

0062



State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

March 9, 1998

TO: File

THRU: Daron Haddock, Permit Supervisor 

FROM: Robert Davidson, Soils Reclamation Specialist 

RE: Soils Technical Analysis of the Permit Application Package (PAP) and the Mining and Reclamation Plan (MRP), Canyon Fuel Company, LLC, Dugout Canyon Mine. PRO/007/039-PM97A, Folder #2, Carbon County, Utah

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

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:

- Prime Farmland Investigation
- Soil Survey Information
- Disturbed Soils
- Undisturbed Soils
- Soil Productivity
- Substitute Topsoil

Prime Farmland Investigation

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"¹ 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.

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 discrepancy 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 Overburden²; 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

¹Jensen, E. H., and Borchert, J. W., 1988. Soil Survey of Carbon Area, Utah. Soil Conservation Service, U. S. Department of Agriculture, Washington D. C.

²Leatherwood, 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.

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.

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 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 Haploborolls³ 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

³Soil Conservation Service, U.S. Department of Agriculture, Agriculture Handbook No.436, pp 288-289.

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 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.

OPERATION PLAN

TOPSOIL AND SUBSOIL

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

Analysis:

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, 4A, and 4B. 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.

Area #4B is identified as topsoil borrow. Soils from Area #4B will be utilized as substitute topsoil at final reclamation. The PAP states that soils will be removed from this area during construction to protect the soils from coal fines originating from coal haulage trucks and to reduce steep slopes adjacent to the haulage road. A significant portion of the needed soil volume for reclamation is contained within this area; that is, 7680 CY of soil, or 50% of the total volume of soil projected for the 15 inches of soil cover over the 7.6 acres of disturbance. Without this soil borrow, only 7.5 inches of soil is available. The bottom line is that the volume of borrow soil contained in Area #4B is critical for revegetation success at reclamation which meets regulatory requirements. *However, regulations also require that the MRP contain a plan for protecting vegetation by disturbing the smallest practicable area at any one time. Therefore, until borrow soil is needed for reclamation, or will be disturbed for approved mining activities, it needs to be left in place, undisturbed, and under established natural vegetation. Preserving borrow soil in-place until reclamation not only preserves soil structure under natural vegetation cover, but also allows "live haul" of the soil at reclamation. "Live haul" gives the greatest success for reclamation and vegetation re-establishment because soil structure is much less impacted and soil microbiology remains viable and active. Stockpiled soil can be negatively impacted with weeds, severely damaged soil structure, and non-existent micro-flora, depending on storage duration and stockpile depth.*

The estimated volumes of stockpiled soils are presented in Table 2-2 and in Appendix 2-5 which includes soil recovery calculations. Topsoil and subsoils are salvaged from the temporary waste rock storage area (4,869 CY), the sediment pond area (8,684 CY), the water tank area (1,120 CY) and the Dugout Creek culvert area (1,051 CY). Overburden soils are salvaged from the water tank area (553 CY). In total, 16,257 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.

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.

Appendix 2-5 contains additional information regarding soil removal from within the culvert expansion area of the Dugout Creek. The Appendix contains an original report submitted to the Division on October 15, 1997, a modified, updated Plate 2-5A, and an addendum correcting soil salvage volumes due to a correction in the disturbance area boundary. The original appendix and Plate 2-5A shows seven different salvage areas along Dugout Creek. The culvert expansion project has been modified by shortening the downstream portion of the culvert. As a result, Areas 1, 2, and 3 will not be disturbed and soils will not be removed. This results in a 517 CY reduction of soil salvaged from these three areas.

Except for the large woody vegetation, all vegetation will be salvaged with the soil and incorporated in the stockpiled soils. The approximate volume of soil to be removed is calculated at 1,051 CY. The soil removal volumes are based on the assumption and calculations provided in Attachment B and the Addendum of 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.

Topsoil Substitutes and Supplements

Substitute topsoil are identified in three different categories as follows for salvage and possible use during reclamation:

1. The B and C horizon soils from the temporary waste rock storage area, the sediment pond area and the area southwest of the sediment pond will be salvaged prior to construction and used during reclamation as substitute topsoil.
2. The disturbed soils within the water tank area will also be removed and stored prior to construction. Soil volume is estimated at 533 CY.
3. The proposed coal pile area contains disturbed soils that meet the Division's guidelines for topsoil and overburden. Approximately 6,504 CY of substitute soils could be generated during reclamation from this area after they have been tested and approved for use. This volume of soil is not included in the calculations for soil salvage or available topsoil/growth media. Any waste will be segregated from the soil material and material heavily contaminated with coal waste will not be used.

Soils listed in #1 and #2 above will be salvaged and used in conjunction with salvaged topsoil during reclamation. With the exception of the coarse fragment concentration, the physical and chemical properties of the overburden and the B and C horizon soils fall within the "acceptable range" of the Division Guidelines for substitute topsoil.

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 16,257 CY of soil.

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:

R645-301-232.100, R645-301-232.720 and R645-301-331, In order to meet regulation requirements, the volume of borrow soil contained in Area #4B is critical for revegetation success at reclamation. However, regulations also require that the MRP contain a plan for protecting vegetation by disturbing the smallest practicable area at any one time. Therefore, until borrow soil is needed for reclamation, or will be disturbed for approved mining activities, it needs to be left in place, undisturbed, and under established natural vegetation. Preserving borrow soil in-place until reclamation not only preserves soil structure under natural vegetation cover, but also allows "live haul" of the soil at reclamation. "Live haul" gives the greatest success for reclamation and vegetation re-establishment because soil structure is much less impacted and soil microbiology remains viable and active. Stockpiled soil can be negatively impacted with weeds, severely damaged soil structure, and non-existent microflora, depending on storage duration and stockpile depth.

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. The Analysis section discusses reclamation information as follows:

- Soil Redistribution
- Soil Nutrients and Amendments
- Soil Stabilization

Soil Redistribution

Based on the 7,526 CY of salvaged soil (excluding 1,134 CY culvert topsoil) and 7,680 CY of borrow soil, an average soil redistribution across the 7.6 acres of disturbance yields a depth of 15 inches is available during reclamation. These deeper soil depths allow for the implementation of surface roughening reclamation techniques, such as deep pocking, or gouging of the soil surface without penetrating the subsurface fills.

The soils salvaged from the culvert expansion, 1,134 CY, were not included in the soil redistribution depths since these soils will be returned to the reclaimed channel area. If excess soil is available after channel reclamation, then these excess soils may be used elsewhere in the disturbance area. Where dictated by the reclamation channel design, soils 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 roughening.

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. 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 Nutrients and Amendments

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

compaction and reduce erosion.

Reclamation Cross Sections, Plate 5-4, within Dugout Creek channel which exceed 2:1 are shown as follows:

Horz./Vert.	Degree Slope	Number of X-Sections Dugout Creek Channel
< 2:1	< 25	39
2:1 < 1¾:1	25 < 30	11
1¾:1 < 1½:1	30 < 34	11
1½:1 < 1:1	34 < 45	12
≥ 1:1	≥ 45	4

Shading indicates slopes greater than the Angle-of-Repouse.

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:

R645-301-233, 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.