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State of Utah
DEPARTMENT OF NATURAL RESOURCES
BRIAN C. STEED
Executive Director
Division of Oil, Gas and Mining
JOHN R. BAZA
Division Director

March 19, 2020

Kirk Nicholes, Resident Agent
Alton Coal Development, LLC
463 North 100 West, Suite 1
Cedar City, Utah 84720

Subject: Appendix 9-1 Prime Farmland Soils, Alton Coal Development, LLC, Coal Hollow Mine, C/025/0005, Task #6066

Dear Mr. Nicholes:

The Division has reviewed your application. The Division has identified deficiencies that must be addressed before final approval can be granted. The deficiencies are listed as an attachment to this letter.

The deficiencies authors are identified so that your staff can communicate directly with that individual should questions arise. The plans as submitted are denied. Please resubmit the entire application by no later than April 20, 2020..

If you have any questions, please call me at (801) 538-5350.

Sincerely,

Steve Christensen
Coal Program Manager

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Technical Analysis and Findings

Utah Coal Regulatory Program

PID: C0250005
TaskID: 6066
Mine Name: COAL HOLLOW
Title: APP 9-1 PRIME FARMLAND SOILS

Special Categories

Prime Farmland Application Contents

Analysis:

The application meets the State of Utah R645 requirements for Prime Farmland: Soil Survey.

Appendix 9-1 provides the 2018 North Lease pre-disturbance prime farmland soil data required by a commitment in Volume 9, Section [R645-302]-317.400. Appendix 9-1 Procedures explains how the nuclear gauge measurements were taken; why the nuclear gauge is preferable to soil laboratory data, and how the nuclear gauge measurements are the most reliable and efficient for the purpose of confirming soil redistribution density in real time.

The following information is found within Appendix 9-1:

Figure 1 shows sample locations as a “P” in a blue circle. (There is no legend on this figure.)

Table 1 and Appendix A provide the Intermountain Laboratory data.

Appendix B provides photographic documentation of each soil pit and the pedon sampled.

Appendix C provides photographs of the soil profile box made to archive each location.

Table 2 and Appendix D are the GEM Engineering field density test summary sheets.

Table 2 provides the conversion of field data dry density to dry density in g/cm3 for comparison with final nuclear gauge density.

Soil density data was gathered to add to the previously collected baseline data for prime farmland soil chemistry and density as required by R645-302-314.120. The density of the redistributed prime farmland soils is important because of its effect on yields (R645-302.317.510). Root growth decreases linearly with increasing bulk density. Bulk density is defined as the weight of dry soil per unit of volume and is expressed in g/cm^3. Roots cannot penetrate silty clay with a bulk density of 1.58 g/cm^3 or greater. Roots cannot penetrate pure clay with a bulk density of 1.47 g/cm^3. Roots cannot penetrate sand with a bulk density of 1.75 g/cm^3 or greater (NRCS).

Appendix 9-1 describes the procedure for collecting soil samples for laboratory analysis. In June 2018, soil pits were excavated to four feet deep on 2.2 acre centers. Soil samples were taken by horizon or in 12 inch increments, bagged and sent to Intermountain Laboratory (IML) in Wyoming for analysis of parameters described in Section

R645-302-317.400. Soil pH was also monitored during salvage.

Table 1 presents the IML data. Most of the soils sampled had a texture of silty clay loam or silty clay. Analytical data from the IML provides an excellent record of the existing pH, EC, SAR , available water capacity and texture of the soil.

The IML bulk density data is not accurate, and not a suitable method for monitoring redistribution of prime farmland soil, because the volume of the original soil core was not recorded. To report bulk density from laboratory data, one must have a volume component. The IML bulk density data were obtained by picking out a soil clod from the 1 gallon bag. The volume of the clod was obtained by coating it in paraffin (to preserve the pore space within) and measuring its displacement in water. (The methods and results were confirmed with K. Secor , Intermountain Laboratory, 1/14/20). IML reported bulk density values were between 2.69 tand 24.5 g/cm^3. Compare those reported bulk density figures to the average bulk density of rock, 2.65 g/cm^3. (NRCS)

Gathering and preserving soil aggregates for a bulk density analysis is unsuitable for monitoring redistributed prime farmland soil density in a timely manner. Therefore, the Permittee will gather density data with a nuclear gauge data in an effort to develop a rapid analysis of compaction and a pre-disturbance data set.

Table 2 presents a lot of information, only some of which is pertinent to the density of the undisturbed prime farmland. For example, the columns of **laboratory data** relate the optimum moisture for maximum compaction and the corresponding density at maximum compaction in lbs/ft^3. [Since engineers are concerned with getting maximum compaction, the laboratory results are intended to be used when achieving maximum compaction is the goal. This situation is to be avoided on agricultural lands.]

The Table 2 columns of **field data** provides readings of pre-disturbance % compaction and moisture content, which are converted into dry density (three right hand columns of the data sheet). The dry density measurements reported in lbs/ft3 can be converted to g/cm^3 by a factor of 0.016. (i.e. 1 lb/ft^3 x 0.00058 lb/in^3 x 27.6799 g/cm^3 = 0.016 g/cm^3).

For example: Prime 1, -6” sample has a dry density value of 76.7 lbs/ft^3 . It’s dry density (at 18.3% moisture) equates to 1.23 g/cm^3. i.e. 76.7 lb/ft^3 x 0.016 = 1.23 g/cm^3. This is the particle density of the soil. The value accounts for pore space at a specified moisture content.

Citation:

NRCS publication Soil Bulk Density/Moisture/Aeration. Guides for Educators. Available online at https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053260.pdf .

pburton

Prime Farmland Soil Replacement

Analysis:

The application does not meet the State of Utah R645 requirements for Prime Farmland: Performance Standards, Soil Reconstruction.

Appendix 9-1 Summary states that if baseline density is exceeded, a disc will be used to relieve compaction. Discing soil can relieve compaction to a maximum depth of 10 inches. The plan must indicate that if a disc is used to relieve compaction, density will be measured at each 10 inch lift. Or the plan could indicate that a subsoiler/v-ripper will be used to relieve compaction in the C or BC horizons when density measurements are exceeded. Using a subsoiler/v-ripper can be adjusted to relieve compaction down to 22 inches.

The plans to prevent compaction of redistributed prime farmlands are described in Volume 9, Sections [R645-302]-317.510 and 317.530.

Nuclear gauge data presented in Appendix 9-1 Table 2 and Appendix D document the pre-disturbance prime farmland baseline dry density in g/ cm^3. The Appendix 9-1 Summary provides the average prime farmland soil densities to be replicated in final reclamation. These average converted dry densities are derived from Table 2 as follows: A horizon = -1.35 g/cm^3, B horizon = 1.53 g/cm^3, C horizon = 1.62 g/cm^3. Each replaced horizon will be measured by nuclear gauge and the converted dry density will be compared to these averages.

Citation:

USDA-NRCS. 2017. Tillage Equipment. Pocket Identification Guide. p.24

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1323703.pdf accessed 3/17/20020

Deficiencies Details:

The application does not meet the State of Utah R645 requirements for Prime Farmland Soil Reconstruction. The following deficiency must be addressed prior to final approval:

R645-302-317.510, The method of demonstrating that the density of reconstructed prime farmland soil will not limit agricultural yield must be explained in Appendix 9-1 or Chapter 9. Appendix 9-1 Summary states that if baseline density is exceeded, a disc will be used to relieve compaction. Discing soil can relieve compaction to a maximum depth of 10 inches. The plan must indicate that if a disc is used to relieve compaction, density will be measured at each 10 inch lift. The plan must indicate that if a disc is used to relieve compaction, density will be measured at each 10 inch lift in the C or combined BC horizon. Or the plan could indicate that density will be measured every 24 inches in the C or combined BC horizon and that a subsoiler/v-ripper will be used to relieve compaction in the C horizon when density measurements are exceeded. Using a subsoiler/v-ripper can relieve compaction down to 22 inches.

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