COSTAIN COAL INC.
P.O. BOX 68
ADGER, ALABAMA 35006
(205) 477-5731

Mr. Mike Harrison, P.E.
Alabama Surface Mining Commission
P.O. Box 2390
Jasper, Alabama 35502-2390

July 30, 1993

RE: Alabama Land and Mineral Corp.
Area 6 Mine
P-3699

Dear Mike:

I hereby certify that Basin 010E, located in the SE1/4 of the NW1/4 and NE1/4 of the SW1/4 of Section 3, Township 20 South, Range 6 West, Jefferson County, Alabama, for the Alabama Land and Mineral Corp. Area 6 Mine was modified in accordance with approved ASMC design plans and meets all applicable minimum design criteria as per my field inspection.

Sincerely,

Costain Coal Inc.

Leslie G. Stephens

Leslie G. Stephens, PLS & P.E.
AL Reg. No. 14117

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR REGISTERED No. 14117 LESLIE G. STEPHENS

AUG 19

COSTAIN COAL INC.
P.O. BOX 68
ADGER, ALABAMA 35006
(205) 477-5731

Mr. Mike Harrison, P.E.
Alabama Surface Mining Commission
P.O. Box 2390
Jasper, Alabama 35502-2390

July 30, 1993

RE: Alabama Land and Mineral Corp.
Area 6 Mine
P-3699

Dear Mike:

I hereby certify that Basin 010A, located in the NE1/4 of the SW1/4 of Section 3, Township 20 South, Range 6 West, Jefferson County, Alabama, for the Alabama Land and Mineral Corp. Area 6 Mine was constructed in accordance with approved ASMC design plans and meets all applicable minimum design criteria as per my field inspection.

Sincerely,

Costain Coal Inc.

Leslie G. Stephens

Leslie G. Stephens, PLS & P.E.
AL Reg. No. 14117

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR REGISTERED No. 14117 LESLIE G. STEPHENS

AUG 1993

STATE OF ALABAMA

SURFACE MINING COMMISSION

P. O. BOX 2390 — JASPER, ALABAMA 35502-2390
(205) 221-4130

PERMITTING

November 18, 1992

Alabama Land and Mineral Corporation
P. O. Box 68
Adger, AL 35006

ATTENTION: Mr. Leslie Stephens

RE: P-3699
Area 6 Mine

Dear Sir:

Please accept this letter as notification that the modification plans submitted for pond 010E and the detailed design plans for proposed ponds 010A, 004, 005 and 006 are hereby approved.

If you have any questions, please feel free to call.

Sincerely,

J. Michael Harrison
P.E.

JMH/kb

cc: I & E
File

HYDROLOGICAL STUDY FOR

ALABAMA LAND AND MINERAL CORP.

AREA 6 MINE

P-3699

JEFFERSON COUNTY, ALABAMA

AND

TUSCALOOSA COUNTY, ALABAMA

BY

COSTAIN COAL INC.

P.O. BOX 68

ADGER, ALABAMA 35006

October 14, 1992

4 OCT 1992
RECEIVED
SURFACE MINING COMMISSION

COSTAIN COAL INC.

P.O. BOX 68
ADGER, ALABAMA 35006
(205) 477-5731

October 14, 1992

Mr. Michael Harrison, P.E.
Alabama Surface Mining Commission
P.O. Box 2390
Jasper, Alabama 35502-2390

RE: Alabama Land and Mineral Corp.
Area 6 Mine
Permit Application

Dear Michael:

I, hereby certify the attached detailed design plans for Basins 010E and 010A Series for the above referenced mine are in accordance with the regulations of the Alabama Surface Mining Commission as adopted by Act 81-435 of December 18, 1981 and amended by Rulemaking Number 83-3 effective January 1, 1984 and are true and correct to the best of my knowledge and belief. Basin 010E is an existing basin with modification plans and basin 010A is a proposed basin.

If you need any additional information, please do not hesitate to contact me.

Sincerely,
Costain Coal Inc.

Leslie G. Stephens

Leslie G. Stephens, P.E. & L.S.
AL Reg. No. 14117

enc.\

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR
REGISTERED
No. 14117
LESLIE G. STEPHENS

POND CONSTRUCTION CRITERIA

The embankment for sediment basins (temporary and permanent) shall be designed and built using the following as minimum criteria:

1. The top of the dam shall be no less than 12 feet wide.

2. See design sheet for maximum and minimum embankment slopes.

3. The foundation and abutments for the impounding structure shall be designed to be stable under all conditions of construction and operation of the impoundment, with a minimum static safety factor of 1.5 for the normal pool with steady seepage saturation conditions, and a seismic safety factor of at least 1.2.

4. The dam shall be constructed with a cutoff trench based upon prudent engineering practices for the site. The cutoff shall be located on the dam centerline and be of sufficient depth to extend into a relatively impervious material from which the core of the dam shall also be constructed.

5. The embankment foundation area shall be cleared of all organic matter, all surfaces sloped to no steeper than 1v:1h, and the entire foundation surface scarified.

6. The entire embankment and cutoff trench shall be compacted to 95 percent density, based on standard proctor as outlined in ASTM.

7. The material placed in the embankment shall be free of sod, roots, stones over 6 inches in diameter, and other objectionable materials. The fill material shall be placed and spread over the entire fill area, starting at the lowest point of the foundation, in layers not to exceed 12 inches in thickness. Construction of the fill shall be undertaken only at such times that the moisture content of the fill material will permit satisfactory compaction in accordance with paragraph 5.

8. The primary decant system when consisting of a pipe shall be installed according to Class C pipe installation for embankment bedding.

POND CONSTRUCTION CRITERIA
(Continued)

9. The primary decant system shall be equipped with a device, or constructed, such as to ensure that subsurface withdrawal, is accomplished to prevent discharge of floating solids. If a channel is used as the primary decant a skimmer shall be installed to prevent floating solids from discharging.

10. A splash pad or riprap may be required under the discharge of the primary decant system where necessary to ensure that the discharge does not erode the embankment.

11. The combination primary and secondary decant system shall be designed to safely carry the expected peak flow from a 25 year -6 hour storm. When designing spillways that are in the drainage course of a public water supply, then 50 year - 24 hour storm data will be used. The entire emergency overflow spillway channel will be a stabilized channel and will be stabilized upon completion of construction using prudent engineering measures. These measures may consist of concrete, durable rock riprap, or the spillway being constructed in consolidated non-erodible material or a combination of any or all of the above as per the enclosed detailed design plans.

12. Sediment basins using a single spillway system shall be an open channel of non-erodible construction consisting of concrete, durable rock riprap or its being constructed in consolidated non-erodible material.

13. The settled embankment for temporary impoundments shall be a minimum of 1.0 feet above the maximum water elevation for the runoff from a 25 year - 6 hour, or a 10 year - 24 hour precipitation event (whichever has the greatest runoff). The settled embankment for permanent impoundments shall be a minimum of 1.0 foot above the maximum water elevation for the runoff from a 50 year - 6 hour, or a 10 year - 24 hour precipitation event (whichever has the greatest runoff.)

14. If basins are built in series, then the combined decant system for each shall be designed to accommodate the entire contributing drainage area.

POND CONSTRUCTION CRITERIA
(Continued)

15. The dam and all disturbed areas shall be seeded with both perennial and annual grasses in order to ensure erosion is minimized. Hay bales or riprap may be placed at the toe of the dam immediately upon completion of construction.

16. The constructed height of the dam shall be increased a minimum of 5 percent over the design height to allow for settlement, unless it has been demonstrated to the Regulatory Authority that the material used and the design will ensure against all settlement.

17. Final graded slopes of the entire permanent water impoundment area shall not exceed 2.5h:1.0v to provide for adequate safety and access for proposed water users.

18. Prior to Phase II bond release, additional data concerning water quality, water quantity, depth, size, configuration, postmining land use, etc., for each proposed permanent water impoundment, shall be submitted to the Regulatory Authority for permanent water impoundment approval.

19. All sediment basins will be inspected for stability, erosion, etc. two (2) times a month until removal of the structure or release of the reclamation bond.

20. The embankment and spillway will be maintained by repairing any damage such as erosion, slope failure or spillway damage until removal of the structure or release of the performance bond.

21. All ponds shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary. Formal inspections shall be made on an annual basis, including any reports or modifications, in accordance with 880-X-10C\.20[1(j)] of the Alabama Surface Mining Commission Regulations.

22. Sediment will be removed from each pond when the accumulated sediment reaches the sediment storage volume as shown on the detailed design sheet.

POND CONSTRUCTION CRITERIA
(Continued)

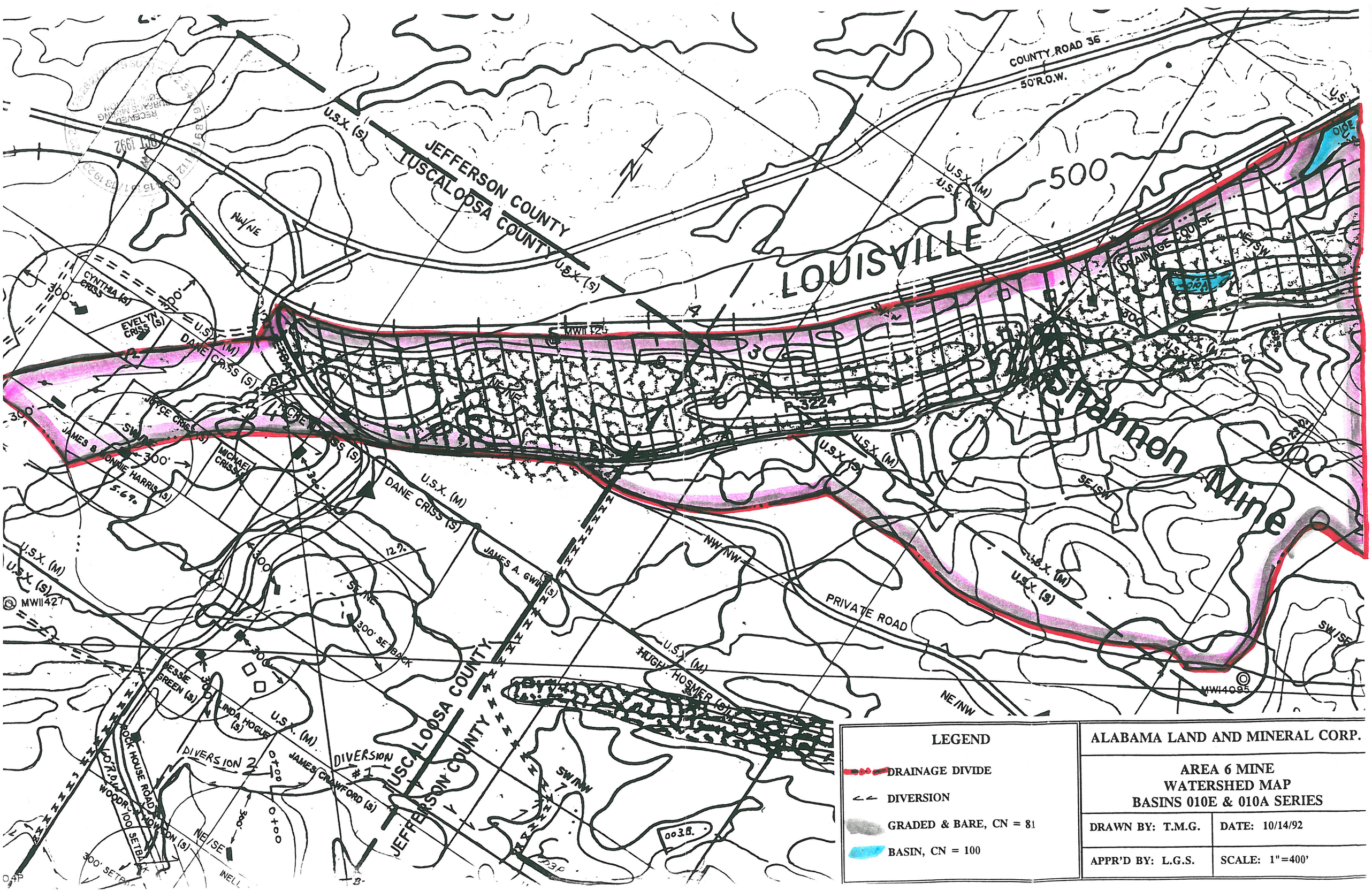
23. Upon completion of mining, successful reclamation and effluent standards being met, each sediment basin not remaining as a permanent water impoundment will be dewatered in an environmentally safe manner (such as siphoning, pumping, etc.) and reclaimed to approximate original contours by the following procedure:

    A permanent diversion channel (designed for a 10 year - 24 hour precipitation event) shall be cut along the outer edge of the basin to re-route drainage around the basin and back through the stabilized spillway to allow reclamation of the sediment basin. The diversion channel shall be designed and grassed as per enclosed information. (See permanent diversion for basin disposal). Upon completion of the diversion channel the back slope of the dam shall be graded to a minimum of 3h:1v slope. The dewatered sediment basin area shall be seeded with some combination of the following: Fescue, bermuda, rye grass, canary grass and willows. After seeding the area shall be mulched. Any additional sediment or embankment material not used to meet original contour, if non-toxic, shall be spread in thin layers within the permit area and vegetated as stated in the approved reclamation plan. All toxic material encountered in the basin disposal shall be buried and covered with 4 feet of non-toxic material and vegetated as stated in the approved reclamation plan.

24. A qualified registered professional engineer or other qualified professional specialist, under the direction of the professional engineer shall conduct regular inspections during construction and upon completion shall inspect each basin for certification purposes.

25. Point source discharge embankments shall be constructed and abutments keyed into desirable material if at all possible. In the event that undesirable material is encountered, additional design and construction criteria shall be submitted prior to certification.

26. If a basin is to be constructed in spoil, the basin area will be compacted until the spoil material is broken down sufficiently to minimize infiltration. When this step is complete it will be inspected by qualified personnel to determine if the porosity has been reduced enough to insure water stability. If the spoil material is inadequate due to permeability then the basin area will be lined with clay material to minimize infiltration and provide water stability.

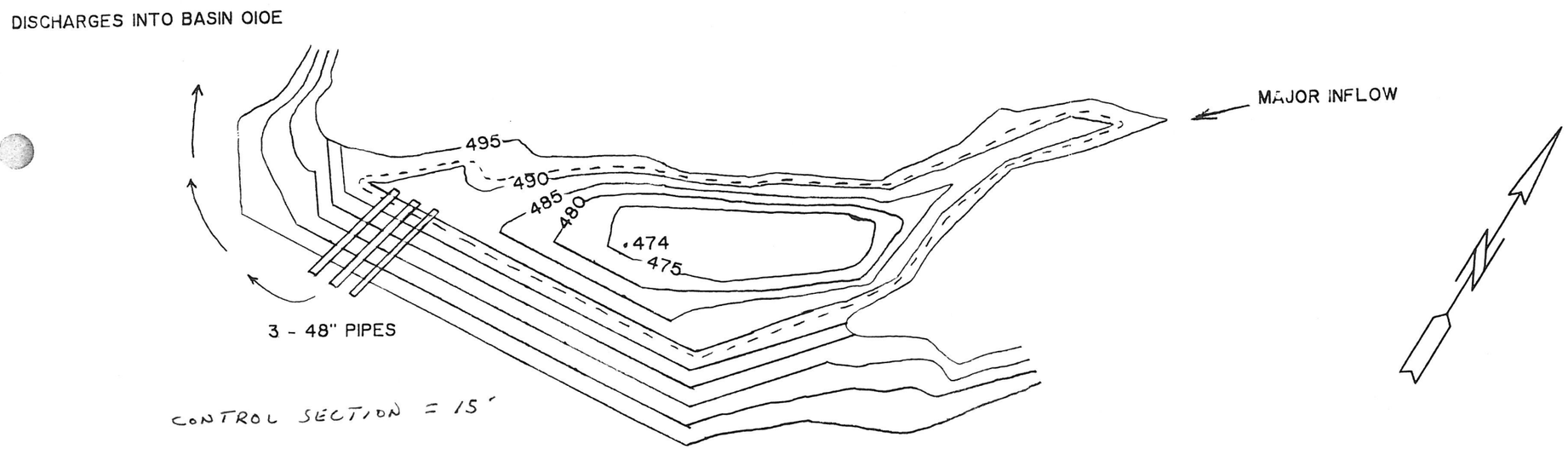


LEGEND	ALABAMA LAND AND MINERAL CORP.	
DRAINAGE DIVIDE	AREA 6 MINE WATERSHED MAP BASINS 010E & 010A SERIES	
DIVERSION		
GRADED & BARE, CN = 81	DRAWN BY: T.M.G.	DATE: 10/14/92
BASIN, CN = 100	APPR'D BY: L.G.S.	SCALE: 1"=400'

TOP OF DAM ~~495.0'~~ 495.5'

EMERGENCY SPILLWAY 491.2'

TOE OF DAM 474.0'



ALABAMA LAND AND MINERAL CORP.

AREA 6 MINE

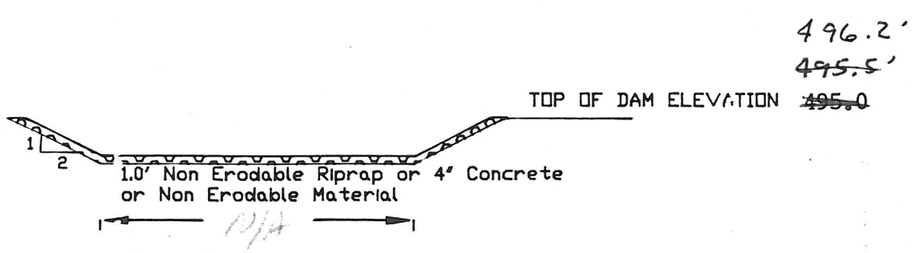
BASIN 010A

PLAN VIEW

SCALE: 1"=100'

DATE: 10/14/92

EMERGENCY SPILLWAY ELEV. 491.2
Q Out 110.99 cfs
V Out 2.95 f/sec

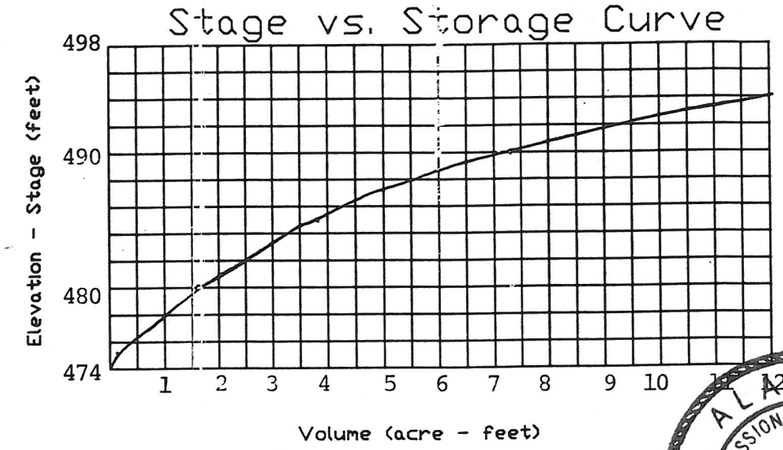


Spillway Gradient Shall Be Approximately 3%

Notes:

1. The sediment shall be removed from the basin when the accumulated sediment reaches the sediment storage volume.
2. Sediment control structures are required on pond inlets.
3. Outer slopes of embankment shall be grassed.
4. Fill material shall be placed in 12 " lifts and compacted to 95% of standard proctor.
5. The surface beneath the embankment shall be stripped of undesirable material.
6. Upon completion of mining, reclamation and maintenance of water quality standards the pond will be de-watered and reclaimed.
7. See the attached pond construction criteria.
8. See the attached drawings and specifications for diversions.
9. Elevations are based on assumed datum.

Stage vs. Storage Curve



Storage Computation

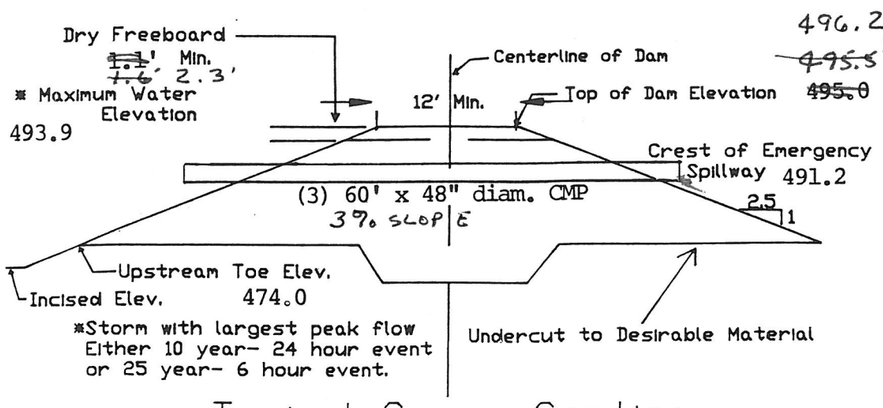
Elevation (feet)	Area (acres)	Ave. Area (acres)	Interval (feet)	Storage (ac-ft)	Acc. Storage (ac.-ft.)
474	0				0.1050
		0.105	1	0.105	
475	0.21				1.5460
		0.288	5	1.441	
480	0.37				3.7700
		0.445	5	2.224	
485	0.52				7.3018
		0.706	5	3.532	
490	0.89				12.7996
		1.099	5	5.498	
495	1.31				

Key Basin Parameters

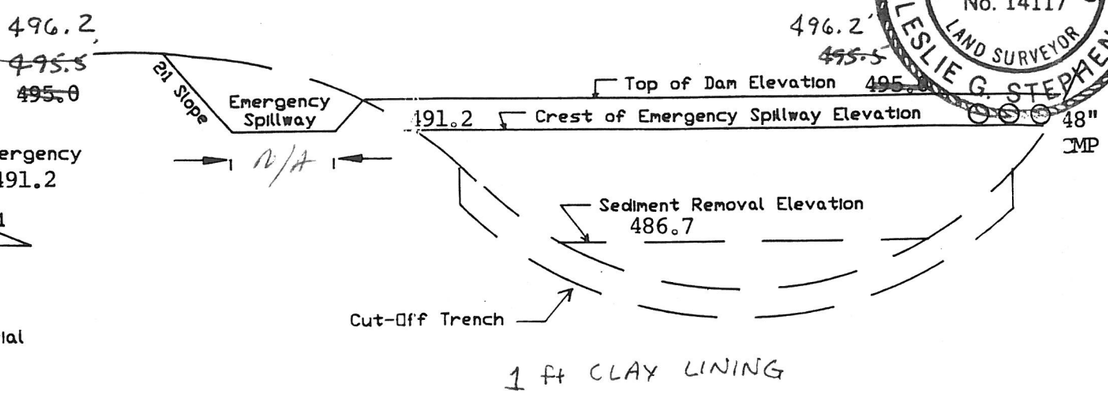
Drainage Area 83.90 Acres
Disturbed Area 82.90 Acres
Sediment Storage 4.70 Ac. Ft.
Detention Storage 3.63 Ac. Ft.
Permanent Pool Capacity 8.33 Ac. Ft.
Total Basin Capacity 11.59 Ac. Ft.
Peak Inflow 135.70 C.F.S.
Peak Outflow 110.99 C.F.S.

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR REGISTERED No. 14117 LESLIE G. STEPHENS

Leslie G. Stephens
LESLIE G. STEPHENS, P.E. & L.S.
AL Registration # 14117



Typical Cross Section
Along Primary Spillway



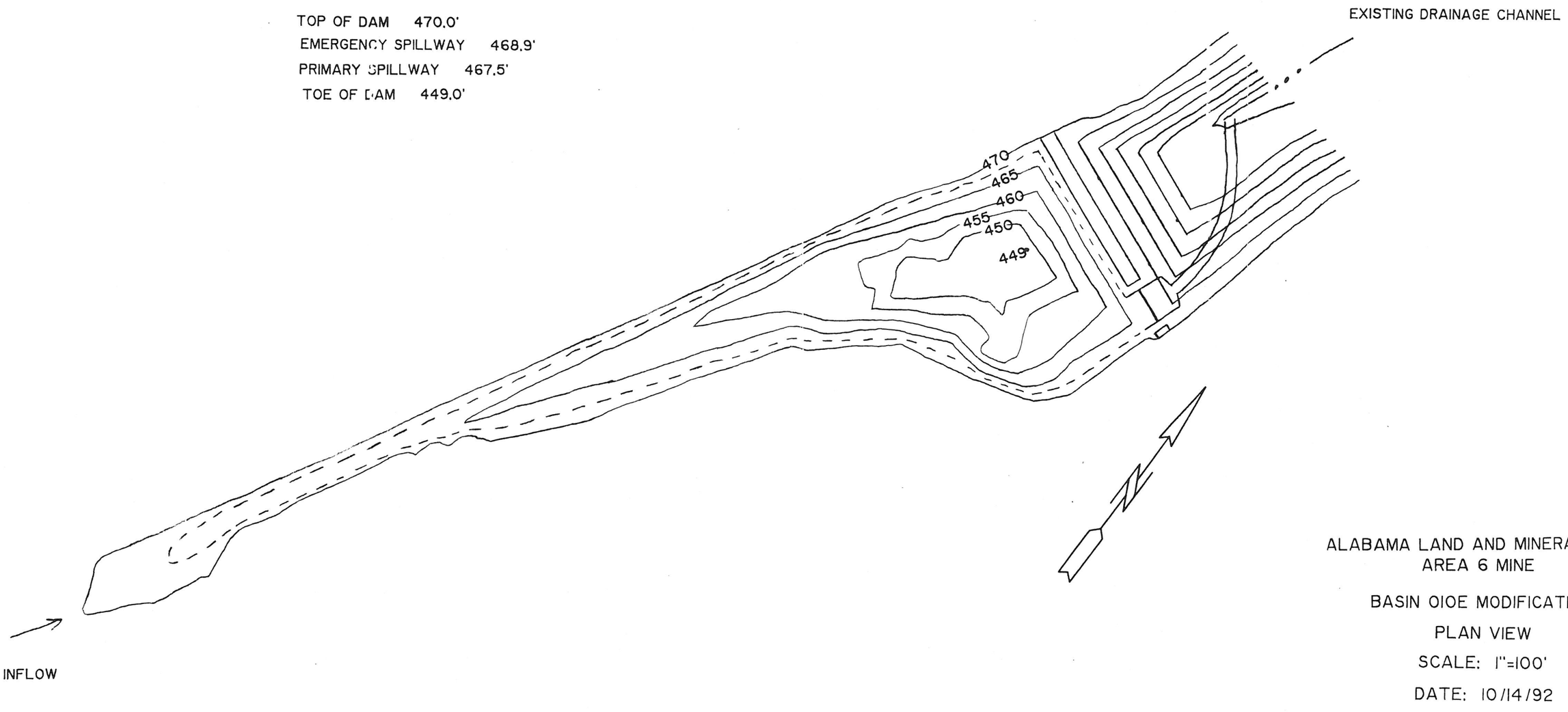
Typical Profile Looking Downstream

ALABAMA LAND AND MINERAL CORP.

AREA 6 Mine
P - 3699
Basin 010AP
Detailed Basin Design Plans

DRAWN BY: T.M.G.
APPROVED BY: L.G.S.
SCALE: NONE

TOP OF DAM 470.0'
EMERGENCY SPILLWAY 468.9'
PRIMARY SPILLWAY 467.5'
TOE OF DAM 449.0'



ALABAMA LAND AND MINERAL CORP.
AREA 6 MINE

BASIN 01OE MODIFICATION

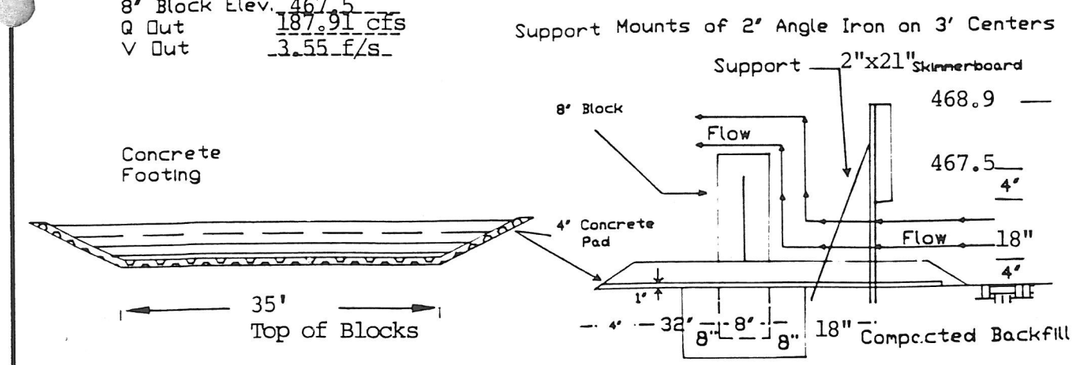
PLAN VIEW

SCALE: 1"=100'

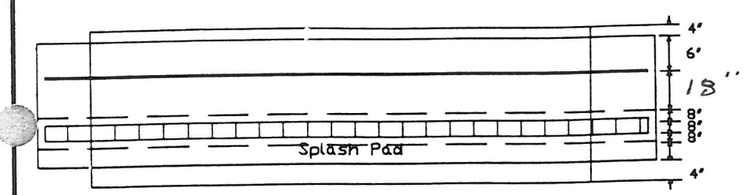
DATE: 10/14/92

Skimmerboard Detailed Design

Skimmerboard Elev. 468.9
8' Block Elev. 467.5
Q Out 187.91 cfs
V Out 3.55 f/s



Footing to be centered beneath 8' blocks
Minimum width: 2.0 feet
Minimum depth: 1.5 feet (unless solid rock encountered)



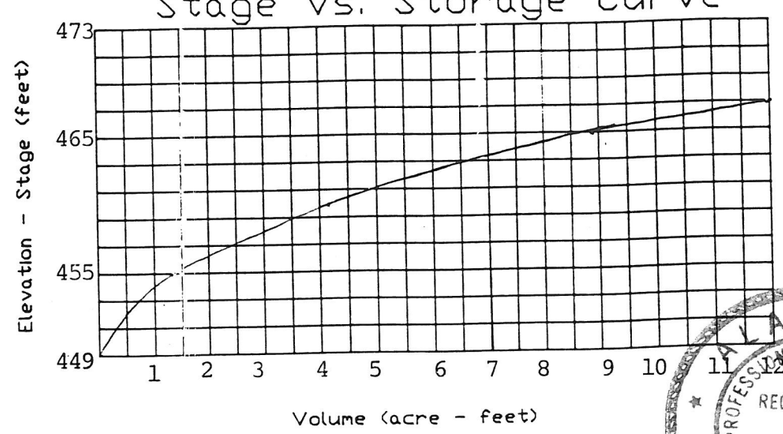
Plan View

Spillway Gradient Shall Be Approximately 3%

Notes:

1. The sediment shall be removed from the basin when the accumulated sediment reaches the sediment storage volume.
2. Sediment control structures are required on pond inlets.
3. Outer slopes of embankment shall be grassed.
4. Fill material shall be placed in 12" lifts and compacted to 95% of standard proctor.
5. The surface beneath the embankment shall be stripped of undesirable material.
6. Upon completion of mining, reclamation and maintenance of water quality standards the pond will be de-watered and reclaimed.
7. See the attached pond construction criteria.
8. See the attached drawings and specifications for diversions.
9. Elevations are based on assumed datum.

Stage vs. Storage Curve



Storage Computation

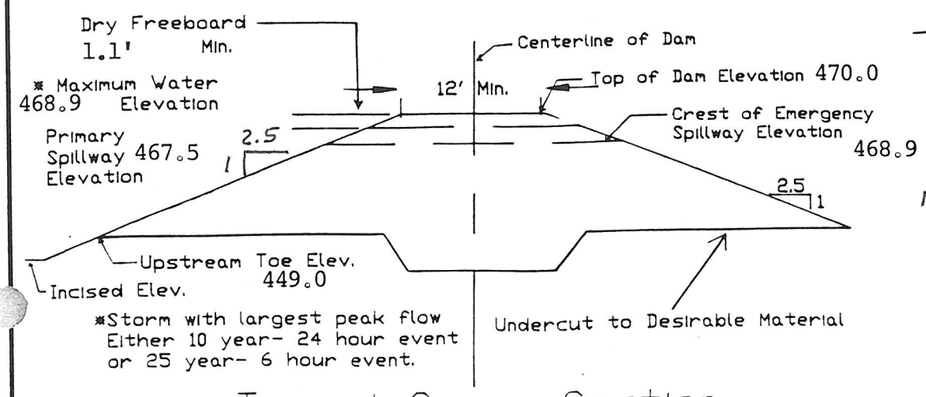
Elevation (feet)	Area (acres)	Ave. Area (acres)	Interval (feet)	Storage (ac-ft)	Acc. Storage (ac.-ft.)
449	0				0.0854
		0.0854	1	0.085	
450	0.171				1.3844
		0.2598	5	1.299	
455	0.349				4.1244
		0.5480	5	2.740	
460	0.747				8.9279
		0.9607	5	4.804	
465	1.174				16.881
		1.5906	5	7.953	
470	2.007				

Key Basin Parameters

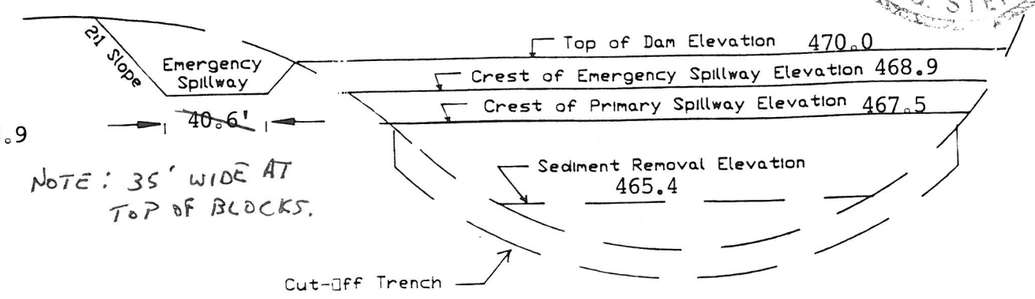
Drainage Area	155.0	Acres
Disturbed Area	152.0	Acres
Sediment Storage	9.30	Ac. Ft.
Detention Storage	2.90	Ac. Ft.
Permanent Pool Capacity	12.20	Ac. Ft.
Total Basin Capacity	14.60	Ac. Ft.
Peak Inflow	193.23	C.F.S.
Peak Outflow	187.91	C.F.S.

ALABAMA PROFESSIONAL ENGINEER AND LAND SURVEYOR REGISTERED No. 14117 LESLIE G. STEPHENS

Leslie G. Stephens
LESLIE G. STEPHENS, P.E. & L.S.
AL Registration # 14117



Typical Cross Section Along Primary Spillway



NOTE: 35' WIDE AT TOP OF BLOCKS.

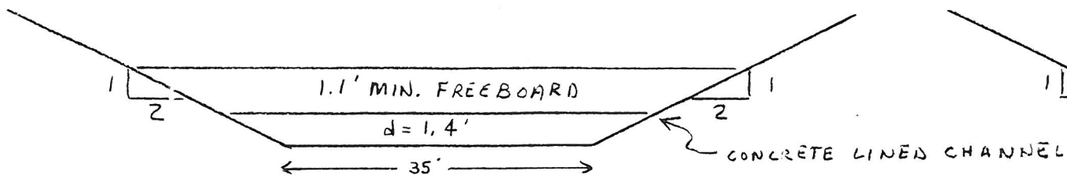
Typical Profile Looking

ALABAMA LAND AND MINERAL CORP.

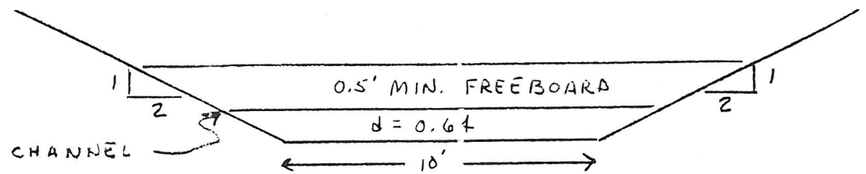
AREA 6 MINE
P - 3699
Basin 010EP
Detail Basin Design Plans

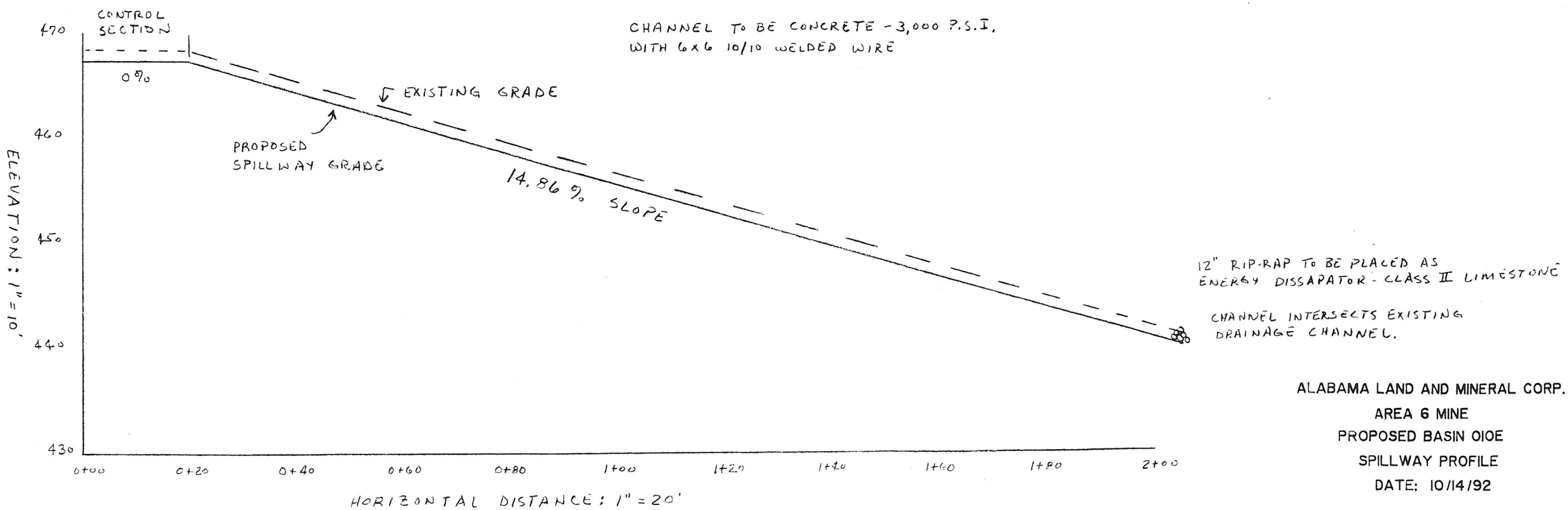
DRAWN BY: T.M.G.	
APPROVED BY: L.G.S.	SCALE: NONE

TYPICAL CONTROL SECTION
CHANNEL CROSS SECTION
(NOT TO SCALE)



TYPICAL EXIT CHANNEL
CHANNEL CROSS SECTION
(NOT TO SCALE)





CHANNEL TO BE CONCRETE - 3,000 P.S.I.
WITH 6x6 10/10 WELDED WIRE

12" RIP-RAP TO BE PLACED AS
ENERGY DISSAPATOR - CLASS II LIMESTONE

CHANNEL INTERSECTS EXISTING
DRAINAGE CHANNEL.

ALABAMA LAND AND MINERAL CORP.
AREA 6 MINE
PROPOSED BASIN 010E
SPILLWAY PROFILE
DATE: 10/14/92

SEDCAD+ NONERODIBLE CHANNEL DESIGN

A.L.M.C. BASIN 010E EXIT CHANNEL

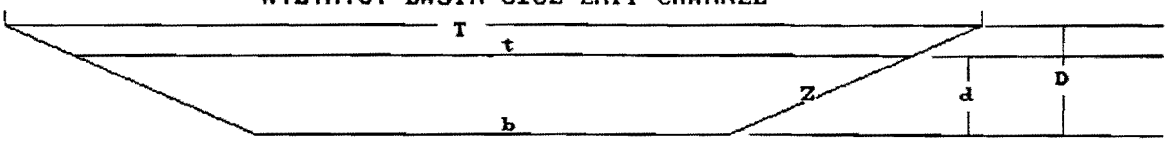
INPUT VALUES:

Shape	TRAPEZOIDAL	
Discharge	187.91 cfs	
Slope	14.86 %	
Sideslopes	2.00:1 (L)	2.00:1 (R)
Bottom Width	10.00 ft	
Manning's n	0.015	
Material	CONCRETE	
Freeboard	0.5 ft	

RESULTS:

Depth	0.64 ft
with Freeboard	1.14 ft
Top Width	12.56 ft
with Freeboard	14.56 ft
Velocity	26.05 fps
Cross Sectional Area	7.21 sq ft
Hydraulic Radius	0.56 ft
Froude Number	6.06

SEDCAD+ CHANNEL DESIGN
A.L.M.C. BASIN 010E EXIT CHANNEL



MATERIAL: CONCRETE

Discharge	= 187.91 cfs		Depth (d)	= 0.64	w/ Freeboard: (D = 1.14) ft
Bottom (b)	= 10.00 ft		Top width (t)	= 12.56	(T = 14.56) ft
Side slopes (Z)	= 2.0:1(L) 2.0:1(R)		Velocity	= 26.05 fps	
Bed Slope	= 14.86 %		Hydraulic Radius	= 0.56 ft	
Manning's n	= 0.015		Froude number	= 6.06	

ALABAMA LAND AND MINERAL CORP.
AREA 6 MINE
PERMIT APPLICATION
HYDROLOGY AND SEDIMENTOLOGY
25 ~~10~~ YR. & ~~24~~ HR. EVENT
BASINS 010E & 010A SERIES

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES

by

Name: T.M.G.

Company Name: COSTAIN COAL INC.
File Name: C:\SEDCAD3\AREA6\AREA6-10

Date: 10-13-1992

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

STORM #1:

User-Defined Distribution

Label: drn58

	Accumulated Time (hrs)	Accumulated Dimensionless Depth
1	0.0	0.000
2	0.5	0.010
3	1.0	0.020
4	1.5	0.030
5	2.0	0.040
6	2.5	0.050
7	3.0	0.060
8	3.5	0.070
9	4.0	0.080
10	4.5	0.090
11	5.0	0.100
12	5.5	0.115
13	6.0	0.130
14	6.5	0.140
15	7.0	0.150
16	7.5	0.170
17	8.0	0.180
18	8.5	0.200
19	9.0	0.220
20	9.5	0.240
21	10.0	0.260
22	10.5	0.290
23	11.0	0.320
24	11.5	0.370
25	12.0	0.500
26	12.5	0.630
27	13.0	0.680
28	13.5	0.710
29	14.0	0.740
30	14.5	0.760
31	15.0	0.780
32	15.5	0.800
33	16.0	0.820
34	16.5	0.830
35	17.0	0.850
36	17.5	0.860
37	18.0	0.870

38	18.5	0.885
39	19.0	0.900
40	19.5	0.910
41	20.0	0.920
42	20.5	0.930
43	21.0	0.940
44	21.5	0.950
45	22.0	0.960
46	22.5	0.970
47	23.0	0.980
48	23.5	0.990
49	24.0	1.000

****

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	FINER % Finer	COARSER % Finer
3.0000	78.00	69.00
2.0000	76.00	63.00
1.0000	75.00	54.00
0.5000	74.00	47.00
0.3000	73.00	44.00
0.2000	64.00	37.00
0.1000	44.00	23.00
0.0500	26.00	13.00
0.0300	14.00	7.00
0.0200	12.00	5.00
0.0100	8.00	2.00
0.0050	5.00	1.00
0.0030	3.00	0.50
0.0010	1.00	0.30
0.0001	0.00	0.00

Detailed Between Structure Routing:

J	B	To S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	X
1	1	2	1	6	350.82	6.86	3.93	0.02	0.024	0.348

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	82.90*	81	F	0.644	0.000	0.000	0.0	19.41	134.73
111	2	1.00*	100	F	0.000	0.000	0.000	0.0	0.40	3.59
		Type: Pond			Label: BASIN 010A					
111	Structure	83.90							19.81	
111	Total IN	83.90							19.81	135.70
111	Total OUT								19.81	110.99
112	1	69.10*	81	F	1.208	0.000	0.000	0.0	16.18	81.19
112	2	2.00*	100	F	0.000	0.000	0.000	0.0	0.80	7.18
		Type: Pond			Label: BASIN 010E					
112	Structure	71.10							36.78	
112	Total IN	155.00							36.78	193.23
112	Total OUT								36.78	187.91
111 to 112 Routing						0.024	0.348			

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

	JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
M	111	1	0.24	100.0	11.6	0.900	0.000	2	2989.4				
M	111	2	0.00	100.0	0.0	0.000	0.000	1	0.0				
					Type: Pond		Label: BASIN 010A						
	111	Structure							2989.4				
	111	Total IN							2989.4	152854	117.77	81.62	14.31

```
  111 Total OUT                                   159.5    9339   3.80   2.40   0.53
  ==================================================================================
M 112  1   0.24  100.0   4.0 0.900  0.000 2  455.9
M 112  2   0.00  100.0   0.0 0.000  0.000 1    0.0
                        Type: Pond   Label: BASIN 010E
  112 Structure                                   615.4
  ----------------------------------------------------------------------------------
  112 Total IN                                    615.4   16939  11.35   8.22   1.77
  112 Total OUT                                   144.5    4277   1.26   0.85   0.19
  ==================================================================================
  111 to 112 Routing                  0.024
  ==================================================================================
```

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

J	B	S	SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1	1	1	1	-a	5	4100.00	3.12	1.77	0.64	0.644		
1	1	2	1	-a	5	6050.00	1.93	1.39	1.21	1.208		

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

POND INPUT/OUTPUT TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

DISCHARGE OPTIONS:

	Trickle Tube	Trickle Tube	Trickle Tube
Riser Diameter (in)	----	----	----
Riser Height (ft)	----	----	----
Barrel Diameter (in)	48.0	48.0	48.0
Barrel Length (ft)	60.00	60.00	60.00
Barrel Slope (%)	3.00	3.00	3.00
Manning's n of Pipe	0.024	0.024	0.024
Spillway Elevation	491.2	491.2	491.2
Lowest Elevation of Holes	----	----	----
# of Holes/Elevation	----	----	----
Entrance Loss Coefficient	0.9	0.9	0.9
Tailwater Depth (ft)	0.0	0.0	0.0
Notch Angle (degrees)	----	----	----
Weir Width (ft)	----	----	----
Siphon Crest Elevation	----	----	----
Siphon Tube Diameter (in)	----	----	----
Siphon Tube Length (ft)	----	----	----
Manning's n of Siphon	----	----	----
Siphon Inlet Elevation	----	----	----
Siphon Outlet Elevation	----	----	----
Emergency Spillway Elevation	----	----	----
Crest Length (ft)	----	----	----
Z:1 (Left and Right)	-- --	-- --	-- --
Bottom Width (ft)	----	----	----

POND RESULTS:

Sediment Storage* (ac-ft)	Permanent Pool (ac-ft)	Dead Space (%)	Sediment Algorithm
4.70	3.63	20.00	CSTRS

*Sediment Capacity based on User Input

	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Concentration (ml/l)	24VW (ml/l)	24AA (ml/l)
IN	19.81	135.70	2989.4	152854	117.77	81.62	14.31
OUT	19.81	110.99	159.5	9339	3.80	2.40	0.53

Peak Elevation	Trap Efficiency (%)	Hydrograph Detention Time (hrs)
493.9	94.66	0.39

****

J1, B1, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

DISCHARGE OPTIONS:

	Broad Crested Weir	Emergency Spillway
Riser Diameter (in)	----	----
Riser Height (ft)	----	----
Barrel Diameter (in)	----	----
Barrel Length (ft)	----	----
Barrel Slope (%)	----	----
Manning's n of Pipe	----	----
Spillway Elevation	467.5	----
Lowest Elevation of Holes	----	----
# of Holes/Elevation	----	----
Entrance Loss Coefficient	----	----
Tailwater Depth (ft)	----	----
Notch Angle (degrees)	----	----
Weir Width (ft)	35.0	----
Siphon Crest Elevation	----	----
Siphon Tube Diameter (in)	----	----
Siphon Tube Length (ft)	----	----
Manning's n of Siphon	----	----
Siphon Inlet Elevation	----	----
Siphon Outlet Elevation	----	----
Emergency Spillway Elevation	----	468.9
Crest Length (ft)	----	10.0
Z:1 (Left and Right)	-- --	2 2
Bottom Width (ft)	----	40.7

POND RESULTS:

Sediment Storage* (ac-ft)	Permanent Pool (ac-ft)	Dead Space (%)	Sediment Algorithm
9.30	2.90	20.00	CSTRS

*Sediment Capacity based on User Input

	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Concentration (ml/l)	24VW (ml/l)	24AA (ml/l)
IN	36.78	193.23	615.4	16939	11.35	8.22	1.77
OUT	36.78	187.91	144.5	4277	1.26	0.85	0.19

Peak Elevation	Trap Efficiency (%)	Hydrograph Detention Time (hrs)
468.9	76.52	0.19

****

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

ELEVATION-DISCHARGE TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

Elevation	Trickle Tube (cfs)	Trickle Tube (cfs)	Trickle Tube (cfs)	Total Discharge (cfs)
486.70	0.0	0.0	0.0	0.0
487.00	0.0	0.0	0.0	0.0
488.00	0.0	0.0	0.0	0.0
489.00	0.0	0.0	0.0	0.0
490.00	0.0	0.0	0.0	0.0
491.00	0.0	0.0	0.0	0.0
491.20	0.0	0.0	0.0	0.0
492.00	6.0	6.0	6.0	18.0
493.00	20.2	20.2	20.2	60.7
494.00	39.3	39.3	39.3	117.8
495.00	62.1	62.1	62.1	186.2

J1, B1, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

Elevation	Broad Crested Weir (cfs)	Emergency Spillway (cfs)	Total Discharge (cfs)
465.42	0.0	0.0	0.0
466.00	0.0	0.0	0.0
467.00	0.0	0.0	0.0
467.50	0.0	0.0	0.0
468.00	38.2	0.0	38.2
468.90	179.0	0.0	179.0
469.00	198.5	7.0	205.5
469.42	295.2	36.8	332.0
469.52	318.0	43.8	361.9
469.62	340.9	58.1	399.0
469.72	363.8	73.7	437.5

469.82	386.6	90.6	477.2
470.00	427.1	126.7	553.8
470.32	517.6	193.5	711.1
470.82	657.8	321.8	979.6
471.00	707.5	379.3	1086.7
471.32	812.1	472.1	1284.2
471.82	974.0	644.1	1618.1
472.00	1031.4	718.7	1750.1
472.32	1148.4	836.8	1985.1
472.82	1329.5	1049.7	2379.2
473.00	1393.6	1140.4	2534.1
473.32	1521.8	1282.5	2804.3
473.82	1720.2	1535.1	3255.3
474.00	1790.5	1641.6	3432.1
474.82	2143.3	2098.9	4242.2
475.00	2219.2	2221.1	4440.3

****

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:48:45
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 4.80 inches, 25 year- 6 hour, SCS 6 Hour
Hydrograph Convolution Interval: 0.1 hr

ELEVATION-AREA-CAPACITY-DISCHARGE TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

SW#1: Trickle Tube
SW#2: Trickle Tube
SW#3: Trickle Tube

Elev	Stage (ft)	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	
474.00	0.00	0.00	0.00		
486.00	12.00	0.59	4.30		
486.70	0.00	0.64	4.70	0.00	Top of Sediment Storage (0 Stage)
487.00	0.30	0.66	0.19	0.00	
488.00	1.30	0.73	0.89	0.00	
489.00	2.30	0.81	1.66	0.00	
490.00	3.30	0.89	2.51	0.00	
491.00	4.30	0.97	3.43	0.00	
491.20	4.50	0.98	3.63	0.00	Stage of SW#1, SW#2, SW#3
492.00	5.30	1.05	4.44	17.98	
493.00	6.30	1.13	5.53	60.73	
493.88	7.18	1.13	6.57	110.99	Peak Stage
494.00	7.30	1.22	6.71	117.82	
495.00	8.30	1.31	7.97	186.25	

J1, B1, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

SW#1: Broad Crested Weir
SW#2: Emergency Spillway

Elev	Stage (ft)	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	
449.00	0.00	0.00	0.00		
465.00	16.00	1.17	8.81		
465.42	0.00	1.24	9.30	0.00	Top of Sediment Storage (0 Stage)
466.00	0.58	1.32	0.74	0.00	
467.00	1.58	1.48	2.14	0.00	

467.50	2.08	1.56	2.90	0.00	Stage of SW#1
468.00	2.58	1.65	3.70	38.20	
468.90	3.48	1.81	5.26	178.98	Stage of SW#2
468.93	3.51	1.81	5.32	187.91	Peak Stage
469.00	3.58	1.82	5.44	205.53	
469.42	4.00	1.90	6.23	331.97	
469.52	4.10	1.92	6.42	361.87	
469.62	4.20	1.94	6.61	399.00	
469.72	4.30	1.96	6.80	437.48	
469.82	4.40	1.97	7.00	477.22	
470.00	4.58	2.01	7.35	553.83	
470.32	4.90	2.12	8.02	711.13	
470.82	5.40	2.30	9.13	979.63	
471.00	5.58	2.36	9.54	1086.75	
471.32	5.90	2.49	10.32	1284.22	
471.82	6.40	2.68	11.61	1618.10	
472.00	6.58	2.75	12.09	1750.07	
472.32	6.90	2.88	13.00	1985.13	
472.82	7.40	3.09	14.49	2379.19	
473.00	7.58	3.16	15.05	2534.08	
473.32	7.90	3.30	16.09	2804.33	
473.82	8.40	3.52	17.79	3255.32	
474.00	8.58	3.60	18.43	3432.10	
474.82	9.40	3.99	21.55	4242.24	
475.00	9.58	4.07	22.26	4440.29	

****

ALABAMA LAND AND MINERAL CORP.
AREA 6 MINE
PERMIT APPLICATION
HYDROLOGY AND SEDIMENTOLOGY
~~25 YR. - 6 HR~~. EVENT
BASINS 010E & 010A SERIES

10 yr. 24 hr.

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES

by

Name: T.M.G.

Company Name: COSTAIN COAL INC.
File Name: C:\SEDCAD3\AREA6\AREA6-10

Date: 10-13-1992

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

STORM #1:

User-Defined Distribution

Label: drn58

	Accumulated Time (hrs)	Accumulated Dimensionless Depth
1	0.0	0.000
2	0.5	0.010
3	1.0	0.020
4	1.5	0.030
5	2.0	0.040
6	2.5	0.050
7	3.0	0.060
8	3.5	0.070
9	4.0	0.080
10	4.5	0.090
11	5.0	0.100
12	5.5	0.115
13	6.0	0.130
14	6.5	0.140
15	7.0	0.150
16	7.5	0.170
17	8.0	0.180
18	8.5	0.200
19	9.0	0.220
20	9.5	0.240
21	10.0	0.260
22	10.5	0.290
23	11.0	0.320
24	11.5	0.370
25	12.0	0.500
26	12.5	0.630
27	13.0	0.680
28	13.5	0.710
29	14.0	0.740
30	14.5	0.760
31	15.0	0.780
32	15.5	0.800
33	16.0	0.820
34	16.5	0.830
35	17.0	0.850
36	17.5	0.860
37	18.0	0.870

38	18.5	0.885
39	19.0	0.900
40	19.5	0.910
41	20.0	0.920
42	20.5	0.930
43	21.0	0.940
44	21.5	0.950
45	22.0	0.960
46	22.5	0.970
47	23.0	0.980
48	23.5	0.990
49	24.0	1.000

****

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	FINER % Finer	COARSER % Finer
3.0000	78.00	69.00
2.0000	76.00	63.00
1.0000	75.00	54.00
0.5000	74.00	47.00
0.3000	73.00	44.00
0.2000	64.00	37.00
0.1000	44.00	23.00
0.0500	26.00	13.00
0.0300	14.00	7.00
0.0200	12.00	5.00
0.0100	8.00	2.00
0.0050	5.00	1.00
0.0030	3.00	0.50
0.0010	1.00	0.30
0.0001	0.00	0.00

Detailed Between Structure Routing:

J	B	To S	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Muskingum K (hr)	Muskingum X
1	1	2	1	6	350.82	6.86	3.93	0.02	0.024	0.348

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	82.90*	81	F	0.644	0.000	0.000	0.0	26.83	94.32
111	2	1.00*	100	F	0.000	0.000	0.000	0.0	0.50	1.57
		Type: Pond			Label: BASIN 010A					
111	Structure	83.90							27.33	
111	Total IN	83.90							27.33	94.92
111	Total OUT								27.33	88.72
112	1	69.10*	81	F	1.208	0.000	0.000	0.0	22.36	65.93
112	2	2.00*	100	F	0.000	0.000	0.000	0.0	1.00	3.15
		Type: Pond			Label: BASIN 010E					
112	Structure	71.10							50.69	
112	Total IN	155.00							50.69	155.09
112	Total OUT								50.69	152.12
111 to 112 Routing						0.024	0.348			

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
M 111	1	0.24	100.0	11.6	0.900	0.000	2	2935.0				
111	2	0.00	100.0	0.0	0.000	0.000	1	0.0				
				Type: Pond		Label: BASIN 010A						
111	Structure							2935.0				
111	Total IN							2935.0	130681	101.40	59.04	32.11

```
  111 Total OUT                                   105.9    6292   2.09   0.95   0.40
  ==================================================================================
M 112  1   0.24  100.0   4.0 0.900  0.000 2  486.3
M 112  2   0.00  100.0   0.0 0.000  0.000 1    0.0
                        Type: Pond   Label: BASIN 010E
  112 Structure                                   592.2
  ----------------------------------------------------------------------------------
  112 Total IN                                    592.2   14755  10.12   5.89   3.21
  112 Total OUT                                    94.3    2723   0.50   0.25   0.12
  ==================================================================================
  111 to 112 Routing                  0.024
  ==================================================================================
```

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

DETAILED SUBWATERSHED INPUT/OUTPUT TABLE

J	B	S	SWS	Seg. #	Land Flow Condition	Distance (ft)	Slope (%)	Velocity (fps)	Segment Time (hr)	Time Conc. (hr)	Muskingum K (hr)	Muskingum X
1	1	1	1	-a	5	4100.00	3.12	1.77	0.64	0.644		
1	1	2	1	-a	5	6050.00	1.93	1.39	1.21	1.208		

Civil Software Design -- SEDCAD+ Version 3.1
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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

POND INPUT/OUTPUT TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

DISCHARGE OPTIONS:

	Trickle Tube	Trickle Tube	Trickle Tube
Riser Diameter (in)	----	----	----
Riser Height (ft)	----	----	----
Barrel Diameter (in)	48.0	48.0	48.0
Barrel Length (ft)	60.00	60.00	60.00
Barrel Slope (%)	3.00	3.00	3.00
Manning's n of Pipe	0.024	0.024	0.024
Spillway Elevation	491.2	491.2	491.2
Lowest Elevation of Holes	----	----	----
# of Holes/Elevation	----	----	----
Entrance Loss Coefficient	0.9	0.9	0.9
Tailwater Depth (ft)	0.0	0.0	0.0
Notch Angle (degrees)	----	----	----
Weir Width (ft)	----	----	----
Siphon Crest Elevation	----	----	----
Siphon Tube Diameter (in)	----	----	----
Siphon Tube Length (ft)	----	----	----
Manning's n of Siphon	----	----	----
Siphon Inlet Elevation	----	----	----
Siphon Outlet Elevation	----	----	----
Emergency Spillway Elevation	----	----	----
Crest Length (ft)	----	----	----
Z:1 (Left and Right)	-- --	-- --	-- --
Bottom Width (ft)	----	----	----

POND RESULTS:

Sediment Storage* (ac-ft)	Permanent Pool (ac-ft)	Dead Space (%)	Sediment Algorithm
4.70	3.63	20.00	CSTRS

*Sediment Capacity based on User Input

	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Concentration (ml/l)	24VW (ml/l)	24AA (ml/l)
IN	27.33	94.92	2935.0	130681	101.40	59.04	32.11
OUT	27.33	88.72	105.9	6292	2.09	0.95	0.40

Peak Elevation	Trap Efficiency (%)	Hydrograph Detention Time (hrs)
493.5	96.39	0.46

****

J1, 31, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

DISCHARGE OPTIONS:

	Broad Crested Weir	Emergency Spillway
Riser Diameter (in)	----	----
Riser Height (ft)	----	----
Barrel Diameter (in)	----	----
Barrel Length (ft)	----	----
Barrel Slope (%)	----	----
Manning's n of Pipe	----	----
Spillway Elevation	467.5	----
Lowest Elevation of Holes	----	----
# of Holes/Elevation	----	----
Entrance Loss Coefficient	----	----
Tailwater Depth (ft)	----	----
Notch Angle (degrees)	----	----
Weir Width (ft)	35.0	----
Siphon Crest Elevation	----	----
Siphon Tube Diameter (in)	----	----
Siphon Tube Length (ft)	----	----
Manning's n of Siphon	----	----
Siphon Inlet Elevation	----	----
Siphon Outlet Elevation	----	----
Emergency Spillway Elevation	----	468.9
Crest Length (ft)	----	10.0
Z:1 (Left and Right)	-- --	2 2
Bottom Width (ft)	----	40.7

POND RESULTS:

Sediment Storage* (ac-ft)	Permanent Pool (ac-ft)	Dead Space (%)	Sediment Algorithm
9.30	2.90	20.00	CSTRS

*Sediment Capacity based on User Input

	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Sediment (tons)	Peak Sediment Concentration (mg/l)	Peak Settleable Concentration (ml/l)	24VW (ml/l)	24AA (ml/l)
IN	50.69	155.09	592.2	14755	10.12	5.89	3.21
OUT	50.69	152.12	94.3	2723	0.50	0.25	0.12

Peak Elevation	Trap Efficiency (%)	Hydrograph Detention Time (hrs)
468.7	84.08	0.22

****

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

ELEVATION-DISCHARGE TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

Elevation	Trickle Tube (cfs)	Trickle Tube (cfs)	Trickle Tube (cfs)	Total Discharge (cfs)
486.70	0.0	0.0	0.0	0.0
487.00	0.0	0.0	0.0	0.0
488.00	0.0	0.0	0.0	0.0
489.00	0.0	0.0	0.0	0.0
490.00	0.0	0.0	0.0	0.0
491.00	0.0	0.0	0.0	0.0
491.20	0.0	0.0	0.0	0.0
492.00	6.0	6.0	6.0	18.0
493.00	20.2	20.2	20.2	60.7
494.00	39.3	39.3	39.3	117.8
495.00	62.1	62.1	62.1	186.2

J1, B1, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

Elevation	Broad Crested Weir (cfs)	Emergency Spillway (cfs)	Total Discharge (cfs)
465.42	0.0	0.0	0.0
466.00	0.0	0.0	0.0
467.00	0.0	0.0	0.0
467.50	0.0	0.0	0.0
468.00	38.2	0.0	38.2
468.90	179.0	0.0	179.0
469.00	198.5	7.0	205.5
469.42	295.2	36.8	332.0
469.52	318.0	43.8	361.9
469.62	340.9	58.1	399.0
469.72	363.8	73.7	437.5

469.82	386.6	90.6	477.2
470.00	427.1	126.7	553.8
470.32	517.6	193.5	711.1
470.82	657.8	321.8	979.6
471.00	707.5	379.3	1086.7
471.32	812.1	472.1	1284.2
471.82	974.0	644.1	1618.1
472.00	1031.4	718.7	1750.1
472.32	1148.4	836.8	1985.1
472.82	1329.5	1049.7	2379.2
473.00	1393.6	1140.4	2534.1
473.32	1521.8	1282.5	2804.3
473.82	1720.2	1535.1	3255.3
474.00	1790.5	1641.6	3432.1
474.82	2143.3	2098.9	4242.2
475.00	2219.2	2221.1	4440.3

****

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Company Name: COSTAIN COAL INC.
Filename: C:\SEDCAD3\AREA6\AREA6-10 User: T.M.G.
Date: 10-13-1992 Time: 13:47:58
ALABAMA LAND AND MINERAL CORP. AREA 6 MINE BASIN 010E & 010A SERIES
Storm: 6.00 inches, 10 year-24 hour, drn58
Hydrograph Convolution Interval: 0.1 hr

ELEVATION-AREA-CAPACITY-DISCHARGE TABLE

J1, B1, S1
BASIN 010A

Drainage Area from J1, B1, S1, SWS(s)1-2: 83.9 acres
Total Contributing Drainage Area: 83.9 acres

SW#1: Trickle Tube
SW#2: Trickle Tube
SW#3: Trickle Tube

Elev	Stage (ft)	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	
474.00	0.00	0.00	0.00		
486.00	12.00	0.59	4.30		
486.70	0.00	0.64	4.70	0.00	Top of Sediment Storage (0 Stage)
487.00	0.30	0.66	0.19	0.00	
488.00	1.30	0.73	0.89	0.00	
489.00	2.30	0.81	1.66	0.00	
490.00	3.30	0.89	2.51	0.00	
491.00	4.30	0.97	3.43	0.00	
491.20	4.50	0.98	3.63	0.00	Stage of SW#1, SW#2, SW#3
492.00	5.30	1.05	4.44	17.98	
493.00	6.30	1.13	5.53	60.73	
493.49	6.79	1.13	6.11	88.72	Peak Stage
494.00	7.30	1.22	6.71	117.82	
495.00	8.30	1.31	7.97	186.25	

J1, B1, S2
BASIN 010E

Drainage Area from J1, B1, S2, SWS(s)1-2: 71.1 acres
Total Contributing Drainage Area: 155.0 acres

SW#1: Broad Crested Weir
SW#2: Emergency Spillway

Elev	Stage (ft)	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	
449.00	0.00	0.00	0.00		
465.00	16.00	1.17	8.81		
465.42	0.00	1.24	9.30	0.00	Top of Sediment Storage (0 Stage)
466.00	0.58	1.32	0.74	0.00	
467.00	1.58	1.48	2.14	0.00	

467.50	2.08	1.56	2.90	0.00	Stage of SW#1
468.00	2.58	1.65	3.70	38.20	
468.73	3.31	1.65	4.96	152.12	Peak Stage
468.90	3.48	1.81	5.26	178.98	Stage of SW#2
469.00	3.58	1.82	5.44	205.53	
469.42	4.00	1.90	6.23	331.97	
469.52	4.10	1.92	6.42	361.87	
469.62	4.20	1.94	6.61	399.00	
469.72	4.30	1.96	6.80	437.48	
469.82	4.40	1.97	7.00	477.22	
470.00	4.58	2.01	7.35	553.83	
470.32	4.90	2.12	8.02	711.13	
470.82	5.40	2.30	9.13	979.63	
471.00	5.58	2.36	9.54	1086.75	
471.32	5.90	2.49	10.32	1284.22	
471.82	6.40	2.68	11.61	1618.10	
472.00	6.58	2.75	12.09	1750.07	
472.32	6.90	2.88	13.00	1985.13	
472.82	7.40	3.09	14.49	2379.19	
473.00	7.58	3.16	15.05	2534.08	
473.32	7.90	3.30	16.09	2804.33	
473.82	8.40	3.52	17.79	3255.32	
474.00	8.58	3.60	18.43	3432.10	
474.82	9.40	3.99	21.55	4242.24	
475.00	9.58	4.07	22.26	4440.29	

****

SOIL CLASSIFICATION

Alabama Land and Mineral Corp.
Area No. 6

STABILITY ANALYSIS DATA

METHODOLOGY

The static and dynamic loading stability analyses were performed using the Simplified Bishop Method. The computer program used was the REAME Slope Stability Program as developed by Dr. Yang H. Haung, P.E. of the University of Kentucky.

SOIL CLASSIFICATION UNITS

The soil types (soil classifications) to be used in the construction of the embankment structures of Basin 010 (SM) and Basin 010A (ML) and the soil types (soil classification) of the material between the proposed embankments and stiff base of Basin 010 (ML) and Basin 010A (SM) were sampled and analyzed by PERC Engineering Co., Inc. The soil properties used in the stability analysis (SM) AND (ML) type soils, were taken from the U.S. Department of the Interior Bureau of Reclamation Design of Small Dams.*

SOIL PROPERTIES

	UNIFIED CLASS	COHESION (PSF)	ANGLE OF INT. FRICTION	DESIGN DENSITY (PCF)
Basin 010 Dam Material	SM	270.0	33.02	132.14
Basin 010 Foundation	ML	100.8	30.54	129.54
Basin 010A Dam Material	ML	100.8	30.54	129.54
Basin 010A Foundation	SM	270.0	33.02	132.14

*United States Department of Interior Bureau of Reclamation Design of Small Dams page 137.

Alabama land and Mineral Corp.
Area No. 6

STABILITY ANALYSIS DATA

(Continued)

DESIGN DATA

1) Design Density = 95% of the standard proctor maximum density.
2) Embankment top width: 12.0'.
3) Freeboard minimum = 10% of structure (from top of embankment to normal pool level).
4) Safety factors for embankments with 2.5H:1V slopes, front and back.
5) Sediment Basin 010 design height = 21.0 ft.
6) Sediment Basin 010A design height = 22.2 ft.
7) DMIN = 0.00
8) All design heights are measured from the top of the embankment to the toe of the upstream slope.

SAFETY FACTORS

BASIN NUMBER	STATIC SAFETY FACTOR	SEISMIC SAFETY FACTOR
010	1.9	1.7
010A	1.6	1.4

FOUNDATIONS AND ABUTMENTS

The foundation and abutments area will be inspected for visible structural deficiencies after clearing and grubbing, and if found they will be treated using sound engineering practices.

LIQUID & PLASTIC LIMIT TEST DATA

PROJECT DATA

Project No.: 217 Date: 8-17-92
Client: ALABAMA LAND & MINERIAL
Project: BASIN 010 DAM MATERIAL

Project location: ABERNAT, ALABAMA
AREA #6
Remarks: DAM MATERIAL
BASIN 010

Figure Number:

TEST DATA - Test number 1

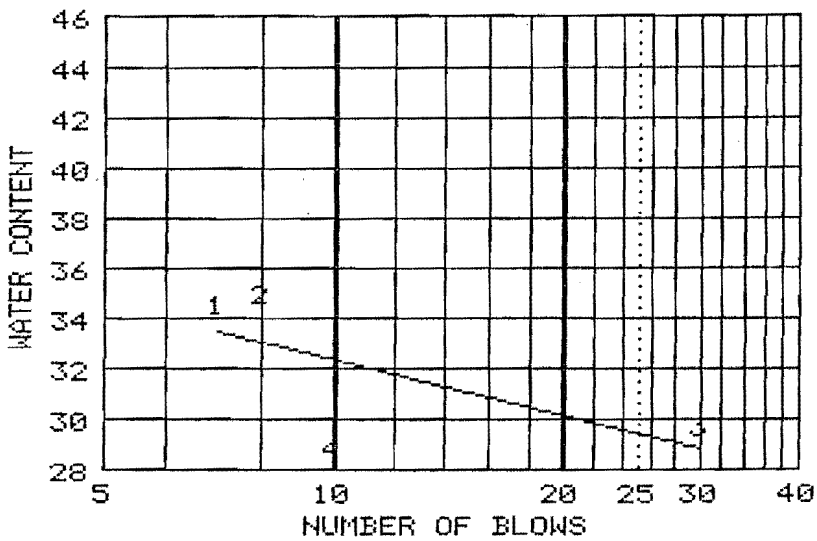
Location and description: LIGHT BROWN SILT

LIQUID LIMITS

Run No.	1	2	3	4
WT w+t	20.5	20.4	18.4	18.6
WT d+t	17.6	17.5	16.3	16.5
WT tare	9.2	9.2	9.2	9.2
# Blows	7	8	30	10
Moisture	34.5	34.9	29.6	28.8

PLASTIC LIMITS

Run No.	1	2	3
WT w+t	18.0		
WT d+t	16.2		
WT tare	9.1		
Moisture	25.4		



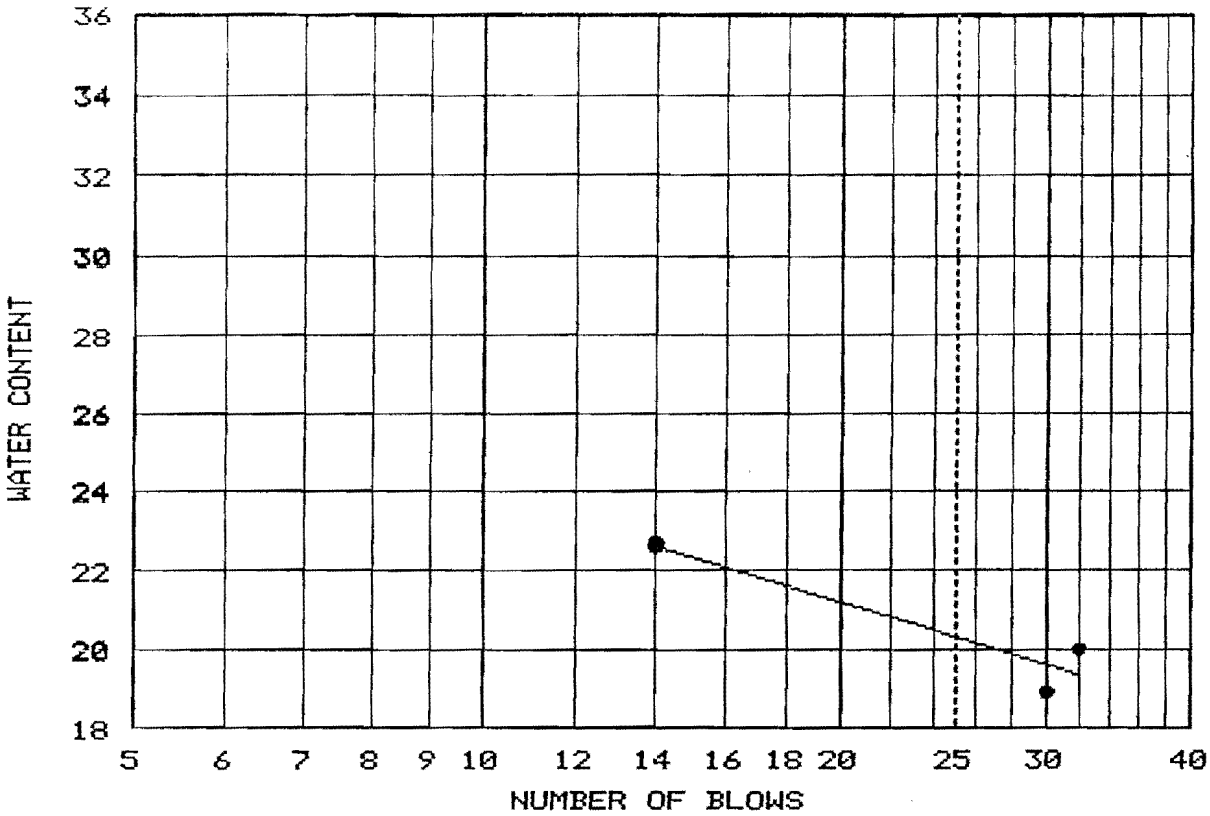
Liquid Limit = 29.5
Plastic Limit = 25.4
Plasticity Index = 4.1

CLASSIFICATION DATA

%-4 = 81.17 %-10 = 69.23 %-40 = 62.43 %-200 = 49.85
Uniformity Coefficient = Curvature Coefficient =
LL = 29.5 PL = 25.4 PI = 4.1 LL (oven dry) =
ASTM = SM, Silty sand with gravel
AASHTO = A-4(0)

PERC ENGINEERING CO., INC.

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	BASIN 10-E FOUNDATION MATERIAL	20.3	17.9	2.4	50.33	ML, Sandy silt

Project No.: 356
Project: BASIN 10-E
FOUNDATION MATERIAL
Client: ALABAMA LAND & MINERAL
Location: AREA 6

Date: 11-17-92

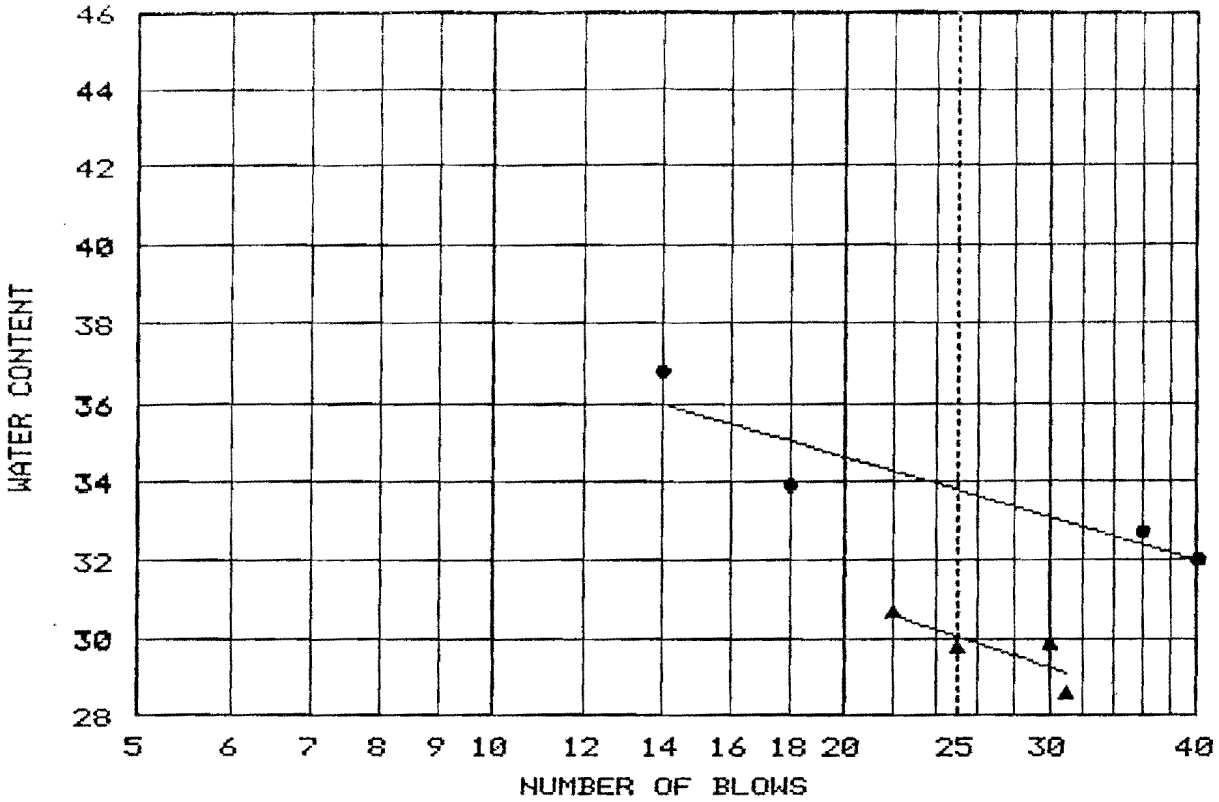
Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

PERC ENGINEERING CO., INC.

Fig. No._____

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	BASIN 10-A DAM MATERIAL	33.8	23.8	10	69.92	ML, Sandy silt
▲	BASIN 10-A FOUNDATION MATERIAL	30.0	25.0	5	48.65	SM, Silty sand with gravel

Project No.: 354
Project: BASIN 10-A

Client: ALABAMA LAND & MINERAL
Location: AREA 6

Date: 11-16-92

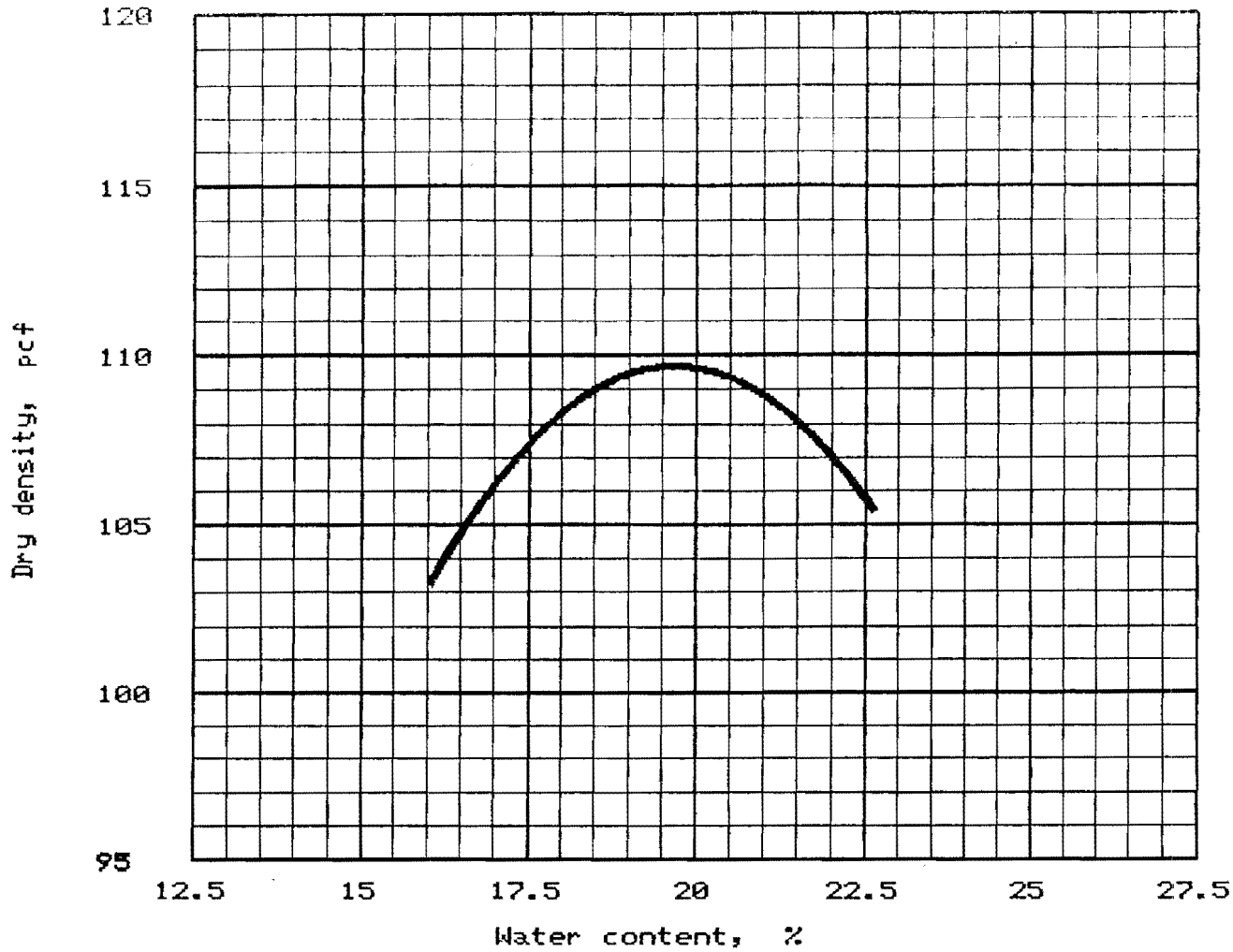
Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

PERC ENGINEERING CO., INC.

Fig. No._____

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method C

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in	% < No. 20
	USCS	AASHTO						
					33.8	10		

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 19.7 % Maximum dry density = 109.7 pcf	RED SANDY SILT

Project No.: 355
Project: ALABAMA LAND & MINERAL
Location: AREA 6

Date: 11-16-1992

Remarks:
BASIN 10-A
DAM MATERIAL

PROCTOR TEST REPORT

PERC ENGINEERING CO., INC.

Figure No._____

ME (Rotational Equilibrium Analysis of Multilayered Embankments)
Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
2301 22nd Ave.
Northport, AL 35476
(205)-339-6536

Alabama Land and Mineral, Corp. Area No. 6 Basin 010A Static

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 4
Number of points on boundary lines are: 2 2 3 7

On boundary line no. 1 Point no. and coordinates are:
1 .000 19.000 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 12.400 2 335.912 7.235

On boundary line no. 3 Point no. and coordinates are:
1 .000 20.000 2 200.000 12.400 3 243.000 29.600

On boundary line no. 4 Point no. and coordinates are:
1 .000 29.600 2 243.000 29.600 3 255.500 34.600 4 267.500 34.600 5 320.256 13.497
6 335.912 7.235 7 500.000 1.000

Line no. and slope of each segment are:
1 -.038
2 -.038
3 -.038 .400
4 .000 .400 .000 -.400 -.400 -.038

No. of radius control zones= 1 Plot or no plot= 1 No. of seepage cases= 1

Total no. of lines at bottom of radius control zones is: 1

For rad. cont. zone no. 1 Radius decrement= .000 No. of Circles= 5 Id no. for first circle=, 1
Line no.= 1 Begin pt. no.= 1 End pt. no.= 2

Soil no.	Cohesion	F. angle	Unit wt.
1	270.000	33.020	132.140
2	100.800	30.540	129.540
3	.000	.000	62.400

Seismic coefficient= .000 Min. depth of tallest slice= .000 Unit weight of water= 62.400

The factors of safety are determined by the SIMPLIFIED BISHOP method

NSPG= 1 NSRCH= 0 No. of slices= 10 No. of add. radii= 2

No. of points on water table for each case= 6

```
 1      .000    29.600    2  243.000    29.600    3  275.178    23.338    4  320.256    13.497    5  335.912     7.235
 6  500.000     1.000

point1=(   269.000,    56.000) point2=(   269.000,    36.000) point3=(   337.000,    36.000) NJ=    2 NI=    2
   Automatic search will follow after grid with XINC=    10.000 and YINC=    10.000

At point (   269.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      47.188     7.582        42.041     6.958        36.894     6.845        31.747     6.727        26.600     6.401
      24.884     7.313        23.168    10.934
   Lowest factor of safety=     6.401 and occurs at radius  =     26.600


At point (   269.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      37.195     7.514        32.056     6.707        26.916     6.303        21.777     6.000        16.638     5.843
      14.925     6.473        13.211     8.858
   Lowest factor of safety=     5.843 and occurs at radius  =     16.638


At point (   269.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      27.202     7.810        22.133     6.738        17.064     6.488        11.995     6.702         6.926     6.418
      20.444     6.661        18.754     6.591        15.375     6.577        13.685     6.597         5.236     6.310
       3.547     6.531
   Lowest factor of safety=     6.310 and occurs at radius  =      5.236


At point (   303.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      48.479     1.888        45.394     1.764        42.309     1.895        39.224     2.190        36.139     2.681
      47.451     1.716        46.422     1.734        44.366     1.801        43.337     1.840
   Lowest factor of safety=     1.716 and occurs at radius  =     47.451


At point (   303.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      38.486     1.956        35.543     1.833        32.599     1.981        29.656     2.269        26.713     2.794
      37.505     1.774        36.524     1.801        34.562     1.875        33.581     1.924
   Lowest factor of safety=     1.774 and occurs at radius  =     37.505


At point (   303.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      28.493     2.190        25.692     2.029        22.890     2.171        20.088     2.447        17.286     2.989
      27.560     2.041        26.626     2.002        24.758     2.064        23.824     2.110
   Lowest factor of safety=     2.002 and occurs at radius  =     26.626


At point (   337.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      49.770     2.696        48.952     2.454        48.135     2.239        47.317     2.887        46.499     4.834
      48.680     2.006        48.407     2.110        47.862     2.400        47.590     2.608
   Lowest factor of safety=     2.006 and occurs at radius  =     48.680


At point (   337.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      39.777     3.117        39.101     2.999        38.425     2.413        37.749     3.164        37.073     5.438
      38.876     2.732        38.650     2.264        38.200     2.600        37.974     2.842
   Lowest factor of safety=     2.264 and occurs at radius  =     38.650


At point (   337.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      29.785     3.872        29.250     3.944        28.715     2.751        28.181     3.699        27.646     6.608
      29.072     3.870        28.894     3.590        28.537     2.983        28.359     3.290
   Lowest factor of safety=     2.751 and occurs at radius  =     28.715


For piezometric line No.    1
```

the minimum factor of safety is 1.716

At point (303.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

48.479	1.888	45.394	1.764	42.309	1.895	39.224	2.190	36.139	2.681
47.451	1.716	46.422	1.734	44.366	1.801	43.337	1.840		

Lowest factor of safety= 1.716 and occurs at radius = 47.451

At point (313.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

48.859	1.780	46.441	1.659	44.022	1.821	41.604	2.181	39.186	2.919
48.053	1.692	47.247	1.624	45.635	1.700	44.828	1.752		

Lowest factor of safety= 1.624 and occurs at radius = 47.247

At point (323.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

49.238	1.826	47.487	1.635	45.736	1.824	43.985	2.219	42.233	3.362
48.655	1.770	48.071	1.595	46.903	1.685	46.320	1.746		

Lowest factor of safety= 1.595 and occurs at radius = 48.071

At point (333.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

49.618	2.204	48.534	1.756	47.449	2.010	46.365	2.537	45.280	4.084
49.257	2.154	48.895	2.042	48.172	1.824	47.811	1.907		

Lowest factor of safety= 1.756 and occurs at radius = 48.534

At point (323.000, 66.000) under seepage 1,the radius and the corresponding factor of safety are:

59.231	1.773	57.338	1.616	55.445	1.811	53.553	2.206	51.660	3.226
58.600	1.713	57.969	1.574	56.707	1.667	56.076	1.730		

Lowest factor of safety= 1.574 and occurs at radius = 57.969

At point (323.000, 76.000) under seepage 1,the radius and the corresponding factor of safety are:

69.224	1.729	67.190	1.603	65.155	1.799	63.120	2.187	61.086	3.099
68.546	1.667	67.868	1.560	66.511	1.656	65.833	1.723		

Lowest factor of safety= 1.560 and occurs at radius = 67.868

At point (323.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.217	1.716	77.041	1.596	74.865	1.790	72.688	2.177	70.512	2.990
78.491	1.646	77.766	1.555	76.315	1.649	75.590	1.713		

Lowest factor of safety= 1.555 and occurs at radius = 77.766

At point (323.000, 96.000) under seepage 1,the radius and the corresponding factor of safety are:

89.210	1.730	86.892	1.611	84.574	1.786	82.256	2.164	79.939	2.895
88.437	1.653	87.664	1.574	86.119	1.659	85.347	1.718		

Lowest factor of safety= 1.574 and occurs at radius = 87.664

At point (333.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.597	1.906	78.087	1.674	76.578	1.904	75.069	2.360	73.559	3.609
79.093	1.842	78.590	1.619	77.584	1.738	77.081	1.812		

Lowest factor of safety= 1.619 and occurs at radius = 78.590

At point (313.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

78.837	1.792	75.994	1.676	73.151	1.821	70.308	2.117	67.465	2.670
77.889	1.683	76.942	1.648	75.046	1.713	74.099	1.759		

Lowest factor of safety= 1.648 and occurs at radius = 76.942

At point (325.500, 86.000) under seepage 1,the radius and the c

78.642	1.668	77.972	1.559	76.633	1.663	75.963	1.726

[illegible] of safety 1.559 and occurs at radius = 77.972

At point (320.500, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.122	1.718	76.779	1.600	74.436	1.778	72.093	2.157	69.751	2.892
78.341	1.639	77.560	1.564	75.998	1.647	75.217	1.709		

Lowest factor of safety= 1.564 and occurs at radius = 77.560

At point (323.000, 88.500) under seepage 1,the radius and the corresponding factor of safety are:

81.715	1.718	79.504	1.597	77.292	1.788	75.080	2.175	72.869	2.965
80.978	1.646	80.241	1.558	78.766	1.649	78.029	1.711		

Lowest factor of safety= 1.558 and occurs at radius = 80.241

At point (323.000, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.719	1.716	74.578	1.596	72.437	1.792	70.296	2.179	68.156	3.015
76.005	1.648	75.291	1.554	73.864	1.652	73.151	1.716		

Lowest factor of safety= 1.554 and occurs at radius = 75.291

At point (323.000, 81.000) under seepage 1,the radius and the corresponding factor of safety are:

74.220	1.718	72.115	1.599	70.010	1.794	67.904	2.181	65.799	3.042
73.519	1.653	72.817	1.555	71.413	1.653	70.712	1.718		

Lowest factor of safety= 1.555 and occurs at radius = 72.817

At point (325.500, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.814	1.730	74.840	1.608	72.866	1.808	70.892	2.207	68.918	3.135
76.156	1.673	75.498	1.561	74.182	1.664	73.524	1.729		

Lowest factor of safety= 1.561 and occurs at radius = 75.498

At point (320.500, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.624	1.716	74.316	1.596	72.009	1.781	69.701	2.159	67.394	2.914
75.855	1.638	75.085	1.559	73.547	1.645	72.778	1.708		

Lowest factor of safety= 1.559 and occurs at radius = 75.085

For piezometric line No. 1

At point (323.000, 83.500) ,RADIUS 75.291
the minimum factor of safety is 1.554

Cross section in distorted scale. Numerals indicate boundary line no.
If there area more than 10 bound. lines, alphabets will then be used. P indicates Piezometric line. If a portion of Piezometric line coincides with the ground or another boundary line, only the ground or boundary line will be shown. X indicates intersection of two boundary lines. * indicates failure surface.
The minimum factor of safety is 1.554

```
4.000E+01 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
          +    +                                        +
          +    +                                        +
          +    +                                        +
          +    +                                        +
3.600E+01 X    X    +         +         +         +         X
          +    +                                        +
          +    +              44                        +
          +    +                                        +
          +    +                                        +
3.200E+01 X    X    +         +         +         +         X
          +    +                                        +
          +    +                                        +
          +    444444444444444X                         +
          +    +                                        +
2.800E+01 X    X    +         + 4       +         +         X
          +    +                                        +
          +    +              P                         +
          +    +                                        +
          +    +                                        +
2.400E+01 X    X    +         +         +         +         X
          +    +               P                        +
          +    +                                        +
          +    +                *                       +
          +    +            3    4                       +
2.000E+01 X    X3   +         + P       +         +         X
          +    113                                      +
          +    + 13                                     +
          +    +  133                                   +
          +    +   113            P                     +
1.600E+01 X    X    +13       +         +         +         X
          +    +      133                               +
          +    +       113                              +
          +    +         13       *4                    +
          +    +          13                            +
1.200E+01 X    X    +      1X2+         +         +         X
          +    +           112                          +
          +    +             12                         +
          +    +              122                       +
          +    +               112*                     +
8.000E+00 X    X    +         +   12    +         +         X
          +    +                  1X4                  +
          +    +                   1 4                 +
          +    +                    114                +
          +    +                      14               +
4.000E+00 X    X    +         +         144       +         X
          +    +                         114            +
          +    +                           14           +
          +    +                            14          +
          +    +                             14         +
.000E+00 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X

       -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
```

REAME (Rotational Equilibrium Anal[illegible] Embankments)

Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
2301 22nd Ave.
Northport, AL 35476
(205)-339-6536

Alabama Land and Mineral, Corp. Area No. 6 Basin 010A Dynamic

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 4
Number of points on boundary lines are: 2 2 3 7

On boundary line no. 1 Point no. and coordinates are:
1 .000 19.000 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 12.400 2 335.912 7.235

On boundary line no. 3 Point no. and coordinates are:
1 .000 20.000 2 200.000 12.400 3 243.000 29.600

On boundary line no. 4 Point no. and coordinates are:
1 .000 29.600 2 243.000 29.600 3 255.500 34.600 4 267.500 34.600 5 320.256 13.497
6 335.912 7.235 7 500.000 1.000

Line no. and slope of each segment are:

1	-.038				
2	-.038				
3	-.038	.400			
4	.000	.400	.000	-.400	-.400	-.038

No. of radius control zones= 1 Plot or no plot= 1 No. of seepage cases= 1

Total no. of lines at bottom of radius control zones is: 1

For rad. cont. zone no. 1 Radius decrement= .000 No. of Circles= 5 Id no. for first circle=, 1
Line no.= 1 Begin pt. no.= 1 End pt. no.= 2

Soil no.	Cohesion	F. angle	Unit wt.
1	270.000	33.020	132.140
2	100.800	30.540	129.540
3	.000	.000	62.400

Seismic coefficient= .050 Min. depth of tallest slice= .000 Unit weight of water= 62.400

The factors of safety are determined by the SIMPLIFIED BISHOP method

NSPG= 1 NSRCH= 0 No. of slices= 10 No. of add. radii= 2

No. of points on water table for each case= 6

```
  1      .000    29.600    2   243.000    29.600    3  -275.178    23.338    4   320.256    13.497    5   335.912     7.235
  6   500.000     1.000

point1=(   269.000,    56.000) point2=(   269.000,    36.000) point3=(   337.000,    36.000) NJ=    2 NI=    2
   Automatic search will follow after grid with XINC=    10.000 and YINC=    10.000

point (   269.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      47.188     4.917        42.041     4.605        36.894     4.696        31.747     4.825        26.600     4.758
      45.472     4.577        43.757     4.597        40.325     4.628        38.609     4.673        24.884     5.411
      23.168     7.879
   Lowest factor of safety=     4.577 and occurs at radius  =     45.472


At point (   269.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      37.195     5.144        32.056     4.726        26.916     4.638        21.777     4.587        16.638     4.540
      14.925     5.008        13.211     6.800
   Lowest factor of safety=     4.540 and occurs at radius  =     16.638


At point (   269.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      27.202     5.785        22.133     5.210        17.064     5.198        11.995     5.470         6.926     5.319
      20.444     5.210        18.754     5.216        15.375     5.298        13.685     5.361         5.236     5.284
       3.547     5.574
   Lowest factor of safety=     5.198 and occurs at radius  =     17.064


At point (   303.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      48.479     1.646        45.394     1.540        42.309     1.659        39.224     1.922        36.139     2.358
      47.451     1.494        46.422     1.512        44.366     1.573        43.337     1.609
   Lowest factor of safety=     1.494 and occurs at radius  =     47.451


point (   303.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      38.486     1.715        35.543     1.606        32.599     1.737        29.656     1.993        26.713     2.458
      37.505     1.554        36.524     1.577        34.562     1.642        33.581     1.686
   Lowest factor of safety=     1.554 and occurs at radius  =     37.505


At point (   303.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      28.493     1.927        25.692     1.782        22.890     1.907        20.088     2.151        17.286     2.632
      27.560     1.794        26.626     1.758        24.758     1.813        23.824     1.853
   Lowest factor of safety=     1.758 and occurs at radius  =     26.626


At point (   337.000,    56.000) under seepage    1,the radius and the corresponding factor of safety are:
      49.770     2.363        48.952     2.158        48.135     1.963        47.317     2.540        46.499     4.270
      48.680     1.756        48.407     1.849        47.862     2.106        47.590     2.292
   Lowest factor of safety=     1.756 and occurs at radius  =     48.680


At point (   337.000,    46.000) under seepage    1,the radius and the corresponding factor of safety are:
      39.777     2.728        39.101     2.642        38.425     2.118        37.749     2.786        37.073     4.807
      38.876     2.406        38.650     1.986        38.200     2.285        37.974     2.499
   Lowest factor of safety=     1.986 and occurs at radius  =     38.650


At point (   337.000,    36.000) under seepage    1,the radius and the corresponding factor of safety are:
      29.785     3.379        29.250     3.467        28.715     2.419        28.181     3.262        27.646     5.848
      29.072     3.411        28.894     3.169        28.537     2.626        28.359     2.898
   Lowest factor of safety=     2.419 and occurs at radius  =     28.715


For piezometric line No.    1
```

the minimum factor of safety is 1.494

At point (303.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

48.479	1.646	45.394	1.540	42.309	1.659	39.224	1.922	36.139	2.358
47.451	1.494	46.422	1.512	44.366	1.573	43.337	1.609		

Lowest factor of safety= 1.494 and occurs at radius = 47.451

At point (313.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

48.859	1.559	46.441	1.449	44.022	1.593	41.604	1.913	39.186	2.569
48.053	1.480	47.247	1.418	45.635	1.485	44.828	1.531		

Lowest factor of safety= 1.418 and occurs at radius = 47.247

At point (323.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

49.238	1.601	47.487	1.427	45.736	1.594	43.985	1.946	42.233	2.962
48.655	1.549	48.071	1.392	46.903	1.471	46.320	1.526		

Lowest factor of safety= 1.392 and occurs at radius = 48.071

At point (333.000, 56.000) under seepage 1,the radius and the corresponding factor of safety are:

49.618	1.936	48.534	1.534	47.449	1.760	46.365	2.228	45.280	3.604
49.257	1.892	48.895	1.792	48.172	1.595	47.811	1.668		

Lowest factor of safety= 1.534 and occurs at radius = 48.534

At point (323.000, 66.000) under seepage 1,the radius and the corresponding factor of safety are:

59.231	1.553	57.338	1.410	55.445	1.583	53.553	1.934	51.660	2.842
58.600	1.498	57.969	1.372	56.707	1.455	56.076	1.511		

Lowest factor of safety= 1.372 and occurs at radius = 57.969

At point (323.000, 76.000) under seepage 1,the radius and the corresponding factor of safety are:

69.224	1.513	67.190	1.398	65.155	1.573	63.120	1.918	61.086	2.728
68.546	1.457	67.868	1.360	66.511	1.446	65.833	1.505		

Lowest factor of safety= 1.360 and occurs at radius = 67.868

At point (323.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.217	1.498	77.041	1.391	74.865	1.565	72.688	1.909	70.512	2.631
78.491	1.436	77.766	1.354	76.315	1.439	75.590	1.496		

Lowest factor of safety= 1.354 and occurs at radius = 77.766

At point (323.000, 96.000) under seepage 1,the radius and the corresponding factor of safety are:

89.210	1.505	86.892	1.401	84.574	1.559	82.256	1.898	79.939	2.547
88.437	1.437	87.664	1.367	86.119	1.444	85.347	1.498		

Lowest factor of safety= 1.367 and occurs at radius = 87.664

At point (333.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.597	1.670	78.087	1.461	76.578	1.665	75.069	2.071	73.559	3.182
79.093	1.614	78.590	1.412	77.584	1.518	77.081	1.583		

Lowest factor of safety= 1.412 and occurs at radius = 78.590

At point (313.000, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

78.837	1.549	75.994	1.451	73.151	1.585	70.308	1.853	67.465	2.348
77.889	1.453	76.942	1.424	75.046	1.485	74.099	1.527		

Lowest factor of safety= 1.424 and occurs at radius = 76.942

79.417	1.509	77.302	1.401	75.293	1.578	73.284	1.932	71.274	2.734
[illegible]	1.455	77.972	1.359	76.633	1.452	75.963	1.508		

Lowest factor of safety= 1.359 and occurs at radius = 77.972

At point (320.500, 86.000) under seepage 1,the radius and the corresponding factor of safety are:

79.122	1.497	76.779	1.393	74.436	1.553	72.093	1.891	69.751	2.544
78.341	1.428	77.560	1.360	75.998	1.435	75.217	1.491		

Lowest factor of safety= 1.360 and occurs at radius = 77.560

At point (323.000, 88.500) under seepage 1,the radius and the corresponding factor of safety are:

81.715	1.498	79.504	1.392	77.292	1.563	75.080	1.907	72.869	2.609
80.978	1.435	80.241	1.356	78.766	1.438	78.029	1.494		

Lowest factor of safety= 1.356 and occurs at radius = 80.241

At point (323.000, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.719	1.499	74.578	1.392	72.437	1.566	70.296	1.911	68.156	2.654
76.005	1.439	75.291	1.354	73.864	1.442	73.151	1.498		

Lowest factor of safety= 1.354 and occurs at radius = 75.291

At point (323.000, 81.000) under seepage 1,the radius and the corresponding factor of safety are:

74.220	1.502	72.115	1.394	70.010	1.568	67.904	1.913	65.799	2.678
73.519	1.443	72.817	1.355	71.413	1.443	70.712	1.501		

Lowest factor of safety= 1.355 and occurs at radius = 72.817

At point (325.500, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.814	1.514	74.840	1.402	72.866	1.580	70.892	1.935	68.918	2.760
76.156	1.462	75.498	1.361	74.182	1.453	73.524	1.510		

Lowest factor of safety= 1.361 and occurs at radius = 75.498

At point (320.500, 83.500) under seepage 1,the radius and the corresponding factor of safety are:

76.624	1.497	74.316	1.391	72.009	1.556	69.701	1.893	67.394	2.565
75.855	1.428	75.085	1.357	73.547	1.434	72.778	1.492		

Lowest factor of safety= 1.357 and occurs at radius = 75.085

For piezometric line No. 1

At point (323.000, 83.500) ,RADIUS 75.291
the minimum factor of safety is 1.354

Cross section in distorted scale. Numerals indicate boundary line no.
If there area more than 10 bound. lines, alphabets will then be used. P indicates
Piezometric line. If a portion of Piezometric line coincides with
the ground or another boundary line, only the ground or boundary
line will be shown. X indicates intersection of two boundary
lines. * indicates failure surface.
The minimum factor of safety is 1.354

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4.000E+01 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
          +   +                                            +
          +   +                                            +
          +   +                                            +
          +   +                                            +
3.600E+01 X   X   +        +        +        +        X
          +   +                                            +
          +   +             44                             +
          +   +                                            +
          +   +                                            +
3.200E+01 X   X   +        +        +        +        X
          +   +                                            +
          +   +                                            +
          +   444444444444444X                             +
          +   +                                            +
2.800E+01 X   X   +        + 4      +        +        X
          +   +                                            +
          +   +             P                              +
          +   +                                            +
          +   +                                            +
2.400E+01 X   X   +        +        +        +        X
          +   +               P                            +
          +   +                                            +
          +   +                *                           +
          +   +            3   4                           +
2.000E+01 X   X3  +        + P      +        +        X
          +   113                                          +
          +   + 13                                         +
          +   + 133                                        +
          +   + 113            P                           +
1.600E+01 X   X   +13      +        +        +        X
          +   +     133                                    +
          +   +     113                                    +
          +   +       13       *4                          +
          +   +       13                                   +
1.200E+01 X   X   +     1X2+        +        +        X
          +   +         112                                +
          +   +           12                               +
          +   +           122                              +
          +   +             112*                           +
8.000E+00 X   X   +        +  12    +        +        X
          +   +                 1X4                        +
          +   +                 1 4                        +
          +   +                  114                       +
          +   +                   14                       +
4.000E+00 X   X   +        +       144      +        X
          +   +                     114                    +
          +   +                       14                   +
          +   +                       14                   +
          +   +                        14                  +
.000E+00 X+++++++++X+++++++++X+++++++++X+++++1+++X+++++++++X

        -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
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REAME (Rotational Equilibrium Analysis of Multilayered Embankments)
Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
2301 22nd Ave.
Northport, AL 35476
(205)-339-6536

Alabama Land and Mineral, Corp. Area No. 6 Basin 010 Static

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 4
Number of points on boundary lines are: 2 2 3 7

On boundary line no. 1 Point no. and coordinates are:
1 .000 10.000 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 7.000 2 323.158 4.537

On boundary line no. 3 Point no. and coordinates are:
1 .000 11.000 2 200.000 7.000 3 246.250 25.500

On boundary line no. 4 Point no. and coordinates are:
1 .000 25.500 2 246.250 25.500 3 252.500 28.000 4 264.500 28.000 5 306.387 11.245
6 323.158 4.537 7 500.000 1.000

Line no. and slope of each segment are:

1	-.020				
2	-.020				
3	-.020	.400			
4	.000	.400	.000	-.400	-.400	-.020

No. of radius control zones= 1 Plot or no plot= 1 No. of seepage cases= 1

Total no. of lines at bottom of radius control zones is: 1

For rad. cont. zone no. 1 Radius decrement= .000 No. of Circles= 5 Id no. for first circle=, 1
Line no.= 1 Begin pt. no.= 1 End pt. no.= 2

Soil no.	Cohesion	F. angle	Unit wt.
1	100.800	30.540	129.540
2	270.000	33.020	132.140
3	.000	.000	62.400

Seismic coefficient= .000 Min. depth of tallest slice= .000 Unit weight of water= 62.400

The factors of safety are determined by the SIMPLIFIED BISHOP method

NSPG= 1 NSRCH= 0 No. of slices= 10 No. of add. radii= 2

No. of points on water table for each case= 6

```
  1      .000    25.500    2   246.250    25.500    3   269.381    19.630    4   306.387    11.245    5   323.158     4.537
  6   500.000     1.000

point1=(   266.000,    49.000) point2=(   266.000,    29.000) point3=(   324.000,    29.000) NJ=    2 NI=    2
    Automatic search will follow after grid with XINC=    10.000 and YINC=    10.000

At point (   266.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       44.311     6.926        39.660     7.618        35.008     7.925        30.357     8.497        25.705    10.313
    Lowest factor of safety=     6.926 and occurs at radius  =     44.311


At point (   266.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       34.313     6.911        29.671     7.478        25.029     7.418        20.386     7.642        15.744     9.481
       28.123     7.428        26.576     7.429        23.481     7.418        21.934     7.503
    Lowest factor of safety=     6.911 and occurs at radius  =     34.313


At point (   266.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       24.315     7.557        19.749     7.876        15.183     8.102        10.617     9.011         6.051    10.275
    Lowest factor of safety=     7.557 and occurs at radius  =     24.315


At point (   295.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       44.891     2.116        42.078     2.429        39.265     2.695        36.452     3.300        33.639     4.877
    Lowest factor of safety=     2.116 and occurs at radius  =     44.891


At point (   295.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       34.893     2.184        32.223     2.538        29.552     2.848        26.882     3.475        24.211     5.161
    Lowest factor of safety=     2.184 and occurs at radius  =     34.893


At point (   295.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       24.895     2.467        22.367     2.880        19.839     3.188        17.312     3.833        14.784     5.643
    Lowest factor of safety=     2.467 and occurs at radius  =     24.895


At point (   324.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       45.471     2.975        44.696     3.593        43.921     4.629        43.146     6.389        42.371    11.667
    Lowest factor of safety=     2.975 and occurs at radius  =     45.471


At point (   324.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       35.473     3.354        34.841     4.049        34.208     5.366        33.576     7.504        32.943    13.953
    Lowest factor of safety=     3.354 and occurs at radius  =     35.473


****WARNING AT NEXT CENTER**** When radius is    24.495
center of circle lies below ground line or circle does not intercept ground line properly, or the circle cuts the slope
very slightly, so a large factor of safety is assigned.

At point (   324.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       25.475     3.999        24.985     4.823        24.495**********
    Lowest factor of safety=     3.999 and occurs at radius  =     25.475


Piezometric line No.    1

At point (   295.000,    49.000) ,RADIUS    44.891
    the minimum factor of safety is      2.116
```

44.891 2.116 42.078 2.429 39.265 2.695 36.452 [illegible] 33.639 4.877
Lowest factor of safety= 2.116 and occurs at radius = 44.891

At point (305.000, 49.000) under seepage 1,the radius and the corresponding factor of safety are:
45.091 1.987 42.981 2.445 40.870 2.803 38.760 3.557 36.650 5.774
Lowest factor of safety= 1.987 and occurs at radius = 45.091

At point (315.000, 49.000) under seepage 1,the radius and the corresponding factor of safety are:
45.291 2.075 43.883 2.752 42.476 3.255 41.068 4.276 39.661 7.344
Lowest factor of safety= 2.075 and occurs at radius = 45.291

At point (305.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
55.089 1.943 52.836 2.360 50.583 2.710 48.330 3.442 46.077 5.490
Lowest factor of safety= 1.943 and occurs at radius = 55.089

At point (305.000, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
65.087 1.962 62.691 2.341 60.296 2.649 57.900 3.347 55.505 5.238
Lowest factor of safety= 1.962 and occurs at radius = 65.087

At point (315.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
55.289 2.038 53.739 2.631 52.189 3.103 50.638 4.066 49.088 6.926
Lowest factor of safety= 2.038 and occurs at radius = 55.289

At point (295.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
54.889 2.129 51.933 2.451 48.978 2.697 46.022 3.215 43.066 4.666
Lowest factor of safety= 2.129 and occurs at radius = 54.889

At point (307.500, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
55.139 1.938 53.062 2.402 50.984 2.773 48.907 3.547 46.830 5.788
Lowest factor of safety= 1.938 and occurs at radius = 55.139

At point (310.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:
55.189 1.955 53.287 2.457 51.386 2.858 49.484 3.680 47.583 6.112
Lowest factor of safety= 1.955 and occurs at radius = 55.189

At point (307.500, 61.500) under seepage 1,the radius and the corresponding factor of safety are:
57.638 1.931 55.526 2.382 53.413 2.753 51.300 3.520 49.187 5.712
Lowest factor of safety= 1.931 and occurs at radius = 57.638

At point (307.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:
60.138 1.928 57.989 2.368 55.841 2.734 53.692 3.495 51.544 5.639
Lowest factor of safety= 1.928 and occurs at radius = 60.138

At point (307.500, 66.500) under seepage 1,the radius and the corresponding factor of safety are:
62.637 1.927 60.453 2.358 58.269 2.710 56.085 3.471 53.901 5.569
Lowest factor of safety= 1.927 and occurs at radius = 62.637

At point (307.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:
65.137 1.933 62.917 2.351 60.697 2.690 58.477 3.449 56.257 5.502
Lowest factor of safety= 1.933 and occurs at radius = 65.137

At point (310.000, 66.500) under seepage 1,the radius and the corresponding factor of safety are:

Lowest factor of safety= 1.928 and occurs at radius = 62.687

At point (305.000, 66.500) under seepage 1,the radius and the corresponding factor of safety are:

62.587	1.954	60.228	2.337	57.868	2.655	55.508	3.375	53.148	5.298

Lowest factor of safety= 1.954 and occurs at radius = 62.587

For piezometric line No. 1

At point (307.500, 66.500) ,RADIUS 62.637
the minimum factor of safety is 1.927

Cross section in distorted scale. Numerals indicate boundary line no.
If there area more than 10 bound. lines, alphabets will then be used. P indicates
Piezometric line. If a portion of Piezometric line coincides with
the ground or another boundary line, only the ground or boundary
line will be shown. X indicates intersection of two boundary
lines. * indicates failure surface.
The minimum factor of safety is 1.927

```
3.600E+01 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
3.200E+01 X   X   +        +        +        +   X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
2.800E+01 X   X   +        +44      +        +   X
          +   +                                   +
          +   +                                   +
          +   444444444444444X                    +
          +   +                                   +
2.400E+01 X   X   +        +        +        +   X
          +   +             P                     +
          +   +                                   +
          +   +              *                    +
          +   +                                   +
2.000E+01 X   X   +        + P4     +        +   X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
1.600E+01 X   X   +       3+  P     +        +   X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
1.200E+01 X   X   +        +        +        +   X
          +   333              4                  +
          +   + 333          *                    +
          +   111  33                             +
          +   + 111 333                           +
8.000E+00 X   X   +11  33 +        +        +   X
          +   +     111 X22                       +
          +   +        11  22                     +
          +   +          111 22                   +
          +   +            111*X44                +
4.000E+00 X   X   +        +  11 44+        +   X
          +   +                111 44             +
          +   +                   11 44           +
          +   +                     11144         +
          +   +                        114        +
 .000E+00 X+++++++++X+++++++++X+++++++++X+++++I+++X+++++++++X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
-4.000E+00 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X

       -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
```

REAME (Rotational Equilibrium analysis of multilayered embankments)
Implemented on the 16-bit Microcomputers C. F. Hains, Jr. and D. M. Hains
2301 22nd Ave.
Northport, AL 35476
(205)-339-6536

Alabama Land and Mineral, Corp. Area No. 6 Basin 010 Dynamic

Number of cases to be analyzed 1

Case Number 1

Number of boundary lines= 4
Number of points on boundary lines are: 2 2 3 7

On boundary line no. 1 Point no. and coordinates are:
1 .000 10.000 2 500.000 .000

On boundary line no. 2 Point no. and coordinates are:
1 200.000 7.000 2 323.158 4.537

On boundary line no. 3 Point no. and coordinates are:
1 .000 11.000 2 200.000 7.000 3 246.250 25.500

On boundary line no. 4 Point no. and coordinates are:
1 .000 25.500 2 246.250 25.500 3 252.500 28.000 4 264.500 28.000 5 306.387 11.245
6 323.158 4.537 7 500.000 1.000

Line no. and slope of each segment are:
1 -.020
2 -.020
3 -.020 .400
4 .000 .400 .000 -.400 -.400 -.020

No. of radius control zones= 1 Plot or no plot= 1 No. of seepage cases= 1

Total no. of lines at bottom of radius control zones is: 1

For rad. cont. zone no. 1 Radius decrement= .000 No. of Circles= 5 Id no. for first circle=, 1
Line no.= 1 Begin pt. no.= 1 End pt. no.= 2

Soil no.	Cohesion	F. angle	Unit wt.
1	100.800	30.540	129.540
2	270.000	33.020	132.140
3	.000	.000	62.400

Seismic coefficient= .050 Min. depth of tallest slice= .000 Unit weight of water= 62.400

The factors of safety are determined by the SIMPLIFIED BISHOP method

NSPG= 1 NSRCH= 0 No. of slices= 10 No. of add. radii= 2

No. of points on water table for each case= 6

```
  1      .000    25.500    2   246.250    25.500    3   269.381    19.630    4   306.387    11.245    5   323.158     4.537
  6   500.000     1.000

point1=(   266.000,    49.000) point2=(   266.000,    29.000) point3=(   324.000,    29.000) NJ=    2 NI=    2
    Automatic search will follow after grid with XINC=    10.000 and YINC=    10.000

 point (   266.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       44.311     4.689         39.660     5.237         35.008     5.554         30.357     6.162         25.705     7.696
    Lowest factor of safety=     4.689 and occurs at radius  =     44.311


 At point (   266.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       34.313     4.929         29.671     5.423         25.029     5.537         20.386     5.905         15.744     7.382
    Lowest factor of safety=     4.929 and occurs at radius  =     34.313


 At point (   266.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       24.315     5.775         19.749     6.203         15.183     6.541         10.617     7.394          6.051     8.585
    Lowest factor of safety=     5.775 and occurs at radius  =     24.315


 At point (   295.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       44.891     1.837         42.078     2.122         39.265     2.363         36.452     2.905         33.639     4.307
    Lowest factor of safety=     1.837 and occurs at radius  =     44.891


 At point (   295.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       34.893     1.911         32.223     2.229         29.552     2.504         26.882     3.061         24.211     4.559
    Lowest factor of safety=     1.911 and occurs at radius  =     34.893


 At point (   295.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       24.895     2.169         22.367     2.536         19.839     2.807         17.312     3.379         14.784     4.988
    Lowest factor of safety=     2.169 and occurs at radius  =     24.895


 At point (   324.000,    49.000) under seepage    1,the radius and the corresponding factor of safety are:
       45.471     2.593         44.696     3.160         43.921     4.085         43.146     5.650         42.371    10.341
    Lowest factor of safety=     2.593 and occurs at radius  =     45.471


 At point (   324.000,    39.000) under seepage    1,the radius and the corresponding factor of safety are:
       35.473     2.918         34.841     3.557         34.208     4.741         33.576     6.641         32.943    12.373
    Lowest factor of safety=     2.918 and occurs at radius  =     35.473


****WARNING AT NEXT CENTER**** When radius is    24.495
center of circle lies below ground line or circle does not intercept ground line properly, or the circle cuts the slope
very slightly, so a large factor of safety is assigned.

 At point (   324.000,    29.000) under seepage    1,the radius and the corresponding factor of safety are:
       25.475     3.462         24.985     4.220         24.495**********
    Lowest factor of safety=     3.462 and occurs at radius  =     25.475


For piezometric line No.    1

 At point (   295.000,    49.000) ,RADIUS    44.891
    the minimum factor of safety is      1.837


 At point (   295.000,    49.000) under seepage    1,the radius and the corresponding factor of safety
```

Lowest factor of safety= 1.837 and occurs at radius = 44.891

At point (305.000, 49.000) under seepage 1,the radius and the corresponding factor of safety are:

45.091	1.736	42.981	2.144	40.870	2.463	38.760	3.133	36.650	5.104

Lowest factor of safety= 1.736 and occurs at radius = 45.091

At point (315.000, 49.000) under seepage 1,the radius and the corresponding factor of safety are:

45.291	1.812	43.883	2.417	42.476	2.864	41.068	3.771	39.661	6.499

Lowest factor of safety= 1.812 and occurs at radius = 45.291

At point (305.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:

55.089	1.692	52.836	2.067	50.583	2.379	48.330	3.030	46.077	4.851

Lowest factor of safety= 1.692 and occurs at radius = 55.089

At point (305.000, 69.000) under seepage 1,the radius and the corresponding factor of safety are:

65.087	1.699	62.691	2.041	60.296	2.320	57.900	2.946	55.505	4.627

Lowest factor of safety= 1.699 and occurs at radius = 65.087

At point (315.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:

55.289	1.780	53.739	2.309	52.189	2.728	50.638	3.585	49.088	6.128

Lowest factor of safety= 1.780 and occurs at radius = 55.289

At point (295.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:

54.889	1.830	51.933	2.123	48.978	2.349	46.022	2.820	43.066	4.119

Lowest factor of safety= 1.830 and occurs at radius = 54.889

At point (307.500, 59.000) under seepage 1,the radius and the corresponding factor of safety are:

55.139	1.690	53.062	2.106	50.984	2.436	48.907	3.124	46.830	5.116

Lowest factor of safety= 1.690 and occurs at radius = 55.139

At point (310.000, 59.000) under seepage 1,the radius and the corresponding factor of safety are:

55.189	1.707	53.287	2.155	51.386	2.511	49.484	3.242	47.583	5.404

Lowest factor of safety= 1.707 and occurs at radius = 55.189

At point (307.500, 61.500) under seepage 1,the radius and the corresponding factor of safety are:

57.638	1.683	55.526	2.087	53.413	2.418	51.300	3.100	49.187	5.049

Lowest factor of safety= 1.683 and occurs at radius = 57.638

At point (307.500, 64.000) under seepage 1,the radius and the corresponding factor of safety are:

60.138	1.678	57.989	2.073	55.841	2.401	53.692	3.077	51.544	4.984

Lowest factor of safety= 1.678 and occurs at radius = 60.138

At point (307.500, 66.500) under seepage 1,the radius and the corresponding factor of safety are:

62.637	1.676	60.453	2.063	58.269	2.379	56.085	3.056	53.901	4.922

Lowest factor of safety= 1.676 and occurs at radius = 62.637

At point (307.500, 69.000) under seepage 1,the radius and the corresponding factor of safety are:

65.137	1.679	62.917	2.055	60.697	2.360	58.477	3.037	56.257	4.862

Lowest factor of safety= 1.679 and occurs at radius = 65.137

At point (310.000, 66.500) under seepage 1,the radius and the corresponding factor of safety are:

[illegible]

```
At point (   305.000,    66.500) under seepage    1,the radius and the corresponding factor of safety are:
       62.587     1.694         60.228     2.040         57.868     2.327         55.508     2.971         53.148     4.680
   Lowest factor of safety=     1.694 and occurs at radius  =     62.587


For piezometric line No.    1

At point (   307.500,    66.500) ,RADIUS    62.637
   the minimum factor of safety is      1.676
```

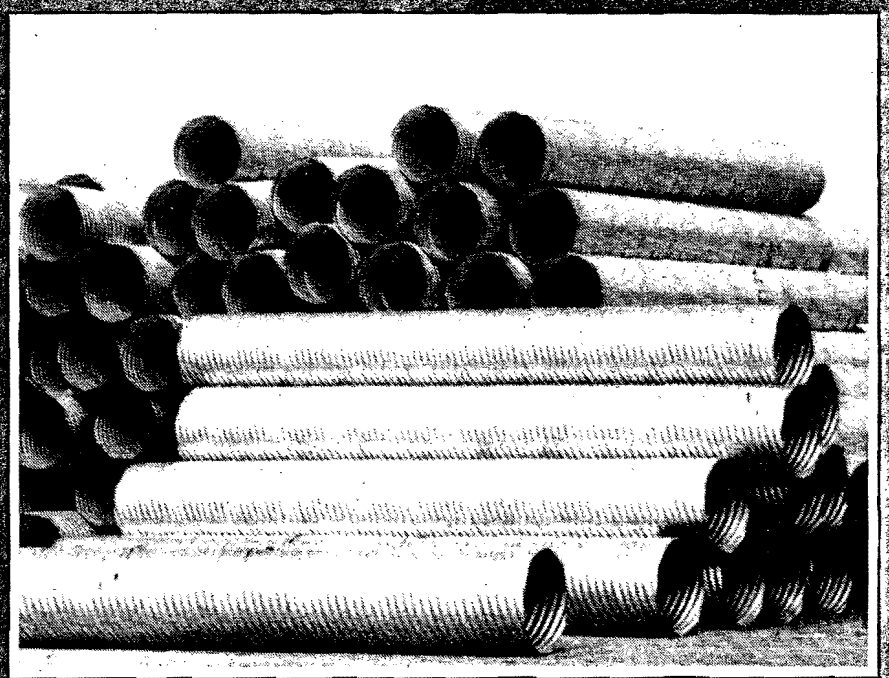
Cross section in distorted scale. Numerals indicate boundary line no.
If there area more than 10 bound. lines, alphabets will then be used. P indicates Piezometric line. If a portion of Piezometric line coincides with the ground or another boundary line, only the ground or boundary line will be shown. X indicates intersection of two boundary lines. * indicates failure surface.
The minimum factor of safety is 1.676

```
3.600E+01 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
3.200E+01 X   X   +        +        +        +        X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
2.800E+01 X   X   +        +44      +        +        X
          +   +                                   +
          +   +                                   +
          +   444444444444444X                    +
          +   +                                   +
2.400E+01 X   X   +        +        +        +        X
          +   +             P                     +
          +   +                                   +
          +   +              *                    +
          +   +                                   +
2.000E+01 X   X   +        + P4     +        +        X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
1.600E+01 X   X   +       3+  P     +        +        X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
1.200E+01 X   X   +        +        +        +        X
          +   333              4                  +
          +   + 333           *                   +
          +   111   33                            +
          +   + 111  333                          +
8.000E+00 X   X   +11   33 +        +        +        X
          +   +      111  X22                     +
          +   +         11   22                   +
          +   +           111  22                 +
          +   +              111*X44              +
4.000E+00 X   X   +        +   11  44+       +        X
          +   +                 111 44            +
          +   +                    11 44          +
          +   +                      11144        +
          +   +                         114       +
 .000E+00 X+++++++++X+++++++++X+++++++++X+++++1+++X+++++++++X
          +   +                                   +
          +   +                                   +
          +   +                                   +
          +   +                                   +
-4.000E+00 X+++++++++X+++++++++X+++++++++X+++++++++X+++++++++X

      -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
```

CHOCTAW®

corrugated steel pipe



Technical Manual

2⅔″ x ½″ HEIGHT OF COVER LIMITS

H20 LIVE LOAD—ROUND PIPE

Diameter or Span in Inches	Min.* Cover	Maximum Cover in Feet					
		Specified Thickness in Inches					
		0.052	.064	.079	.109	.138	.168
12	12-in. Minimum Cover	199	248	310			
15		159	199	248			
18		132	166	207			
21		113	142	178	249		
24		99	124	155	218		
27			111	138	193		
30			99	124	174		
36			83	103	145	186	
42			71	88	124	160	195
48			62	77	109	140	171
54				66	93	120	147
60					79	102	125
66					68	87	107
72						73	89
78							74
84							61
90							50
96							41

*From top of pipe to top of subgrade.

E80 LIVE LOAD—ROUND PIPE

Diameter or Span in Inches	Min. Cover	Maximum Cover in Feet					
		Specified Thickness in Inches					
		0.052	.064	.079	.109	.138	.168
12	12 inches	199	248	310			
15		159	199	248			
18		132	166	207			
21		113	142	178	249		
24		99	124	155	218		
27			111	138	193		
30			99	124	174		
36			83	103	145	186	
42			71	88	124	160	195
48			62	77	109	140	171
54	18 inches			66	93	120	147
60					79	102	125
66					68	87	107
72						73	89
78	24 inches						74
84							61
90							50
96							41

H20 LIVE LOAD—PIPE-ARCH

Size in Inches	Minimum Specified Thickness Required in In.	Maximum Height-of-Fill Over Pipe-Arch for the Following Corner Bearing Pressures in Tons per Sq Ft		
Span x Rise		2 Tons	3 Tons	4 Tons
17 x 13	0.064	15	22	30
21 x 15	0.064	14	21	28
24 x 18	0.064	12	19	25
28 x 20	0.064	12	18	24
35 x 24	0.064	12	18	24
42 x 29	0.064	10	15	20
49 x 33	0.079	9	14	19
57 x 38	0.109	9	14	19
64 x 43	0.109	9	14	19
71 x 47	0.138	9	14	19
77 x 52	0.168	9	14	19
83 x 57	0.168	10	15	20

Minimum cover from top of pipe-arch to top of subgrade = 1 ft

(1) Height-of-cover tables use the following values for soil and steel parameters: unit weight of soil—120 pounds per cubic foot; relative density of compacted backfill—85% AASHTO standard; yield point of steel—33,000 psi.

E80 LIVE LOAD—PIPE-ARCH

Size in Inches	Height of Cover in Feet			
	2	3-4	5-7	8-15
Span x Rise	Specified Thickness in Inches			
17 x 13	.079	.079	.079	.079
21 x 15	.079	.079	.079	.079
24 x 18	.109	.079	.079	.079
28 x 20	.109	.109	.079	.079
35 x 24	.138	.109	.109	.109
42 x 29	.168	.138	.138	.109
49 x 33		.168	.138	.138
57 x 38			.168	.168
64 x 43				.168
71 x 47				.168

The above table is an empirical "gage" table based on experience.

Alabama Land and Mineral Corp.
Area 6 Mine P-3699

MODIFICATION SHEET FOR BASIN 010E

1) The existing primary spillway (a 24 inch C.M. pipe) at elevation of 457.0' will be replaced with a broadcrested weir with a width at the top of blocks of 35 feet and at elevation of 467.5'.

2) The existing emergency spillway at elevation of 459.6' will be replaced with a skimmerboard system at elevation of 468.9' and approximately 40.6 feet wide.

3) The existing top of dam at elevation 461.0' will be raised to 470.0'.

4) The existing front slope of 4.4:1 will be replaced with 2.5:1 minimum.

5) The existing back slope of 7:1 will be replaced with 2.5:1 minimum.