COALEX COMPARISON REPORT - 45

January, 1986

TOPIC: TOPSOIL SUBSTITUTES*

* This report is based on the most recent documents identified in the COALEX file. A state may have additional or revised rules or procedures not contained in the COALEX file.

SEARCH RESULTS:

Sec. 515(b)(5) of the Federal Surface Mining Control & Reclamation Act (SMCRA) requires the removal, segregation, and preservation of topsoil from the area to be mined. However, other strata may be similarly removed, segregated, and preserved if the topsoil is of insufficient quantity or of poor quality, or if other strata can be shown to be more suitable for sustaining vegetation.

Given this statutory framework, questions arise as to when topsoil substitutes can be used, what criteria for using substitutes is mandated by federal regulation, and what criteria is left to the discretion of the states. This Report focuses on the federal regulations and the various state equivalents pertaining to soil substitutes.

Federal Regulations

OSM's permanent program regulations include the general provisions of SMCRA providing for the removal, storage, and replacement of topsoil or a substitute. The regulations also include direction as to when a topsoil substitute may be used and what tests must be performed.

OSM defines topsoil as "the A & E soil horizon layers of the four master soil horizons." The federal regulations promulgated pursuant to SMCRA list four major soil horizons. The A horizon, often called the surface soil, is the part of the soil in which organic matter is most abundant. Leaching of soluble or suspended particles is typically the greatest in the A horizon. The layer near the surface and below the A horizon is known as the E horizon. An E horizon is most commonly differentiated from the A horizon by a lighter color and generally has measurably less organic matter. It can be differentiated from the B horizon by color of higher value or lower chroma, or by a coarser texture. Immediately below the E horizon is the B horizon, commonly known as the subsoil. This layer commonly contains more clay, iron, and aluminum than the other three horizons. The deepest layer of the soil profile, known as the C horizon, consists of loose material or weathered rock that is relatively unaffected by biologic activity. (30 CFR Sec. 701.5) If topsoil of sufficient quality and quantity is available, it must be removed, segregated, and replaced in accordance with 30 CFR Sec. 816.22 or 817.22. However, situations may arise in which the available topsoil is too thin or of poor quality for sustaining revegetation. Recognizing these problems, the re= gulations provide for the use of selected overburden materials as a substitute for or as a supplement to existing topsoil. (30 CFR Sec. 816.22(b), 817.22(b))

Before removing the topsoil and the substitute materials to be used, the operator must demonstrate to the regulatory authority that the resulting medium is equal to, or more suitable

for sustaining vegetation than, the existing topsoil and is the best available in the permit area. (30 CFR Secs. 816.22(b) and 817.22(b)) If use of a substitute or supplement is approved, the alternative material should be treated in accordance with topsoil handling requirements found in 30 CFR Secs. 816.22 and 817.22.

Insufficient Quality

The factors which an operator is required to evaluate to demonstrate the suitability of a soil substitute are found in the reclamation plan requirements of 30 CFR Secs. 780.18(b)(4) and 784.13(b)(4). Several tests are mandated by federal regulation: analysis of the thickness of soil horizons, total depth, texture, percent coarse fragments, pH, and areal extent of the different kinds of soils. (Id.) Other tests may be performed if deemed "necessary and desirable" by the regulatory authority; including field-site trials or greenhouse tests. (Id.) Tests for net acidity or alkalinity, phosphorus and potassium were deleted from the final rules, but may be conducted according to local conditions. (46 FR 22092, 22093 (1983))

Interpretive rules found at 30 CFR Secs. 816.200 and 817.200 clarify when and how these tests should be conducted. Both the existing topsoil and the proposed substitute must be tested in order to show the advantage of using the substitute and the results must be certified by an approved laboratory. Sources where the analysis, trials, and tests may be obtained are also listed. (30 CFR Sec. 816.200(c)(1), 817.200(c)(1)) If the operator can demonstrate through soil survey or other data that the topsoil is insufficient and substitute material will be used, only the substitute must be analyzed under 780.18(b)(4) and 784.13(b)(4).

If surface soils have not already been mapped, an operator may request the Soil Conservation Service to conduct a soil investigation. Other data may also be accepted or required which has been collected according to National Cooperative Soil Survey Standards. (45 FR 39446, 39447 (1980))

No regulatory provisions were identified at the federal level that specifically indicated the number or frequency of soil samples that may be necessary on a mine site prior to approval of a topsoil substitute. However, several states have adopted rules requiring a certain number of soil samples. This information, taken from a April, 1984 survey conducted by the Interstate Mining Compact, is summarized in Table 1.

Insufficient Quantity

The federal regulations provide guidelines for thin topsoil situations. If the topsoil is less than six inches thick, the operator may remove the topsoil and the unconsolidated materials directly below and treat the mixture as topsoil. (30 CFR Secs. 816.22(a)(2) and 817.22(a)(2)) This six inch requirement is a minimum, so additional material may be required to be saved if necessary to ensure soil productivity. (44 FR 15138, 15140 (1979)) However, this minimum does not apply if more than six inches of topsoil is available; in that situation all existing topsoil must be removed. (46 FR 22092, 22094 (1983))

State Regulations

A search was conducted of the states listed with COALEX to determine what topsoil substitution tests are required. In addition, results of a survey conducted by the Interstate Mining Compa= ct Commission on topsoil and overburden handling procedures were utilized.

Many of the states identified use the same criteria for approval as is found in the federal regulations. Thus, selected overburden materials may be used as a topsoil substitute or supplement if the operator can demonstrate to the regulatory authority that the resulting soil medium will be equal to or more suitable than the existing topsoil for sustaining revegetation. However, the tests which must be conducted to demonstrate the suitability of the substitute vary from state to state.

Seven states (Missouri, Kentucky, Virginia, Louisiana, Maryland, Mississippi, and Arkansas) use the mandatory tests found in earlier versions of the federal regulations. (See 30 CFR Secs. 816.22(e)(I) and 817.22(e)(I) (1982)) These tests are: pH, net acidity or alkalinity, phosphorous, potassium, and texture class. In addition, other tests may be required by the regulatory authority (see Table 2).

Three states reported that substitution is not utilized. In Kansas, there is no overburden substituted for the A or B horizons; in Iowa, none is substituted due to the geology.

Pennsylvania's regulatory requirements for surface coal mining do not allow for topsoil substitutes. However, subsoil substitutes are allowed under the provisions found in Appendix A-1.

The remaining fifteen states use a variety of tests to determine the adequacy of topsoil substitutes. These tests are listed on Table 3. All states require testing for pH, while seven or more require testing for texture class, potassium, phosphorous, net acidity/alkalinity, electrical conductivity and sodium absorption ratio. In Wyoming, revegetation test plots for subsoil are mandatory. (Wyoming Land Quality Regulations, Sec. 2c(2))

Oklahoma's proposed topsoil substitute plan requires a variety of tests according to which strata are to be used. A number of tests are required for all strata, but additional tests are to be performed on subsoil and geologic strata. (See Appendix A-2)

ATTACHMENTS:

A. 44 FR 15138 (1979).
B. 45 FR 39446 (1980).
C. 48 FR 22092 (1983).
D. Wyoming Land Quality Division Regulations, Sec. 2c(2) (1980).

APPENDIX A
A-1 Pennsylvania Narrative on Subsoil Substitutes
A-2 Oklahoma Narrative on Topsoil Substitutes

TABLE 1: OVERBURDEN CORE SAMPLES REQUIRED
(IMCC Survey, 4/24/85)
(Reformatted from original)

ALABAMA
1 per 40 acres - mines less than 100 aces.
1 per 80 acres - mines greater than 100 acres.

ILLINOIS
Site specific - generally 2 per pit; 1 per 80 acres for prime farmland.

IOWA
Site specific.

INDIANA
Site specific.

KANSAS
Site specific.

KENTUCKY
Site specific - generally 1 per 1/4 mile in Eastern Kentucky, 1 per « mile in Western Kentucky.

MISSOURI
Site specific - minimum of 1 per permit area.

NEW MEXICO
1 per 150 acres; minimum of 3 per permit.

NORTH CAROLINA
Site specific.

NORTH DAKOTA
Site specific.

OHIO
Site specific.

OKLAHOMA
a) No apparent limiting factors and moderate level of soil complexity:
1) less than 2 acres - none
2) 2-25 acres - 1
3) 15-75 acres - 2
4) greater than 75 acres - 3
b) One or more apparent limiting factors and moderate level of soil complexity:
1) less than 2 acres - none
2) 2-10 acres - 1
3) 10-50 acres - 2

4) 50-120 acres - 3
5) greater than 120 acres - 4.

TEXAS
Approximately 1 per 500 acres.

UTAH
4 boreholes per section for ACR.
16 per section 1 year prior to mining.

WYOMING
Number should adequately characterize each mapping unit; suggested that at least one sample be taken for each series found. Recommended intensities:
a) 5% of mine area (or 40-60 acres) - 3 samples
b) -5% of mine area (40-160 acres) - 2 samples
c) 2% of mine area (40 acres) - 1 sample.

TABLE 2: STATES FOLLOWING 30 CFR SEC. 816.22(e)(1)
(Reformatted from original)

MISSOURI
10 CSR 40-3.030(2)(E)

KENTUCKY
405 KAR 16:050E

VIRGINIA
Coal Surface Mining Reclamation Regs., V816.22(e)

LOUISIANA
La. Surface Mining Regulations, Statewide Order 29-0-1 Sec. 216.22

MARYLAND
Md. Admin. Code, Tit. 8, Sec. 08.13.09.02

MISSISSIPPI
Surface Coal Mining & Reclamation Regs., Sec. 216.22

ARKANSAS
Surface Coal Mining & Reclamation Code, Sec. 816.22

STATES NOT USING SUBSTITUTION

IOWA
None due to geology.

KANSAS
No overburden substituted for A or B horizons.

PENNSYLVANIA
Topsoil substitutes not allowed; subsoil substitutes or supplements allowed.

TABLE 3: TESTS USED TO DETERMINE THE ADEQUACY OF TOPSOIL SUBSTITUTES
(Reformatted from original)

ALABAMA
ph; Potassium; Phosphorous Net Acidity/Alkalinity; % Coarse Fragments
Other: Weathering ability; Calcium, Sulfur (Total or Pyritic)

ALASKA
pH, Texture Class; % Coarse Fragments
Other: Thickness of soil horizons; Chemistry areal extent of soils; Mineralogy of fine earth fraction

COLORADO
pH; Potassium; Phosphorous; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio

ILLINOIS
pH; Texture Class; Potassium
Other: P1, P2, NNP

INDIANA
pH; Texture Class; Potassium; Phosphorous; Net Acidity/Alkalinity; Nitrogen; % Organic Matter; CaCo3 Equivalent/Deficiency
Other: % Pyritic Sulfur

MONTANA
pH; Texture Class; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio

MISSOURI
pH; Texture Class; Potassium; Phosphorous; Electrical Conductivity; Sodium Absorption Ratio; % Organic Matter; CaCo3 Equivalent/Deficiency
Other: Calcium, Magnesium

NEW MEXICO
pH; Texture Class; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio; CaCo3 Equivalent/Deficiency
Other: Saturation, Boron, Selenium, Molybdenium, Copper

NORTH DAKOTA
pH; Texture Class; Potassium; Phosphorous; Electrical Conductivity; Sodium Absorption Ratio; Nitrogen; % Organic Matter; Water Holding Capacity

OHIO
pH; Texture Class; Potassium; Phosphorous; % Coarse Fragments; % Organic= Matter; CaCo3 Equivalent/Deficiency

OKLAHOMA
pH; Texture Class; Potassium; Phosphorous; Electrical Conductivity; Nitrogen; % Coarse Fragments; CaCo3 Equivalent/Deficiency
Other: See Appendix A-2

TEXAS
pH; Texture Class; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio

UTAH
pH; Texture Class; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio; Nitrogen; % Coarse Fragments
Other: Saturation, Selenium, Boron, Molybdenium, Arsenic

WEST VIRGINIA
pH; Texture Class
Other: Nutrient Content

WYOMING
pH; Texture Class; Potassium; Phosphorous; Net Acidity/Alkalinity; Electrical Conductivity; Sodium Absorption Ratio; Nitrogen; % Coarse Fragments; % Organic Matter; Water Holding Capacity
Other: Revegetation test plots for subsoil required; Selenium, Boron, Arsenic

ATTACHMENTS:

A. COALEX COMPARISON REPORT - 37.
B. Short excerpts of state regulations referencing coal exploration.