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August 19, 1998 3.1

TO: File

THRU: Joe Helfrich, Permit Supervisor JH

FROM: Priscilla Burton, Soils Reclamation Specialist PB

RE: Soils Technical Analysis of Phase II Revision of the Permit Application Package (PAP) and the Mining and Reclamation Plan (MRP), Dugout Canyon Mine, Canyon Fuel Company, PRO/007/039-SR98-1. Folder #2, Carbon County, Utah

SUMMARY

This Technical Analysis (TA) merges Robert Davidson's recent TA regarding the Alluvial Valley Floor determination (dated 8/19/98) and two previous documents (my TA dated August 7, 1998 for Dugout Phase II and the soils portions of the Final Dugout TA dated March 16th, 1998 for which Robert Davidson took responsibility). This document was used to create the final Dugout Phase II Technical Analysis.

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

Analysis:

SOILS RESOURCE INFORMATION

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

Analysis:

Chapter 2, Soils, Sections 220 through 224, discusses the soil resources within the proposed Dugout Canyon Mine disturbances. Relevant soils information includes current and published soil surveys, characterizations, and substitute topsoil identification. The Analysis

section discusses resource information as follows:

- Soil Survey Information
- Disturbed Soils
- Undisturbed Soils
- Soil Productivity
- Substitute Topsoil

Soil Survey Information

Soil survey information is provided by both a general-area Order-III and a site-specific Order-I soil surveys. The Order-III survey is reproduced from the SCS "Soil Survey of the Carbon County Area" and is delineated on a general area soils map (Plate 2-1). According to the SCS soil survey, soils present on the east/south-east facing slopes of Dugout Canyon are part of the Rock outcrop-Rubbleland-Travessilla complex (#96) while those on the west/north-west facing slopes are shown as Croydon loam (#21) at lower elevations and Midfork family-Comodore complex (#62) at higher elevations in the upper reaches of the canyon. The SCS map (#11) shows a subjective line that separates the #21 soil from the #62 soil with no apparent vegetation break separating the soils. Mr. Leland Sassar, Soil Scientist, NRCS, was contacted on 3/3/98 concerning the apparent discrepance and lack of coherency for placing #21 soils on steeper, Douglas-fir dominated slopes. Mr. Sassar indicated that some #20 (Comodore-Datino Variant Complex) soils probably exist within the #21 soils. The #21 soils are characterized as higher-elevation, non-rocky, deep loams, dominated by quaking aspen, whereas the #20 soils are characterized as lower-elevation, rocky, shallow soils, dominated by Douglas-fir.

Generally, the predominantly stoney to gravelly sandy loam soils formed from sandstone, shale colluvium, and alluvium. Soils within the Rock outcrop-Rubbleland-Travessilla complex and the Midfork family-Comodore complex are typically well drained with moderate permeability, rapid runoff, and are highly susceptible to water erosion. Soils within the Croydon loam have moderately slow permeability, and therefore, depending on slope, erosion characteristics vary from slight to severe. The main point is that because of steepness of slope and soil quality, all of these soils are highly erosive. Shallow soils dominate the east facing side slopes while generally deeper soils characterize the west facing toe slopes.

The Order-I survey was conducted for the Dugout Canyon Mine to describe soils found within the surface facilities area. A total of 12 soil test pits were excavated and are located on a soils map, Plate 2-2, Disturbed Area Soil Map. Soil test pits located in disturbed/overburden soils include TP-2, 3, and 11; pits located in Type TS soils include TP-1, 4, 5, 6, 7, 8, 9, 14, and 14A. Soils were delineated and described in accordance with the standards

of the National Cooperative Soil Survey. Soil Test Pits TP-1, 2, 3, 4, 5, 6, 8, 9, and 11 were sampled and characterized according to the DOGM's Guidelines for Topsoil and Overburden[1]; laboratory data and analytical summaries for each of these samples are provided in Table 2-1 of the PAP. Pits 7, 14 and 14A were not sampled, but pit descriptions were used to estimate soil volumes.

Chris Hansen of EarthFax Engineering, Inc., gathered the soil resource information. A Qualification statement for performing the Dugout Canyon soil survey and a personal Resume are provided in Appendix 2-3, Soil Test Pit Logs.

The Phase II submittal updates the Order-I survey by including sites TP7 (below the sediment pond in soil the Datino Variant complex[1], designated as TS); TP13 (located at the proposed water tank area, also Datino Variant, designated as TS) ; and TP16 (located on the slope above the coal storage area and designated 96 for Rock Outcrop - Rubbleland- Travesilla Complex). These soil test pit locations are located on soils map, Plate 2-2, Disturbed Area Soils Map. Laboratory data and analytical summaries for each of these samples are provided in Table 2-1 of the PAP.

Disturbed Soils

A large portion of the mine facility's area is covered by overburden and disturbed soils consisting of soil mixed with coal waste and/or waste rock from previous mining operations. These soils are described by soil test pits TP-2, TP-3, and TP-11. The overburden is a mixture of rock and/or coal waste with Travessilla soils. The Travessilla soils are classified by the SCS soil survey as loamy, mixed (calcareous) mesic, Lithic Ustic Torriorthents. The overburden is found in the flat areas and on most of the steep slopes; is moderately well drained, and supports sage brush, juniper, rabbit brush, and a variety of grasses. Soil thickness varies from a few feet to more than eight feet. Generally, the overburden soils are described as a "gravelly loam" with rock concentrations between 10 and 40 percent and rock size that varies from gravel to boulder. Rock fragments are composed of sandstone with some siltstone blocks.

Undisturbed Soils

The remainder of the facilities area has soils that appear to be undisturbed or have been only slightly disturbed. Soils present in the canyon bottom lie within the disturbed and undisturbed areas of the mine. The undisturbed soils were identified by the Order-I survey as part of the SCS listed soil unit Datino Variant complex, and were given the distinction "Soil Type TS." According to the SCS Carbon County soils survey, the Datino Variant soil complex is

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[1]Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

characterized as very deep, well drained, moderate permeable soils on mountain slopes being formed in colluvium derived dominantly from sandstone and shale. The SCS survey defines Datino Variant soils as loamy-skeletal, mixed Typic Haploborolls. The typic subgroup of Haploborolls[2] is defined as freely drained soils with a moderately thick brownish mollic epipedon. Typic Haploborolls were formed in alluvium during the late-Pleistocene or Holocene ages, do not have a shallow lithic (stone) contact, and do not have deep wide cracks in most years. The USDA handbook further states that where slopes are suitable, Haploborolls are mostly under cultivation.

Undisturbed TS soils, as represented by soil test pits TP-1, 4, 5, 6, 7, 8, 9, 14, and 14A, are found on both sides of Dugout Creek in the northeastern portion and in the southwestern portion of the facilities area. The TS soils are found in flat lying areas and on slopes with grades up to 40 percent or more. The soil supports vegetation consisting of sage, cottonwood, gambel oak, grass, pinyon, and fir. Information condensed from soil test pit TP-4, TP-6 and lower sections of pit TP-1 show soil horizons O1 (1 inch), A1 (1 to 5 inches), B2 (5 to 14 inches), B3 (14 to 28 inches), and C (28 inches to 9 feet). Portions of TP-5 and TP-8 soil profiles appear to have been reworked by Dugout Creek; the upper four feet of TP-1 soil profile appear disturbed. Undisturbed Type TS soils have acceptable physical and chemical characteristic results consistent with requirements outlined by DOGM's soil and overburden guidelines as recorded in Table 2-1.

Other undisturbed soils located within the Disturbed Area Boundary and described by the SCS soils Order-III survey include Croydon loam, Comodore-Datino Variant complex, and Rock Outcrop-Rubbleland-Travessilla complex soils.

Soil Productivity

Current soil productivity for the undisturbed and/or slightly disturbed soils is reported by the 1996 survey for living cover percentages as recorded in Section 321.100.

Substitute Topsoil

The disturbed soils within the mine area have been significantly altered by previous mining activities and have lost their native identities. These disturbed soils, or overburden materials, typically contain waste rock and/or coal waste. With the exception of rock fragments and coal waste, these overburden materials have physical and chemical properties that are within DOGM's acceptable range for soil and overburden guidelines and could therefore be considered a substitute topsoil. The Division recognizes that native soils contain high percentages of rock fragments, is inevitable and does not present a reclamation hazard. Indeed, to reclaim and restore

[2]Soil Conservation Service, U.S. Department of Agriculture, Agriculture Handbook No.436, pp 288-289.

the land to pre-mining conditions will require soils with indigenous rock fragment volumes and content. Therefore, it is not only acceptable, but desirable to salvage soils containing intrinsic rock. Waste and coal waste will be segregated from the soils and disposed of properly.

Findings:

The information provided meets the regulatory requirements of this section.

ALLUVIAL VALLEY FLOORS

Regulatory Reference: R645-302-320.

Analysis:

The Phase 2 submittal presented several factors that preclude the mine site from being classified as alluvial valley floors. Based on information presented, the following findings can be made:

- No significant deposits of stream-laid alluvium exist within the permit area. The closest areas of alluvium occur outside the permit area, approximately 2,000 feet downstream area along Dugout Creek and 600 feet north in the headwaters of Pine Canyon.

- Stream-laid deposits within the proposed disturbed area do not "hold" Dugout Creek as required by the AVF definition. The Dugout Creek is generally held by underlying bedrock.

- No irrigated agriculture has or does occur within the permit and adjacent areas.

- No flood irrigation or subirrigation of stream-laid deposits have historically occurred within the proposed disturbed area.

- Soil and topographic conditions within the proposed disturbed area preclude future flood irrigation of the site.

Finally, the proposed disturbed area occurs mainly upland. Therefore, by definition, no Alluvial Valley Floor exists.

Findings:

The information provided meets the regulatory requirements of this section.

PRIME FARMLAND

Regulatory Reference: R645-301-221, -302-270.

Analysis:

No prime farmland has been identified within the presently proposed Dugout Canyon Mine permit area. A negative prime farmland determination was concluded in 1980 for the Sage Point-Dugout Mine permit (ACT/007/009). Within the immediate mine facilities area, the Soil Conservation Service's (SCS) "Soil Survey of the Carbon County Area"[3] identify Croydon Loam, Comodore-Datino Variant complex, Midfork family-Comodore complex, and the Rock outcrop-Rubbleland-Travessilla complex as non-irrigated soils. The Croydon Loam is rated good for livestock grazing and is well suited for timber harvesting of aspen. For Comodore-Datino Variant, Midfork family-Comodore complex, and Rock outcrop-Rubbleland-Travessilla complex, these soils are not considered grazeable by livestock and the soil-unit areas are limited for harvesting wood products because of slope steepness, surface stones and boulders, and abundant rock outcrops.

Findings:

The information provided meets the regulatory requirements of this section.

OPERATION PLAN

TOPSOIL AND SUBSOIL

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

Analysis:

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[3]Jensen, E. H., and Borchert, J. W., 1988. Soil Survey of Carbon Area, Utah. Soil Conservation Service, U. S. Department of Agriculture, Washington D. C.

Chapter 2, Soils, Sections 230 through 234, discusses the soil's operation plan for the proposed Dugout Canyon Mine. Relevant information includes soil salvage, stockpiling, and topsoil substitutes and supplements. The Analysis section discusses operational information as follows:

- Topsoil and Subsoil Removal
- Culvert Expansion Soil Removal
- Topsoil Substitutes and Supplements
- Topsoil Storage

Topsoil and Subsoil Removal

The PAP attempts to preserve and protect the natural soil resources by using soil salvage plans for maximizing soil recovery volumes for both topsoil and subsoils within Type TS soils. All B and C horizons will be salvaged in addition to salvaging the A horizon topsoil from the undisturbed, Type TS soils for salvage areas #2, 3, and 4. The undisturbed TS soils are deep rich Mollisols, with deep subsoils (B and C horizons) of excellent quality material available for salvage. These B and C horizon soils will be salvaged, segregated and stockpiled as substitute topsoil.

The estimated volumes of stockpiled soils are presented in Table 2-2 and in Appendix 2-6 which includes soil recovery calculations. Topsoil and subsoils are salvaged from the northwest facilities area (area 2) will yield 1,653 CY; the coal storage (area 3) will yield 4,869 CY; the sediment pond, slope area areas between road and creek (areas 4, 6, 7) will yield 20,118 CY; the water tank area (area 8) overburden soils will yield 247 CY; and the Dugout Creek culvert area (area 5) will yield 1,568 CY. In total, 28,455 CY of soil will be salvaged and stockpiled.

A non-biased, third party, professional soil scientist will be on-site during soil salvage to monitor and supervise soil salvage operations for the purpose of maximizing soil salvage volumes and quantities. Surface disturbance activities will only take place after topsoil removal.

Undisturbed soils marked #96 will not be disturbed although they are within the disturbed boundary. These southwest facing, undisturbed soils are therefore considered a buffer zone.

Soils to be salvaged prior to construction are those labeled with TS on Plate 2-2. The A,

B and C horizons will be salvaged.

The estimated volumes of stockpiled soils are presented in Table 2-2 and in Appendix 2-5 (Soil Removal from Within the Culvert Expansion Area) and Appendix 2-6 (Topsoil, Substitute Topsoil, and Storage Pile Calculations). An estimated total of 28,455 CY of soil will be salvaged and stockpiled.

During a technical site visit on August 5, 1998 by Priscilla Burton, Robert Davidson, and Paul Baker of the Division and Scott Boylen of Canyon Fuels Inc., additional areas of TS soils were noted that were identified as either needing protection during operations or as requiring salvage during the expansion of the site in Phase II, as described below:

- the soils on the southwest facing slope where the north and east drainages of Dugout Creek unite. These soils will be impacted by proximity of the future coal storage pile and they should be salvaged during Phase II expansion.

- The soils on the west facing slope in the area of the coal storage pile. Most of this slope is undisturbed soil that must be salvaged during Phase II expansion. The area of salvage should be from the existing roadway at the north end of the pad to the rock outcrop at the location of the proposed transfer house (not as shown on Plate 5-2, but the new proposed location as explained by Scott Boylen, DugOut Project Engineer). The distance of salvage is approximately 300feet.

Culvert Expansion Soil Removal

Canyon Fuel Company has committed to salvage soils from steep slopes within the culvert expansion area along Dugout Creek provided that salvage operations do not jeopardize slope stability and safety of construction workers. A qualified soils scientist will decide which soils from steep slopes are suitable for salvage. The construction supervisor will decide which slopes are safe to remove soil from. By mutual agreement, the decision for soil salvage on what slopes will be made based on slope steepness, the potential for slope failure, and timing within the construction sequence. Timing is critical to help maximize safety and slope integrity during salvage operations by coordinating culvert installation and fill placement immediately after soil removal. The placed fills will stabilize the hillsides and will remain in place at final reclamation. After construction, an as-built map will illustrate which areas received salvaged and what volumes of soil were salvaged.

Installation of a culvert in Dugout Creek will result in the removal and storage of

1,568 CY of riparian soil. The soil removal volumes are based on the assumption and calculations provided in Appendix 2-5. Soils removed during culvert construction will be stored separately from other soils and are expressly designated for reclamation of the Dugout Creek, riparian area. Soils on the northwest facing slope of the stream on the opposite bank from the operations pad at the location of the sediment pond will not be salvaged due to their importance in stabilizing the steep stream bank. The idea of protecting the soils with geotextile fabric was discarded after it was determined that the stream bank would not be re-exposed during reclamation, since the channel will be moved westward to improve stability of the slope. Therefore this 300 foot length of streambank soils will be buried in the fill in order to stabilize the entire slope above. The Division concurs with this judgement.

Topsoil Substitutes and Supplements

The Facilities area (Area 1 on Plate 2-2). Soils from Area 1 will be utilized as substitute topsoil at final reclamation if they are not contaminated. Appendix 2-6 provides calculations showing that if 2 feet of material is recovered from this location, approximately 6.504 CY of additional substitute topsoil could be available after testing and approval for use. Any waste will be segregated from the soil material and material heavily contaminated with coal waste will not be used.

Culvert installation and pad construction will require importing fill. The PAP commits to demonstrate the suitability of the imported fill by determining if the fill is acid- and/or toxic-forming prior to placement. Acid and/or toxic-forming materials will not be used.

Topsoil Storage

As stated in the PAP, the topsoil stockpile will be located at the Soldier Canyon Mine topsoil storage area (Plate 2-3) with the Dugout stockpile marked and kept separate from the Soldier Canyon Mine stored soils. A contiguous containment berm separates the Dugout soil pile from the Soldier Canyon Mine piles. The containment berm is designed as a self contained Alternate Sedimentation Control Area (ASCA). Section 231.400 gives the construction, modification, use, and maintenance of the storage piles. The pile is designed to hold a maximum volume of 17,000 CY of soil. The total projected volume of soil salvage from Dugout, culvert expansion area, and topsoil borrow is 28,455 CY of soil. An expansion of the Soldier Canyon Mine topsoil storage area is anticipated by bothe the applicant and the Division. An application for expansion must be filed and approved prior to approval of Phase II.

The current Soldier Canyon Mine soil stockpile is infested with Cheatgrass.

Therefore, the operator has committed to maintain, to the extent possible, the stockpile's interim vegetation in a noxious weed- and Cheatgrass-free state. Discussion has focused on controlling the Cheatgrass using both selective and non-selective herbicides in early spring before dormancy breaks with other desirable plants, and by using pre-emergent herbicides in the fall to kill germinating Cheatgrass.

The PAP states that stockpiled soil in jeopardy of being detrimentally affected in terms of soil quantity and quality by mine operations may be temporarily redistributed. Such action will only take place by prior approval of DOGM with appropriate amendment changes to the MRP.

Findings:

The permittee must provide the following, prior to approval, in accordance with the requirements of:

R645-301-234, a designated location for the storage of the additional topsoil to be generated by the expansion of Phase II. The present capacity of existing storage location (17,000 CY) will be exceeded by approximately 11,455 CY.

R645-301-232.100 Descriptions of topsoil and subsoil removal and estimates of salvage volumes during Phase II should include the two locations as discussed during a technical site visit on August 5, 1998 and as described above under the **Topsoil and Subsoil** heading.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

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

Analysis:

Chapter 2, Soils, Sections 240 through 250, discusses the soil's reclamation plan for the proposed Dugout Canyon Mine. Appendix 2-6 provides information on topsoil volumes. Chapter 5, section 542.200, and Chapter 3, section 341.200, address slope stability and erosion control, respectively. Reclamation Topography is shown on Plate 5-5 and Reclamation Cross-

Sections are shown on six sheets of Plates 5-6. This Analysis section discusses reclamation information as follows:

- Soil Redistribution
- Soil Nutrients and Amendments
- Soil Stabilization

Soil Redistribution

Cut and fill calculations for the site are found on page 5-61 and Appendix 5-5. An estimated 99,630 CY are needed for fill and an estimated cut quantity is 97,575 CY. This leaves a difference of 2,055 C Y of fill.

Topsoil will be replaced on all areas with slopes less than 2:1 (page 2-38). Based on the 28, 455 CY of salvaged soil (see Appendix 2-6) and 14.7 acres or 640,332 sq ft to receive topsoil, the average soil redistribution will be a depth of 14.4 inches as stated on page 2-39 of the MRP. However, the soils salvaged from the culvert expansion, 1,568 CY, were included in the soil redistribution depths, but should not have been, since these soils will be returned to the reclaimed channel area. This reduces the reclamation topsoil depth to 13.6 inches. (26,887 CY x 27 CF/CY = 725,949 CF. 725,949 CF x 640, 332 SF = 1.13 ft or 13.6 inches.) If the underlying material is suitable, these soil depths will allow for the implementation of surface roughening reclamation techniques, such as deep pocking, or gouging of the soil surface without penetrating the subsurface fills. Should the additional 6,504 CY of topsoil substitute material become available during reclamation, the topsoil depth would increase to approximately 16 inches. If excess soil is available after channel reclamation, then these excess soils may be used else where in the disturbance area.

Where dictated by the reclamation channel design, riparian soils (1,568 CY salvaged and stored separately) will be placed within the interstitial spaces of the riprap to promote riparian vegetation establishment. Soils placed outside the riprap areas will be reseeded following soil preparation and surface.

As noted in the backfilling and grading section of the engineering review within this Technical Anaysis, all slopes should receive topsoil (R645-301-553.100). Any areas which will not receive topsoil should be identified on the Reclamation Topography Map, Plate 5-5.

Soil Nutrients and Amendments

Soil nutrients and amendments will be applied to the redistributed soils based on analyses of samples collected from the stockpiled topsoil.

Soil Stabilization

Soil stabilization practices include surface roughening techniques such as gouging and/or deep pocking, and "high -quality" erosion mat placement on slopes 2:1 or steeper (page 2-28, p2-41, pg 3-40, p3-45 and pg 3-51). No calculations for the added cost of the erosion matting and installation were found in Appendix 5-6 Bond Calculations. The Division is unclear as to how the application of erosion control matting will occur over the gouged surface.

Soil may be replaced at grades of up to 1.5H:1V (page 5-70). The steepness of these slopes will be reduced at their base, providing a concave slope. Slopes which are 3H:1V or or steeper will be gouged using a trackhoe (page 5-70).

Soil redistribution with the culvert expansion area will require placing soils on slopes greater than 2:1. According to the reclamation cross sections, these steep slopes exist throughout the reclaimed channel for Dugout Creek. Figure 3-1 shows a cross-section of the riprapped channel. The PAP does not discuss soil placement techniques on these steep slopes that drop directly into Dugout Creek.

The plan explains that any contaminated surface soil within the disturbed area will be removed and stored during final reclamation. Furthermore, the plan says that if the contaminated soils can not be rehabilitated, the contaminated material will be buried along with excess gravels, crushed stone, or other contaminants.

Soil stabilization techniques after topsoil is placed on steep slopes greater than 2:1 are needed, especially within the stream corridor where the culvert will be removed. Specific techniques should be stated in accordance with slope steepness to ensure that soil will remain intact on the steep slopes while vegetation is being established.

Findings:

The permittee must provide the following, prior to approval, in accordance with the requirements of:

R645-301-242, The soils salvaged from the culvert expansion, 1,568 CY, were included in the soil redistribution depths in App 2-6, but should not have been, since these soils will be returned to the reclaimed channel area. This reduces the reclamation topsoil depth to 13.6 inches. Appendix 2-6 should be modified to reflect the segregation and selective replacement of the riparian area soils.

R645-301-233, Specific locations of erosion control matting use should be identified in the MRP and calculated into the bonding. Other possible soil stabilization techniques for slopes greater than 2:1 should be stated, should erosion control matting be eliminated from the plan.

R645-301-240, The MRP should be revised to indicate that all slopes will receive topsoil.
Slopes which will not receive topsoil should be identified on the Reclamation Topography Map, Plate 5-5.

cc: Robert Davidson
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