFESSIONAL ENGINEER
MARK A. REYNOLDS
No. 5049079-2202
STATE OF UTAH
2-14-19

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE SURFACE YARD MAP AS-BUILT

DRAWN BY: K. LARSEN

SCALE: 1" = 100'

DRAWING #: WS449D

DATE: OCTOBER 17, 2018

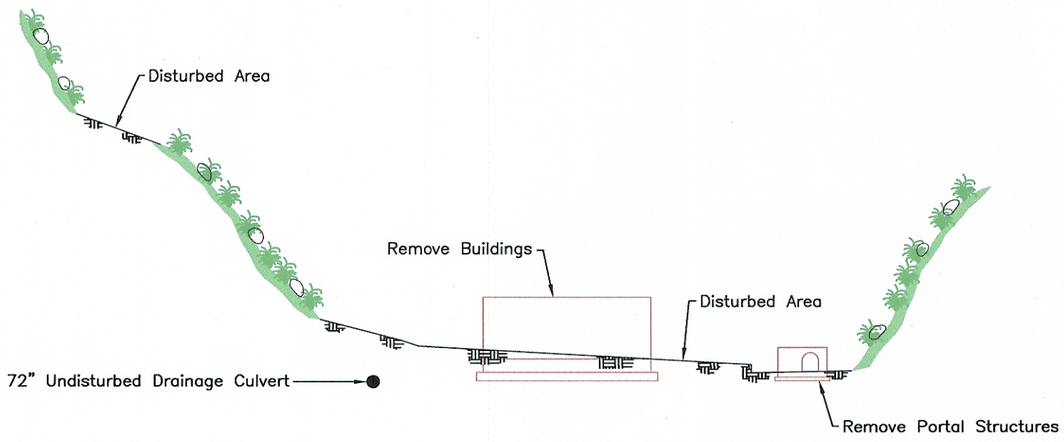
SHEET 1 OF 3

REV.

COTTONWOOD MINE - TYPICAL RECLAMATION SEQUENCE

EXISTING CONDITION WITH STRUCTURES IN PLACE

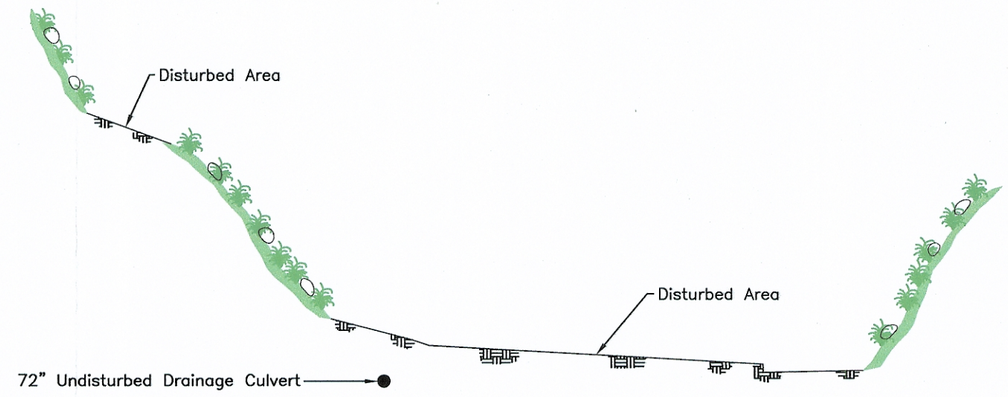
a) Demolish buildings and dispose of metal offsite (Completed 2nd Quarter of 2015)
b) Dispose of concrete footers and foundations



STEP 1

CONDITION AFTER REMOVAL OF STRUCTURES

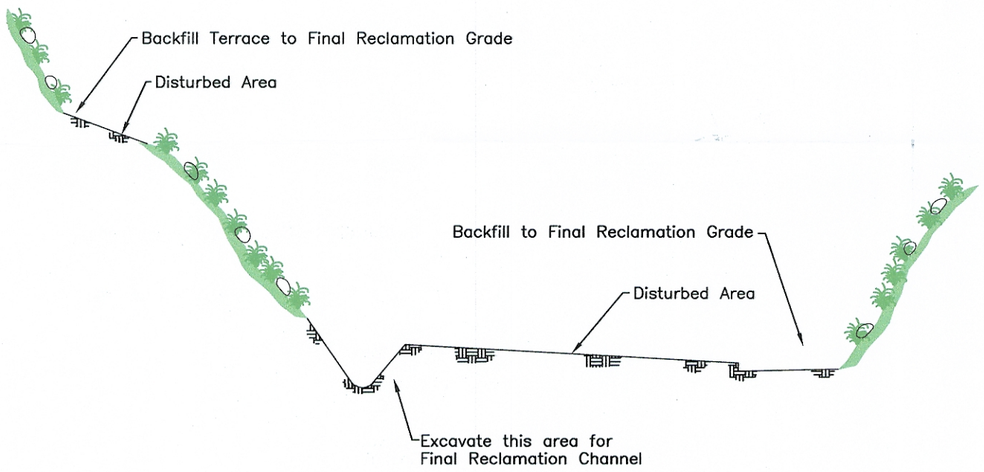
a) Remove Undisturbed Drainage Culvert
b) Remove all culverts and buried drainage structures



STEP 2

STEP 2 CONDITION AFTER REMOVAL OF CULVERTS

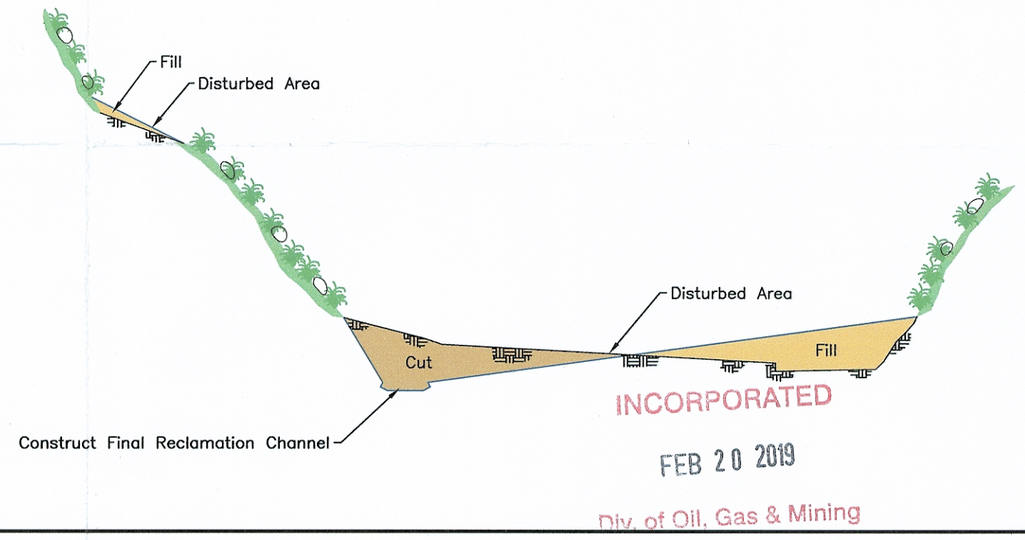
a) Excavate Soil for Construction of Final Reclamation Channel
b) Backfill Terraces, Highwalls and other areas for Final Reclamation



STEP 3

CONDITION DURING BACKFILLING AND GRADING OPERATIONS

a) Construct Final Reclamation Channel
b) Construct Deep Gouging techniques on fill areas
c) Roughen areas on final contoured slopes



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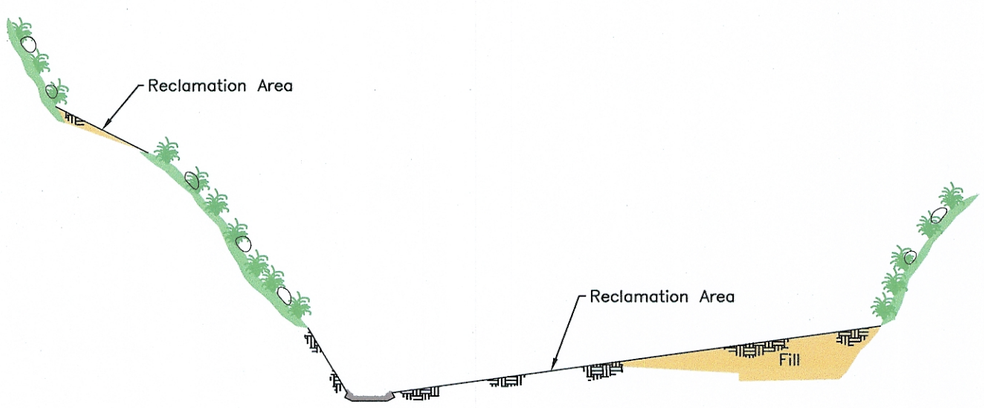
STEP 4

CONDITION AFTER CONSTRUCTION OF FINAL RECLAMATION CHANNEL

a) Perform Soil Preparation
b) Apply Seed Mix & Mulching



STEP 5

CONDITION AT 10 YEAR RESPONSIBILITY PERIOD

a) Reclaimed areas meet Performance Standards

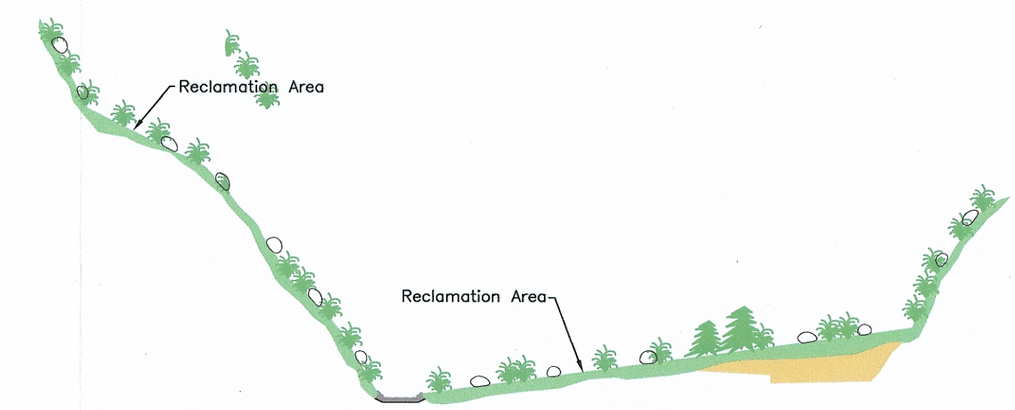


PLATE 4A

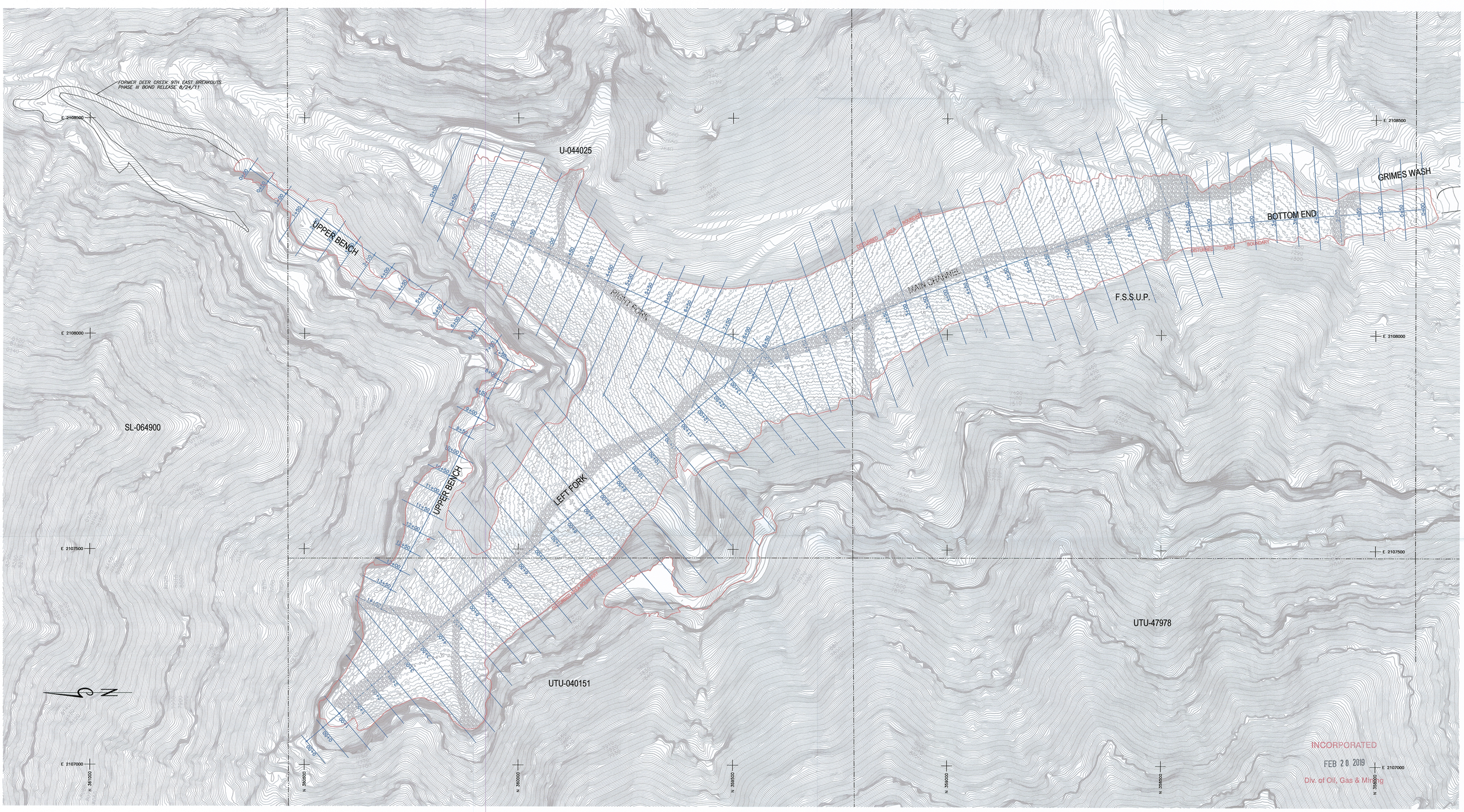
CAD FILE NAME/DISK#: PLATE 4A AS-BUILT

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD MINE
SEQUENCE OF RECLAMATION

1-35-19	REMOVED CULVERT DETAIL	CAS	
DATE		BY	CHK.

DRAWN BY: K. LARSEN
SCALE: NONE
DATE: JULY 14, 2016
PLATE 4A
DRAWING #:
SHEET 1 OF 1
REV. ___



Note: Cross-sections are found on Map 4C, 1 of 6 thru 6 of 6

2' Contour Intervals

CAD FILE NAME/DISK#: PLATE 4B AS-BUILT

PLATE 4B

Material Moved During Reclamation	Cut yds^3	Fill yds^3
Upper Bench	6,870	6,157
Right Fork	17,966	24,168
	73,817	35,559
Main Channel	28,665	27,365
Bottom End	0	12,859
Total Material Moved	127,318	106,108

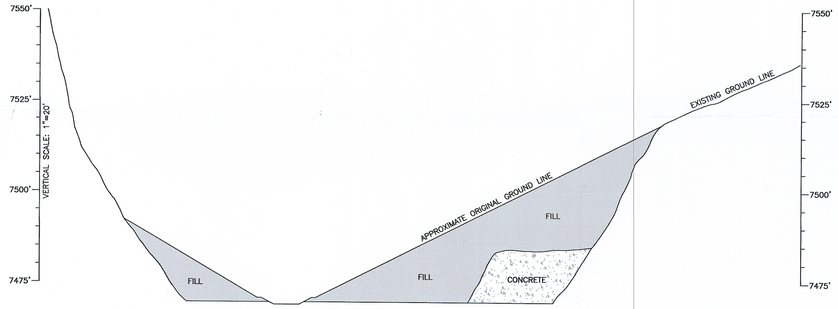
LICENSED PROFESSIONAL ENGINEER
No. 5046079-2202
MARK A. REYNOLDS
STATE OF UTAH
2-14-19

DATE	REVISIONS	BY	CHK.
1-3-19	REVISED DISTURBED AND RIP RAP BOUNDARIES	CAS	
10-5-18	REDRAWN TO REFLECT FINAL RECLAMATION AS-BUILT CONDITIONS	KJL	

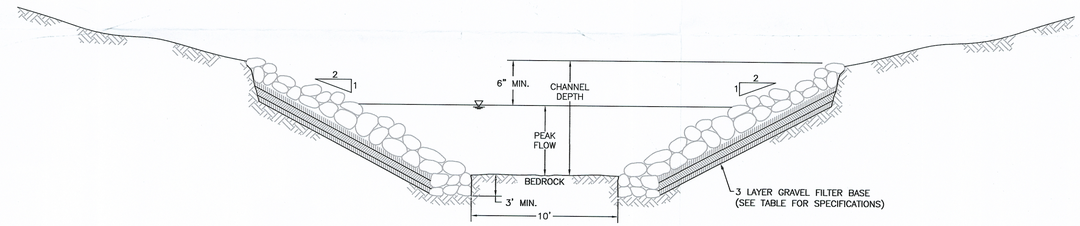
INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
FINAL RECLAMATION MAP
AS-BUILT

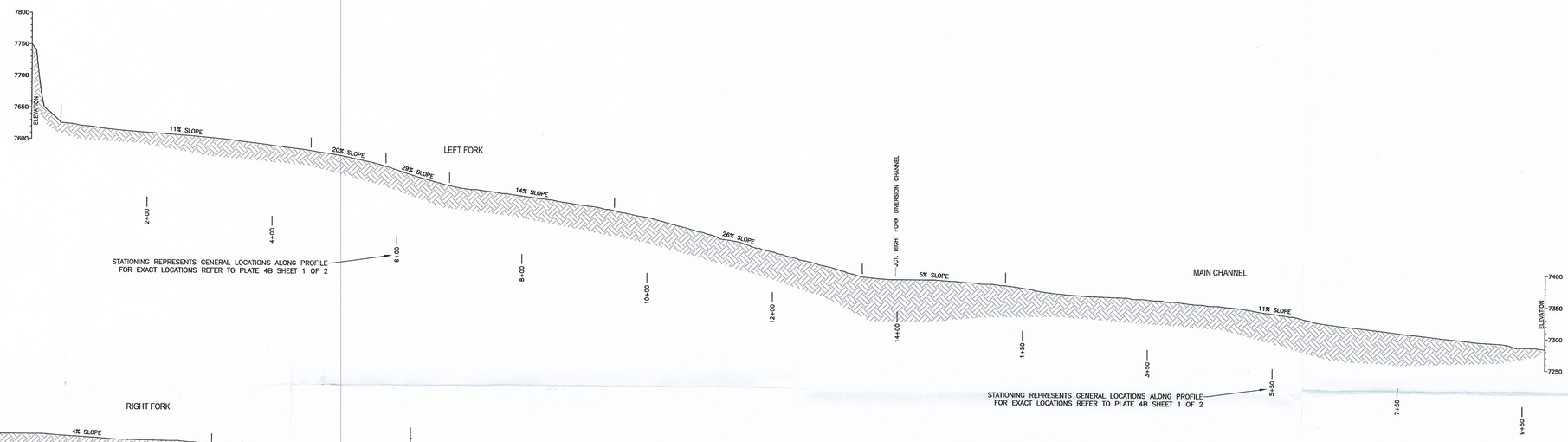
DRAWN BY: K. LARSEN
SCALE: 1"=100'
DATE: OCTOBER 17, 2018
DRAWING #: CM-10378-WB
SHEET 1 OF 3
REV.



TYPICAL CROSS SECTION
HORIZONTAL SCALE: 1"=40'

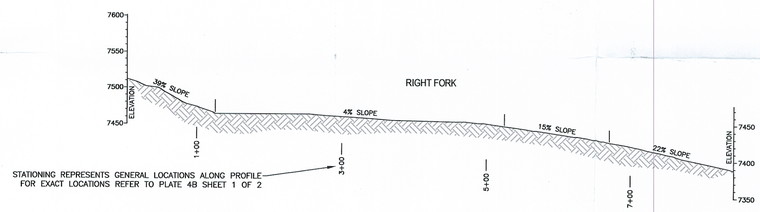


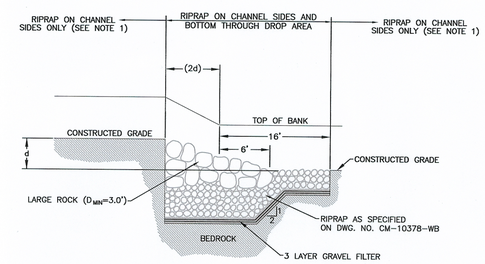
TYPICAL CHANNEL DRAINAGE CROSS SECTION
NO SCALE
NOTE:
LIMITED TO AREA BETWEEN 1+50 AND 2+00 IN RIGHT FORK



LEGEND

FINAL RECLAMATION AS-BUILT LINE





SECTION B-B'
TYPICAL DROP STRUCTURE RIPRAP DETAILS
NOT TO SCALE
NOTE:
NO DROP STRUCTURES USED IN FINAL RECLAMATION

GRAVEL FILTER & RIPRAP SPECIFICATIONS					
	D_{15} (MM)	D_{50} (MM)	D_{85} (MM)	D_{MAX} (FT)	THICKNESS (INCHES)
BOTTOM LAYER	0.42	1.09	2.00	–	6
MIDDLE LAYER	4.76	12.00	25.40	–	6
TOP LAYER	38.10	95.00	152.00	–	8
RIPRAP	365.00	914.00	–	3.75	

NOTES:

1. CHANNEL BOTTOM IS TO BE RIPRAPPED WHEN COMPETENT BEDROCK IS NOT FOUND.
2. MAX. CHANNEL SLOPE VARIES BETWEEN 5 AND 11 PERCENT.
3. MAX. DROP HEIGHT (d) IS 5 FEET.
4. CONSTRUCTED DROP HEIGHT TO BE DETERMINED IN FIELD.
5. REFER TO APPENDIX F FOR SIDE CHANNEL DRAINAGE AREAS

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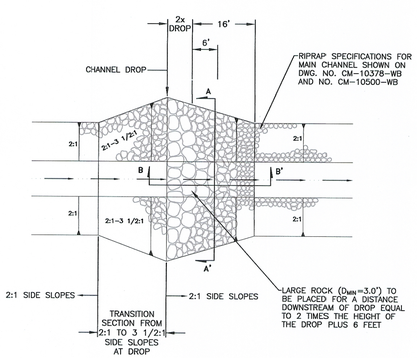
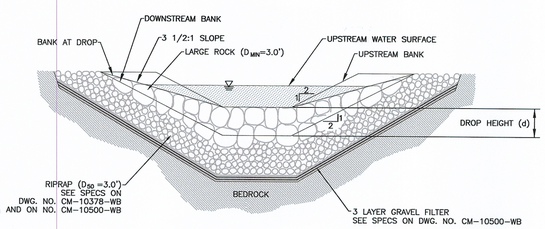


TYPICAL DROP STRUCTURE - PLAN VIEW
NOT TO SCALE
NOTE:
NO DROP STRUCTURES USED IN FINAL RECLAMATION



TYPICAL SECTION A-A'
NOT TO SCALE
NOTE:
NO DROP STRUCTURES USED IN FINAL RECLAMATION

DATE	REVISIONS	BY	CHK.
11-12-18	LEFT FORK AND RIGHT FORK PROFILES HAVE BEEN REDRAWN TO REFLECT FINAL RECLAMATION AS-BUILT CONDITIONS	KJL	
7-24-15	REVISED TO REFLECT A SINGLE PHASE RECLAMATION VS. 2 PHASES	KJL	
5/29/15	REVISED UTILIZING CARLSON SOFTWARE & AEROQUEST TOPOGRAPHY	KJL	
1/3/01	CONVERTED TO AUTOCAD	KJL	
3/1/89	CHANGED TITLE BLOCK	JRG	
10/25/84	ADDED TYPICAL DROP STRUCTURE CROSS SECTION	AWB	SMC
8/7/84	REVISED CHANNEL PROFILE TO INCLUDE DROP STRUCTURES	SMC	SMC
5/3/84	PROFILE REVISED TO MATCH REVISED DIVERSION CHANNEL	LJG	SMC

LICENSED PROFESSIONAL ENGINEER
MARK A. REYNOLDS
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2-14-19
STATE OF UTAH

CAD FILE NAME/DISK#: PLATE 4B

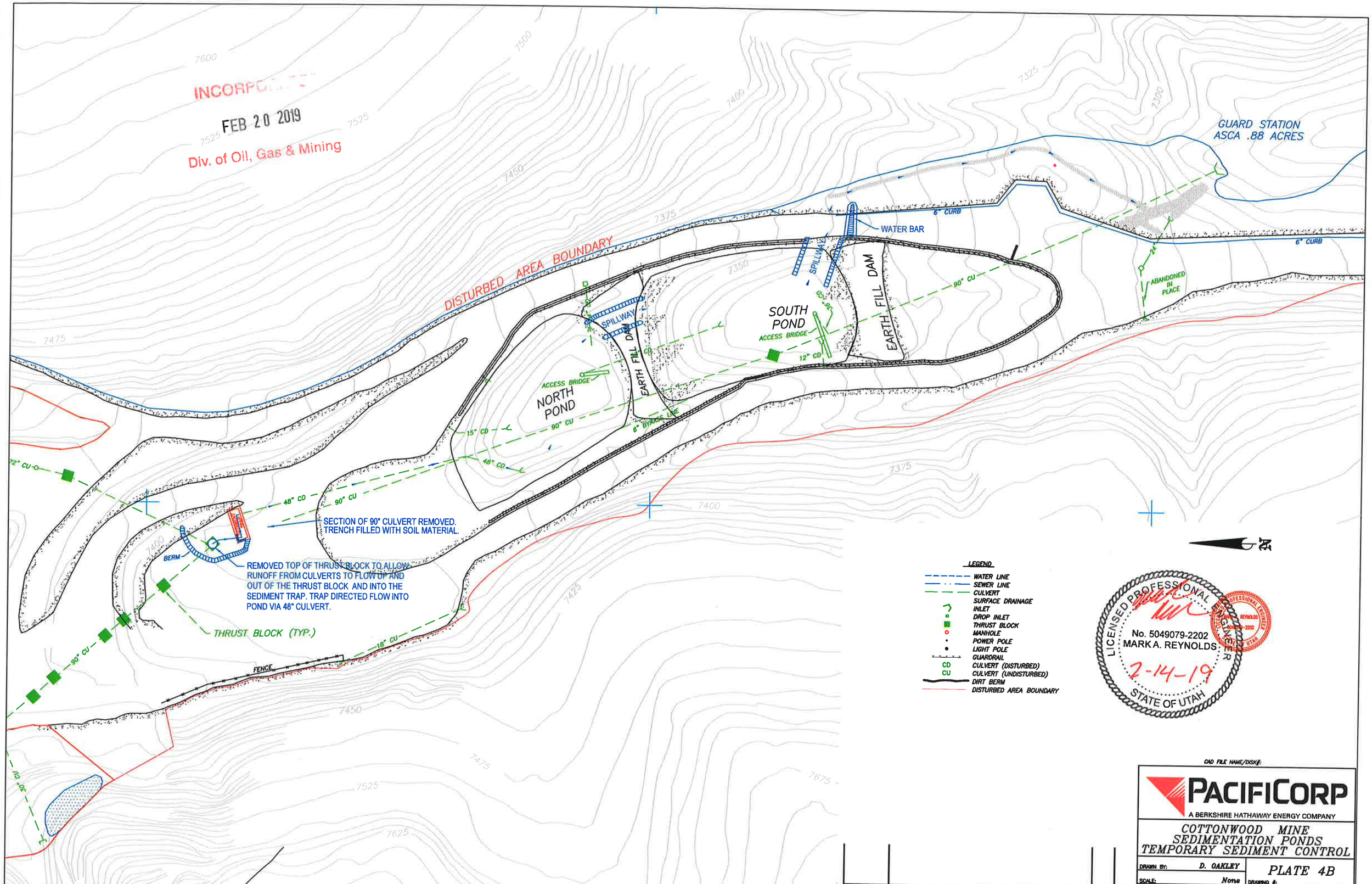
PLATE 4B

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
FINAL RECLAMATION MAP

DRAWN BY: K. LARSEN
SCALE: 1"=100'
DRAWING #: CM-10378-WB
DATE: OCTOBER 8, 2018
SHEET 2 OF 3
REV.

INCORPORATED
FEB 20 2019
Div. of Oil, Gas & Mining



LEGEND

- WATER LINE
- SEWER LINE
- CULVERT
- SURFACE DRAINAGE
- INLET
- DROP INLET
- THRUST BLOCK
- MANHOLE
- POWER POLE
- LIGHT POLE
- GUARDRAIL
- CD CULVERT (DISTURBED)
- CU CULVERT (UNDISTURBED)
- DIRT BERM
- DISTURBED AREA BOUNDARY

LICENSED PROFESSIONAL ENGINEER
No. 5049079-2202
MARK A. REYNOLDS
2-14-19
STATE OF UTAH

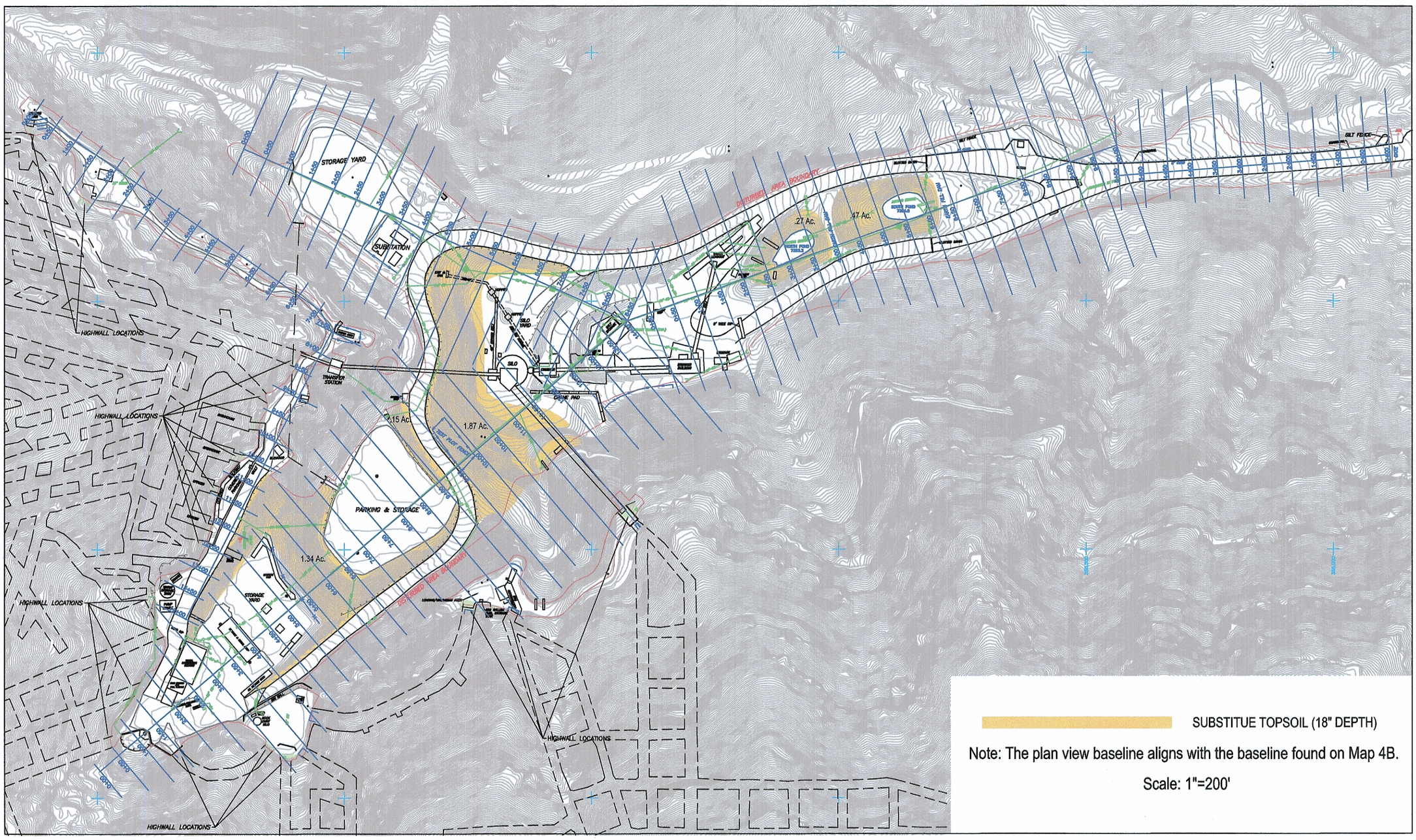
CAD FILE NAME/DISK#:

PACIFICORP
A BERKSHIRE HATHAWAY ENERGY COMPANY

COTTONWOOD MINE
SEDIMENTATION PONDS
TEMPORARY SEDIMENT CONTROL

DRAWN BY: D. OAKLEY		PLATE 4B	
SCALE: None		DRAWING #:	
DATE: DECEMBER 17, 2018		SHEET 3 OF 3	REV.

DATE	REVISIONS	BY	CHK



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Note: Refer to Map 4B for cross-section baseline

Cut Volume	Fill Volume
6,870 yds³	6,157yds³

LICENSED PROFESSIONAL ENGINEER
No. 5049079-2202
MARK A. REYNOLDS
STATE OF UTAH
2-14-19

Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built

CAD FILE NAME/DISK#: PLATE 4C

PLATE 4C

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
UPPER BENCH/OFFICE AREA
CROSS SECTIONS

DRAWN BY: K. LARSEN	PLATE 4C	
SCALE: 1"=100'	DRAWING #:	
DATE: OCTOBER 17, 2018	SHEET 1 OF 6	REV.

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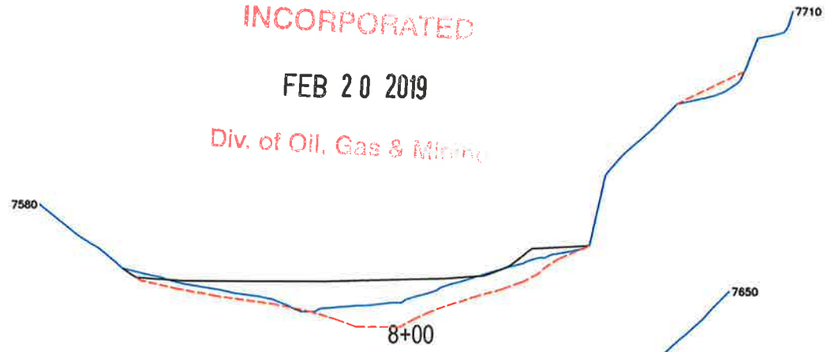

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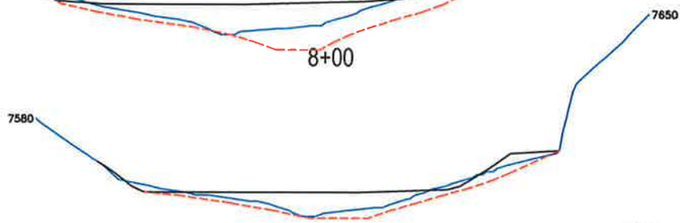

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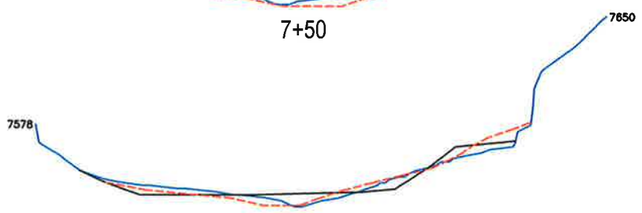

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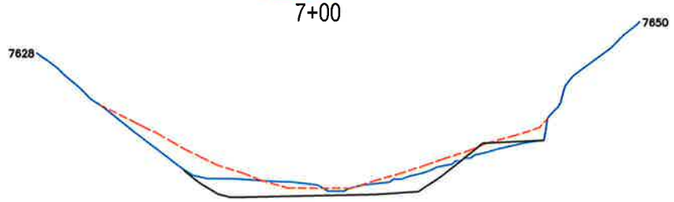

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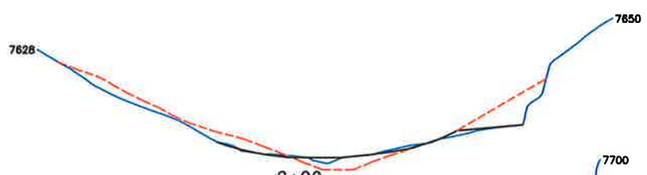

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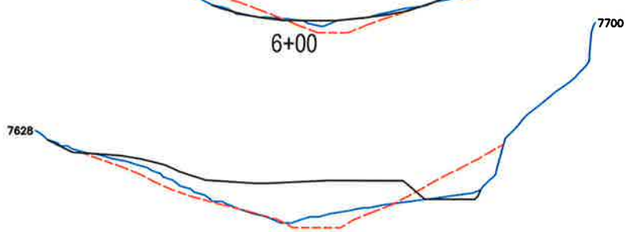

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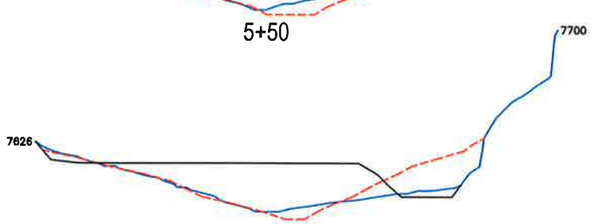

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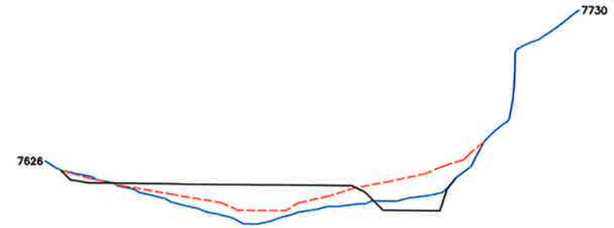

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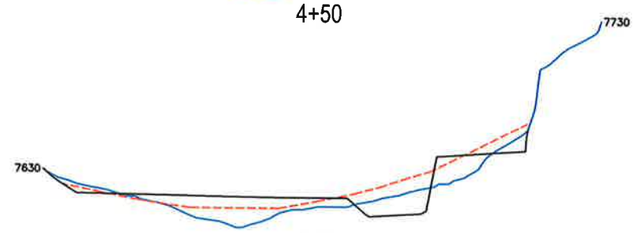

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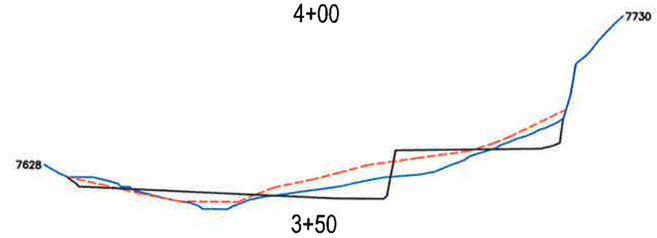

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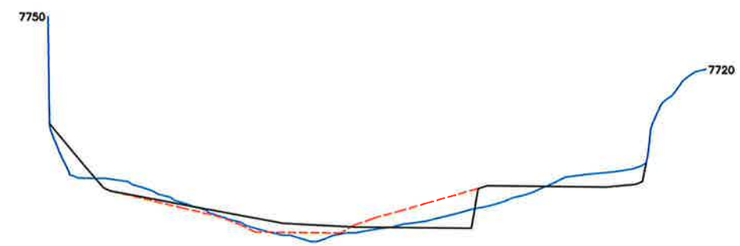

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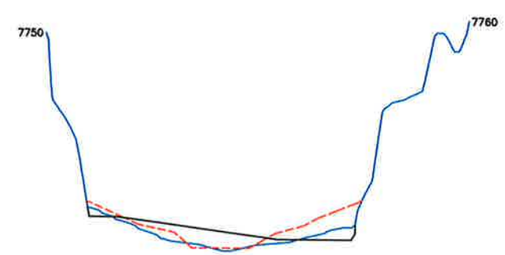

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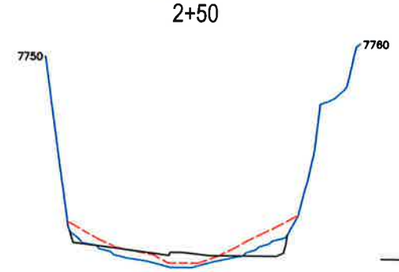

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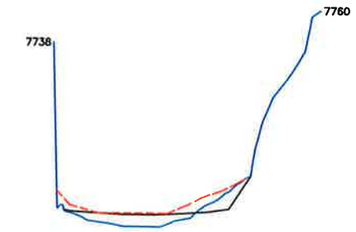

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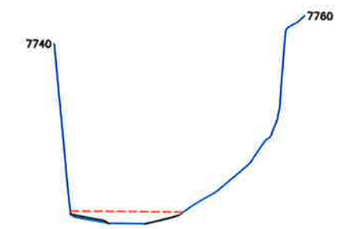

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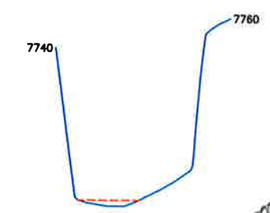

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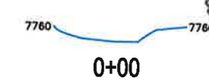


0+00

LICENSED PROFESSIONAL ENGINEER
No. 5049079-2202
MARK A. REYNOLDS
STATE OF UTAH
2-14-19

Note: Refer to Map 4B for cross-section baseline

Cut Volume	Fill Volume
73,817 yds³	35,559yds³

Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built

CAD FILE NAME/DISK#: PLATE 4C

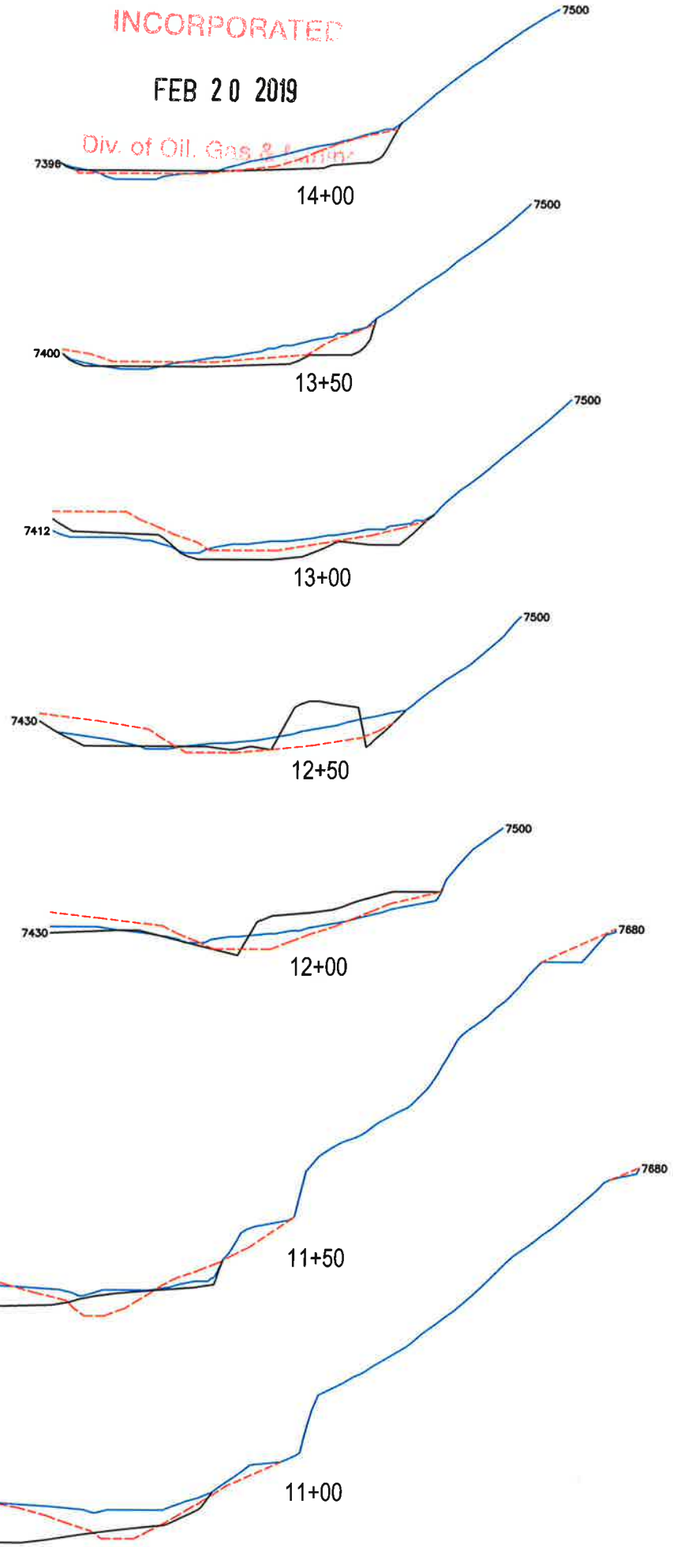
PLATE 4C

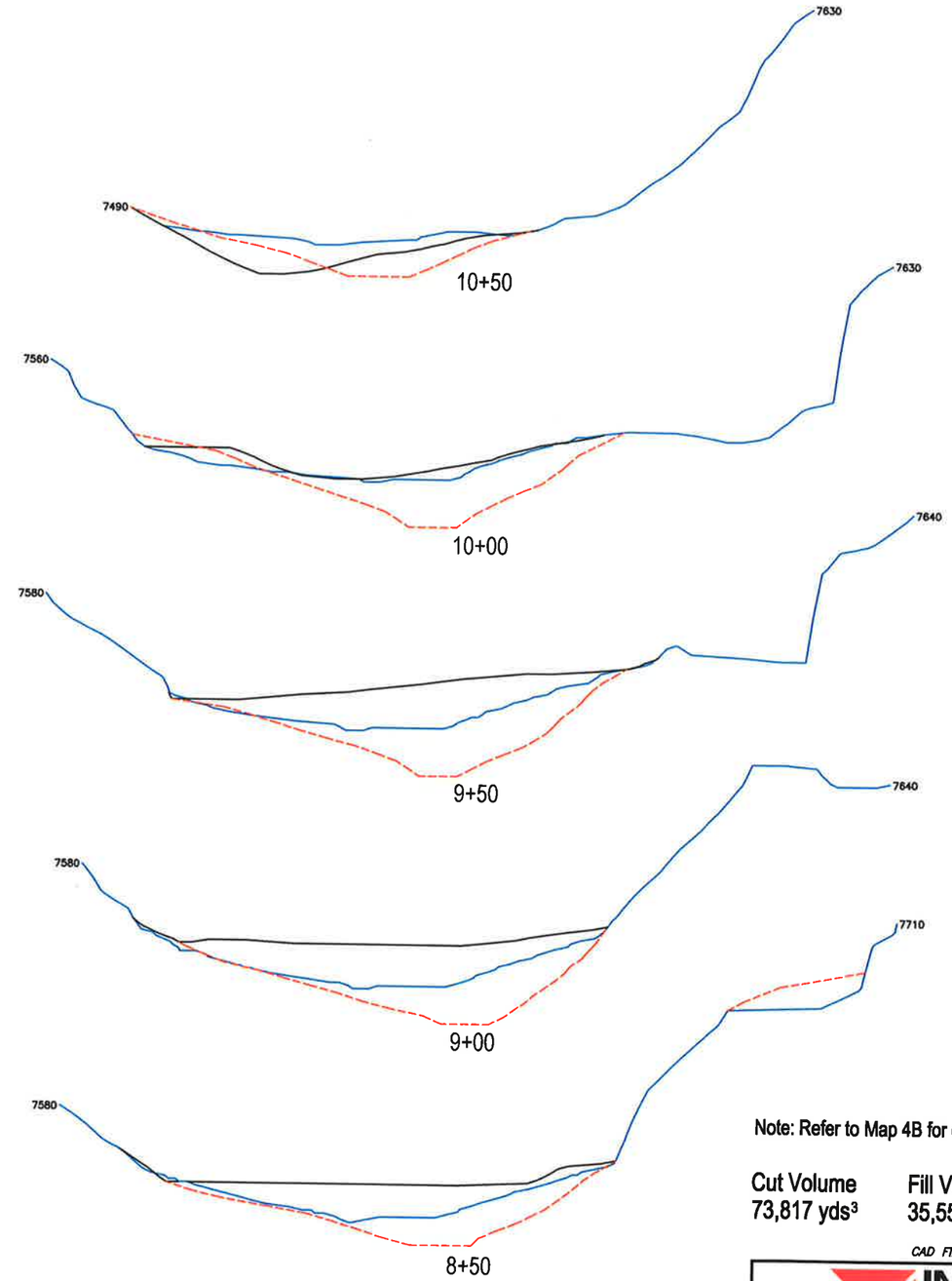
INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
LEFT FORK DRAINAGE CHANNEL
CROSS SECTIONS

DRAWN BY:	K. LARSEN	PLATE 4C	
SCALE:	1"=100'	DRAWING #:	
DATE:	OCTOBER 17, 2018	SHEET 2 OF 6	REV. ___

INCORPORATED
FEB 20 2019
Div. of Oil, Gas & Mining





LICENSED PROFESSIONAL ENGINEER
No. 5049079-2202
MARK A. REYNOLDS
2-14-19
STATE OF UTAH

Note: Refer to Map 4B for cross-section baseline

Cut Volume	Fill Volume
73,817 yds³	35,559yds³

Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built

CAD FILE NAME/DISK#: PLATE 4C

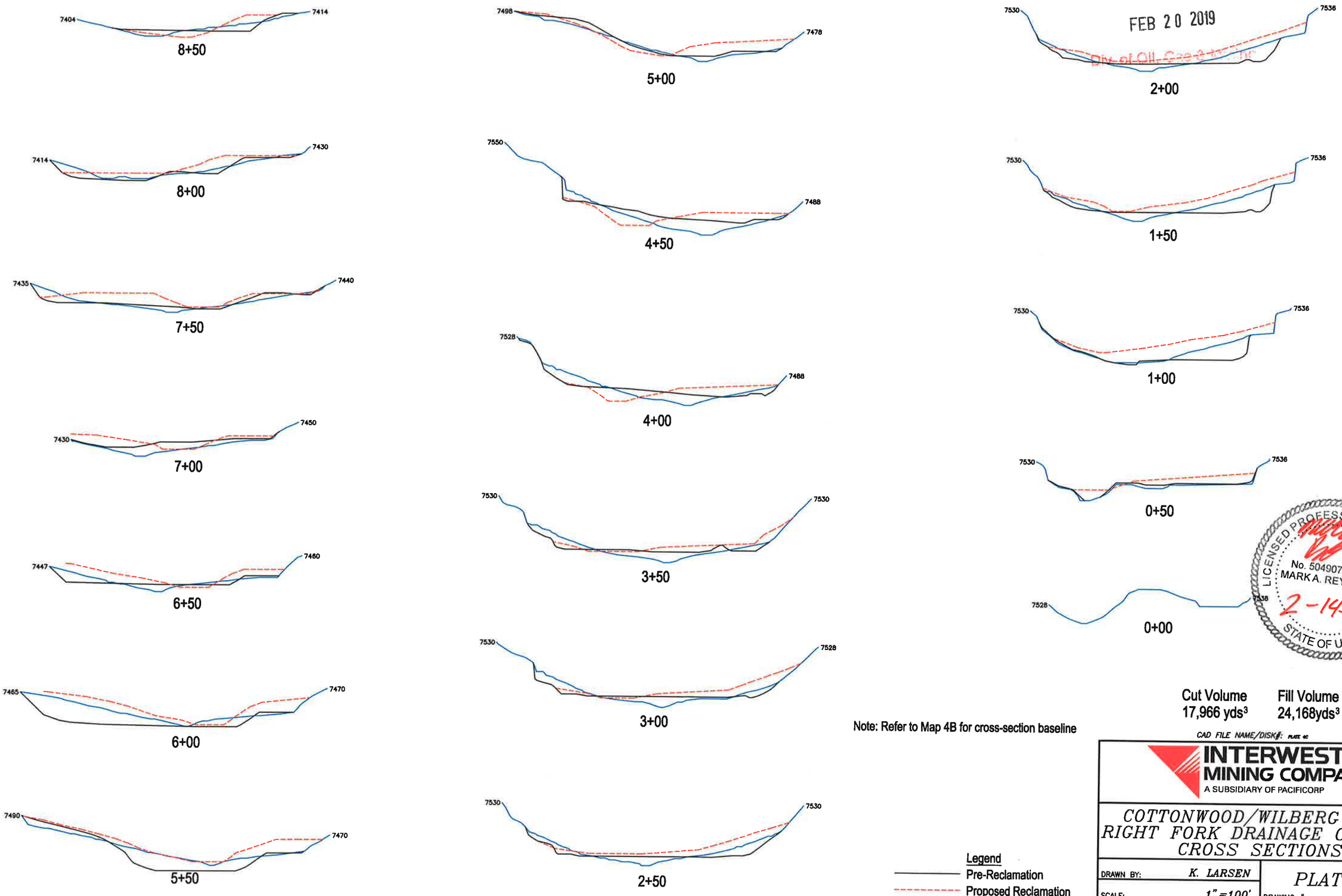
PLATE 4C

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
LEFT FORK DRAINAGE CHANNEL
CROSS SECTIONS

DRAWN BY: K. LARSEN	PLATE 4C	
SCALE: 1"=100'	DRAWING #:	
DATE: OCTOBER 17, 2018	SHEET 3 OF 6	REV. ___

INCORPORATED
FEB 20 2019
Div. of Oil, Gas & Mining



Cut Volume 17,966 yds³

Fill Volume 24,168yds³

Note: Refer to Map 4B for cross-section baseline

Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built

LICENSED PROFESSIONAL ENGINEER
No. 5049079-2202
MARK A. REYNOLDS
2-14-19
STATE OF UTAH

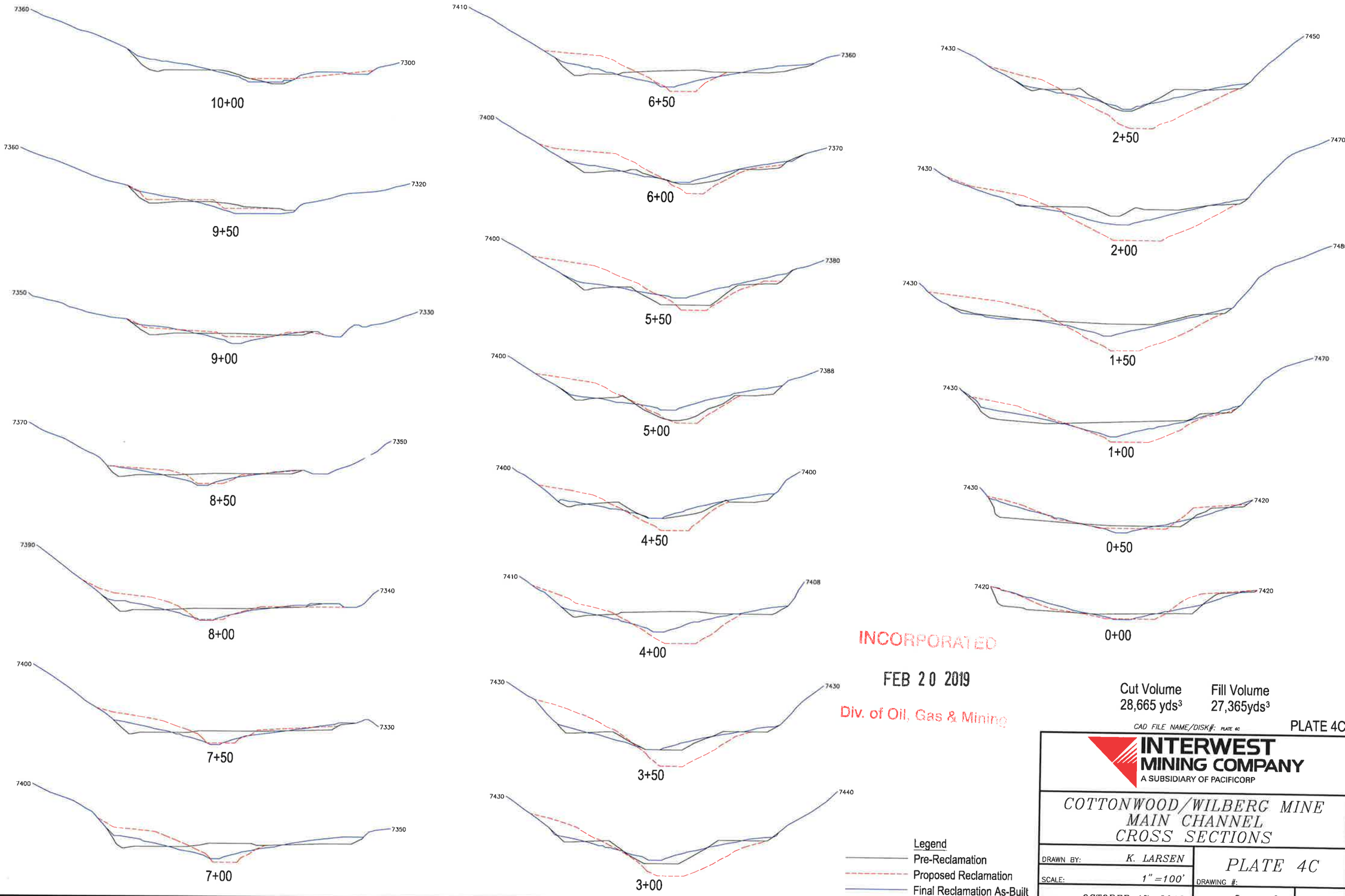
CAD FILE NAME/DISK#: PLATE 4C

PLATE 4C

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
RIGHT FORK DRAINAGE CHANNEL
CROSS SECTIONS

DRAWN BY:	K. LARSEN	PLATE 4C	
SCALE:	1"=100'	DRAWING #:	
DATE:	OCTOBER 17, 2018	SHEET 4 OF 6	REV. ___



INCORPORATED

FEB 20 2019

Div. of Oil, Gas & Mining

Cut Volume	Fill Volume
28,665 yds³	27,365yds³

CAD FILE NAME/DISK#: PLATE 4C

PLATE 4C

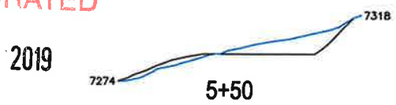
Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built

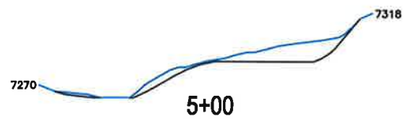
INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

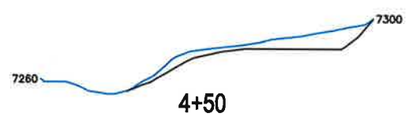
COTTONWOOD/WILBERG MINE
MAIN CHANNEL
CROSS SECTIONS

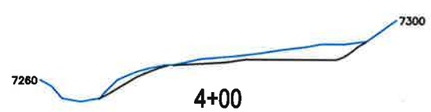
DRAWN BY: K. LARSEN	PLATE 4C	
SCALE: 1"=100'	DRAWING #:	
DATE: OCTOBER 17, 2018	SHEET 5 OF 6	REV.

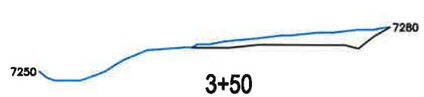
INCORPORATED
FEB 20 2019
Div. of Oil, Gas & Mining

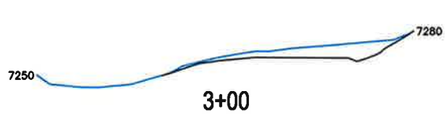


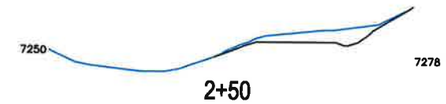


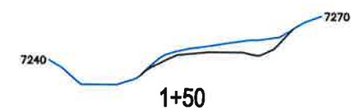


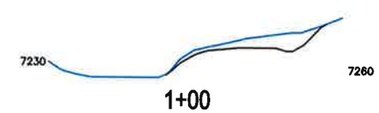


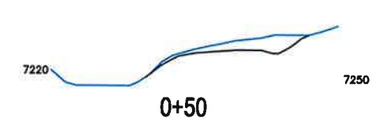


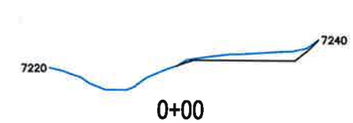












Note:
This Main Channel Bottom End is Outside of the Original Proposed Reclamation Area, Therefore No Proposed Reclamation Line is Available.

Note: Refer to Map 4B for cross-section baseline

Fill Volume
12,859yds^3

CAD FILE NAME/DISK#: PLATE 4C

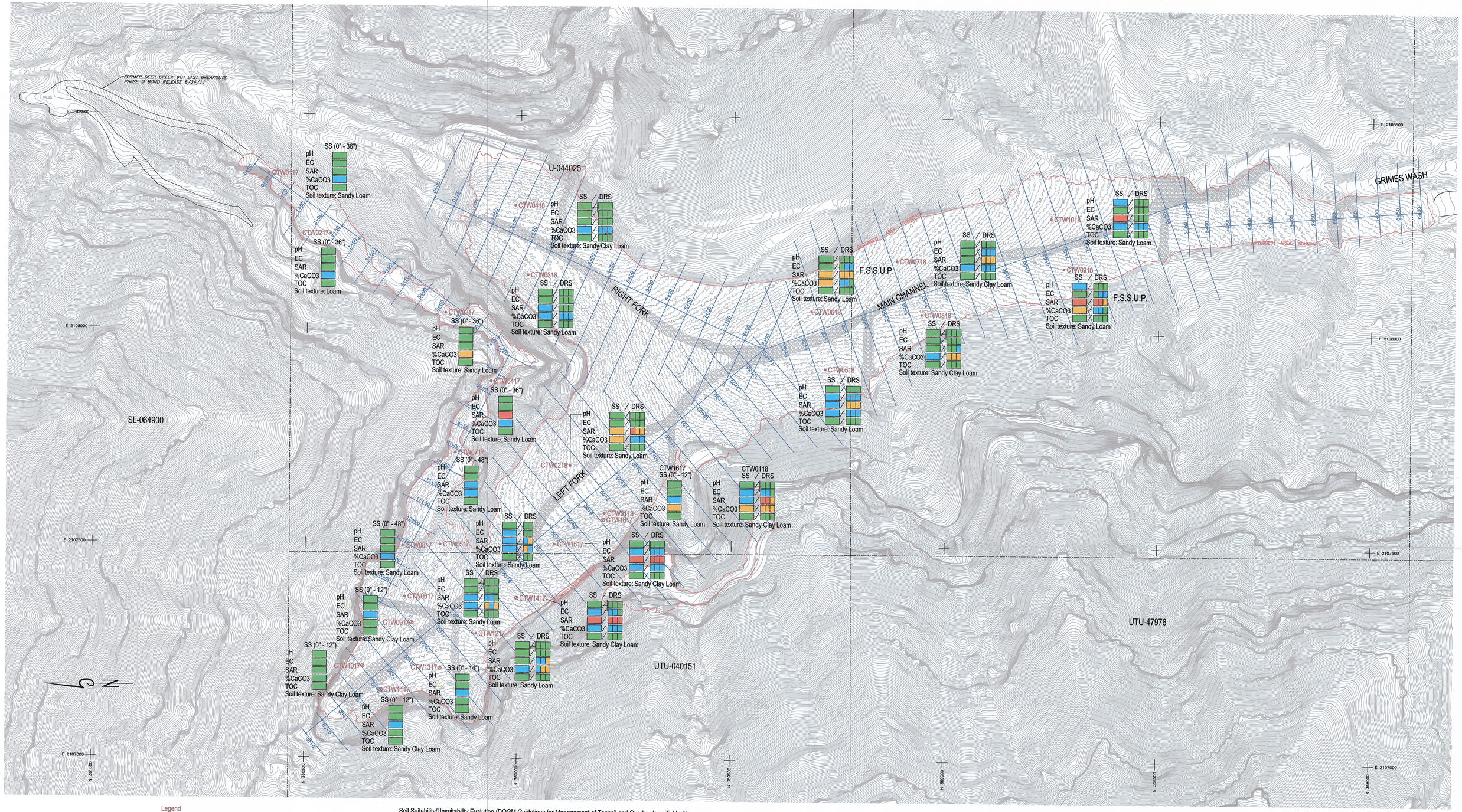
PLATE 4C

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
MAIN CHANNEL BOTTOM END
CROSS SECTIONS

DRAWN BY:	K. LARSEN	PLATE 4C	
SCALE:	1"=100'	DRAWING #:	
DATE:	OCTOBER 17, 2018	SHEET 6 OF 6	REV. ___

Legend
- Pre-Reclamation
- Proposed Reclamation
- Final Reclamation As-Built



Legend

- ⊘ 0-1' Depth - Surface Sample Only
- • 4 Samples at 1' Depth Intervals Up to 4' (Unless Otherwise Noted)

Soil Suitability/Unsuitability Evalution (DOGM Guidelines for Management of Topsoil and Overburden - Table 4)

Evaluation Intervals Surface Soil (SS) 0" - 12" / Deep Root Zone Soil (DRS) 12"- 24", 24"-36", 36"-48"

Criteria	Good	Fair	Poor	Unacceptable
pH	6.5 - 8.0	6.0 - 6.4 8.2 - 8.5	5.5 - 6.0 8.6 - 9.0	<5.5 >9.0
EC	0 - 4	4 - 8	8 - 15	>15
SAR	0 - 4	5 - 10	10 -14	>14 >20 (sandy soils)
%CaCO3	<15	15 - 30	>30	
TOC	<10%			
Soil texture	Loam/Sandy Clay Loam/Sandy Loam			

Example for location: CTW0818

• CTW0818

SS / DRS

pH
EC
SAR
%CaCO3
TOC

Soil texture: Sandy Loam

STATE OF UTAH
REFERENCE NUMBER
5224883-2250
KENNETH S. FLECK
LICENSED PROFESSIONAL GEOLOGIST

I, KENNETH S. FLECK LICENSED PROFESSIONAL GEOLOGIST DO HEREBY CERTIFY THAT THE INFORMATION CONTAINED ON THIS DRAWING IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Note: Cross-sections for the baseline on this map are found on Map 4C (6 maps)

APPENDIX A-2

CAD FILE NAME/DISK#: SUBSTITUTE TOPSOIL SAMPLING LOCATIONS

INTERWEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

COTTONWOOD/WILBERG MINE
FINAL RECLAMATION MAP
SUBSTITUTE TOPSOIL SAMPLING LOCATIONS

DATE	REVISIONS	BY	CHK.
12-18-18	ADDED SOIL SUITABILITY SAMPLING DATA	CAS	
12-7-18	REVISED DISTURBED BOUNDARY	CAS	

DRAWN BY: K. LARSEN
SCALE: 1"=100'
DATE: OCTOBER 17, 2018
DRAWING #: .....
SHEET 1 OF 1
REV. ___