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

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OK

August 16, 2001

TO: Internal File

FROM: Priscilla Burton, Soils Reclamation Specialist & Team Lead

RE: Response to Deficiencies. Reclamation Plan, Part 4, PacifiCorp, Cottonwood/Wilburg Mine, C/015/019-AM00B-3

SUMMARY:

The last Technical Analysis of this revised reclamation plan was dated November 14, 2000. A response from the Permittee has been delayed by several requests for extension, and was finally received over a year later on July 2, 2001. The response includes adjusted bond calculations for Stage I and Stage II reclamation work.

On August 3, 2000, Dennis Oakley of PacifiCorp, came up to the Salt Lake office to conduct a side-by-side review of the MRP. PacifiCorp's copy of the MRP was compared with the copies in the Salt Lake Public Information Center and in the Price Field Office. Several inconsistencies were found. Several items were corrected immediately. This submittal provides most of the remaining missing information: one copy of each of the nine plates associated with Appendix III (overland tube).

Soil sampling to characterize the fill slopes for potential use as substitute topsoil was conducted in 1980, 1983, 1989 and 2001. Results indicate that some of this soil must be disqualified for use as substitute topsoil due to salt loading from winter road salting and snow removal operations.

TECHNICAL ANALYSIS:

WRITTEN FINDINGS FOR PERMIT APPLICATION APPROVAL

COMPLETE AND ACCURATE

Regulatory Reference: R645-300-133.100.

Analysis:

The revised Introduction, Table of Contents for the MRP, and Table of Contents for the Appendices volumes (dated 5/24/2000) are to replace those found in the Introduction section of Volume 1 (dated 12/20/99 and approved under amendment AM00A) . The latest information includes Volumes 8 - 11 in the Table of Contents list. The Division files were checked for accuracy against the Table of Contents. The following has been noted:

- The information listed as existing in Volume 2 is now being presented in two volumes: Volume 2 and the recently submitted volume entitled "Part 4 - Reclamation Plan" (dated 1/17/00, yet to be incorporated). Once Part 4 has been approved, it will be incorporated into Volume 2.

- Volume 4 is an empty volume; it used to contain Maps 2-7, 2-10, 2-11, 2-12, and 2-13. According to this submittal, these maps were moved to Volume 8 in 1993.

  As plates were moved from Volume 4 to Volume 8, the following changes occurred:

  1. Plate 2-7 (Hiawatha-Cottonwood and Cottonwood-Blind Canyon Interburden Isopach Map) became Plate 2-6A or Map CM-10692-EM .

  2. Plate 2-8 (Isopach Map of the Blind Canyon and Cottonwood Coal Seams) was replaced with Plate 2-6 or Map CM-10696-EM.

  3. Plate 2-10 (Hiawatha Coal Seam Overburden Isopach Map) became Plate 2-6B or Map CM-10703-EM.

  4. Plate 2-11 (East Mountain Property. Blind Canyon and Cottonwood Coal Seams Overburden Isopach Map) was moved to Volume 8 and became Plate 2-6C or CE-10704-EM..

Plates labeled 2-12 and 2-13 were moved to Volume 9:

5. Plate 2-13 (East Mountain Property Hydrology Data Map), CM-10478-EM, was replaced with Plate HM-1 in Volume 9.

6. Plate 2-12 (East Mountain Property Hiawatha Coal Seam In-Mine Watering Locations), CM-10532-EM, was replaced with Plate HM-3 in Volume 9.

- Volume 7 is included in the Table of Contents as non-existant.

- Volume 8 is a shared volume between Deer Creek Mine (C/015/018) and Des Bee Dove Mine (C/015/017). It is filed in the Public Information Center with the Des Bee Dove Mine files.

- Volumes 9, 9A and 9B are noted in the Table of Contents. These volumes are shared with the Deer Creek Mine (C/015/018) and the Des Bee Dove Mine (C/015/017). They are filed in the Public Information Center with the Deer Creek Mine files.

- Appendix XX should be moved to volume 9, according to this submittal.

- The Appendices are found in three unlabeled volumes:

  Appendix I through X
  Appendix XI through XIX
  Appendix XX and XXII.

- This submittal (7/2/01) provides Plates 1-9, Overland Tube, Appendix III.

- Missing Plate 3-16A CM-10982-CP of Appendix III dealt with the Cottonwood Canyon Fan Portal surface facilities. The Cottonwood Fan Portal area was disturbed but facilities were never developed. The Cottonwood Fan Portal area was reclaimed in November of 1998. Therefore, the Permittee requests that Plate 3-16A is removed from the plan.

The submittal has brought the Table of Contents and the Division's copy of the Mining and Reclamation plan up to date.

Findings:

The information provided meets the minimum permit application format and contents requirements of the Regulations.

ENVIRONMENTAL RESOURCE INFORMATION

SOILS RESOURCE INFORMATION

Regulatory Reference: R645-301-411, -301-220.

Analysis:

Soils information for the mine is located as follows:

Old Waste Rock site (UTU 37642)
Appendix VII and Part 4 (Reclamation Plan) Appendix D, page 32.

New Waste Rock site (UTU-65027)
Volume 10 and Part 4 (Reclamation Plan) Appendix D, page 34.

Cottonwood Mine Facilities
Volume 1 Part 2, pages 2-143 to 2-158 and Appendix D

Drawing CE 1047 WB General Soil Map of the Cottonwood/Wilburg Mine Permit Area (designated by the Division as Map 2-17)

Drawing CE 10346 - WB Mine Plan Area Soils Map (designated by the Division as Map 2-18).

Wilberg Mine Site

The area of the Wilberg Mine is about 18 acres at an elevation of 7400 to 8000 feet. The general slope is 35 degrees (70% or 1.5h:1v). The slopes have a southern exposure. Annual precipitation is about eight inches (Part 4, Appendix D).

Construction of the Wilberg Mine was begun and completed in 1978. Dr. A. R. Southard states in his June 1989 report entitled, "Soil Resources of the Wilberg Mine Area," (found in Appendix D) that a permit for construction was granted by the U.S. Geological Survey under the authority of 30 CFR 211, which required "approximately the same soil conservation practices as SMCRA's interim regulations effective December 13, 1977."

The soils in existence prior to disturbance at the mine site were probably loamy-skeletal, mixed, mesic Lithic Ustorthents. A typical pedon description would have an A horizon of 0 - 4 inches of very gravelly loam, moderately calcareous, moderately alkaline (pH 8.3). This surface horizon would be followed by a C horizon from 4 - 14 inches of fine sandy loam with 40% flagstones, strongly calcareous, strongly alkaline (pH 8.8) disseminated carbonates. Below

fourteen inches would have been sandstone.

On site, small areas (less than 100 square feet) of deep colluvial deposition were noted. One such area had a soil depth of 45 inches and is represented by samples 1112 to 1116 on the Mine Plan Area Soils Map (CM-10346-WB). The deep soil was sandy loam in texture with approximately 60% sand, 25% silt and 15% clay. The pH of these soils was between 8.0 and 8.4. The Electrical Conductivity was between 0.4 and 1.5 dS/cm. The Sodium Adsorption Ratio values were below 1.5. Organic Matter percentage was 4.4 at the surface (0 - 6 inches) and lowered to 1.3% at the 31 - 45 inch depth. Phosphorus levels were recorded as 2.9 ppm at the surface and down to 0.6 ppm at 14 - 21 inche depth, falling to 0.1ppm at 31 - 45 inches.

Dr. Southard concludes in his June 1989 report that no topsoil existed in sufficient quantities to warrant stockpiling. However, Dr. Southard found that the fill slopes and pad material could be utilized as substitute topsoil, if the soil was not contaminated by mining activity (page 9 of the June 1989 report entitled, "Soil Resources of the Wilberg Mine Area"). Consequently, a plan to monitor the fill slopes for chemical characteristics was included in the MRP.

Sampling and laboratory analysis of the fill slopes was to be conducted at 5 year intervals to record productivity changes on the slopes with the ultimate goal of creating substitute topsoil from the fill (see Part 4, pages 18 - 21). At five year intervals pH, EC. SAR, OM%, SP%, AWC, and soil fertility (P, K) analyses were to have been performed on five composite samples from five fill slopes. The plan still retains a commitment to sample the fill slopes every five years to monitor soil productivity changes.

The reclamation plan describes using the top 18 inches of soil from five major interim fill slopes which were seeded in 1988 (see Part 4, pages 18 - 21). These slopes are shown in green on Drawing KS1217D,1993, Vegetation Monitoring Map, dated 4/18/94 (found in the Annual Report Volume); on Plate 2-18 Mine Plan Area Soils Map (CM-10346-WB); on Drawing WS 449 D, Cottonwood Mine Surface Facilities Map 2000 Vegetation Monitoring (found in the Annual Report Volume); and on a 1989 Figure drawn in Appendix D, Soil Physical and Chemical Analysis. The fill slopes identified in Appendix D are: Area W1 (upper parking lot); Area W2 west (slope west of the Wilberg conveyor); Area W2 east (slope east of the Wilberg conveyor); Area W2 north (slope below parking lot and adjacent to the road); and Area W3 (sediment pond fill).

Spoil banks were tested in 1980, 1983 and 2001. The soil in the fill slopes was sampled in 1983 , 1989 and in 2001. Sampling results and location maps are included in Appendix D. The Mine Plan Area Soils Map (CM-10346-WB) is also necessary for interpretation of the results. Samples were not composited in the year 2001. However, in 1989, the laboratory analyzed sub-samples composited by depth segment from several sample locations within each fill area. Sampling locations were similar between studies, although not all five fill slopes are represented at each sampling date.

In the year 2001, at the Cottonwood/Wilberg Mine facilities area, sample SS1 was taken of the spoil banks by the former security guard station. Samples SS2 and SS8 were taken from the main access road and the Wilberg fan portal access road, respectively. Sample SS9 was taken outside the disturbed area boundary from the slope directly north of the substation/storage yard. Samples SS3, SS4, SS5, SS6, SS7 represent the fill slopes. The following chart listing sample site locations and designation for each sample year was created to enable comparison of the spoil banks and fill slopes over time.

Sample Location and Designation By Year Sampled

	1980	1983	1989	2001
Spoil banks – by former security guard station	samples 658, 659, 660, 661, 662.	Sample W4 (a composite of 10 samples)	not sampled	sample site SS1
Area W1 – upper parking lot	not sampled	sample W1 (a composite of 10 samples)	samples 1213, 1214, 1215 (each a composite of 5 samples)	sample sites SS6 and SS7
Area W2 north – slope below parking lot and adjacent to the road	not sampled	sample W2 (a composite of 10 samples)	samples 1222, 1223, 1224 (each a composite of 2 samples)	not sampled
Area W2 east – fill slope east of the Wilberg conveyor	not sampled	not sampled	samples 1219, 1220, 1221 (each a composite of 5 samples)	sample site SS4
Area W2 west – fill slope west of the Wilberg conveyor	not sampled	not sampled	samples 1216, 1217, 1218 (each a composite of 5 samples)	sample sites SS5
Area W3 – sediment pond fill slope	not sampled	sample W3 (a composite of 10 samples)	not sampled	not sampled

The Division has created the following tables to show the physical and chemical characteristics reported for each fill slope over time. There is one table for each fill slope.

Spoil Banks Comparison of Chemical and Physical Properties Over Time

	1980 average of the five samples reported	1983 composite of 10 samples	2001 one sample averaged over all depths sampled
Sand		75	66
Silt		14.5	22
Clay		10.5	12
Texture		loamy sand	sandy loam
pH	7.76	7.8	7.7
EC	5.64	0.80	4.3
SAR		0.06	8.57
%OM (%N)		10.98 (0.254)	2.2 total organic carbon (.09%)
Ca		8.67%	11.68 meq/L
Mg		1.85%	4.66 meq/L
Na	17.52 meq/L	0.72%	25.73 meq/L
K	0.007 %	0.094%	
ppm P	3.8	0.055	
% Calcium carbonate		16.5	
Nitrate nitrogen ppm			1.26
Keldahl nitrogen%			0.09%
Saturation percent		20%	24.8%
Available Water Holding Capacity			0.07 (when adjusted for coarse fragments and EC).

Fill Slope Area W1 (Upper Parking Lot) Time Comparison of Chemical and Physical Properties

	1983 composite of 10 samples	1989 average of 3 composite samples	2001 two samples averaged over all depths sampled
Sand	78.5	59	52
Silt	6.5	22	32
Clay	15	19	16
Texture	loamy sand	sandy loam	loam
pH	8.5	8.1	7.6
EC	0.51dS/m	2.0 dS/m	0.95mmhos/cm
SAR	2.29	2.9	0.87
OM% (%N)	5.50 (0.85)	2.1 % TOC	2.5% TOC
Ca	8.98%	7.0 meq/L	5.98 meq/L
Mg	2.58%	5.9 meq/L	2.5 meq/L
Na	0.30%	7.3 meq/L	1.42 meq/L
K	0.88%	180 ppm	
ppm P	0.028	7.3	
% Calcium carbonate	16.7		
Nitrate nitrogen ppm			2.7
Keldahl nitrogen%			0.11
Saturation percent	30	29	26.7
Available Water Holding Capacity		0.04 (adjusted for coarse fragments)	0.08 (adjusted for coarse fragments)

Fill Slope Area W2 north (slope below parking lot) Time Comparison of Chemical and Physical Properties

	1983 composite of 10 samples	1989 average of 3 composite samples
Sand	79.5	56
Silt	13.5	27
Clay	8.5	18
Texture	loamy sand	sandy loam
pH	8.2	8.0
EC	0.98	11
SAR	0.02	13
OM% (%N)	12.22 (0.266)	1.7% TOC
Ca	9.5%	21 meq/L
Mg	2.54%	18 meq/L
Na	0.82%	76 meq/L
K	0.57%	139 ppm
ppm P	0.035	2.8 ppm
% Calcium carbonate	16.5%	
Nitrate nitrogen ppm		
Keldahl nitrogen%		
Saturation percent	20%	31%
Available Water Holding Capacity		0.06 (corrected for rock content and EC)

Fill Slope Area W2 east (fill slope east of the Wilberg conveyor) Time Comparison of Chemical and Physical Properties

	1989 average of 3 composite samples	2001 one sample averaged over all depths sampled
Sand	58	59
Silt	23	28
Clay	19	13
Texture	sandy loam	sandy loam
pH	7.9	7.6
EC	8.6	6.6
SAR	8.4	21.4
TOC%	1.8%	1.7%
Ca meq/L	37	5.7
Mg meq/L	26	3.6
Na meq/L	47	46.5
ppm K	78	
ppm P	2.0	
% Calcium carbonate		
Nitrate nitrogen ppm		1.11
Keldahl nitrogen%		0.12
Saturation percent	27%	22.3
Available Water Holding Capacity	0.05 (adjusted for rock content and EC)	0.06 (adjusted for rock and EC)

Fill Slope Area W2 west (fill slope west of the Wilberg conveyor) Time Comparison of Chemical and Physical Properties

	1989 average of 3 composite samples	2001 one samples averaged over all depths sampled
Sand	58	59
Silt	23	25
Clay	19	15
Texture	sandy loam	sandy loam
pH	7.9	7.4
EC	7.5	3.4
SAR	8.4	5.0
TOC%	1.6	1.4
Ca meq/L	27.3	10.9
Mg meq/L	23.5	7.7
Na meq/L	41.5	14.2
ppm K	99	
ppm P	3.33	
% Calcium carbonate		
Nitrate nitrogen ppm		
Keldahl nitrogen%		0.08
Saturation percent	28	25.5
Available Water Holding Capacity (in/in)	0.05 (adjusted for rock content and EC)	0.07 (adjusted for rock content and EC)

Fill Slope Area W3 (sediment pond fill slope) List of Chemical and Physical Properties

	1983 a composite of 10 samples	No other sampling conducted
Sand	75	
Silt	12.5	
Clay	12.5	
Texture	loamy sand	
pH	8.6	
EC	1.0	
SAR	1.19	
OM% (%N)	19.90 (.299)	
Ca	7.5%	
Mg	2.23%	
Na	0.144%	
K	0.52%	
ppm P	0.110	
% Calcium carbonate	15.1%	
Nitrate nitrogen ppm		
Keldahl nitrogen%		
Saturation percent	30	
Available Water Holding Capacity		

Glancing through these soil sample results one immediately notes that sample site SS4 has elevated Electrical Conductivity (values of 3.16 mmhos/cm in the 0 - 6 inch depth sample increasing to 9.5 mmhos/cm in the 12 - 18 inch depth sample) and Sodium Adsorption Ratio values. The SAR value in the 0 - 6 inch sample is 16.4 and ratio increases with depth to 24.6. As previously noted by A. R. Southard and T. H. Furst in the June 15, 1989 report entitled "Soils of the Wilberg Mine Site: Report on Soil Physical and Chemical Analyses" (found in Appendix D), extreme SAR values are probably due to snow removal and salting operations along the road during the winter months. The Division concludes that the soil in the area of SS4 (Area W2 East) is not useful as topsoil material. Southard and Furst found the area immediately north of the test plots (designated as W2 north in the 1989 study) was unsuitable for the same reason. Prior to including Area W2E in substitute topsoil calculations, further sampling of the Area W2 East will be required to show that the sample SS4 is not representive of the entire slope.

Other fill slopes also have SAR values that are higher than native soils, but not to this extreme. For example SS5 has a SAR value of 5.24 in the upper six inches and the value decreases through the profile.

A very different soil was found on the undisturbed slope 200 yards away from SS5. This soil was a silt loam. Differences were found in EC, AWC, rock content, saturation percent and TOC.

On page 22 of Part 4 it is noted that 70,000 cubic yards of substitute topsoil will be recovered from the fill slopes. The information provided on fill slopes is incomplete. The Division must know the acreage of each fill area and volumes projected to be salvaged from each fill area. In searching through the submittal for this information, the Division noted that reference is made to the redistribution of interim topsoil over two acres of the site on page C-43 of Appendix C, but no further information on the topsoil segregation or redistribution was found in the MRP.

Wilberg Mine Test Plots

In 1989 were established in Area W2 West (see Map 2-18) at the Wilberg Mine site to test mulch (hydromulch vs. mulch blanket vs. hay & netting) and irrigation applications (once a week for two years) for final reclamation (see page 20 and 21 of the submittal for details). All test plots received the final reclamation mix (page 24 of the submittal). A design of the test plots is located in Part 4, Figure 4. Page 20 of the submittal states that test plots have been monitored according to the plan for final reclamation monitoring and refers the reader to Part 2: Vegetation Information for sampling technique. The sampling results are found in the volumes of Annual Vegetation Monitoring Reports. The most recent sampling was conducted in 1999. During the 1999 evaluation, a salt-effect on vegetation growth was noted on plots immediately adjacent to the road.

Waste Rock Storage Site (UTU-65027)

The waste rock facility is 16.9 acres. The access road to the site is 1.435 feet long and covers 5 acres of ground. The waste is being contemporaneously reclaimed with 12 inches of subsoil and 6 inches of topsoil cover (see Chapter 3, Appendix XXI of the MRP. Appendix XXI will become Volume 10 of the MRP when this submittal is approved.)

Soils of the waste rock site were surveyed in 1989. A report entitled, "A Report on the Soils of the Wilberg Waste Rock Site" by T.H. Furst is found in Chapter VII of Appendix XXI of the MRP. Laboratory analyses are found in Tables 2 , 3 and 4 of this report. The soils were identified as Strych soils: Lithic Ustic Torriorthent, fine-silty, mixed (calcareous) mesic family, 5 - 30% slopes and 0 - 5% slopes. The pedon excavation sites and soil boundaries are illustrated on Plate 7-1, CM-10818-WB of Appendix XXI. The topsoil

In Chapter 3, page 3-11, of Appendix XXI of the MRP, a commitment is made to sample soil materials on the interim revegetation sites.

In the year 2001, samples were collected from waste rock at the Waste Rock Storage Site (UTU-65027). The analytical results have been placed in Appendix D of Part 4. However on page 34 of Part 4 there is no reference made to the location of these samples, the reader is sent to "Volume 10 for complete details". Perhaps these results are better placed in an Appendix with the Waste Rock Site information.

Findings:

The information provided is not adequate to meet the minimum soils resource information requirements of the Regulations. Prior to approval the Permittee must provide the following in accordance with:

R645-301-232.200, Provide acreage information for each of the five fill slopes that hold the substitute topsoil for the Wilberg Mine to support the statement on page 22 of Part 4 that 70,000 cubic yards of substitute topsoil will be generated from the five fill areas at the Wilberg Mine site.

R645-301-731.311, Place in the narrative a reference for the location of sample results for the Cottonwood/Wilberg Waste Rock site.

RECLAMATION PLAN

MAPS, PLANS, AND CROSS SECTIONS OF RECLAMATION OPERATIONS

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

Minimum Regulatory Requirements:

Each application shall contain maps, plans, and cross sections which show the reclamation activities to be conducted, the lands to be affected throughout the operation, and any change in a facility or feature to be caused by the proposed operations, if the facility or feature was shown and described as an existing structure.

The permit application must include as part of the reclamation plan information, the following maps, plans and cross sections:

Reclamation backfilling and grading maps

Contour maps and cross sections to adequately show detail and design for backfilling and grading operations during reclamation. Where possible, cross sections shall include profiles of the pre-mining, operations, and post-reclamation topography. Contour maps shall be at a suitable scale and contour interval so as to adequately detail the final surface configuration. When used in the formulation of mass balance calculations, cross sections shall be at adequate scale and intervals to support the mass balance calculations. Mass balance calculations derived from contour information must demonstrate that map scale and contour accuracy are adequate to support the methods used in such earthwork calculations. Detailed cross sections shall be provided when required to accurately depict reclamation designs which include, but are not limited to: terracing and benching, retained roads, highwall remnants, slopes requiring geotechnical analysis, and embankments of permanent impoundments.

Analysis:

Reclamation backfilling and grading maps

Backfilling and grading is planned in two stages as described on page 7, Part 4 of the submittal. Stage I will recontour the disturbed areas of the right and left forks of Grimes Wash. Stage II will remove the access road and the north and south sediment ponds. Appendix C itemizes the cut and fill quantities.

This submittal includes revisions of Plates 4-1 (Cottonwood Wilberg Mine Final Reclamation Map Stage I), 4-2 (Cottonwood Wilberg Mine Final Reclamation Map Stage II, Sheets 1, 2 and 3 of 3), and 4-3 (Cottonwood Wilberg Mine Disturbed Mine Area Cross-Sections). These plates were re-created in autocad. Notable changes to these plates are the mass balance calculations and the inclusion of the disturbed area boundary. The disturbed area boundary matches that found on Plate 3-16 Cottonwood Mine Surface Yard Map approved and incorporated into the MRP 12/21/00 with Amendment 00C.

Page 8 of Part 4 makes reference to Plate 4-2, map CM 10378-WB, 1 of 2. This reference should be to Plate 4-2 map CM 10378-WB, sheets 1 of **3.**

Cut/Fill Comparison of Autocad Drawings with Currently Approved Drawings in the MRP

Plate Number and Date	TOTAL CUT (cubic yards)	TOTAL FILL (cubic yards)	EXCESS (cu. yards)
Plate 4-1 (Stage I) autocad generated 12/20/00	143,879	131,499	12,380

Plate 4-1 incorporated 9/89	131,739	133,665.9	0
Plate 4-2 (Stage II) autocad generated 12/20/00	57,368	49,992	7,376
Plate 4-2 incorporated 9/89	49,177.4	49,190.2	0

Findings:

The information provided meets the minimum requirements of the Regulations for maps and cross-section information for backfilling and grading operations during reclamation.

RECOMMENDATION:

The reformatting changes of this submittal (i.e. the new Table of Contents with list of Appendices) is accurate and can be approved. The issues raised by the side-by-side meeting of August 3, 2000 have been resolved. This submittal includes the results of the 2001 soil sampling in Appendix D. Soil in the area of SS4 is not useful as topsoil material due to the extreme SAR values (probably due to snow removal and salting operations along the road during the winter months). Earlier sampling also disqualified the soil on the slope across the road from and north of the test plots (designated as W2 north in the 1989 study) for the same reason.

Now that the reorganization and reformatting has been completed, it would be in the Division's best interest to review the plan for details of reclamation technique which may have changed since the plan was devised in the 1980's.