

0005

AMAX COAL WEST, INC.

A Subsidiary of AMAX Coal Industries, Inc.

ACT/007/004

#2



November 29, 1993

Mr. Paul Baker
State of Utah
Division of Oil, Gas, & Mining
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

Dear Paul:

Enclosed is a report from Earthfax Engineering on the base material in the main channel at Sowbelly Gulch. The report concludes that filter blanket material is not needed in Reach "D" of diversion SBRD-1. The three samples which were taken in the diversion did not exceed the threshold ratio of 40 as explained in the Earthfax Report. Therefore, AMAX will not be placing a filter blanket under the riprap in this reach of the channel.

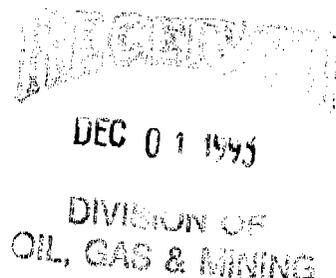
As the channel construction progresses, additional samples will be taken to determine the necessity for the installation of filter blanket material.

Sincerely,

Richard H. Allison Jr. P.E.
Project Supervisor

RHA:njt

Enclosure



November 17, 1993

NOV 19

Mr. Richard Allison, Jr., P.E.
AMAX Coal West, Inc.
165 South Union Blvd.
Suite 1000
Lakewood, CO. 80228-0219



EarthFax

EarthFax
Engineering Inc.
Engineers/Scientists
7324 So. Union Park Ave.
Suite 100
Midvale, Utah 84047
Telephone 801-561-1555
Fax 801-561-1861

SUBJECT: Reclamation diversion SBRD-1D design, Sowbelly Canyon,
Castle Gate Mine, Carbon County, Utah

Dear Richard:

Pursuant to your request, the three enclosed gradation test reports have been evaluated in conjunction with the riprap and filter blanket designs for reclamation diversion SBRD-1, reach "D" in Sowbelly Canyon. The tests were performed on soils sampled by Mr. Dan Guy (Blackhawk Engineering, Inc.). The samples were apparently collected from the base soil along the diversion SBRD-1 alignment, after completion of the rough reclamation grading, at Stations 17 + 50, 14 + 00, and 10 + 00. The purpose of the evaluation was to determine the necessity and gradation for a filter blanket between the base material and the riprap.

Based on the procedures presented in paragraph 7.2-2(6) in Chapter 7 of the Castle Gate Mine permit (No. 007/004) dated January 1993, the filter blanket for permanent reclamation drainage channels must be designed in accordance with the method described by Barfield, et al. (1981). The necessity of a filter layer is determined by comparing the proposed average particle size (D_{50}) of the riprap for that section of the channel with the D_{50} of the base material in that location. If the ratio of these two values exceeds 40, then a filter is necessary to prevent the migration of fine particles from the base material out through the riprap.

Exhibit 3.2-4A identifies the limits of reach "D" of diversion SBRD-1 as stations 9 + 00 and 21 + 00. According to Table 3.2-12 of the permit documents dated June 1993, the D_{50} of the riprap for the proposed channel SBRD-1 is 4 inches. The attached calculations utilizing the results of the sieve analyses indicate that the smallest D_{50} of the sampled base material is 0.1 inch. Consequently, the largest ratio of riprap D_{50} to the D_{50} of the base material is 40. Although this ratio represents the maximum acceptable size difference between the proposed riprap and the base soil, the D_{50} of the base soil is predominately larger than 0.1 inch, and a filter blanket is not deemed necessary. The riprap for diversion SBRD-1D may be placed directly on the base material.

If you any questions concerning this evaluation, please do not hesitate to call.

Sincerely,

William S. Hendrickson, P.E.
Civil Engineer

Enclosures

- Commercial Testing & Engineering Company test reports (3)
- Granular filter calculations



COMMERCIAL TESTING & ENGINEERING CO.

GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • TEL: 708-953-9300 FAX: 708-953-9306

SINCE 1908

Member of the SGS Group (Société Générale de Surveillance)

October 18, 1993

NOV - 8 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1020, HUNTINGTON, UT 84528
TEL: (801) 653-2311
FAX: (801) 653-2436

AMAX COAL WEST
165 SO. UNION BLVD. SUITE 1000
P.O. BOX 280219
LAKEWOOD, COLORADO 80228

Sample identification by
AMAX COAL WEST

Kind of sample Soil
reported to us

AMAX #1
Sowbelly
1 Bucket



Sample taken at *SCKO-1 STATION 17450*

DEC 11 1993

Sample taken by AMAX

Date sampled October 12, 1993

Date received October 14, 1993

DIVISION OF
OIL, GAS & MINING

Analysis Report No. 59-164601

SIEVE ANALYSIS

<u>Passing</u>	<u>Retained On</u>	<u>% Weight</u>	<u>CUMULATIVE RESULTS</u>	
			<u>% Retained</u>	<u>% Passing</u>
-----	+8" RD	0.00	0.00	100.00
+8" RD	6" RD	0.00	0.00	100.00
6" RD	4" RD	5.95	5.95	94.05
4" RD	2" RD	3.57	9.52	90.48
2" RD	1" RD	8.33	17.85	82.15
1" RD	1/2" RD	11.11	28.96	71.04
1/2" RD	1/4" RD	28.57	57.53	42.47
1/4" RD	+16 Mesh	28.97	86.50	13.50
+16 Mesh	100 Mesh	8.34	94.84	5.16
100 Mesh	200 Mesh	3.18	98.02	1.98
200 Mesh	0	1.98	100.00	0.00

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[Signature]
Manager, Huntington Laboratory



OVER 40 BRANCH LABORATORIES STRATEGICALLY LOCATED IN PRINCIPAL COAL MINING AREAS, TIDEWATER AND GREAT LAKES PORTS, AND RIVER LOADING FACILITIES

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October 18, 1993

AMAX COAL WEST
165 SO. UNION BLVD. SUITE 1000
P.O. BOX 280219
LAKEWOOD, COLORADO 80228

Sample identification by
AMAX COAL WEST

Kind of sample Soil
reported to us

AMAX #2
Sowbelly
1 Bucket

Sample taken at SBALD-1 STATION 1A+00

Sample taken by AMAX

Date sampled October 12, 1993

Date received October 14, 1993



DEC 01 1993

DIVISION OF
OIL, GAS & MINING

Analysis Report No. 59-164602

SIEVE ANALYSIS

<u>Passing</u>	<u>Retained On</u>	<u>% Weight</u>	<u>CUMULATIVE RESULTS</u>	
			<u>% Retained</u>	<u>% Passing</u>
-----	+8" RD	0.00	0.00	100.00
+8" RD	6" RD	0.00	0.00	100.00
6" RD	4" RD	2.60	2.60	97.40
4" RD	2" RD	2.16	4.76	95.24
2" RD	1" RD	3.03	7.79	92.21
1" RD	1/2" RD	6.06	13.85	86.15
1/2" RD	1/4" RD	14.29	28.14	71.86
1/4" RD	+16 Mesh	29.00	57.14	42.86
+16 Mesh	100 Mesh	31.60	88.74	11.26
100 Mesh	200 Mesh	7.36	96.10	3.90
200 Mesh	0	3.90	100.00	0.00

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Huntington Laboratory



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FAX: (801) 653-2436

October 18, 1993

AMAX COAL WEST
165 SO. UNION BLVD. SUITE 1000
P.O. BOX 280219
LAKEWOOD, COLORADO 80228

Sample identification by
AMAX COAL WEST

Kind of sample Soil
reported to us

AMAX #3
Sowbelly
1 Bucket

Sample taken at *SBLD-1 STATION 10200*

Sample taken by AMAX

Date sampled October 12, 1993

Date received October 14, 1993

RECEIVED

DEC 11 1993

DIVISION OF
OIL, GAS & MINING

Analysis Report No. 59-164603

SIEVE ANALYSIS

<u>Passing</u>	<u>Retained On</u>	<u>% Weight</u>	<u>CUMULATIVE RESULTS</u>	
			<u>% Retained</u>	<u>% Passing</u>
-----	+8" RD	0.00	0.00	100.00
+8" RD	6" RD	0.00	0.00	100.00
6" RD	4" RD	12.77	12.77	87.23
4" RD	2" RD	11.31	24.08	75.92
2" RD	1" RD	12.77	36.85	63.15
1" RD	1/2" RD	16.79	53.64	46.36
1/2" RD	1/4" RD	23.36	77.00	23.00
1/4" RD	+16 Mesh	14.97	91.97	8.03
+16 Mesh	100 Mesh	5.47	97.44	2.56
100 Mesh	200 Mesh	1.46	98.90	1.10
200 Mesh	0	1.10	100.00	0.00

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

[Signature]
Manager, Huntington Laboratory



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TERMS AND CONDITIONS ON REVERSE

CASTLE GATE COAL
SOUTHERN CANYON
RECLAMATION DIVERSION SBRD-1
GRANULAR FILTER CALCULATIONS

EVALUATE SBRD-1D NATIVE SOILS TO DETERMINE IF A GRANULAR FILTER BLANKET IS NECESSARY BETWEEN THE NATIVE SOILS AND THE RIPRAP.

ACCORDING TO TABLE 3.2-12, REVISED JUNE 1993, THE DESIGN D_{50} OF THE RIPRAP IS 4" FOR SBRD-1D. (STA 9+00 TO 21+00)

THREE SOIL SAMPLES WERE COLLECTED ALONG THE ALIGNMENT OF DIVERSION SBRD-1D AFTER THE ROUGH GRADING WAS COMPLETED. THE SAMPLES WERE TESTED FOR GRADATION BY CTE. SEE ATTACHED TEST RESULTS DATED OCT. 18, 1993.

SBRD-1, RESULTS "D"

SCREEN	STA 17+50		STA 14+00		STA 10+00	
	% RET.	% PASS.	% RET.	% PASS.	% RET.	% PASS.
8"	0	100	0	100	0	100
6"	0	100	0	100	0	100
4"	6.0	94.0	2.6	97.4	12.8	87.2
2"	9.5	90.5	4.8	95.2	24.1	75.9
1"	17.9	82.1	7.8	92.2	30.9	63.1
1/2"	29.0	71.0	13.9	86.1	53.6	46.4
1/4"	57.5	42.5	28.1	71.9	77.0	23.0
NO. 16	86.5	13.5	57.1	42.9	92.0	8.0
NO. 100	94.8	5.2	88.7	11.3	97.4	2.6
NO. 200	98.0	2.0	96.1	3.9	98.9	1.1

NOTE: THE VALUES ARE CUMULATIVE PERCENTAGES

CASTLE GATE CWA
SWITZLEY CANYON
RECLAMATION DIVERSION CONSTRUCTION

INTERPOLATION CALCULATIONS:

STA 17+50

	<u>% PASSING</u>
1/2	71.0
(1/4	50.0)
	42.5

$$\frac{x}{1/4} = \frac{2.5}{28.5}$$

$$x = .066$$

$$+ \frac{.25}{.32}$$

D₅₀ (BASE) = 0.32"

STA 14+00

0.25	71.9
(0.046 (a)	50)
	42.9

$$\frac{x}{.204} = \frac{7.1}{29}$$

$$x = 0.25$$

$$+ \frac{.046}{.096}$$

(a) No 16 = 1.118 mm
= 0.046 in

D₅₀ (BASE) = 0.1

STA 10+00

1"	63.1
(1/2"	50)
	46.4

$$\frac{x}{1/2} = \frac{3.6}{16.7}$$

$$x = 0.11$$

$$+ \frac{.50}{.61}$$

D₅₀ (BASE) = 0.6

CASTLE GATE COAL
SOWBELLY CANYON
RECLAMATION DIVERSION

ACCORDING TO BAFFIELD, ET AL. 1981. PG 195,

$$\text{IF } \frac{D_{50}(\text{RIPRAP})}{D_{50}(\text{BASE})} \leq 40,$$

THEN NO INTERMEDIATE FILTER IS REQUIRED.

$$\frac{\text{STA } 17+50}{D_{50}(\text{RIPRAP})} = \frac{4''}{0.32} = 12.5 < 40 \quad \underline{\text{OK}}$$

$$\frac{\text{STA } 14+00}{D_{50}(\text{RIPRAP})} = \frac{1}{0.1} = 10 \quad \underline{\text{BORDERLINE}}$$

$$\frac{\text{STA } 10+00}{D_{50}(\text{RIPRAP})} = \frac{1}{0.6} = 1.67 < 40 \quad \underline{\text{OK}}$$

CONCLUSION:

SINCE RATIO OF D_{50} OF THE
RIPRAP TO THE D_{50} OF THE BASE
(NATIVE) MATERIAL IS LESS THAN
OR EQUAL TO 40, THEN NO FILTER
IS REQUIRED.