PERC
ENGINEERING CO., INC.

July 21, 2006

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

RE: Twin Pines Coal Company, Inc.
Shannon Mine
P-3859

Dear Michael:

I hereby certify that Basin 003 located in the SW 1/4 of the NW 1/4, Section 10, Township 20 South, Range 6 West, Jefferson County, Alabama, for the above referenced mine was constructed in accordance with the approved ASMC design plans to the minimum design specifications, as per field inspection.

If you have any questions or require additional information please feel free to call.

Sincerely,
PERC Engineering Co., Inc.

Steven R. Ingle, P.E.
AL Reg. No. 18213

P.O. Box 1712 • Jasper, Alabama 35502 • 1806 Highway 78 West • Jasper, Alabama 35501

HYDROLOGY STUDY FOR
TWIN PINES COAL COMPANY, INC.

SHANNON MINE
JEFFERSON AND TUSCALOOSA COUNTIES, ALABAMA

BY
PERC ENGINEERING CO., INC.
P.O. BOX 1712
JASPER, ALABAMA 35502

JUNE 9, 2006

PERC
ENGINEERING CO., INC.

Telephone: (205) 384-5553
Facsimile: (205) 295-3114 - Main Building
(205) 295-3115 - Water Lab
Web Address: www.percengineering.com

June 9, 2006

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

RE: Twin Pines Coal Company, Inc.
Shannon Mine
P- 3859

Dear Michael:

I hereby certify the attached detailed re-evaluation design plans for Basin 003 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 to date, and are true and correct to the best of my knowledge and belief.

If you have any questions or required additional information, please feel free to call.

Sincerely,
PERC Engineering Co., Inc.

Steven R. Ingle, P.E.
Alabama Registration No. 18213

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 impoundments, 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 1.20.

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 lv:lh, 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 pool area of the basin will be cleared of timber and large undergrowth.

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

10. The primary decant system shall be equipped with a device, or constructed, such as to insure 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.

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

12. The combination primary and secondary decant system shall be designed to safely carry the expected peak flow from a 25 year - 6 hour storm. The entire emergency overflow spillway channel will be a stabilized channel and will be stabilized upon completion of construction as specified within the detailed design plans using prudent engineering measures. These measures may consist of lining the spillway with concrete or a durable rock riprap, or the spillway being constructed in consolidated non-erodible material and planted with a mixture or both annual and perennial grasses, or a combination of any or all of the above.

13. 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 as specified in the detailed design plans.

14. The settled embankment for temporary impoundments shall be a minimum of 1.0 foot 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).

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

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

17. The constructed height of the dam shall be increased a minimum of 5 percent over the design height to allow for settlement over the life of the embankment.

18. 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.

19. 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.

20. 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.

21. 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.

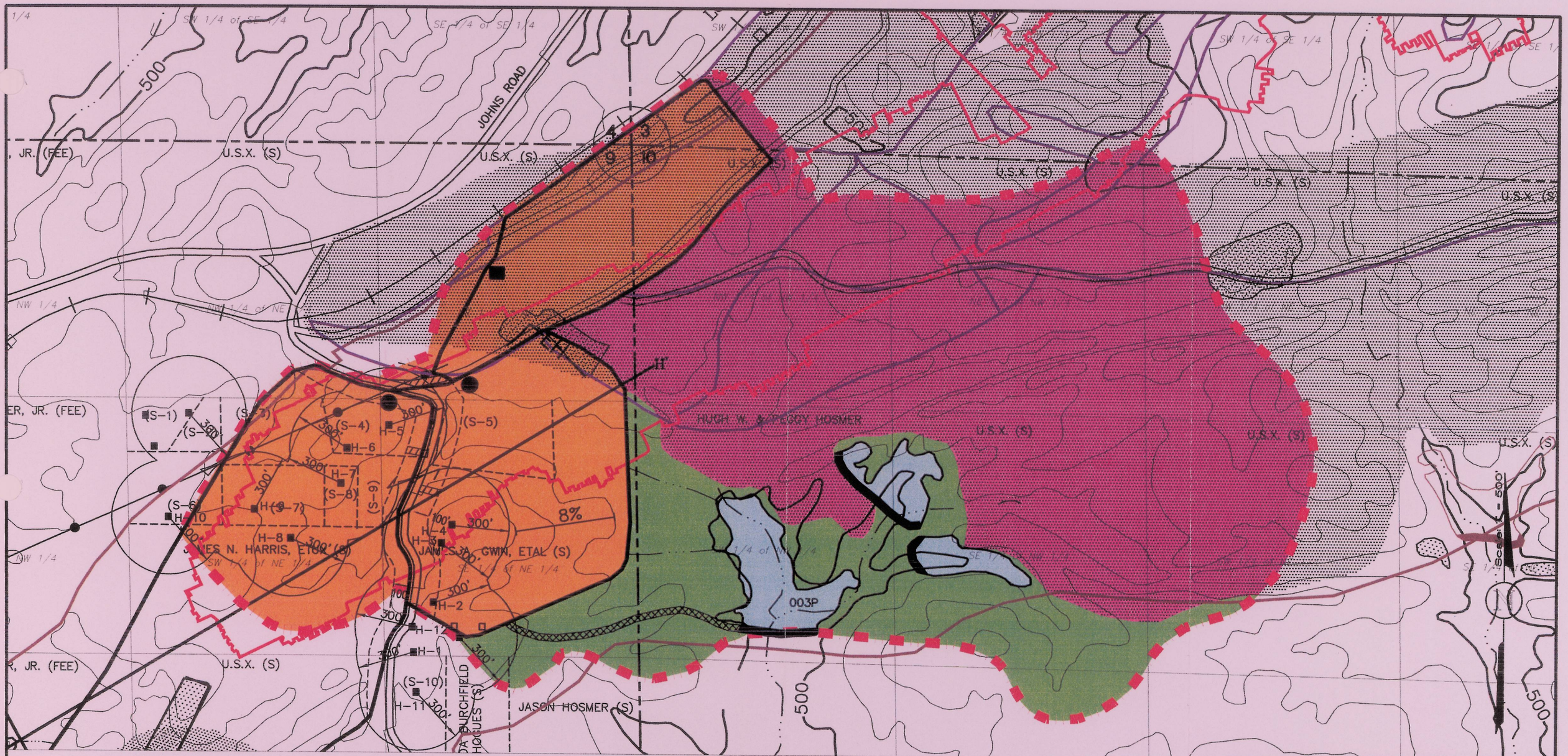
22. All ponds shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary. Formal inspections shall be made on an annual basis, including any reports or modifications, in accordance with 880-X-10C-.20[1(j)] of the Alabama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

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

24. 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 3H to 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.

25. 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.

26. 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, addition design and construction criteria shall be submitted prior to certification.



LEGEND

- *Permit Boundary/Increment Boundary*
- *Drainage Divide*
- *Diversion Ditch/Berm*

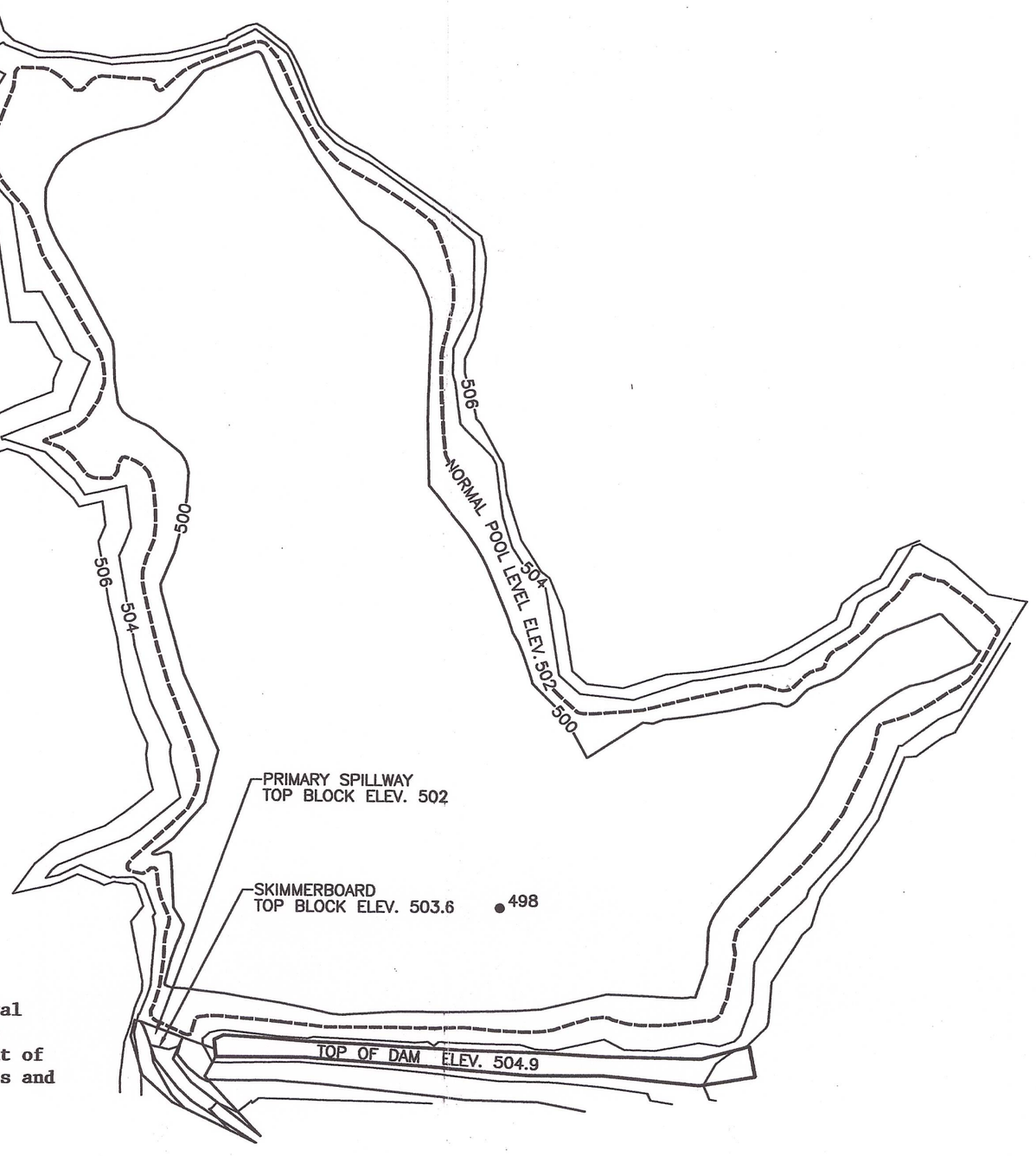
LANDUSE & CURVE NUMBER INFORMATION

- *Unmanaged Timberland, Curve Number 70*
- *Sediment Basin, Curve Number 100*
- *Previously Disturbed, Naturally Revegetated, Curve Number 77*
- *Graded & Bare, Curve Number 81*

PERC ENGINEERING CO., INC.

Twin Pines Coal Company, Inc.
Shannon Mine/P-3859
Basin 003 Re-Evaluation
Watershed Map

DRAWN BY: C.M.O. DWG. NAME: TPSM3RWS	DATE: 6-12-06
APPROVED BY: S.R.I.	SCALE: 1"=500'



Scale: 1" = 100'

Note: Modifications consists of the removal of the existing beaver dam from the spillway channel and the replacement of the skimmerboard system to the lines and grades as shown.

PERC
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1608 Highway 78 West Jasper, Alabama 35501
P.O. Box 1712 Jasper, Alabama 35502
(205) 384-5553 Office (205) 265-3114 Fax

Twin Pines Coal Company, Inc.
Shannon Mine
P-3859
Basin 003 Re-Evaluation Planview

DRAWN BY: C.M.O. DWG. NAME: TPSMB3PV	DATE: 6-12-06
APPROVED BY: S.R.I.	SCALE: 1"=100'

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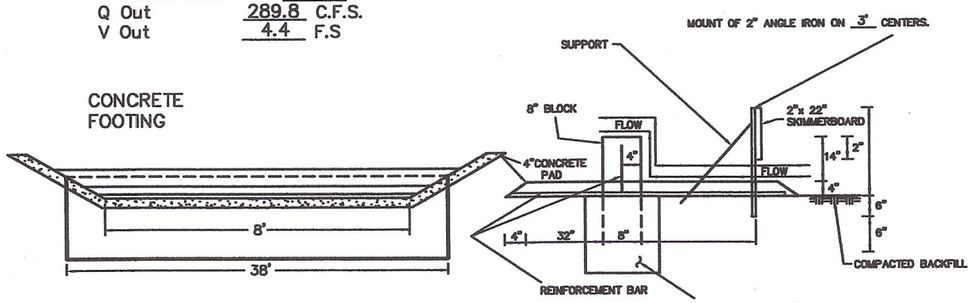
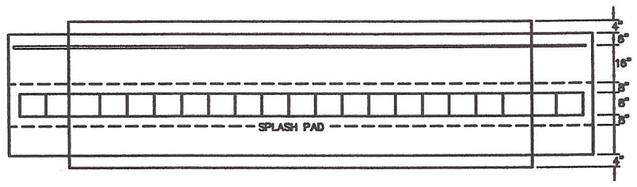
SKIMMERBOARD DETAILED DESIGN

Skimmer Board Elev. 503.6
8" Block Elev. 502
Q Out 289.8 C.F.S.
V Out 4.4 F.S



FOOTING TO BE CENTERED BENEATH 8" BLOCKS
MINIMUM WIDTH : 2.0 FEET
MINIMUM DERTH: FEET (UNLESS SOLID ROCK ENCOUNTERED)



PLAN VIEW

SPILLWAY GRADIANT SHALL BE APPROXIMATELY 3%.

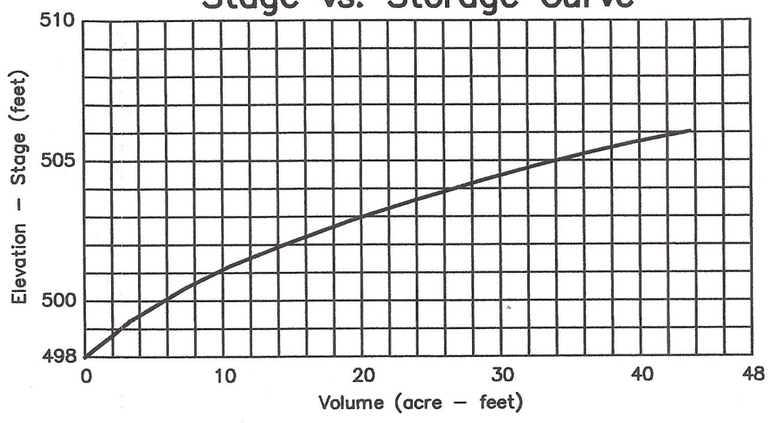
Notes:

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, reclamationn 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.

Storage Computation

Elevation (feet)	Area (acres)	Avg. Area (acres)	Interval (feet)	Storage (ac.-ft.)	Acc. Storage (ac.-ft.)
498	.000				.000
500	4.706	2.353	2	4.706	4.706
504	6.795	5.751	4	23.002	27.708
506	8.959	7.877	2	15.754	43.462

Stage vs. Storage Curve

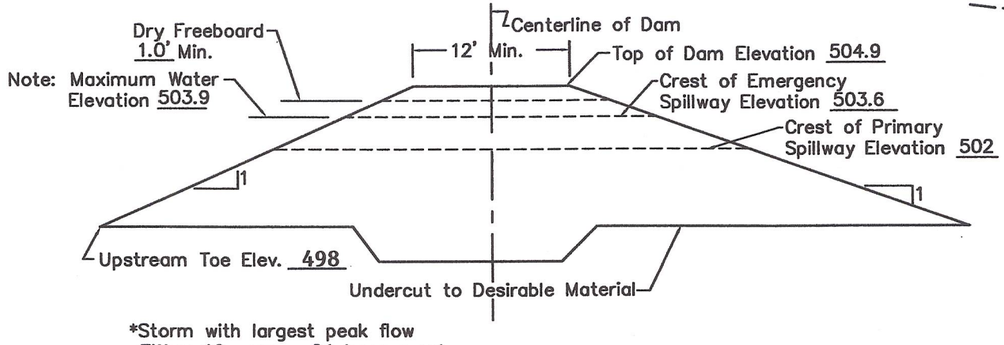


Key Basin Parameters

Drainage Area 286 Acres
Disturbed Area 91 Acres
Sediment Storage 6.8 Ac. Ft.
Detention Storage 6.8 Ac. Ft.
Permanent Pool Capacity 13.6 Ac. Ft.
Total Basin Capacity 13.6 Ac. Ft.
Peak Inflow 386.4 C.F.S.
Peak Outflow 289.8 C.F.S.

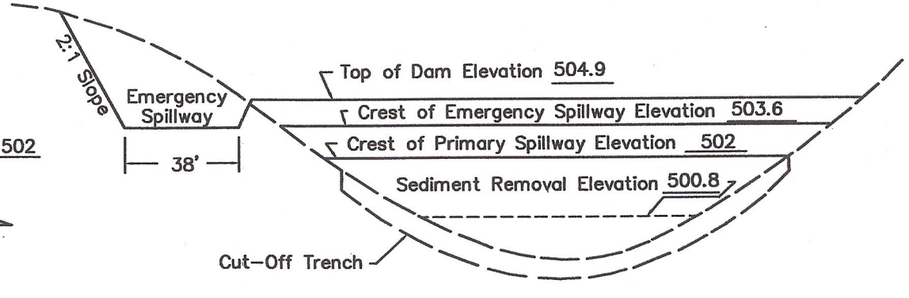
Steven R. Ingle, P.E.
AL Registration #18213

ALABAMA REGISTERED No. 18213 PROFESSIONAL ENGINEER 6-9-06 STEVEN R. INGLE



*Storm with largest peak flow
Either 10 year - 24 hour event
or 50 year - 6 hour event.

Typical Cross Section
Along Primary Spillway



Typical Profile Looking Downstream

PERC ENGINEERING CO., INC.
1606 Highway 78 West Jasper, Alabama 35501
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(205) 384-5003 Office (205) 385-3114 Fax

Twin Pines Coal Company, Inc.
Shannon Mine
P-3859
Basin 003 Re-Evaluation

DRAWN BY: C.M.O. DWG. NAME: TPSMB3RE	DATE: 6-9-06
APPROVED BY: S.R.I.	SCALE: NONE

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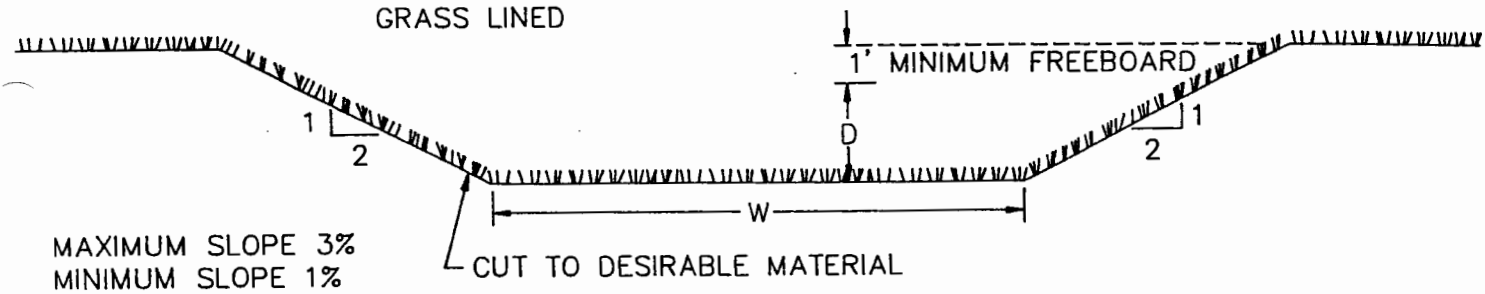


$$Q = \frac{1.49}{N} A R^{2/3} S^{1/2}$$

N(loose stone or grass lined) = 0.035
A = area
R = area/wetted perimeter
S = slope

* Grass lining: fescue, bermuda, rye grass

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 8.0 Ft.	
PEAK FLOW Q (CFS)	DEPTH D (Ft.)
0–15	0.5
15–50	1.0
50–100	1.5
100–180	2.0
180–270	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 10.0 Ft.	
PEAK FLOW Q (CFS)	DEPTH D (Ft.)
0–15	0.5
15–60	1.0
60–120	1.5
120–210	2.0
210–320	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 12.0 Ft.	
PEAK FLOW Q (CFS)	DEPTH D (Ft.)
0–20	0.5
20–70	1.0
70–150	1.5
150–250	2.0
250–383	2.5

DIVERSION CHANNEL DEPTH (D) FOR WIDTH (W) 15.0 Ft.	
PEAK FLOW Q (CFS)	DEPTH D (Ft.)
0–25	0.5
25–90	1.0
90–180	1.5
180–300	2.0
300–450	2.5

PERC
ENGINEERING CO., INC.

PERMANENT DIVERSION CHANNEL FOR BASIN DISPOSAL

DRAWN BY:	DATE:
APPROVED BY:	SCALE: NONE

NOTES

1) The primary spillway of Basin 003 consists of a 38 foot wide open channel/block skimmerboard system lined with 4 inches of concrete reinforced with standard concrete reinforcement wire. The channel lining extends back to the existing drainage course.

2) Modifications required to Basin 003 as a result of these re-evaluation design plans consist of the removal of the beaver dam from the existing spillway channel and the replacement of the skimmerboard to the lines and grades as specified with these design plans.

Twin Pines Coal Company, Inc.

Shannon Mine

P-3859

Basin 003 Re-evaluation

6.0 Inches, 10 Year-24 Hour,

DRN 58

SRI

General Information

Storm Information:

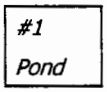
Storm Type:	DRN 58
Design Storm:	10 yr - 24 hr
Rainfall Depth:	6.000 inches

Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	96.000%	94.000%
1.0000	89.500%	74.500%
0.5000	82.500%	49.000%
0.3000	77.500%	39.000%
0.2000	71.500%	32.000%
0.1000	63.000%	24.500%
0.0500	41.000%	16.000%
0.0300	37.000%	13.000%
0.0200	11.000%	8.000%
0.0100	2.500%	3.000%
0.0050	2.500%	3.000%
0.0030	2.500%	3.000%
0.0010	2.500%	3.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Basin 003 Re-evaluation



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	286.000	286.000	277.42	85.71	2,108.2	40,360	30.64	15.52
	Out			238.39	85.70	91.9	1,761	0.20	0.11

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	88.098%	100.000%
0.5000	58.129%	100.000%
0.3000	46.359%	100.000%
0.2000	38.101%	100.000%
0.1000	29.236%	100.000%
0.0500	19.092%	100.000%
0.0300	15.541%	100.000%
0.0200	9.471%	100.000%
0.0100	3.539%	81.187%
0.0050	3.539%	81.187%
0.0030	3.539%	81.187%
0.0010	3.539%	81.187%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Basin 003 Re-evaluation

Pond Inputs:

Initial Pool Elev:	502.00
Initial Pool:	6.75 ac-ft
*Sediment Storage:	6.80 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
502.00	10.00	2.00:1	2.00:1	38.00

Pond Results:

Peak Elevation:	503.64
H'graph Detention Time:	1.17 hrs
Pond Model:	CSTRS
Dewater Time:	0.69 days
Trap Efficiency:	95.64 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
500.75	5.068	0.000	0.000		Top of Sed. Storage
501.00	5.192	1.300	0.000		
501.50	5.445	3.959	0.000		
502.00	5.703	6.746	0.000		Spillway #1
502.50	5.967	9.663	7.792	4.53*	
503.00	6.237	12.713	99.901	11.00	
503.50	6.513	15.901	204.055	0.85	
503.64	6.593	16.821	238.386	0.30	Peak Stage
504.00	6.795	19.227	328.102		
504.50	7.308	22.752	473.620		
505.00	7.840	26.538	639.521		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
505.50	8.390	30.595	825.149	
506.00	8.959	34.931	1,030.099	

**Designates time(s) to dewater have been extrapolated beyond the 50 hour hydrograph limit.*

Detailed Discharge Table

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
500.75	0.000	0.000
501.00	0.000	0.000
501.50	0.000	0.000
502.00	0.000	0.000
502.50	7.792	7.792
503.00	99.901	99.901
503.50	204.055	204.055
504.00	328.102	328.102
504.50	473.620	473.620
505.00	639.521	639.521
505.50	825.149	825.149
506.00	1,030.099	1,030.099

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	91.000	0.350	0.256	0.310	81.000	F	107.49	29.452
	2	138.000	0.300	0.115	0.310	77.000	M	122.90	40.009
	3	46.000	0.115	0.000	0.000	70.000	S	46.49	10.753
	4	2.000	0.000	0.000	0.000	100.000	S	3.15	1.000
	5	3.000	0.000	0.000	0.000	100.000	S	4.72	1.500
	6	6.000	0.000	0.000	0.000	100.000	S	9.44	3.000
	Σ	**286.000**						**277.42**	**85.714**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.240	200.00	8.00	0.0030	1.0000	1	8.5	398	0.30	0.17
	2	0.240	200.00	5.00	0.9000	1.0000	2	2,093.5	81,705	62.03	35.72
	3	0.300	400.00	10.00	0.0030	1.0000	1	7.6	923	0.70	0.39
	4	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	5	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	6	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	Σ							**2,108.2**	**40,360**	**30.64**	**15.52**

Twin Pines Coal Company, Inc.
Shannon Mine
P-3859
Basin 003 Re-evaluation

4.8 Inches, 25 Year-6 Hour,

SCS 6 Hour

SRI

General Information

Storm Information:

Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1680
1.00	0.3840
1.50	0.6480
2.00	1.1040
2.50	2.8800
3.00	3.3600
3.50	3.7440
4.00	4.0080
4.50	4.2480
5.00	4.4400
5.50	4.6320
6.00	4.8000

Peak 30-minute Intensity: 3.552 in/hr

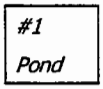
Particle Size Distribution:

Size (mm)	Topsoil	Spoil
3.0000	100.000%	100.000%
2.0000	96.000%	94.000%
1.0000	89.500%	74.500%
0.5000	82.500%	49.000%
0.3000	77.500%	39.000%
0.2000	71.500%	32.000%
0.1000	63.000%	24.500%
0.0500	41.000%	16.000%
0.0300	37.000%	13.000%
0.0200	11.000%	8.000%
0.0100	2.500%	3.000%
0.0050	2.500%	3.000%
0.0030	2.500%	3.000%

Size (mm)	Topsoil	Spoil
0.0010	2.500%	3.000%
0.0001	0.000%	0.000%

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Pond	#1	==>	End	0.000	0.000	Basin 003 Re-evaluation



Structure Summary:

		Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc. (ml/l)	24VW (ml/l)
#1	In	286.000	286.000	386.37	61.20	2,213.5	53,013	39.92	22.55
	Out			289.77	61.20	117.4	2,563	0.47	0.30

Particle Size Distribution(s) at Each Structure

Structure #1:

Size (mm)	In	Out
3.0000	100.000%	100.000%
2.0000	100.000%	100.000%
1.0000	100.000%	100.000%
0.5000	67.039%	100.000%
0.3000	53.463%	100.000%
0.2000	43.938%	100.000%
0.1000	33.714%	100.000%
0.0500	22.016%	100.000%
0.0300	17.921%	100.000%
0.0200	10.923%	100.000%
0.0100	4.082%	76.959%
0.0050	4.082%	76.959%
0.0030	4.082%	76.959%
0.0010	4.082%	76.959%
0.0001	0.000%	0.000%

Structure Detail:

Structure #1 (Pond)

Basin 003 Re-evaluation

Pond Inputs:

Initial Pool Elev:	502.00
Initial Pool:	6.75 ac-ft
*Sediment Storage:	6.80 ac-ft
Dead Space:	20.00 %

**Sediment capacity was entered by user*

Emergency Spillway

Spillway Elev	Crest Length (ft)	Left Sideslope	Right Sideslope	Bottom Width (ft)
502.00	10.00	2.00:1	2.00:1	38.00

Pond Results:

Peak Elevation:	503.85
H'graph Detention Time:	0.89 hrs
Pond Model:	CSTRS
Dewater Time:	1.57 days
Trap Efficiency:	94.70 %

Dewatering time is calculated from peak stage to lowest spillway

Elevation-Capacity-Discharge Table

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)	
500.75	5.068	0.000	0.000		Top of Sed. Storage
501.00	5.192	1.300	0.000		
501.50	5.445	3.959	0.000		
502.00	5.703	6.746	0.000		Spillway #1
502.50	5.967	9.663	7.792	33.30	
503.00	6.237	12.713	99.901	2.45	
503.50	6.513	15.901	204.055	1.40	
503.85	6.709	18.199	289.769	0.55	Peak Stage
504.00	6.795	19.227	328.102		
504.50	7.308	22.752	473.620		
505.00	7.840	26.538	639.521		
505.50	8.390	30.595	825.149		

Elevation	Area (ac)	Capacity (ac-ft)	Discharge (cfs)	Dewater Time (hrs)
506.00	8.959	34.931	1,030.099	

Detailed Discharge Table

Elevation	Emergency Spillway (cfs)	Combined Total Discharge (cfs)
500.75	0.000	0.000
501.00	0.000	0.000
501.50	0.000	0.000
502.00	0.000	0.000
502.50	7.792	7.792
503.00	99.901	99.901
503.50	204.055	204.055
504.00	328.102	328.102
504.50	473.620	473.620
505.00	639.521	639.521
505.50	825.149	825.149
506.00	1,030.099	1,030.099

Subwatershed Hydrology Detail:

Stru #	SWS #	SWS Area (ac)	Time of Conc (hrs)	Musk K (hrs)	Musk X	Curve Number	UHS	Peak Discharge (cfs)	Runoff Volume (ac-ft)
#1	1	91.000	0.350	0.256	0.310	81.000	F	179.79	21.304
	2	138.000	0.300	0.115	0.310	77.000	M	189.68	28.251
	3	46.000	0.115	0.000	0.000	70.000	S	86.51	7.242
	4	2.000	0.000	0.000	0.000	100.000	S	7.16	0.800
	5	3.000	0.000	0.000	0.000	100.000	S	10.74	1.200
	6	6.000	0.000	0.000	0.000	100.000	S	21.49	2.400
	Σ	**286.000**						**386.37**	**61.197**

Subwatershed Sedimentology Detail:

Stru #	SWS #	Soil K	L (ft)	S (%)	C	P	PS #	Sediment (tons)	Peak Sediment Conc. (mg/l)	Peak Settleable Conc (ml/l)	24VW (ml/l)
#1	1	0.240	200.00	8.00	0.0030	1.0000	1	9.5	532	0.40	0.26
	2	0.240	200.00	5.00	0.9000	1.0000	2	2,196.8	104,671	78.81	52.22
	3	0.300	400.00	10.00	0.0030	1.0000	1	8.6	1,489	1.14	0.67
	4	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	5	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	6	0.001	200.00	0.01	0.0010	1.0000	2	0.0	0	0.00	0.00
	Σ							**2,213.5**	**53,013**	**39.92**	**22.55**

SOIL CLASSIFICATION

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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. Huang, P.E. of the University of Kentucky.

SOIL CLASSIFICATION UNITS

The soil types (soil classifications) to be used in the construction of the embankment structure (ML) and the soil types (soil classification) of the material between the proposed embankment and stiff base (CL-ML) for sediment basins 003P, 003A, and 003B were sampled and analyzed by Perc Engineering Co., Inc. The soil properties used in the stability analysis (ML AND CL-ML) type soils, was taken from 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
BASIN 003P				
Dam Material	ML	100.80	30.54	123.04
Foundation	CL-ML	230.40	26.56	128.18
BASIN 003A				
Dam Material	ML	100.80	30.54	123.04
Foundation	CL-ML	230.40	26.56	128.18
BASIN 003B				
Dam Material	ML	100.80	30.54	123.04
Foundation	CL-ML	230.40	26.56	128.18

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

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STABILITY ANALYSIS DATA
(Continued)

DESIGN DATA

(1) Design Density = 95% of the Standard Proctor maximum density

(2) Embankment top width = 12.0' minimum

(3) Freeboard = 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 003P design height = * 10.5 feet
Sediment Basin 003A design height = * 17.0 feet
Sediment Basin 003B design height = * 13.5 feet

* Vertical distance measured from top of the embankment to toe of the upstream slope.

(6) DMIN = 0.00

SAFETY FACTORS

BASIN NUMBER	STATIC SAFETY FACTOR	SEISMIC SAFETY FACTOR
003P	2.158	1.920
003A	1.604	1.398
003B	1.805	1.573

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.

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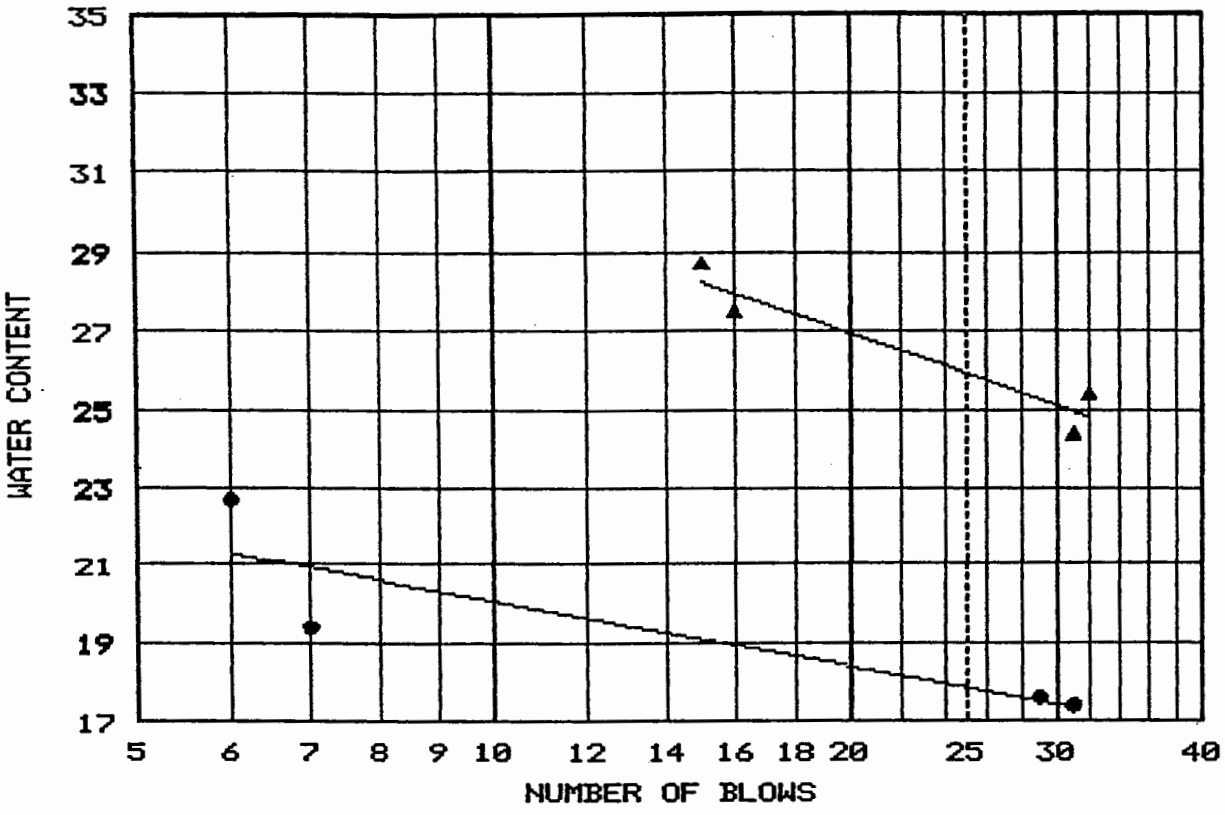
LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	BASIN 003 DAM MATERIAL	17.9	16.2	1.7	70.47	ML, Silt with sand
▲	BASIN 003 FOUNDATION MATERIAL	25.9	20.2	5.7	82.94	CL-ML, Silty clay with sand

Project No.:
Project: BASIN 003

Client: ALABAMA LAND & MINERAL
Location: AREA 6

Date: 12-14-92

LIQUID AND PLASTIC LIMITS TEST REPORT
PERC ENGINEERING CO., INC.

Remarks:
DAM & FOUNDATION
MATERIAL

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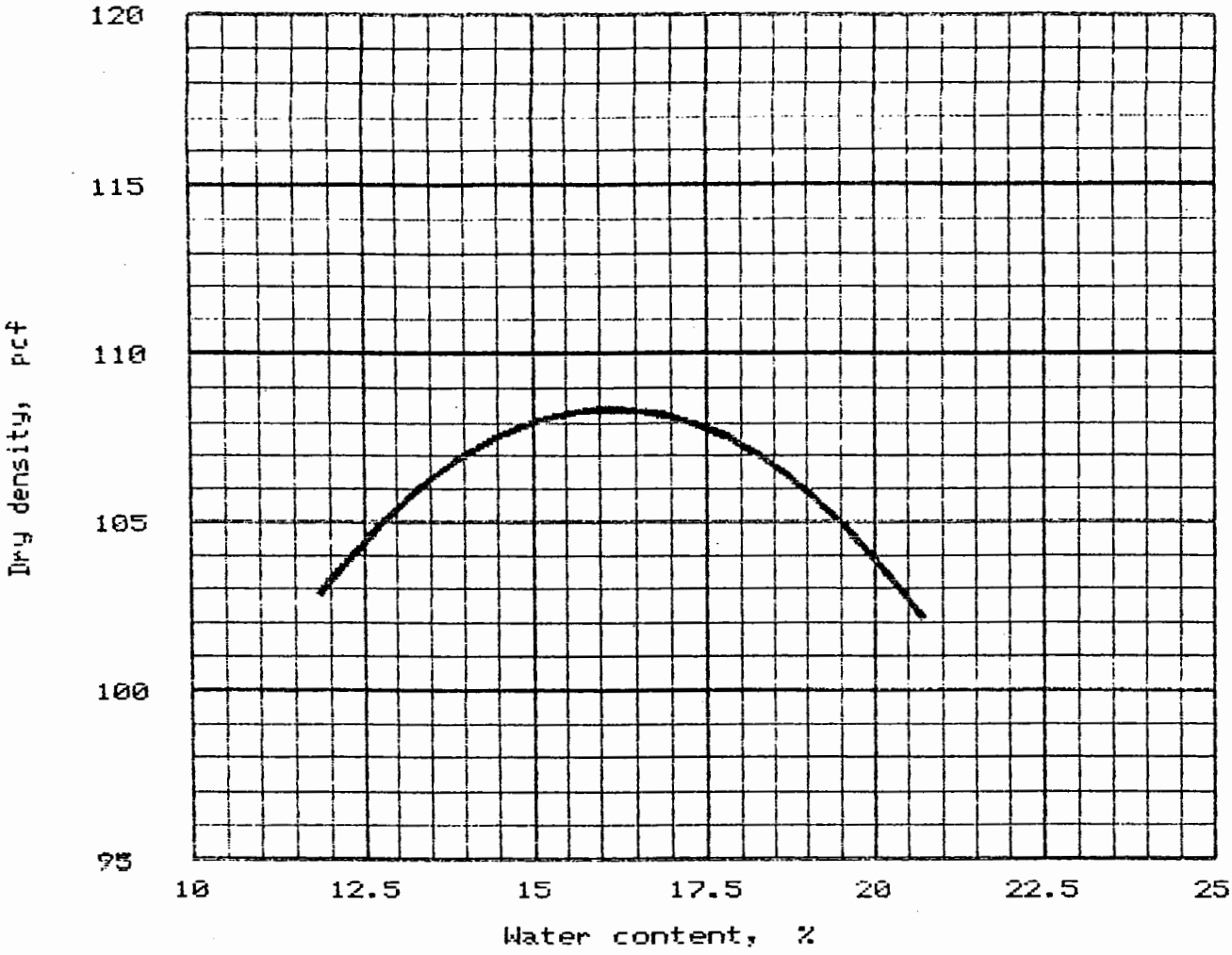
P-3699
ASMC PERMIT FILE

Fig. No._____

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

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

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 16.1 % Maximum dry density = 108.4 pcf	DARK BROWN SILTY SAND

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

Date: 12-14-1992

Remarks:
BASIN 003
DAM MATERIAL

PROCTOR TEST REPORT
PERC ENGINEERING CO., INC.

Figure No.

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P 3699
ASMC PERMIT FILE

ALABAMA LAND AND MINERAL CORP.
AREA 6 MINE
PERMIT APPLICATION
STABILITY ANALYSIS
BASIN 003P

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P-3699
ASMC PERMIT FILE

```
12:36:32   12-15-92    Execution of *** REAME ***
 version of the  UNIVERSITY of KENTUCKY  computer model
                 by Dr. Yang H. Huang
   Adapted   by  M.B. ENGINEERING PROGRAMS INC.
                 P.O. Box 1453
                 Paintsville, Ky. 41240
   Version 3.02     dated 10-12-1985.
Prepared for : Walker Service Company
               P. O. Box 309 - Plant Street
               Oakman, Alabama 35579

    ************************************************************
    *  Alabama Land and Mineral Corp. Area 6 Mine Basin 003P Stati *
    ************************************************************
    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      6.500
 2    500.000       .000

    ON BOUNDARY LINE NO. 2,POINT NO. AND COORDINATES ARE:
  1    200.000      4.900
 2    266.667     4.033

    ON BOUNDARY LINE NO. 3,POINT NO. AND COORDINATES ARE:
  1       .000      7.500
 2    200.000      4.900
      219.250     12.600

    ON BOUNDARY LINE NO. 4,POINT NO. AND COORDINATES ARE:
  1       .000     12.600
 2    219.250     12.600
 3    226.250     15.400
 4    238.250     15.400
 5    262.383      5.747

 6    266.667      4.033
 7    500.000      1.000

    LINE NO. AND SLOPE OF EACH SEGMENT ARE:
          1      -.013
          2      -.013
          3      -.013       .400
          4       .000       .400       .000      -.400      -.400      -.013
    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 ARE:  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      230.400       26.560       128.180
        2      100.800       30.540       123.040
        3         .000          .000       62.400
    SEISMIC COEFFICIENT=       .000  MIN. DEPTH OF TALLEST SLICE=       .000
    UNIT WEIGHT OF WATER=     62.400
```

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THE FACTORS OF SAFETY ARE DETERMINED BY THE SIMPLIFIED BISHOP METHOD

NSPG = 1 NSRCH = 0 # OF SLICES = 10 NO. OF ADD. RADII= 2

NO. OF POINTS ON WATER TABLE FOR EACH CASE= 6

UNDER SEEPAGE CONDITION 1,POINT NO. AND COORDINATES OF WATER TABLE ARE:

1	.000	12.600
2	219.250	12.600
3	237.929	10.201
4	262.383	5.747
5	266.667	4.033
6	500.000	1.000

POINT1=(239.000, 36.000)
POINT2=(239.000, 16.000)
POINT3=(268.000, 16.000)
NJ= 2 NI= 2
AUTOMATIC SEARCH WILL FOLLOW AFTER GRID WITH
XINC= 10.000 AND YINC= 10.000

AT POINT (239.000, 36.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

32.604	6.118
30.206	6.051
27.808	6.442
25.410	7.151
23.012	9.923
31.805	6.061
31.005	6.006
29.407	6.159
28.607	6.295

LOWEST FACTOR OF SAFETY= 6.006 AND OCCURS AT RADIUS = 31.005

AT POINT (239.000, 26.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

22.605	5.605
20.209	5.481
17.814	5.813
15.418	6.619
13.022	8.634
21.807	5.512
21.008	5.457
19.411	5.519
18.612	5.650

LOWEST FACTOR OF SAFETY= 5.457 AND OCCURS AT RADIUS = 21.008

AT POINT (239.000, 16.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

12.606	6.382
10.252	6.760
7.898	7.463
5.544	8.138
3.190	8.632

TAKEN FROM
P-3699
ASMC PERMIT FILE

LOWEST FACTOR OF SAFETY= 6.382 AND OCCURS AT RADIUS = 12.606

AT POINT (253.500, 36.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

32.793	2.484
31.192	2.404
29.592	2.643
27.991	2.978
26.391	3.716
32.259	2.466
31.726	2.350
30.659	2.470
30.125	2.551

LOWEST FACTOR OF SAFETY= 2.350 AND OCCURS AT RADIUS = 31.726

AT POINT (253.500, 26.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

22.794	2.398
21.336	2.294
19.878	2.527
18.421	2.989
16.963	4.017
22.308	2.380
21.822	2.287
20.850	2.351
20.364	2.430

LOWEST FACTOR OF SAFETY= 2.287 AND OCCURS AT RADIUS = 21.822

AT POINT (253.500, 16.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

12.794	2.804
11.480	2.694
10.165	2.980
8.850	3.509
7.535	4.625
12.356	2.804
11.918	2.743
11.041	2.779
10.603	2.873

LOWEST FACTOR OF SAFETY= 2.694 AND OCCURS AT RADIUS = 11.480

AT POINT (268.000, 36.000) UNDER SEEPAGE 1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:

32.981	3.859
32.420	4.028
31.859	3.270
31.298	4.362
30.737	7.454
32.233	4.012
32.046	3.759
31.672	3.544
31.485	3.900

TAKEN FROM
P-3699
ASMC PERMIT FILE

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    LOWEST FACTOR OF SAFETY=     3.270 AND OCCURS AT RADIUS =     31.859

AT POINT (   268.000,    26.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.982     5.089
        22.564     5.520
        22.145     5.780
        21.727     5.187
        21.309     9.264

        22.006     4.150
        21.867     4.594
        21.588     6.005
        21.448     7.234

    LOWEST FACTOR OF SAFETY=     4.150 AND OCCURS AT RADIUS =     22.006


****WARNING AT NEXT CENTER**** WHEN RADIUS IS    11.698
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 (   268.000,    16.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        12.983     8.378
        12.708     9.524
        12.432    11.260
        12.157    14.025
        11.881    12.883

        11.789    18.839
        11.698**********

    LOWEST FACTOR OF SAFETY=     8.378 AND OCCURS AT RADIUS =     12.983


FOR PIEZOMETRIC LINE NO.    1

AT POINT (   253.500,    26.000),RADIUS    21.822
    THE MINIMUM FACTOR OF SAFETY IS     2.287


AT POINT (   253.500,    26.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.794     2.398
        21.336     2.294
        19.878     2.527
        18.421     2.989
        16.963     4.017

        22.308     2.380
        21.822     2.287
        20.850     2.351
        20.364     2.430

    LOWEST FACTOR OF SAFETY=     2.287 AND OCCURS AT RADIUS =     21.822

AT POINT (   263.500,    26.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.924     2.962
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P-3699
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        22.183      2.899
        21.442      2.858
        20.701      3.726
        19.960      6.104

        21.936      2.685
        21.689      2.687
        21.195      3.076
        20.948      3.359

    LOWEST FACTOR OF SAFETY=      2.685 AND OCCURS AT RADIUS =      21.936

AT POINT (   243.500,    26.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.664      3.617
        20.489      3.569
        18.315      3.824
        16.140      4.094
        13.966      4.578

        21.939      3.584
        21.214      3.527
        19.764      3.641
        19.040      3.729

    LOWEST FACTOR OF SAFETY=      3.527 AND OCCURS AT RADIUS =      21.214

AT POINT (   253.500,    36.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        32.793      2.484
        31.192      2.404
        29.592      2.643
        27.991      2.978
        26.391      3.716

        32.259      2.466
        31.726      2.350
        30.659      2.470
        30.125      2.551

    LOWEST FACTOR OF SAFETY=      2.350 AND OCCURS AT RADIUS =      31.726

AT POINT (   253.500,    16.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        12.794      2.804
        11.480      2.694
        10.165      2.980
         8.850      3.509
         7.535      4.625

        12.356      2.804
        11.918      2.743
        11.041      2.779
        10.603      2.873

    LOWEST FACTOR OF SAFETY=      2.694 AND OCCURS AT RADIUS =      11.480

AT POINT (   256.000,    26.000) UNDER SEEPAGE     1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.826      2.342
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TAKEN FROM
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        21.548      2.218
        20.269      2.523
        18.991      3.084
        17.712      4.305

        22.400      2.334
        21.974      2.278
        21.122      2.300
        20.695      2.404

    LOWEST FACTOR OF SAFETY=      2.218 AND OCCURS AT RADIUS =      21.548

AT POINT (   258.500,     26.000) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        22.859      2.389
        21.759      2.229
        20.660      2.569
        19.561      3.222
        18.462      4.700

        22.492      2.399
        22.126      2.377
        21.393      2.321
        21.027      2.434

    LOWEST FACTOR OF SAFETY=      2.229 AND OCCURS AT RADIUS =      21.759

AT POINT (   256.000,     28.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        25.326      2.326
        24.012      2.195
        22.698      2.479
        21.383      3.024
        20.069      4.207

        24.888      2.314
        24.450      2.244
        23.574      2.273
        23.136      2.368

    LOWEST FACTOR OF SAFETY=      2.195 AND OCCURS AT RADIUS =      24.012

AT POINT (   256.000,     31.000) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        27.826      2.335
        26.476      2.202
        25.126      2.463
        23.776      2.967
        22.426      4.118

        27.376      2.318
        26.926      2.244
        26.026      2.272
        25.576      2.358

    LOWEST FACTOR OF SAFETY=      2.202 AND OCCURS AT RADIUS =      26.476

AT POINT (   258.500,     28.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        25.358      2.345
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        24.223      2.190
        23.088      2.526
        21.954      3.162
        20.819      4.581

        24.980      2.347
        24.602      2.317
        23.845      2.284
        23.467      2.391

    LOWEST FACTOR OF SAFETY=      2.190 AND OCCURS AT RADIUS =      24.223

AT POINT (    261.000,     28.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        25.391      2.502
        24.435      2.383
        23.479      2.621
        22.524      3.357
        21.568      5.105

        25.072      2.503
        24.754      2.496
        24.117      2.358
        23.798      2.475

    LOWEST FACTOR OF SAFETY=      2.358 AND OCCURS AT RADIUS =      24.117

AT POINT (    258.500,     31.000) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        27.858      2.319
        26.687      2.165
        25.517      2.491
        24.346      3.110
        23.175      4.473

        27.468      2.318
        27.078      2.280
        26.297      2.252
        25.907      2.354

    LOWEST FACTOR OF SAFETY=      2.165 AND OCCURS AT RADIUS =      26.687

AT POINT (    258.500,     33.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        30.358      2.322
        29.152      2.158
        27.945      2.460
        26.739      3.059
        25.532      4.374

        29.956      2.313
        29.554      2.263
        28.749      2.240
        28.347      2.335

    LOWEST FACTOR OF SAFETY=      2.158 AND OCCURS AT RADIUS =      29.152

AT POINT (    258.500,     36.000) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        32.858      2.333
```

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```
        31.616      2.172
        30.374      2.453
        29.131      3.002
        27.889      4.283

        32.444      2.325
        32.030      2.268
        31.202      2.248
        30.788      2.335

    LOWEST FACTOR OF SAFETY=      2.172 AND OCCURS AT RADIUS =      31.616

AT POINT (    261.000,     33.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        30.390      2.416
        29.363      2.193
        28.336      2.551
        27.309      3.245
        26.282      4.836

        30.048      2.402
        29.706      2.382
        29.021      2.290
        28.678      2.405

    LOWEST FACTOR OF SAFETY=      2.193 AND OCCURS AT RADIUS =      29.363

AT POINT (    256.000,     33.500) UNDER SEEPAGE      1,
THE RADIUS AND THE CORRESPONDING FACTOR OF SAFETY ARE:
        30.325      2.353
        28.940      2.224
        27.554      2.475
        26.169      2.922
        24.783      4.037

        29.864      2.337
        29.402      2.252
        28.478      2.295
        28.016      2.380

    LOWEST FACTOR OF SAFETY=      2.224 AND OCCURS AT RADIUS =      28.940


FOR PIEZOMETRIC LINE NO.     1

AT POINT (    258.500,     33.500),RADIUS     29.152
    THE MINIMUM FACTOR OF SAFETY IS      2.158
```

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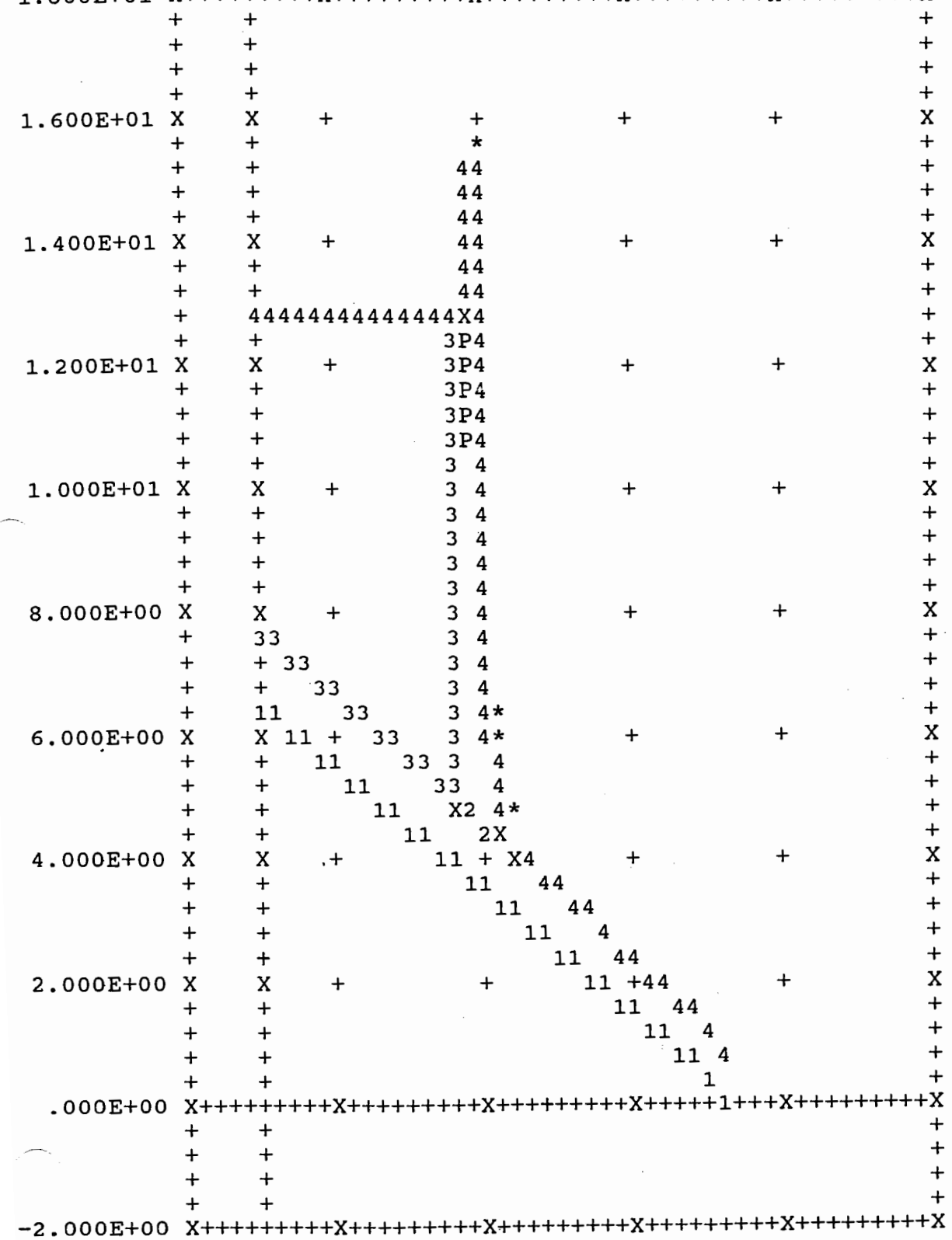
CROSS SECTION IN DISTORTED SCALE
NUMERALS INDICATE BOUNDARY LINE NO. IF THERE ARE MORE THAN 10
BOUND. LINES,ALPHABETS WILL THEN BE USED. P INDICATES
P1ZOMETRIC LINE. IF A PORTION OF PIEZOMETRIC LINE COINCIDES WITH
THE GROUND OR ANOTHER BOUNDARY LINE,ONLY THE GROUND OR BOUNDARY
LINE WILL BE SHOWN. X INDICATES INTERSECTION OF TWO BOUNDARY
LINES. * INDICATES FAILURE SURFACE.
THE MINIMUM FACTOR OF SAFETY IS 2.158



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```
          -8.00E+01  8.00E+01  2.40E+02  4.00E+02  5.60E+02  7.20E+02
....RUN COMPLETE....
```

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