HYDROLOGY STUDY FOR
OAK GROVE RESOURCES, LLC

CONCORD PREP. PLANT

P-3233 R-26

JEFFERSON COUNTY, ALABAMA

BY

PERC ENGINEERING CO., INC.

P.O. BOX 1712

JASPER, ALABAMA 35502

DETAILED DESIGN PLANS

DIVERSION F-F' Extension 10+28.53 to 12+13.09

ATTACHMENT III-B-3

February 8, 2016

PERC
ENGINEERING CO., INC.

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

February 8, 2016

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

RE: Oak Grove Resources, LLC
Concord Prep. Plant
P-3233 Revision R-26

Dear Stephen:

I hereby certify the attached detailed design plans for Diversion Ditch F-F' Extension 10+28.53 to 12+13.09 for the above referenced location 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 me at 295-3127 or e-mail lstephens@percengineering.com

Sincerely,
PERC Engineering Co., Inc.

Leslie G. Stephens, P.E., P.L.S.
Alabama Registration No. 14117-E

ALABAMA
PROFESSIONAL ENGINEER
REGISTERED
No. 14117
LESLIE G. STEPHENS

Attachment III-B-3

SPECIFICATIONS FOR DIVERSION CHANNELS AND DIVERSION BERMS

1. Temporary diversions shall be constructed to pass safely the peak runoff from a 2-year, 6-hour precipitation event.

2. To protect fills and property and to avoid danger to public health and safety, permanent diversions shall be constructed to pass safely the peak runoff from a 10-year, 6-hour precipitation event. Permanent diversions shall be constructed with gently sloping banks that are stabilized by vegetation.

3. Diversions shall be designed, constructed, and maintained in a manner which prevents additional contributions of suspended solids to stream flow and to runoff outside the permit area, to the extent possible, using the best technology currently available. Appropriate sediment control measures for these diversions may include, but not be limited to, maintenance of appropriate gradients, channel lining, revegetation, roughness structures, and detention basins.

4. No diversion shall be located so as to increase the potential for land slides and no diversion shall be constructed on existing land slides.

5. When no longer needed, each temporary diversion shall be removed and the affected land regraded, topsoiled,

and revegetated in accordance with Rules 880-X-10C-.10, 880-X-10C-.11, 880-X-10C-.52 - 880-X-10C-.58, 880-X-10C-.60, and 880-X-10C-.62.

6. Channel linings, when slopes are between 1-3 percent shall consist of both perennial and annual grasses and when slopes are greater than 3 percent, shall consist of riprap or be cut into non-erodible material.

7. Freeboard shall provide protection for transition of flows and for critical areas such as swales and curves along the entire channel length.

8. Energy dissipators shall be installed, when necessary, at discharge points where natural streams and exit velocity of the diversion ditch flow is greater than that of the receiving stream.

9. Excess excavated material not necessary for diversion channel geometry or regrading of the channel shall be disposed of in accordance with Rule 880-X-10C-.36.

10. Topsoil removed from the diversion excavations shall be handled in accordance with Rule 880-X-10C-.07 through 880-X-10C-.11.

11. Diversions shall not be constructed or operated to divert water into underground mines.

12. The embankment or berm foundation area shall be cleared of all organic matter, all surfaces sloped to no steeper than lv:lh and the entire foundation surface scarified.

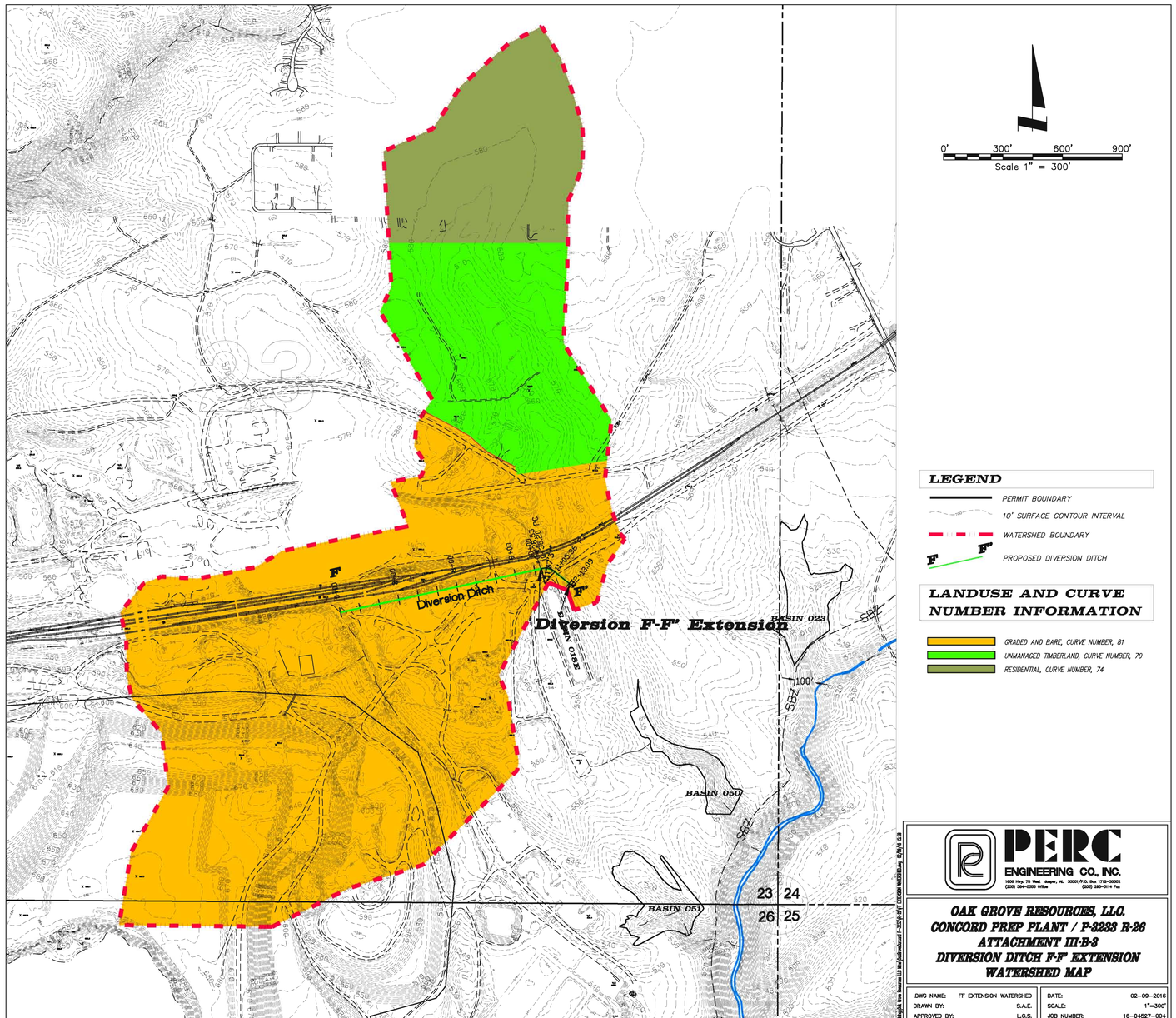
13. The entire embankment or berm shall be compacted to 95% density, based on standard proctor as outlined in ASTM.

14. The material placed in the berm 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 as the moisture content of the fill material will permit satisfactory compaction in accordance with paragraph 13.

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

16. All berms shall be examined quarterly for structural weakness, instability, erosion, or other hazardous conditions and maintenance performed as necessary.

17. Any soil encountered in the excavation process will be stockpiled within the Permit Boundary to be used for cover material during the reclamation of the Coarse Refuse Disposal Area.
    Any rock material encountered in the excavation process will be used for compacted fill in the ditch area currently flowing to Basin 003A. It may be stockpiled temporally prior to placement.



0' 300' 600' 900'
Scale 1" = 300'

LEGEND

- PERMIT BOUNDARY
- 10' SURFACE CONTOUR INTERVAL
- WATERSHED BOUNDARY
- F F' PROPOSED DIVERSION DITCH

LANDUSE AND CURVE NUMBER INFORMATION

- GRADED AND BARE, CURVE NUMBER, 81
- UNMANAGED TIMBERLAND, CURVE NUMBER, 70
- RESIDENTIAL, CURVE NUMBER, 74

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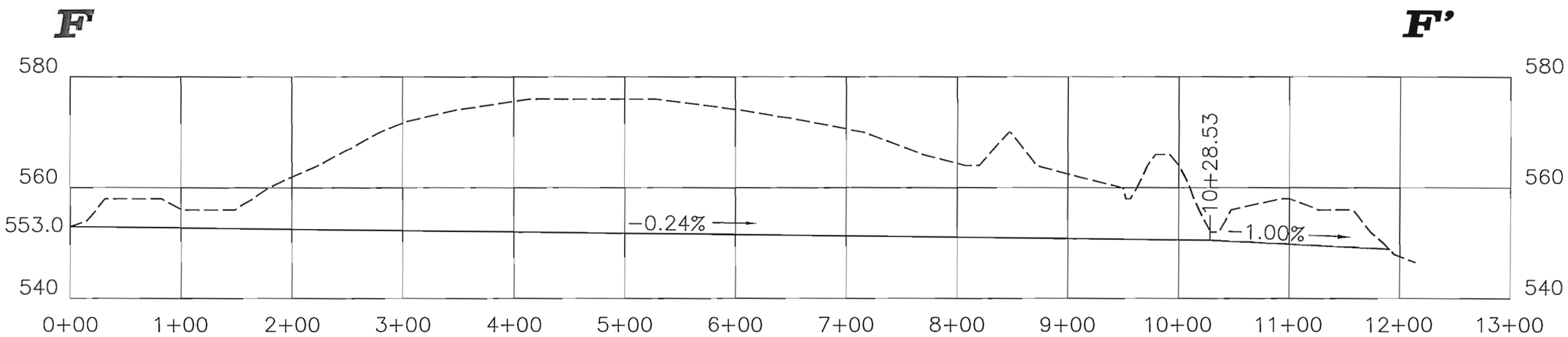
OAK GROVE RESOURCES, LLC.
CONCORD PREP PLANT / P-3233 R-26
ATTACHMENT III-B-3
DIVERSION DITCH F-F' EXTENSION
WATERSHED MAP

.DWG NAME:	FF EXTENSION WATERSHED	DATE:	02-09-2016
DRAWN BY:	S.A.E.	SCALE:	1"=300'
APPROVED BY:	L.G.S.	JOB NUMBER:	16-04527-004



Vertical Scale: 1"=20'
Horizontal Scale: 1"=100'

LEGEND

------ NATURAL GROUND PROFILE

———— PROPOSED DIVERSION PROFILE/BOTTOM OF DITCH

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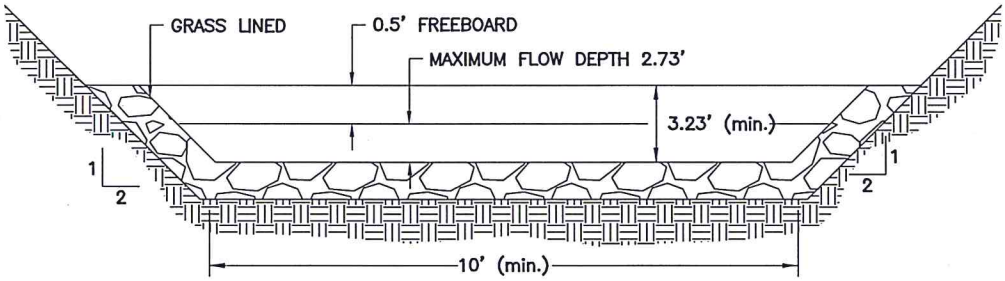
CONCORD PREP PLANT / P-3233 R-26
ATTACHMENT III-B-3
DIVERSION DITCH F-F' EXTENSION

.DWG NAME:	FF EXTENSION WATERSHED	DATE:	02-09-2016
DRAWN BY:	S.A.E.	SCALE:	AS SHOWN
APPROVED BY:	L.G.S.	JOB NUMBER:	16-04527-004



CLASS 1 RIP–RAP LINING
(SEE RIP–RAP SPECIFICATIONS)
CUT SECTION
10+28.53 TO 12+13.09

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CONCORD PREP PLANT
P-3233 R-26
Diversion F-F' EXTENSION

.DWG NAME:	FF EXTENSION WATERSHED	DATE:	02–10–16
DRAWN BY:	S.A.E.	SCALE:	NONE
APPROVED BY:	L.G.S.	JOB NUMBER:	16–04527–004

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RIP-RAP CLASSIFICATION SPECIFICATIONS

CLASS 1 RIP-RAP

No more than 10% of the stone will have a diameter greater than twelve (12) inches; no more than 50% of the stone will have a diameter less than ten (10) inches; and no more than 10% of the stone will have a diameter of less than six (6) inches. The thickness of the rip-rap liner will be no less than twelve (12) inches.

CLASS 2 RIP-RAP

No more than 10% of the stone will have a diameter greater than sixteen (16) inches; no more than 50% of the stone will have a diameter less than twelve (12) inches; and no more than 10% of the stone will have a diameter of less than six (6) inches. The thickness of the rip-rap liner will be no less than sixteen (16) inches.

CLASS 3 RIP-RAP

No more than 10% of the stone will have a diameter greater than twenty two (22) inches; no more than 50% of the stone will have a diameter less than sixteen (16) inches; and no more than 10% of the stone will have a diameter of less than eight (8) inches. The thickness of the rip-rap liner will be no less than twenty two (22) inches.

CLASS 4 RIP-RAP

No more than 10% of the stone will have a diameter greater than twenty seven (27) inches; no more than 50% of the stone will have a diameter less than twenty two (22) inches; and no more than 10% of the stone will have a diameter of less than ten (10) inches. The thickness of the rip-rap liner will be no less than twenty seven (27) inches.

CLASS 5 RIP-RAP

No more than 10% of the stone will have a diameter greater than thirty four (34) inches; no more than 50% of the stone will have a diameter less than twenty seven (27) inches; and no more than 10% of the stone will have a diameter of less than sixteen (16) inches. The thickness of the rip-rap liner will be no less than thirty four (34) inches.

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Oak Grove Resources LLC
Concord Prep. Plant
P-3233 Revision R-26
Diversion F-F' Extension
10+28.53 to 12+13.09

4.25 Inch, 10 Year-6 Hour

NRCS Type II

LGS

PERC ENGINEERING CO., INC.
P. O. BOX 1712
1606 HIGHWAY 78 WEST
JASPER ALABAMA 35502

Phone: 205-384-5553
Email: LSTEPHENS@PERCENGINEERING.COM

General Information

Storm Information:

Storm Type:	Rainfall Event

Accumulated Time (hrs)	Accumulated Depth (in)
0.00	0.0000
0.50	0.1900
1.00	0.3400
1.50	0.5740
2.00	0.9780
2.50	2.5500
3.00	2.9750
3.50	3.3150
4.00	3.5490
4.50	3.7610
5.00	3.9310
5.50	4.1010
6.00	4.2500

Peak 30-minute Intensity: 3.145 in/hr

Structure Networking:

Type	Stru #	(flows into)	Stru #	Musk. K (hrs)	Musk. X	Description
Channel	#1	==>	End	0.000	0.000	Diversion F-F' Extension

#1
Chan'l

Structure Summary:

	Immediate Contributing Area (ac)	Total Contributing Area (ac)	Peak Discharge (cfs)	Total Runoff Volume (ac-ft)
#1	153.300	153.300	256.47	25.92

Structure Detail:

Structure #1 (Riprap Channel)

Diversion F-F' Extension

Trapezoidal Riprap Channel Inputs:

Material: Riprap

Bottom Width (ft)	Left Sideslope Ratio	Right Sideslope Ratio	Slope (%)	Freeboard Depth (ft)	Freeboard % of Depth	Freeboard Mult. x (VxD)
10.00	2.0:1	2.0:1	1.0	0.50		

Riprap Channel Results:

Simons/OSM Method - Mild Slope Design

	w/o Freeboard	w/ Freeboard
Design Discharge:	256.47 cfs	
Depth:	2.73 ft	3.23 ft
Top Width:	20.92 ft	22.92 ft
Velocity:	6.07 fps	
X-Section Area:	42.23 sq ft	
Hydraulic Radius:	1.901 ft	
Froude Number:	0.75	
Manning's n:	0.0377	
Dmin:	2.00 in	
D50:	9.00 in	
Dmax:	12.00 in	

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	114.300	0.240	0.000	0.000	81.000	F	207.59	21.147
	2	21.400	0.130	0.007	0.447	70.000	M	19.95	2.173
	3	17.600	0.058	0.138	0.334	74.000	M	31.10	2.597
	Σ	**153.300**						**256.47**	**25.917**

Subwatershed Time of Concentration Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	1	5. Nearly bare and untilled, and alluvial valley fans	2.00	2.00	100.00	1.410	0.019
		8. Large gullies, diversions, and low flowing streams	13.64	150.00	1,100.00	11.070	0.027
		8. Large gullies, diversions, and low flowing streams	0.24	2.45	1,020.83	1.460	0.194
#1	**1**	**Time of Concentration:**					**0.240**
#1	2	1. Forest with heavy ground litter	3.00	3.00	100.00	0.430	0.064
		8. Large gullies, diversions, and low flowing streams	2.36	26.00	1,100.01	4.610	0.066
#1	**2**	**Time of Concentration:**					**0.130**
#1	3	3. Short grass pasture	3.00	3.00	100.00	1.380	0.020
		8. Large gullies, diversions, and low flowing streams	5.26	50.00	950.00	6.880	0.038
#1	**3**	**Time of Concentration:**					**0.058**

Subwatershed Muskingum Routing Details:

Stru #	SWS #	Land Flow Condition	Slope (%)	Vert. Dist. (ft)	Horiz. Dist. (ft)	Velocity (fps)	Time (hrs)
#1	2	9. Small streams flowing bankfull	2.50	10.00	400.00	14.230	0.007
#1	**2**	**Muskingum K:**					**0.007**
#1	3	8. Large gullies, diversions, and low flowing streams	1.29	22.00	1,700.02	3.410	0.138
#1	**3**	**Muskingum K:**					**0.138**