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December 29, 1994

EarthFax

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Mr. Henry Sowers
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Re: Proposed Soil Sampling Program in Crandall Canyon
Castle Gate Coal Mine, ACT/007/004
Carbon County, Utah.

ACT/007/004 #2

Dear Henry:

Pursuant to our recent discussions, EarthFax recommends the following soil sampling program for the purpose of characterizing disturbed soils in Crandall Canyon. This program was developed on behalf of Amax Coal Company ("Amax") in conjunction with the proposed revisions to the post-mining reclamation plan for Crandall Canyon. The sampling is scheduled to take place this winter in order to achieve an April 30, 1995 deadline for submittal of the revised reclamation plan.

The program was developed with three main objectives in mind:

1). To collect representative samples from previously removed topsoil, currently stockpiled at two locations near the mouth of Crandall Canyon. Analytical data obtained in the process will aid in the determination of amendments, if any, that may need to be added to the topsoil to sustain vegetative cover in accordance with R645-302-350.

2). To identify and characterize the existing canyon bottom overburden within the disturbed area boundary, and identify areas, if any, that may be of concern during final reclamation.

3). To assess the potential of using existing overburden/soil admixture above the upper sediment retention pond as a substitute topsoil.

1. Topsoil Stockpile Sampling.

The location of topsoil stockpiles A and B are shown in Attachment A. In accordance with final reclamation plans (as described in Section 3.7-5 (3)), and based upon the area to be redistributed with topsoil (10.5 acres) samples will be collected from four locations, to a total depth of 8 feet, from each stockpile (Table 1). Where possible, samples will be collected using a tripod mounted auger drill rig. To minimize potential surface impact to vegetative cover, samples will, where possible, be collected from the perimeter of the stockpiled soil. Topsoil sampling is scheduled for winter, weather permitting. However, if access to the stockpiles is restricted by snow cover, and soil penetration is prevented by frozen soils, the

topsoil stockpiles will be sampled in the spring.

Where possible, samples will be composited on site, and two representative samples for each pile, one from the upper 4 feet, and one from the lower 4 feet, will be submitted for analysis as shown in Table 1. Analyses performed on the samples will be as shown in Table 2.

During a previous site visit *Cardaria draba* (whitetop) was observed to be growing on particular areas of the lower topsoil stockpile. Amax will continue to employ an active weed eradication program prior to topsoil redistribution. If, at the time of topsoil redistribution, it can be determined that the *C. draba* population is no longer viable in the stockpile, application of the topsoil will proceed according to the reclamation plan. However, if *C. draba* persists, Amax will remove soils to the depth of rhyzome penetration prior to topsoil redistribution.

2. Canyon Bottom Overburden.

A total of seven sample locations have been selected for the purpose of characterizing the existing overburden and mine shaft waste used to construct the facility pads along the canyon bottom (Attachment B). The sample locations were selected after examination of existing soil and topographic maps of the area. However, the location of the proposed pits may change as sampling progresses. Soil pits will be logged in accordance with generally accepted Soil Conservation Service ("SCS") practices. Samples will be submitted for analysis as shown in Table 3. Samples will be analyzed for the constituents outlined in Table 6 of D.O.G.M. Guidelines for Management of Topsoil and Overburden for Underground Surface Coal Mining (1988).

Vegetative cover is evident on the area west of the main facility infrastructure. Analytical data from soil samples collected from EF-4, EF-5, and EF-6 will be used to ascertain the viability of this material as a substitute topsoil.

In addition, in assessing areas of potential concern within canyon bottom overburden, sampling and analyses will be directed at determining the following:

- To identify and characterize acid- or toxic-forming materials, if any exist on site.
- If shales, present within the lower pad area will be deleterious to root development
- If any areas exist on site that may have been used to store road salt

The compositing system, as outlined in Table 3, was developed under the assumption that the material within the area of "Made Land" (Attachment-B) is relatively homogeneous, and that insufficient time has elapsed since emplacement of the overburden for the development of significant vertical stratification or soil horizons. However, previously identified soils, and/or soil phases may be encountered in the excavations. In these instances, soils, or soil phases will be analyzed on an individual basis. In the event that any potentially acid- or toxic-forming

material is encountered, additional pits will be excavated to determine the vertical and horizontal extent of the acid- or toxic-forming material.

During a previous site visit, Paul Baker (D.O.G.M.) noticed olive-colored shale on the pad immediately west of the emergency shaft. The geologic units that outcrop in the vicinity of Crandall Canyon include the North Horn Formation, and the Price River Formation. As described by Doelling (1972), the North Horn Formation consists of "Gray to green calcareous and silty shale, tan to yellow-gray, fine-grained sandstone and minor conglomerate". In addition, Doelling describes the Price River Formation as follows "Yellow-gray to white, medium-grained shaley sandstone with gray to olive green shale - contains carbonaceous shale with minor coal". Therefore, some of the constituents of the lower pad may represent interbedded shale units within local lithologies, and may appear concentrated in that particular area as a result of shaft excavation that intersected these units. The analyses from EF-3 will be evaluated to determine if the shale will be detrimental to root development.

Records filed with the Division of Environmental Response and Remediation indicate that all known underground fuel storage tanks within the Castle Gate Coal Mine complex have been removed. Therefore encountering hydrocarbon contamination is unlikely. However, areas may exist on site where road salt was stored. These areas, if any, will be tested to a depth of 4 feet to determine if any soluble salts migrated to the root zone.

It is anticipated that the sampling program will commence shortly after approval from D.O.G.M.. Further, it is my understanding that you would like to be present during our sampling activities. We will plan accordingly, and will inform you in a timely fashion of the schedule of events.

We appreciate the opportunity to provide you with this proposed sampling program, and look forward to working with you on this project.

Sincerely yours,

David McMillan

David McMillan
Geochemist

cc: Lonnie Mills - Cyprus Plateau Mining Corporation
Paul Baker - D.O.G.M.
Bill Hendrickson - EarthFax Project Manager
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TABLE 1.
STOCKPILED TOPSOIL SAMPLING PROGRAM

Stockpile	Sample No.	Depth	Composite	Analyses
A	1	0-24"	TS-1	Table 2
A	2	24-48"	TS-1	Table 2
A	3	48-72"	TS-2	Table 2
A	4	72-96"	TS-2	Table 2
B	1	0-24"	TS-3	Table 2
B	2	24-48"	TS-3	Table 2
B	3	48-72"	TS-4	Table 2
B	4	72-96"	TS-4	Table 2

Stockpile A - located adjacent to Crandall Canyon access road, and immediately west of Highway 6.
Stockpile B - located adjacent to Crandall Canyon access road, approximately 600 feet west of Highway 6.

TABLE 2.
ANALYSES FOR TOPSOIL SAMPLES

Parameter	Units	Plant Nutrient Range[1]
pH	---	6 - 9
Conductivity	µmhos/cm	Variable
Phosphorus	ppm	> 5
Potassium	ppm	> 80
Nitrate-N	ppm	> 5
Soluble Ca, Mg, Na	ppm	Variable
Texture	---	Variable

(1). Plant nutrient ranges were obtained from previously published soil data in Crandall Canyon. They are shown for comparative purposes only, and should not be used as determinative factors.

TABLE 3.
SAMPLING AND ANALYTICAL PROGRAM FOR CANYON BOTTOM OVERBURDEN AREAS

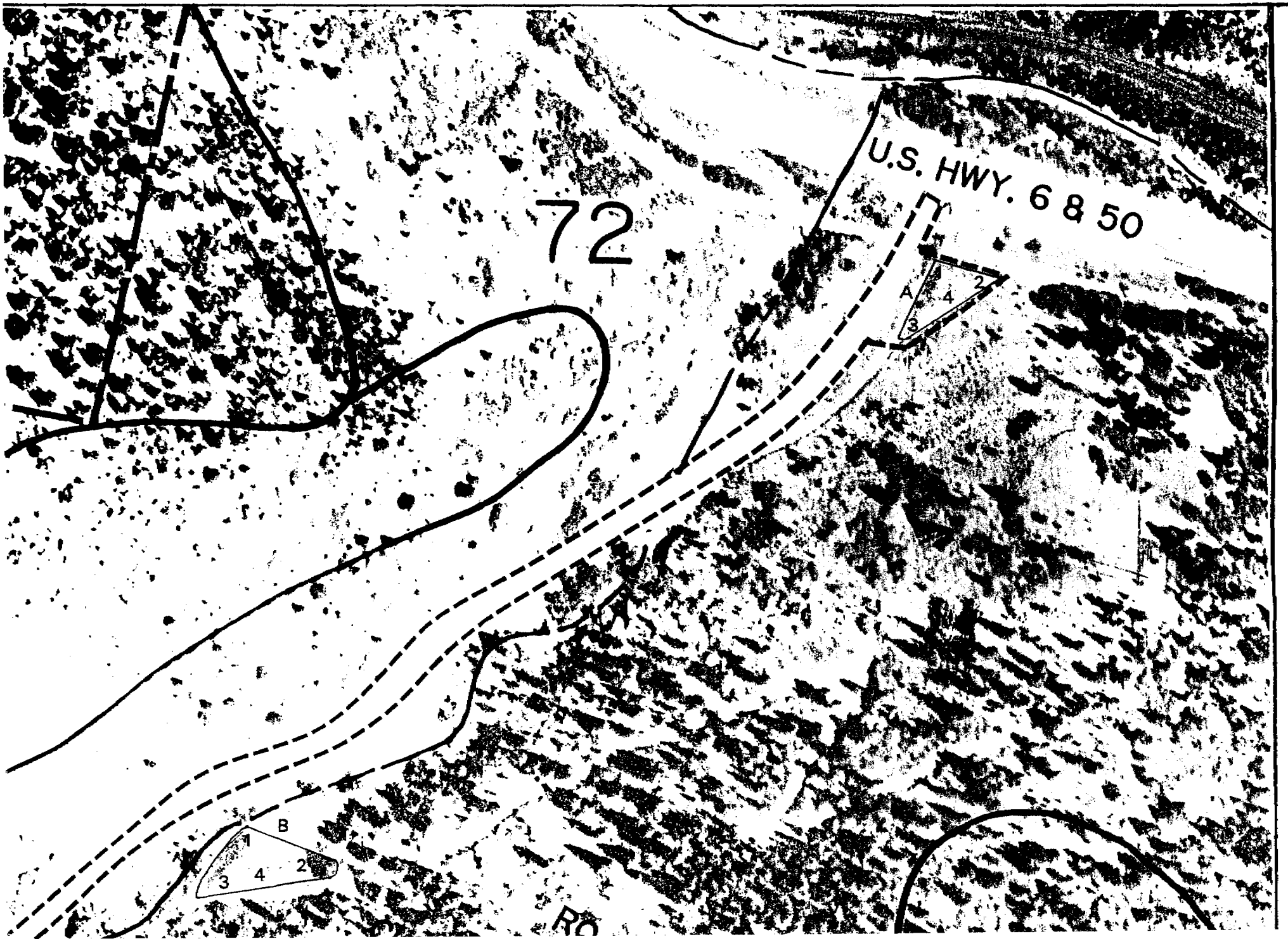
Soil Pit No.	Depth	Composite/Discrete Sample No.	Analyses
EF-1	0-12"	OB-1	DOGM; T6
EF-1	18-24"	OB-2	DOGM; T6
EF-1	30-36"	OB-3	DOGM; T6
EF-1	42-48"	OB-4	DOGM; T6
EF-2	0-12"	OB-1	DOGM; T6
EF-2	18-24"	OB-2	DOGM; T6
EF-2	30-36"	OB-3	DOGM; T6
EF-2	42-48"	OB-4	DOGM; T6
EF-3	0-12"	EF-3-1	DOGM; T6
EF-3	18-24"	EF-3-2	DOGM; T6
EF-3	30-36"	EF-3-3	DOGM; T6
EF-3	42-48"	EF-3-4	DOGM; T6
EF-4	0-12"	EF-4-1	DOGM; T6
EF-4	18-24"	EF-4-2	DOGM; T6
EF-4	30-36"	EF-4-3	DOGM; T6
EF-4	42-48"	EF-4-4	DOGM; T6
EF-5	0-12"	OB-5	DOGM; T6
EF-5	18-24"	OB-6	DOGM; T6
EF-5	30-36"	OB-7	DOGM; T6
EF-5	42-48"	OB-8	DOGM; T6

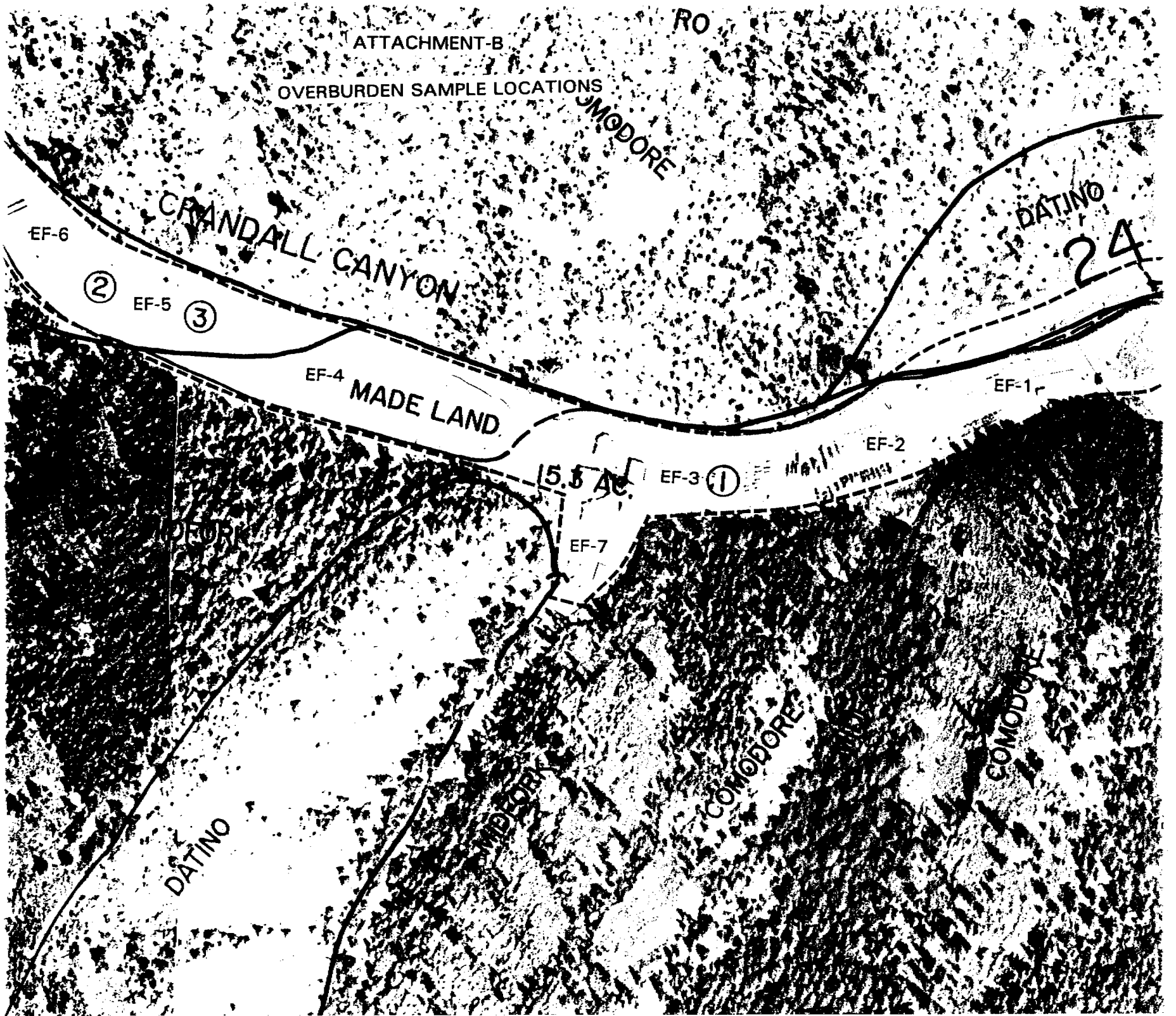
Soil Pit No.	Depth	Composite/Discrete Sample No.	Analyses
EF-6	0-12"	OB-5	DOGM; T6
EF-6	18-24"	OB-6	DOGM; T6
EF-6	30-36"	OB-7	DOGM; T6
EF-6	42-48"	OB-8	DOGM; T6
EF-7	0-12"	EF-7-1	DOGM; T6
EF-7	18-24"	EF-7-2	DOGM; T6
EF-7	30-36"	EF-7-3	DOGM; T6
EF-7	42-48"	EF-7-4	DOGM; T6

OB - Overburden composite sample
EF-3-1 - Overburden discrete sample
DOGM; T6 - Table 6. Analytical Methods for Baseline Soils Data; in Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining, D.O.G.M., 1988.

ATTACHMENT-A

STOCKPILED SOIL SAMPLE LOCATIONS



ATTACHMENT-B

OVERBURDEN SAMPLE LOCATIONS