
ATTACHMENT II-E

GEOLOGY

The Cahaba Resources, LLC.- Carter Mine site is located in Section 34, Township 20 South, Range 8 West, Tuscaloosa County, Alabama, as seen from the 1983 photorevised Brookwood and Coaling, Alabama U.S.G.S. 7.5 minute Quadrangles. The proposed mine site will occupy approximately 132 acres of which approximately 124 is bonded as mining area (See Mine Site Location Map). As shown below in this report, a significant portion of this permit area is previously disturbed, and has no recoverable coal underlying it. As shown on the ASMC permit map for this application, the majority of the surface ownership for this permit area is either Randall Crawford (a principal of Cahaba Resources) or Cahaba Resources, LLC.. One of the main objectives of mining this permit (other than coal recovery) is to reclaim the previously disturbed (unreclaimed) portions of the permitted area for the surface owners.

Structurally, this site is located within the Warrior Coal Basin. The Warrior Basin is the southern most of a series of Pennsylvanian basins of the Appalachian Plateau. Structurally, the Warrior Basin is formed by a large gentle syncline that extends from north-central Mississippi in the west to north-central Alabama in the east. The syncline is tilted southwestward with a regional dip of 30 to 200 feet per mile. Toward the interior of the Warrior Basin, the regional southwest dip of Pottsville strata is modified by a series of three synclines and two anticlines. Of these, the major structures are the Warrior and Coalburg synclines, and the Sequatchie anticline. The fold axes are parallel to the

Appalachian system in a northeast-southwest direction and plunge to the southwest with the regional dip.

The strata which underlies and outcrops in this area is of both the Pottsville Formation of the Pennsylvanian Age and the Coker Formation of the Cretaceous Age. According to 'Ground-water Availability in Tuscaloosa County, Alabama', the Pottsville Formation in this area consists of interbedded dark-gray shale, siltstone, medium-gray sandstone, and coal in cyclic sequences, and the Coker Formation consists of light-colored micaceous very fine to medium sand, cross-bedded sand, varicolored micaceous clay, and a few thin gravel beds containing quartz and chert pebbles.

Locally, the strata which outcrops in the immediate vicinity of the Carter Mine includes sandstones, shales, and coals associated with the Brookwood Coal Group and is overlain by Cretaceous sands, clays, and pebbles associated with the Coker Formation.

According to "Depositional Settings of the Pottsville Formation in the Black Warrior Basin", the Brookwood Coal Group is stratigraphically the highest coal group in the Warrior Coal Basin and lies approximately 150-300 feet above the Utley Group.

The target coal seam at this facility which is present within and adjacent to the proposed permit area is the Carter Seam of the Brookwood Coal Group. The Guide, Brookwood, and Milldale Seams of the Brookwood Group are generally known to overly the Carter, however due to the extensive previous disturbance, the elevation of the Carter Seam, and

the prevailing topography within the permit area , these seams were not identified during the drilling program. It is not anticipated that any other seam will be encountered other than the Carter Seam, however, another seam might occur on a very limited basis. However if encountered during mining, it will be recovered.

"Depositional Settings of the Pottsville Formation in the Black Warrior Basin" states that the Carter Seam occurs approximately 20 to 40 feet above the Johnson Seam, approximately 30 feet below the Milldale Seam , that the Carter ranges in thickness from 5 to 30 inches, and is in much demand as a metallurgical or coking coal.

Approximately half of the proposed permit area has been previously disturbed by pre-law mining of Brookwood Group Coal Seams, although it is not known of any others than the Carter were mined. reported that there are still isolated pockets of the Brookwood Seam.. Exploratory drilling within the proposed permit boundary reveals that the Carter Seam outcrops between approximately 435 and 466 ft. MSL and averages approximately 18 inches thick.

Overburden thickness above the Carter Coal Seam ranges from 0 ft. at the cropline to approximately 51 ft. at the deepest point. Cretaceous material within the proposed permit area ranges from 15 to 42 feet thick and averages approximately 33 ft. thick as shown from available drill hole lithologies. The Coker Formation strata to be disturbed within the proposed permit area can be described as weathered sandy surface material followed by unconsolidated, weathered sand and clay with small amounts of quartz pebbles. The

color of this interval ranges from a medium red-brown at the surface to light yellow brown at the base of the formation. In areas where the thickness of the Pottsville Formation is not dictated by surface topography, the thickness of the Pottsville strata overlying the Carter Seam within the proposed permit area ranges from approximately 11.5 feet to 16 feet with an average thickness of approximately 13.83 ft. thick as shown from available drill hole lithologies. The lithology of Pottsville Formation strata overlying the Carter Seam within the proposed permit area is very simple: either a single shale layer ranging from 6.5 to 16 feet thick or (towards the west of the proposed permit) a sandstone interval which overlies the shale layer. The sandstone interval is a fine to medium grained tightly cemented sandstone which is medium to very hard. In some places the groundwater which has migrated through the highly conductive cretaceous sediments has weathered the first few inches of the Pottsville sandstones and shales. This lithology was taken from drill holes within and adjacent to the proposed permit area and these intervals vary in thickness depending upon their location within the proposed permit area. The elevation of the Pottsville-Cretaceous contact may be seen on the attached Pottsville-Cretaceous Contact Map. The orientation of this contact, which has a profound affect on groundwater movement in the Cretaceous aquifer, is shown on the map as dipping towards the South and West.

Although no faults are known to exist within this small permit area, it is known from previous permit applications in this area (by both Black Warrior Minerals and The Drummond Company) that there is at least one fault to the west and southwest of this permit. This fault (or faults) has an influence on the structure and orientation of the target

coal seam and the overlying strata proposed to be disturbed by coal recovery operations at this site.

According to 'Depositional Settings of the Pottsville Formation in the Black Warrior Basin', investigations have shown that the depositional environment of the coal and enclosing strata has a direct bearing on the character of the coal seams, that the thickness and extent of the seam is largely determined by the relief of the surface on which the coal swamp developed, and that the nature of the sediments which overlie the coal (overburden) have a strong influence on coal quality including sulfur and trace element content. The reference also states that the prevailing theory is that the Pottsville Formation represents a progradational sequence that ranges from Barrier Island deposits near the base of the Formation grading through Lower Delta Plain and transitional deposits *into Upper Delta Plain deposits as you ascend into the upper part of the Formation*. In addition, the reference states that all depositional systems comprise one or more interrelated depositional environments which are in turn represented in the rock record by one or more lithofacies defined by the sedimentologic and biologic processes active within each environment. Based on this information, the fact that the Brookwood Coal Group is the highest coal group in the Pottsville, and on site-specific drill data presented in this report, all indicate that the Brookwood Coal Group was formed in an upper delta plain depositional environment. As shown in 'Depositional Settings of the Pottsville Formation in the Black Warrior Basin', upper delta plain deposits are fluvial in nature, meaning a fresh water depositional environment, and were not deposited in a marine environment (which has been connected to low quality runoff from coal related facilities). The cretaceous deposits,

which overlay the Pottsville strata at the mine site, are thought to be the Coker Formation, or more specifically, the lowest part of the Coker Formation, which has been called the Cottondale Formation. According to 'Geology of the Coastal Plain of Alabama', the Cottondale is present only in the immediate vicinity of Tuscaloosa and the Warrior River, and is an apparent nonmarine sand having only a small amount of gravel at the base. The reference also states that the Cottondale Formation contains no glauconite. Glauconite is defined as essentially a hydrous potassium iron silicate which commonly occurs in sedimentary rocks of marine origin, therefore if there is no glauconite present, the sedimentary material probably did not form in a marine environment. The reference also states that the coarse-grained sand and carbonaceous clay in the formation are believed to have accumulated at or close to a shoreline, perhaps near the mouth of a river. In addition the reference states that the quartz and quartzite discs might indicate prolonged erosion on the swash zone of a beach.

The only deviation from this depositional model is a thin interval at the Coker-Pottsville contact which is locally known to exist. This interval is thought to be re-worked Pottsville Formation strata and is a sand channel, or high energy deposit. This interval is thin (generally less than 3 ft. thick), is discontinuous (meanders), and has periodically caused reclamation problems at other local facilities due to adverse geochemical quality. The dominant lithology for this interval is a light grey friable, or unconsolidated sand. It should be noted that none of the lithologic descriptions presented in this report contains such a description, however due to the discontinuous (meandering) nature of the interval, may or may not exist within the proposed permit area.

Information utilized to describe the orientation, lithology, and geochemistry of the Carter Mine and adjacent areas include the following drill holes, geochemical analysis sites, and groundwater monitoring sites: CRCMDH-1, CRCMMW-1, CRCMMW-2, CRCMMW-3, and CRCMMW-4. These sites were drilled in August of 2014 with a rubber tired, air rotary Davey Drill Rig built by the now defunct Davey Drill Company utilizing a 5 and ½ inch drill bit. All of the above mentioned sites were drilled and/or cased specifically for this report. Samples were collected by qualified personnel from PERC Engineering Company, Inc. every 5 feet in depth or change in lithology, cataloged, and stored in gallon sized reclosable storage bags for later inspection and testing. These samples were delivered to the PERC Engineering Laboratory where the lithology of the samples were determined by a qualified professional. See attached lithologic descriptions. In addition, several exploratory drill holes and channel samples were drilled/excavated by the Operator to determine coal seam elevation and extent. See attached Coal Boundary Map and the attached 'Pertinent Information for Selected Exploratory Drill Holes and Channel Samples'.

Geochemical analysis sites drilled to describe coal and overburden geochemistry specifically for this report include Geochemical Analysis Site CRCMDH-1 and Groundwater Monitoring Site CRCMMW-3. Chemical analysis, including pH and neutralization potential was conducted on overburden samples from the above mentioned sites at the PERC Engineering Laboratory according to ASTM guidelines (See attached analysis). Total sulfur analysis was conducted at Mineral Labs, Inc..(See attached analysis).

Due to the fact that all overburden at this site does not occupy similar areas, intervals

shown in attachment which are located in the upper portions of the drill logs occupy a smaller volume than intervals which are located closer to the bottom, consequently, their acid-base accounts do not contribute as substantially to the overall chemistry of the overburden. In an attempt to more accurately describe the acid-base potential of the overburden at the Carter Mine site, a spreadsheet which was developed at the Pennsylvania Dept. of Environmental Resources, Bureau of Mining and Reclamation was employed. This spreadsheet not only takes into account the volume occupied by each interval tested, but also the amount of coal lost into the spoil. The results of this method showing both the volume weighted acid-base potential of the area each drill hole represents, but also a summary of the acid-base potential of the entire proposed permit area on a volume weighted basis is attached. The results of the volume weighted acid-base potential of the entire proposed permit area from Geochemical Analysis Site CRCMDH-1 and Groundwater Monitoring Site CRCMMW-3 show that overburden at the Carter Mine contains 0.18 (tons CaCO₃/1000 tons overburden) excess neutralization potential. The bottom acreage used for acid-base potential analysis was calculated using the Thiessen Polygon Method.

The elevations of all drill holes, geochemical analysis sites, and groundwater monitoring wells utilized in this report were estimated from a 2-foot contour interval mapping.

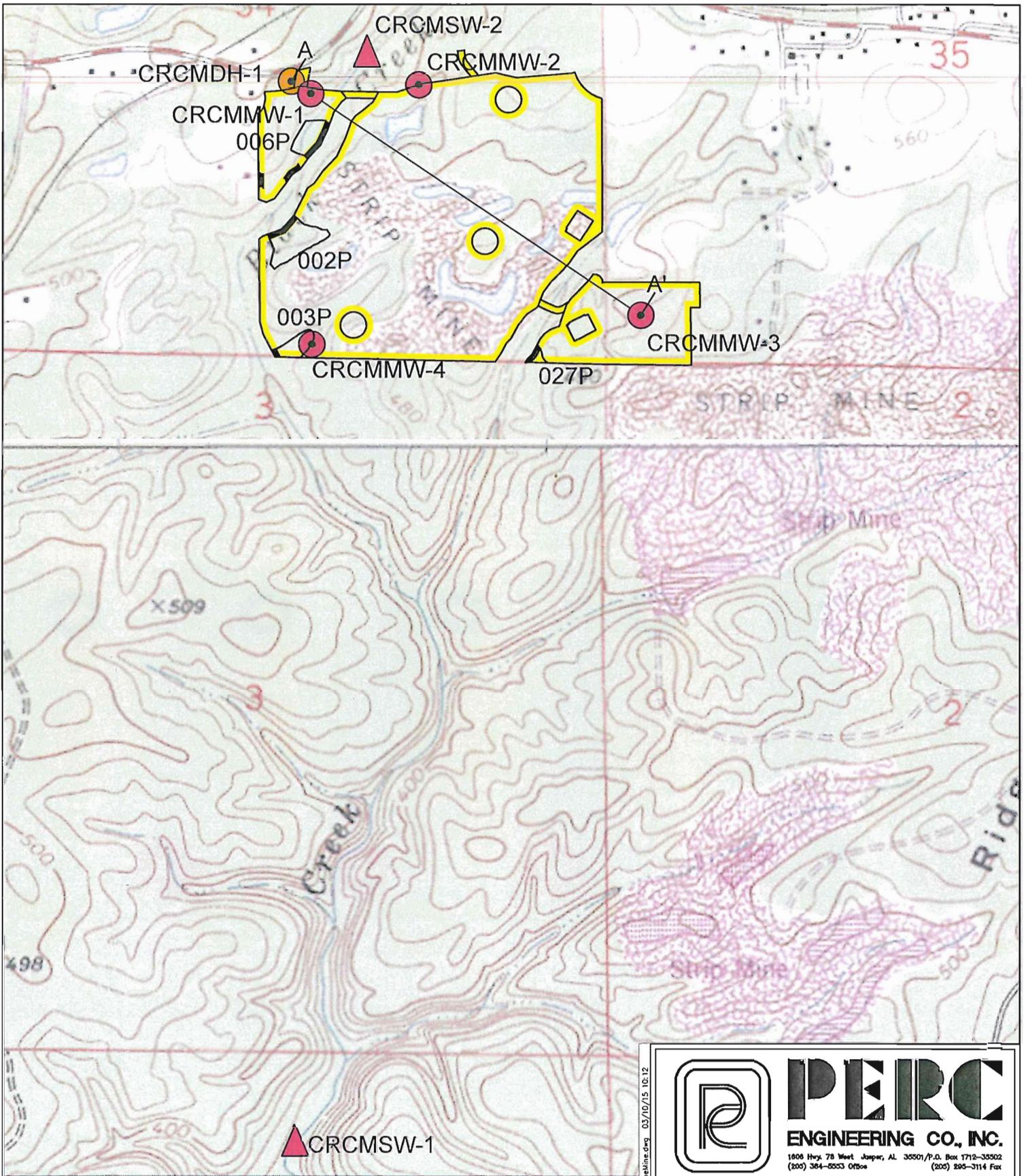
Geochemical Analysis Site CRCMDH-1, Monitoring Wells CRCMMW-1, CRCMMW-2, CRCMMW-3, Channel Sample site CS-1, and Exploratory Drill Holes #227, #228, #229, and #230 were utilized to construct the attached Structure-Contour Map for the Carter

Seam. This map is utilized to determine the elevation and orientation of the target coal seam within the coal recovery area.

The lithology of Geochemical Analysis Site CRCMDH-1 and Groundwater Monitoring Site CRCMMW-3, surface topography from 2-foot contour interval mapping, and coal structure taken from the attached Structure-Contour Map for the Carter Seam was utilized to construct the attached Generalized Fence Diagram A-A'. The location of the Generalized Fence Diagram is shown on the Mine Site Location Map.

The strike and dip of the strata within the proposed permit area is complex due the influence from a nearby fault and the presence of low, open folding. It appears that the target coal seam and the strata overlying it exists as a modified, local anticline, with strata dominantly dipping towards both the southwest and the northeast. As shown on the attached Structure-Contour Map, the dip is more steep towards the west-southwest due to fault influence. The strike on the western side of the proposed permit is approximately South 6 degrees East and the dip magnitude is approximately 2.49 degrees. However, on the eastern side of the proposed permit, the strike is approximately North 60 degrees West with a dip magnitude of approximately 0.95 degrees. The strike and dip was determined from the attached Carter Structure - Contour Map.

Aquifers encountered which would be affected by mining are discussed in the Determination of the Probable Hydrologic Consequences.



MAP LEGEND

-  PERMIT BOUNDARY
-  CRCMDH-1
GEOCHEMICAL ANALYSIS SITE
-  CRCMMW-3
GROUNDWATER MONITORING SITE
-  CRCMSW-1
SURFACE WATER MONITORING SITE
-  004P
GENERALIZED FENCE DIAGRAM LOCATION LINE
-  SEDIMENT BASIN



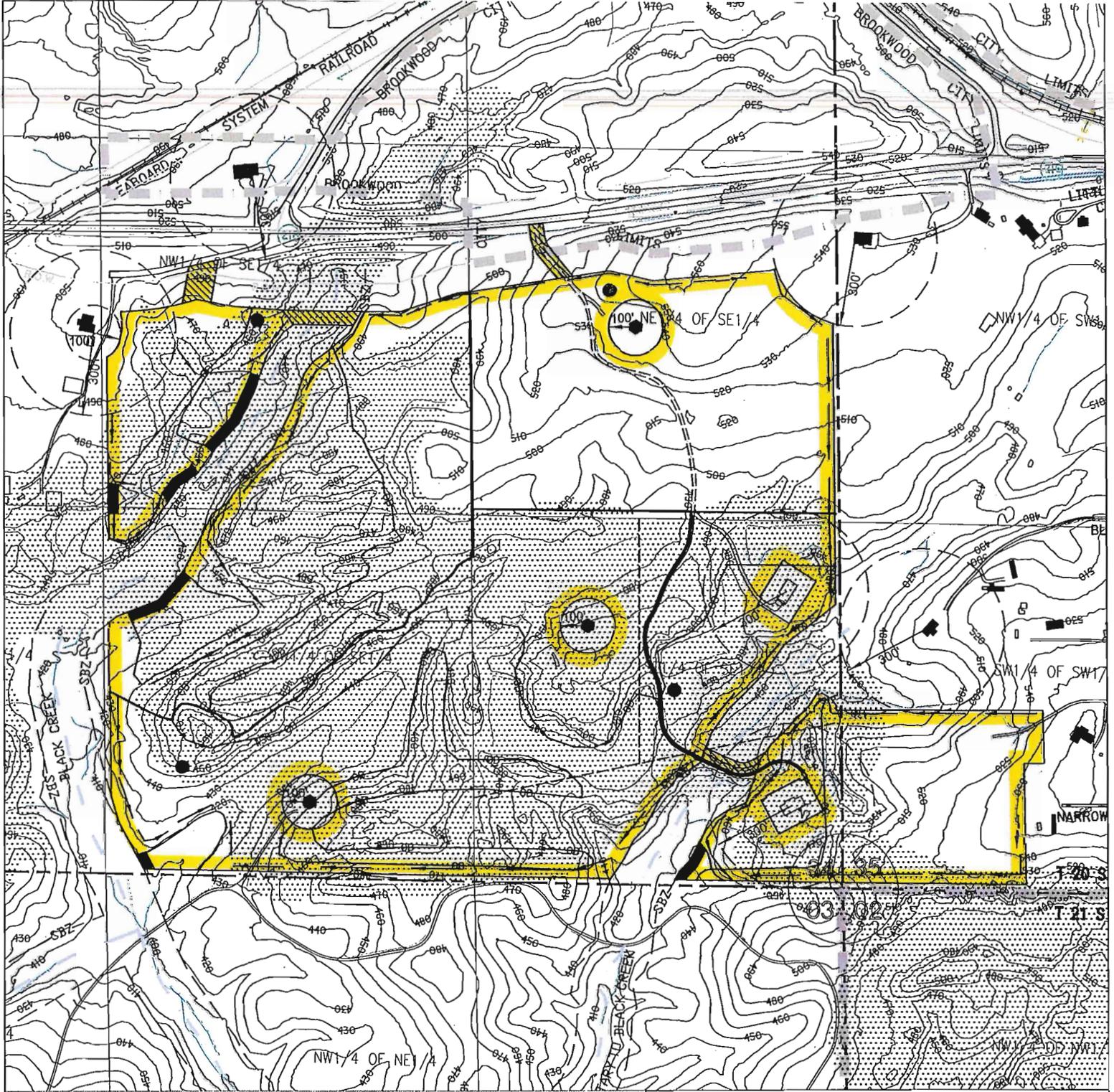
PERC
ENGINEERING CO., INC.

1606 Hwy. 78 West Jasper, AL 35501/P.O. Box 1712-35502
(205) 384-8553 Office (205) 295-3114 Fax

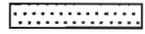
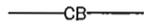
**CAHABA RESOURCES, LLC
CARTER MINE
MINE SITE LOCATION MAP**

DWG NAME:	CR Carter Mine	DATE:	04/02/2015
DRAWN BY:	S.A.E.	SCALE:	1"=1000'
APPROVED BY:	T.S.T.	JOB NUMBER:	13-04068-001

V:\Mining\Red Mesa Bledsoe Mine\RedMesaMine.dwg 03/10/15 10:12



LEGEND

-  PERMIT BOUNDARY
-  PRE LAW DISTURBANCE
-  COAL BOUNDARY LINE

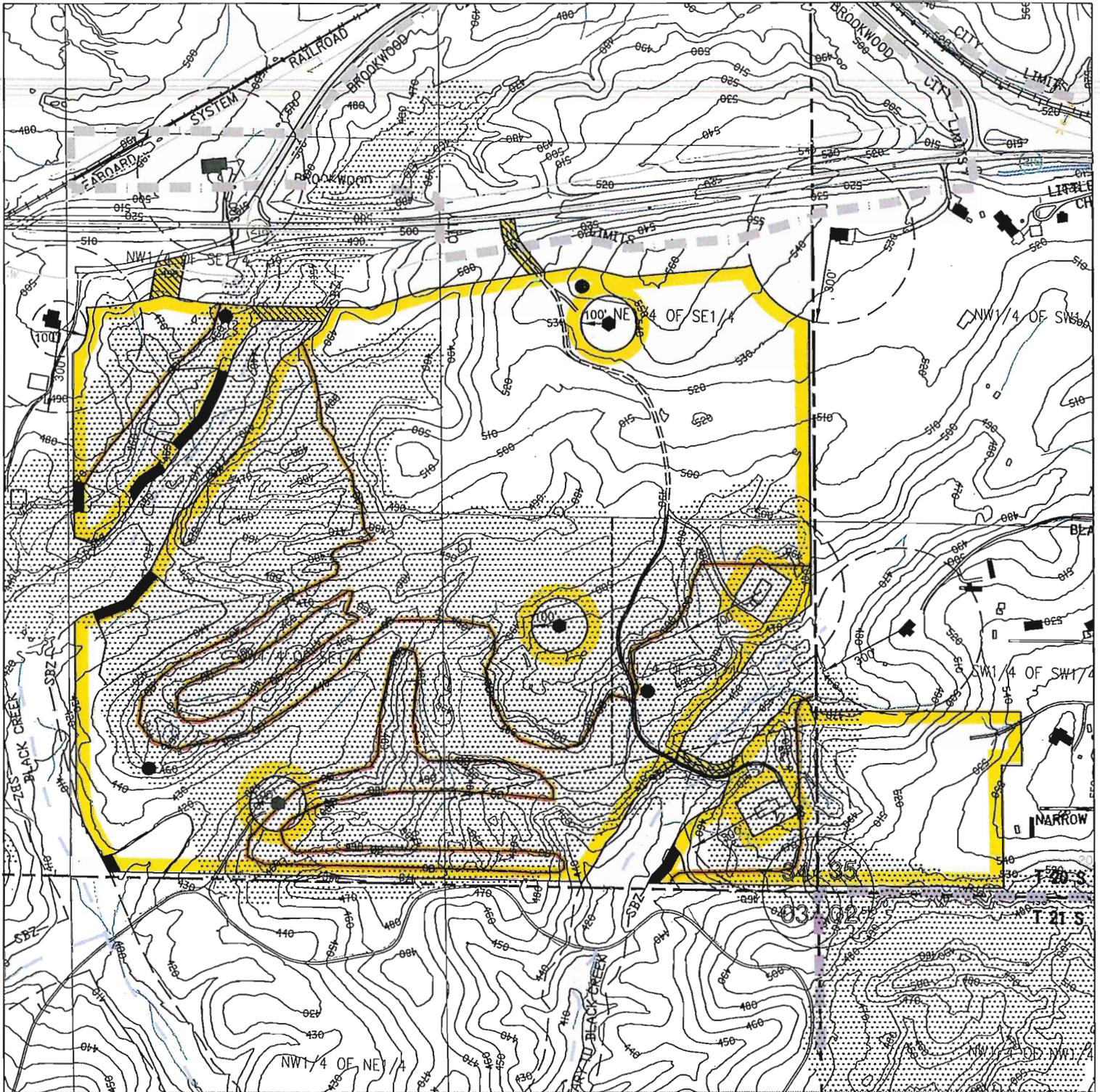


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 ENGINEERING CO., INC.
 1606 Hwy. 78 West Jasper, AL 35501/770-33502
 (800) 364-6333 (205) 295-3114 Fax

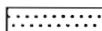
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**CAHABA RESOURCES, LLC
 CARTER MINE
 PREVIOUS MINING MAP**

.DWG NAME:	CR Carter Mine	DATE:	04-02-2015
JOB NUMBER:	13-04066-001	SCALE:	1"=500'
DRAWN BY:	S.A.E.		
APPROVED BY:	T.S.T.		



MAP LEGEND

-  PERMIT BOUNDARY
-  PREVIOUSLY MINED AREA
-  COAL BOUNDARY LINE



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1808 Hwy. 78 West Jasper, AL 35501/P.O. Box 1712-35502
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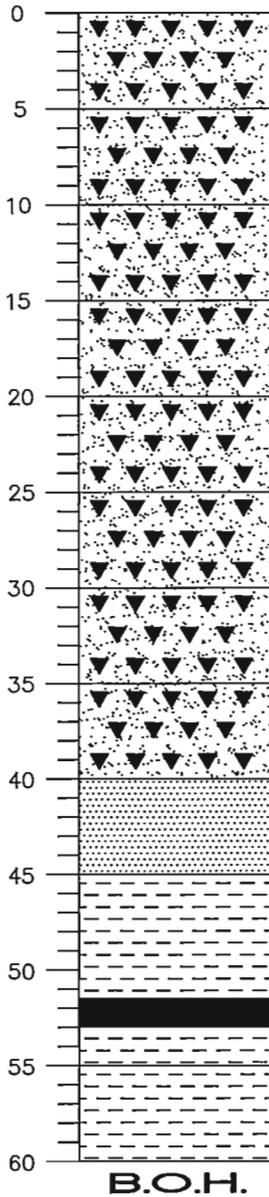
**CAHABA RESOURCES, LLC
CARTER MINE
COAL BOUNDARY MAP**

.DWG NAME: CR Carter Mine DATE: 04/02/2015
DRAWN BY: S.A.E. SCALE: 1"=500'
APPROVED BY: T.S.T. JOB NUMBER: 13-04068-001

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INTERVAL:

DESCRIPTION:



0 - 5'	Surface Material, unconsolidated, sandy clay, few small pebbles, medium brown
5 - 10'	Unconsolidated, sand & clay, few to some small quartz pebbles, medium red-brown
10 - 15'	Unconsolidated, sand & clay, some to many small quartz pebbles, medium yellow-brown
15 - 20'	Unconsolidated, sand & clay, many pebbles, medium yellow-brown
20 - 25'	Unconsolidated, sand & clay, many pebbles, medium yellow-brown
25 - 30'	Unconsolidated, sand & clay, many pebbles, medium yellow-brown, H ₂ O @ 26'
30 - 35'	Unconsolidated, sand & clay, many pebbles, medium yellow-brown
35 - 40'	Unconsolidated, sand & clay, many pebbles, medium yellow-brown
40 - 43'	Sandstone, fine to medium grained, medium to very hard, light to medium gray
43 - 45'	Sandstone, fine to medium grained, medium to very hard, light to medium gray
45 - 51.5'	Shale, silty to sandy, medium hard, medium grey
51.5 - 53'	Coal, Carter Seam (18 inches)
53 - 55'	Shale, sandy, soft to medium hard, medium to dark grey
55 - 60'	Shale, sandy, soft to medium hard, medium to dark grey

SURFACE ELEVATION: 488 FT. MSL
 B.O.H. - BOTTOM OF HOLE

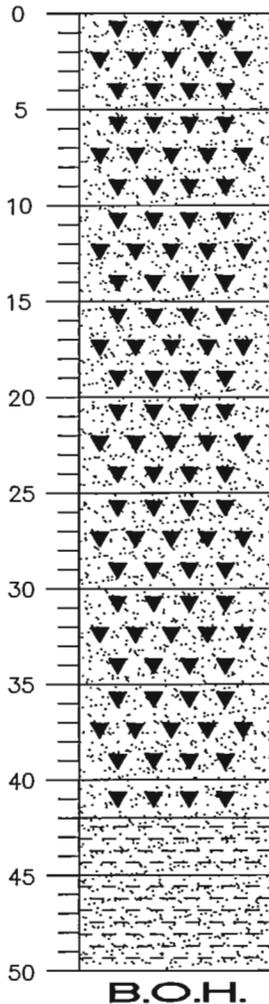


**CAHABA RESOURCES
 CARTER MINE
 LITHOLOGIC DESCRIPTION FOR
 GEOCHEMICAL ANALYSIS SITE
 CRCMDH-1**

DRAWN BY: S.W.L.	DATE: 12-10-14
DWG. NAME: CRCMLITH	
APPROVED BY: TST	SCALE: 1" = 10' vertical

INTERVAL:

DESCRIPTION:



0 - 5'	Surface Material, unconsolidated, sandy clay, medium red-brown
5 - 10'	Unconsolidated, sand & clay, few small quartz pebbles, medium red-brown
10 - 15'	Unconsolidated, sand & clay, few small quartz pebbles, medium red-brown
15 - 20'	Unconsolidated, sand & clay, few small quartz pebbles, medium red-brown
20 - 25'	Unconsolidated, sand & clay, few small quartz pebbles, medium red-brown
25 - 30'	Unconsolidated, sand & clay, few small quartz pebbles, medium red & yellow-brown
30 - 35'	Unconsolidated, sand & clay, few small quartz pebbles, medium red & yellow-brown
35 - 40'	Unconsolidated, sand & clay, few small quartz pebbles, medium red & yellow-brown
40 - 42'	Unconsolidated, sand & clay, some small quartz pebbles, medium red & yellow-brown
42 - 45'	Cretaceous Pottsville Contact @ 42' Shale, sandy to silty, medium hard, medium grey
45 - 50'	Shale, sandy to silty, medium hard, medium grey

SURFACE ELEVATION: 502 FT. MSL
 B.O.H. - BOTTOM OF HOLE

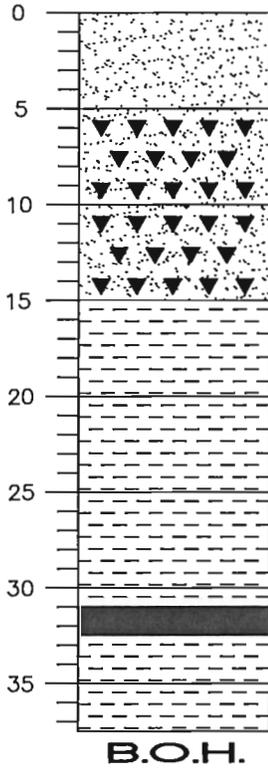


**CAHABA RESOURCES
 CARTER MINE
 LITHOLOGIC DESCRIPTION FOR
 GROUNDWATER MONITORING SITE
 CRCMMW-2**

DRAWN BY: S.W.L.	DATE: 12-10-14
DWG. NAME: CRCMLITH	
APPROVED BY: TST	SCALE: 1" = 10' vertical

INTERVAL:

DESCRIPTION:



0 - 5'	Surface Material, unconsolidated, sand, light to medium yellow-brown (no pebbles)
5 - 10'	Unconsolidated sand with some clay, very few pebbles, light to medium yellow-brown
10 - 15'	Unconsolidated sand with some clay, very few pebbles, light to medium yellow-brown Cretaceous Pottsville Contact @ 15'
15 - 20'	Shale, silty, soft to medium hard, medium grey
20 - 25'	Shale, silty, soft to medium hard, medium grey
25 - 30'	Shale, silty, soft to medium hard, medium grey
30 - 31'	Shale, medium hard, medium to dark grey
31 - 32.5'	Coal, Carter Seam (18 inches)
32.5 - 37.5'	Shale, medium hard, medium to dark grey

SURFACE ELEVATION: 478 FT. MSL
 B.O.H. - BOTTOM OF HOLE

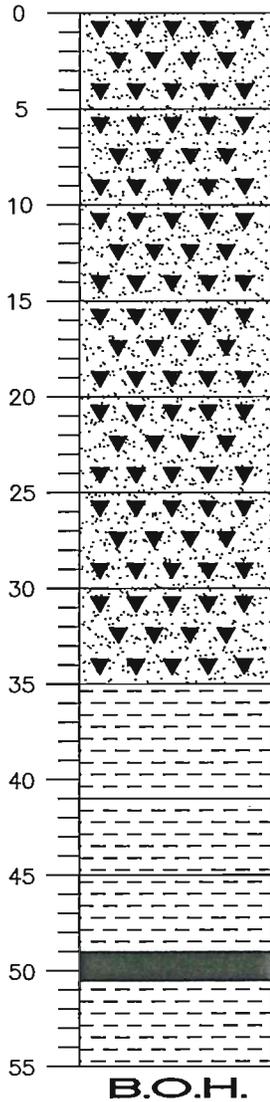


**CAHABA RESOURCES
 CARTER MINE
 LITHOLOGIC DESCRIPTION FOR
 GROUNDWATER MONITORING SITE
 CRCMMW-1**

DRAWN BY: S.W.L.	DATE: 12-10-14
DWG. NAME: CRCMLITH	
APPROVED BY: TST	SCALE: 1" = 10' vertical

INTERVAL:

DESCRIPTION:



0 - 5'	Surface Material, unconsolidated, sandy clay, medium red-brown
5 - 10'	Unconsolidated, sand & clay, very few to no pebbles, medium red-brown.
10 - 15'	Unconsolidated, sand & clay, very few to small pebbles, medium red-brown.
15 - 20'	Unconsolidated, sand & clay, few small quartz pebbles, light to medium red-brown.
20 - 25'	Unconsolidated, sand & clay, few small quartz pebbles, light to medium red-brown.
25 - 30'	Unconsolidated, sand & clay, few to some small quartz pebbles, light to medium red-brown.
30 - 35'	Unconsolidated, sand & clay, some quartz pebbles, medium to light yellow-brown.
35 - 41'	Shale, soft, medium to dark grey
41 - 45'	Shale, soft, medium to dark grey
45 - 49'	Shale, soft, medium to dark grey
49 - 50.5'	Coal, Carter Seam (18 inches)
50.5 - 55'	Shale, soft, medium to dark grey

B.O.H.

SURFACE ELEVATION: 517 FT. MSL
 B.O.H. - BOTTOM OF HOLE

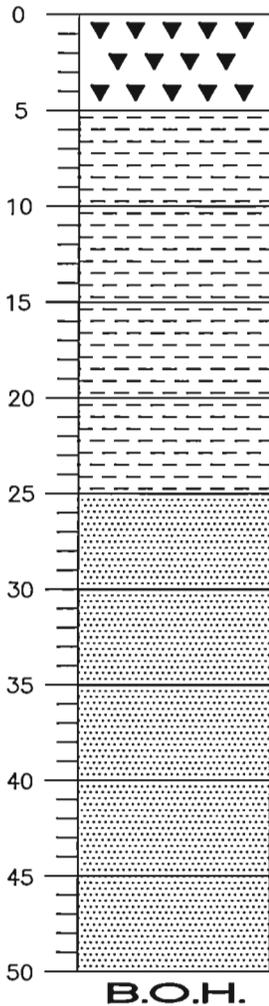


**CAHABA RESOURCES
 CARTER MINE
 LITHOLOGIC DESCRIPTION FOR
 GROUNDWATER MONITORING SITE
 CRCMMW-3**

DRAWN BY: S.W.L.	DATE: 12-10-14
DWG. NAME: CRCMLITH	
APPROVED BY: TST	SCALE: 1" = 10' vertical

INTERVAL:

DESCRIPTION:



0 - 5'

Surface Material, unconsolidated, silty-clay, medium brown

5 - 10'

Shale, silty, weathered, soft, medium brown

10 - 15'

Shale, silty to sandy, medium hard, medium to dark grey

15 - 20'

Shale, silty to sandy, medium hard, medium to dark grey

20 - 25'

Shale, silty to sandy, medium to very hard, medium to dark grey

25 - 30'

Sandstone, medium to fine grained, medium to very hard, medium grey, cuttings very wet

30 - 35'

Sandstone, medium to fine grained, medium to very hard, medium grey, cuttings very wet

35 - 40'

Sandstone, medium to fine grained, medium to very hard, medium grey, cuttings very wet

40 - 45'

Sandstone, medium to fine grained, medium to very hard, medium grey, cuttings very wet

45 - 50'

Sandstone, medium to fine grained, medium to very hard, medium grey, cuttings very wet

SURFACE ELEVATION: 420 FT. MSL
B.O.H. - BOTTOM OF HOLE



**CAHABA RESOURCES
CARTER MINE
LITHOLOGIC DESCRIPTION FOR
GROUNDWATER MONITORING SITE
CRCMMW-4**

DRAWN BY: S.W.L.
DWG. NAME: CRCMLITH

DATE: 12-10-14

APPROVED BY: TST

SCALE: 1" = 10' vertical



Mineral Labs
Phone : (205)-497-3308

Perc Engineering

Lab I.D. #	Date Sampled	Location	Sample ID	% Sulfur
145000767	2/9/2015	CRCMDH-1	0-5'	0.0025%
145000768	2/9/2015	CRCMDH-1	5'-10'	0.0050%
145000769	2/9/2015	CRCMDH-1	10'-15'	0.0023%
145000770	2/9/2015	CRCMDH-1	15'-20'	0.0094%
145000771	2/9/2015	CRCMDH-1	20'-25'	0.0003%
145000772	2/9/2015	CRCMDH-1	25'-30'	0.020%
145000773	2/9/2015	CRCMDH-1	30'-35'	0.040%
145000774	2/9/2015	CRCMDH-1	35'-40'	0.040%
145000775	2/9/2015	CRCMDH-1	40'-43'	0.079%
145000776	2/9/2015	CRCMDH-1	43'-45'	0.100%
145000777	2/9/2015	CRCMDH-1	45'-50'	0.092%
145000778	2/9/2015	CRCMDH-1	50'-51.5'	0.039%
145000779	2/9/2015	CRCMDH-1	51.5'-53'	1.212%
145000780	2/9/2015	CRCMDH-1	53'-58'	0.018%

Cahaba/Carter

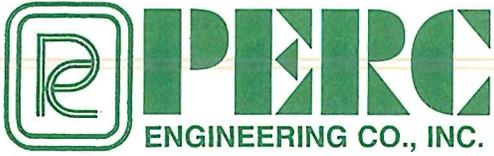


Mineral Labs
Phone : (205)-497-3308

Perc Engineering

Lab I.D. #	Date Sampled	Location	Sample ID	% Sulfur
145000755	2/9/2015	CRCMMW-3	0-5'	0.0014%
145000756	2/9/2015	CRCMMW-3	5'-10'	0.0019%
145000757	2/9/2015	CRCMMW-3	10' - 15'	0.0012%
145000758	2/9/2015	CRCMMW-3	15' -20'	0.0015%
145000759	2/9/2015	CRCMMW-3	20'-25'	0.0014%
145000760	2/9/2015	CRCMMW-3	25'-30'	0.000%
145000761	2/9/2015	CRCMMW-3	30'-35	0.000%
145000762	2/9/2015	CRCMMW-3	35'-40'	0.043%
145000763	2/9/2015	CRCMMW-3	40'-45'	0.037%
145000764	2/9/2015	CRCMMW-3	45'-49'	0.047%
145000765	2/9/2015	CRCMMW-3	49'-50.5'	1.022%
145000766	2/9/2015	CRCMMW-3	50.5'-55'	0.019%

Calaba / Costa



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

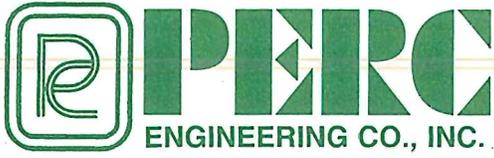
COMPANY NAME: Cahaba Resorces
 MINE NAME: Carter Mine
 DRILL HOLE: CRCMDH1

COLLECTED BY: JC
 DATE COLLECTED: 8-7-14
 ANALYZED BY: JC,SR,JK,JR
 DATE ANALYZED: 2-17-15

All analysis is performed according to
 EPA standards.

INTERVAL	PASTE pH	% SULFUR	MAX. POT. *ACIDITY	NEUT. *POT	A-B *ACCOUNT	ACID FORMING
0.00	5.00	3.730	0.0025	0.078	-1.750	N
5.00	10.00	3.450	0.0050	0.156	-2.750	N
10.00	15.00	3.640	0.0023	0.072	-2.500	N
15.00	20.00	3.670	0.0094	0.294	-1.750	N
20.00	25.00	3.670	0.0003	0.009	-1.750	N
25.00	30.00	3.950	0.0200	0.625	-1.250	N
30.00	35.00	3.870	0.0400	1.250	-1.250	N
35.00	40.00	3.850	0.0400	1.250	-1.000	N
40.00	43.00	4.400	0.0790	2.469	4.750	N
43.00	45.00	4.590	0.1000	3.125	5.750	N
45.00	50.00	5.090	0.0920	2.875	10.000	N
50.00	51.50	4.650	0.0390	1.219	2.750	N
51.50	53.00 Coal	1.2120	37.875 Coal		COAL	***
53.00	58.00	4.960	0.0180	0.563	2.000	N
**AVERAGE		3.837	0.0291	0.909	0.352	-0.557 N

*Calculated in tons CaCo3 per 1000 tons of material.
 **Averages do not include coal seam to be mined or intervals below lowest seam.
 ***Not analyzed



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

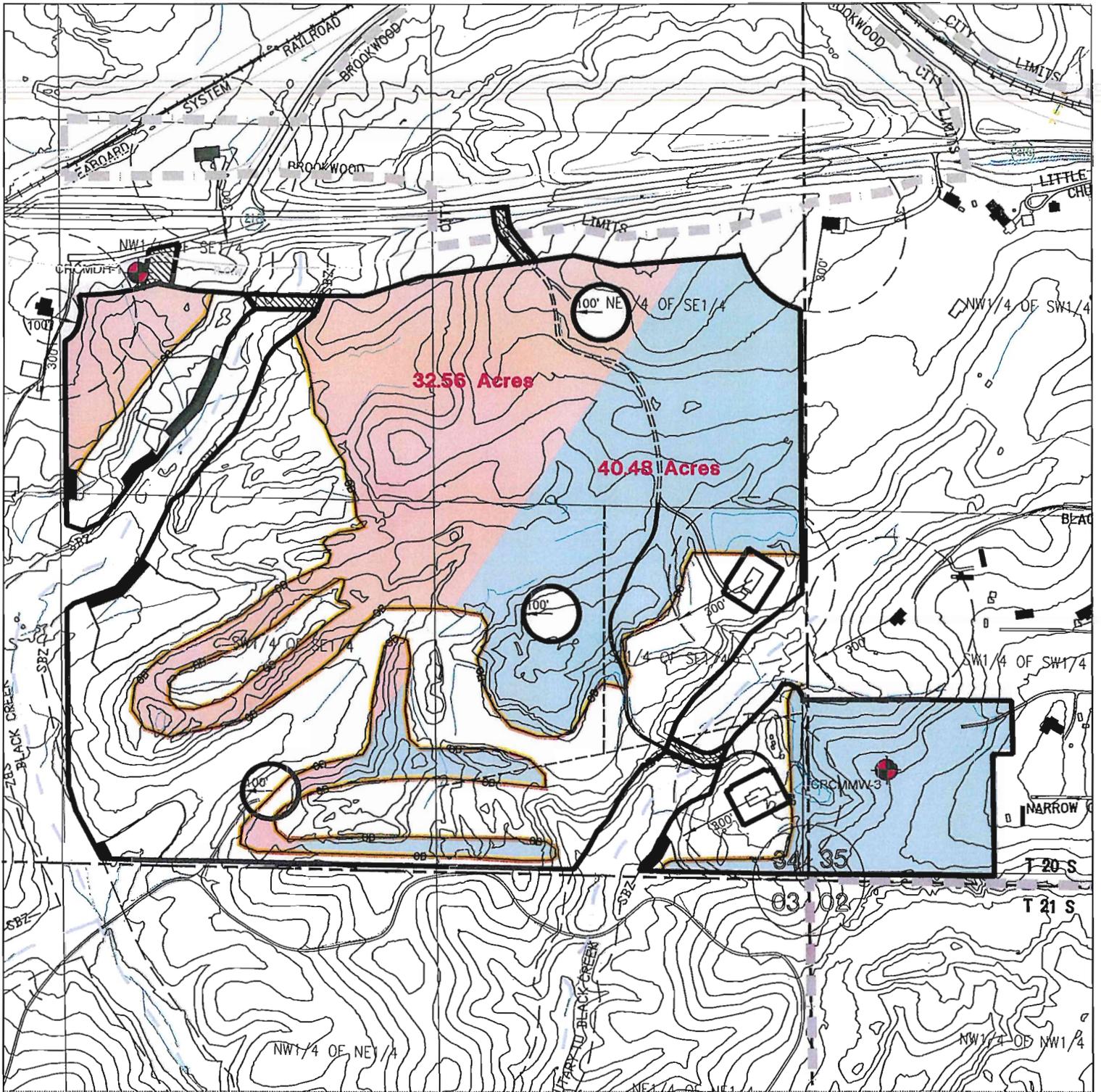
COMPANY NAME: Cahaba Resorces
 MINE NAME: Carter Mine
 DRILL HOLE: CRCMMW3

COLLECTED BY: JC
 DATE COLLECTED: 8-7-14
 ANALYZED BY: JC,SR,JK,JR
 DATE ANALYZED: 2-17-15

All analysis is performed according to EPA standards.

INTERVAL	PASTE pH	% SULFUR	MAX. POT. *ACIDITY	NEUT. *POT	A-B *ACCOUNT	ACID FORMING
0.00	5.00	3.820	0.0014	0.044	-2.750	N
5.00	10.00	3.610	0.0019	0.059	-3.250	N
10.00	15.00	3.800	0.0012	0.038	-2.500	N
15.00	20.00	3.580	0.0015	0.047	-2.250	N
20.00	25.00	3.480	0.0014	0.044	-0.500	N
25.00	30.00	3.610	0.0001	0.003	-3.000	N
30.00	35.00	3.840	0.0001	0.003	-1.500	N
35.00	40.00	2.870	0.0430	1.344	0.001	N
40.00	45.00	3.120	0.0370	1.156	-0.250	N
45.00	49.00	4.480	0.0470	1.469	3.750	N
49.00	50.50 Coal	1.0220	31.938 Coal		COAL	***
50.50	55.00	4.170	0.0190	0.594	0.250	N
**AVERAGE		3.457	0.0133	0.416	-1.194	N

*Calculated in tons CaCo3 per 1000 tons of material.
 **Averages do not include coal seam to be mined or intervals below lowest seam.
 ***Not analyzed



MAP LEGEND

-  AREA INFLUENCED BY CRCMDH-1
-  AREA INFLUENCED BY CRCMMW-3
-  PROPOSED PERMIT BOUNDARY
-  **CRCMDH-1**
CRCMMW-3 GEOCHEMICAL ANALYSIS SITES
-  CB COAL BOUNDARY LINE





PERC

ENGINEERING CO., INC.

1808 Hwy. 78 West Jasper, AL 35301/P.O. Box 1719-35302
(205) 364-6553 Office (205) 295-3114 Fax

CAHABA RESOURCES, LLC

CARTER MINE

THEISSON POLYGON MAP

.DWG NAME: CR Carter Mine	DATE: 04/01/2015	
DRAWN BY: S.A.E.	SCALE: 1"=500'	
APPROVED BY: T.S.T.	JOB NUMBER: 13-04088-001	

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OVERBURDEN ANALYSIS SPREADSHEET
 OPERATOR: CANADA RESOURCES, LLC.
 PERMIT NO: CARTER MINE DRILL HOLE: CROMM-3
 COUNTY:

CLAY CL 3450
 SHALE SH 3700
 SILTSTONE ST 3750 ALK.ADD(tns/ac CaCO3):
 SANDSTONE SS 3670 COAL SEAMS:
 LIMESTONE LS 3670 STATE PLANE ZONE:
 COAL CD 1800 FEET (NORTH/SOUTH):
 CARBONOLITH CB 2580 FEET (EAST/WEST):
 OTHER OT 3670 SURFACE ELEV. (FT):

THRESHOLD SULFUR NP FIZZ
 VALUES: 0 0.00 0
 NUMBER OF INTERVALS: 11

1)A15..A 21
 2)A15..A 22

BOTTOM DEPTH (FT)	THICKNESS FEET	ROCK TYPE	FIZZ RATING	SULFUR %	NP	DEFICIENCY /EXCESS	ACREAGE	UNIT WT TONS/AC-FT	FRACTION SPOILED	TONS MPA	TONS NP	NET NP (TONS)	TONS OF OVERBURDEN
5.00	5.00	OT	0	0.0014	-2.75	-2.79	1.00	3670	1.00	0.80	0.00	-0.80	18350
10.00	5.00	CL	0	0.0019	-3.25	-3.31	5.35	3450	1.00	5.48	0.00	-5.48	92262
15.00	5.00	CL	0	0.0012	-2.50	-2.54	8.25	3450	1.00	5.34	0.00	-5.34	142270
20.00	5.00	CL	0	0.0015	-2.25	-2.30	11.15	3450	1.00	9.01	0.00	-9.01	192278
25.00	5.00	CL	0	0.0014	-0.50	-0.54	14.05	3450	1.00	10.60	0.00	-10.60	242286
30.00	5.00	CL	0	0.0001	-3.00	-3.00	16.94	3450	1.00	0.91	0.00	-0.91	292294
35.00	5.00	CL	0	0.0001	-1.50	-1.50	19.84	3450	1.00	1.07	0.00	-1.07	342301
40.00	5.00	SH	0	0.0430	0.00	-1.34	22.74	3700	1.00	565.37	0.42	-564.95	420738
45.00	5.00	SH	0	0.0370	-0.25	-1.41	25.64	3700	1.00	548.49	0.00	-548.49	474369
49.00	4.00	SH	0	0.0470	3.75	2.28	28.25	3700	1.00	614.10	1567.91	953.81	418110
50.50	1.50	CD	0	1.0220	0.00	-31.94	30.28	1800	1.00	2611.08	0.00	-2611.08	81756

TOTAL OVERBURDEN VOL.(ACRE-FT): 783
 PERCENT SANDSTONE: 0%
 NP/MPA RATIO: 0.36
 TONS/ACRE REQUIRED (1:1): 93 DEFICIENCY

TOTAL (TONS): 4372.25
 TOTAL (TONS/THOUSAND): 1.61
 1568.33
 -2803.92
 -1.03

ABA SUMMARY VALUES USING % SULFUR * 62.5 = MPA:

NP/MPA RATIO: 0.18
 TONS/ACRE REQUIRED (1:1): 237 DEFICIENCY

TOTAL (TONS): 8744.50
 TOTAL (TONS/THOUSAND): 3.22
 1568.33
 -7176.16
 -2.64

OVERBURDEN ANALYSIS SPREADSHEET

OPERATOR: CAHABA RESOURCES, LLC.
 PERMIT NO: CARTER MINE DRILL HOLE: CRCMDH-1
 COUNTY:

CLAY CL 3450
 SHALE SH 3700
 SILTSTONE ST 3750 ALK ADD(tns/ac CaCO3):
 SANDSTONE SS 3670 COAL SEAMS:
 LIMESTONE LS 3670 STATE PLANE ZONE:
 COAL CO 1800 FEET (NORTH/SOUTH):
 CARBONOLITH CB 2500 FEET (EAST/WEST):
 OTHER OT 3670 SURFACE ELEV. (FT):

THRESHOLD SULFUR NP FIZZ
 VALUES: 0 0.00 0
 NUMBER OF INTERVALS: 13

1)A15..A 23
 2)A15..A 24

BOTTOM DEPTH (FT)	THICKNESS FEET	ROCK TYPE	FIZZ RATING	SULFUR %	NP	DEFICIENCY /EXCESS	ACREAGE	UNIT WT TONS/AC-FT	FRACTION SPOILED	TONS HPA	TONS NP	NET NP (TONS)	TONS OF OVERBURDEN
5.00	5.00	OT	0	0.0025	-1.75	-1.83	1.00	3670	1.00	1.43	0.00	-1.43	18350
10.00	5.00	CL	0	0.0050	-2.75	-2.91	5.47	3450	1.00	14.73	0.00	-14.73	94289
15.00	5.00	CL	0	0.0023	-2.50	-2.57	8.44	3450	1.00	10.47	0.00	-10.47	145649
20.00	5.00	CL	0	0.0094	-1.75	-2.04	11.42	3450	1.00	57.87	0.00	-57.87	197008
25.00	5.00	CL	0	0.0003	-1.75	-1.76	14.40	3450	1.00	2.33	0.00	-2.33	248367
30.00	5.00	CL	0	0.0200	-1.25	-1.88	17.38	3450	1.00	187.33	0.00	-187.33	299727
35.00	5.00	CL	0	0.0400	-1.25	-2.50	20.35	3450	1.00	438.86	0.00	-438.86	351086
40.00	5.00	CL	0	0.0400	-1.00	-2.25	23.33	3450	1.00	503.06	0.00	-503.06	402446
43.00	3.00	SS	0	0.0790	4.75	2.28	25.71	3670	1.00	698.88	1344.68	645.80	283090
45.00	2.00	SS	0	0.1000	5.75	2.63	27.20	3670	1.00	623.92	1148.01	524.09	199654
50.00	5.00	SH	0	0.0920	10.00	7.13	29.28	3700	1.00	1557.59	5417.71	3860.12	541771
51.50	1.50	SH	0	0.0390	2.75	1.53	31.22	3700	1.00	211.18	476.58	265.32	173272
53.00	1.50	CO	0	1.2100	0.00	-37.81	32.56	1800	0.00	265.93	0.00	-265.93	7033

TOTAL OVERBURDEN VOL. (ACRE-FT): 838
 PERCENT SANDSTONE: 16%
 NP/NPA RATIO: 1.83
 TONS/ACRE REQUIRED (1:1): 117 EXCESS

TOTAL (TONS): 4573.57
 TOTAL (TONS/THOUSAND): 1.54
 TOTAL (TONS/THOUSAND): 8386.89
 TOTAL (TONS/THOUSAND): 3813.32
 TOTAL (TONS/THOUSAND): 2961741

ABA SUMMARY VALUES USING % SULFUR * 62.5 = NPA:

NP/NPA RATIO: 0.92
 TONS/ACRE REQUIRED (1:1): 23 DEFICIENCY

TOTAL (TONS): 9147.15
 TOTAL (TONS/THOUSAND): 3.03
 TOTAL (TONS/THOUSAND): 8386.89
 TOTAL (TONS/THOUSAND): -760.26
 TOTAL (TONS/THOUSAND): -0.26

OVERBURDEN ANALYSIS - MINE SITE ABA SUMMARY

PERMIT NO: CARTER MINE OPERATOR: CAHABA RESOURCES, LLC.
 COUNTY: TUSCALOOSA TOWNSHIP:

ENTER NUMBER OF DRILL HOLES: 2 (enter; Alt A) ENTER 12

DRILL HOLE	BOTTOM ACREAGE	ALK.ADD. TONS/AC	TOTAL TONS MPA*	TOTAL TONS NP	TOTAL TONS NET NP	TOTAL TONS OVERBURDEN	PERCENT SANDSTONE
CRCMMW-3	30.28	0	4372.25	1568.33	-2803.92	2717013	
CRCNDH-1	32.56	0	4573.57	8386.89	3813.32	2961741	
	62.84	0.00	8946	9955	1009	5678754	0%

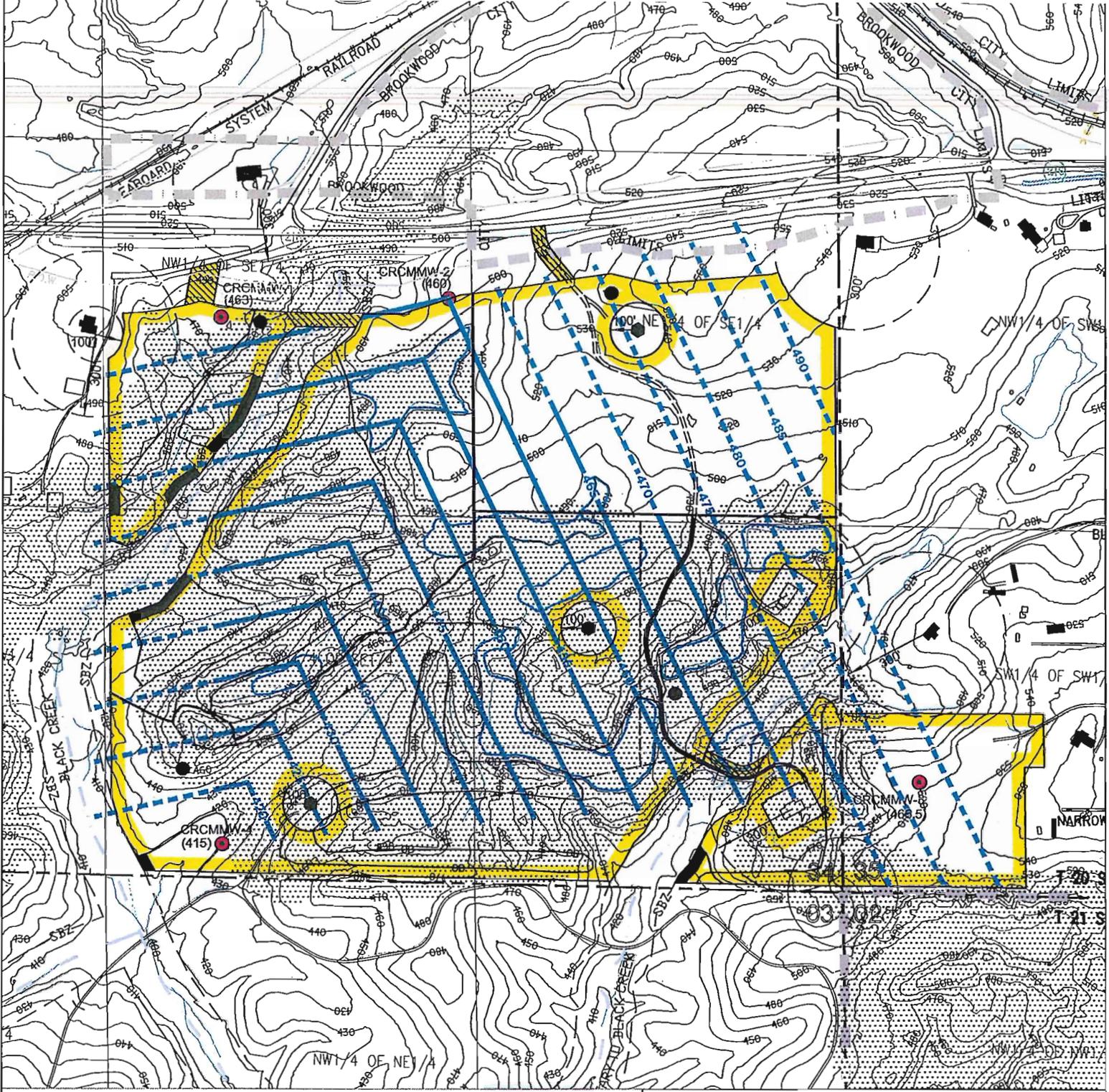
*Tons MPA using X8 X 31.25 from QBCALC

ACID BASE ACCOUNTING SUMMARY PARAMETERS

	WITHOUT ALKALINE ADDITION			WITH ALKALINE ADDITION		
MPA = SULFUR X 31.25:	MPA	NP	NET NP	MPA	NP	NET NP
TOTAL TONS:	8946	9955	1009	8946	9955	1009
ABA PARAMETERS (TONS/THOUSAND):	1.58	1.75	0.18	1.58	1.75	0.18
NP/MPA RATIO:	1.11			1.11		
TONS/ACRE CaCO3 REQUIRED (1:1):	16 EXCESS			16 EXCESS		

**PERTINENT INFORMATION FOR SELECTED
EXPLORATORY DRILL HOLES AND CHANNEL SAMPLES
AT THE CARTER MINE**

Coal Data Site	Surface Elevation (ft MSL)	Depth to Coal (ft)	Coal Thickness (ft)	Bottom Coal Elevation (ft MSL)
XXXXXXXXXXXXX	XXXXXXXXXXXXX	XXXXXXXXXXXXX	XXXXXXXXXXXXX	XXXXXXXXXXXXX
#227	478	25	1.92	451.08
#228	488	20	1.75	466.25
CS-1	485	21	1.83	462.17
#229	490	25	1.50	463.50
#230	466	26	1.58	438.42



LEGEND

- PERMIT BOUNDARY
- CRCMMW-2 ● CONTACT DATA POINT
(415) CONTACT ELEVATION
- 430 POTTSVILLE-CRETACEOUS CONTACT ELEVATION LINE

NOTE: LINE DASHED WHERE INFERRED

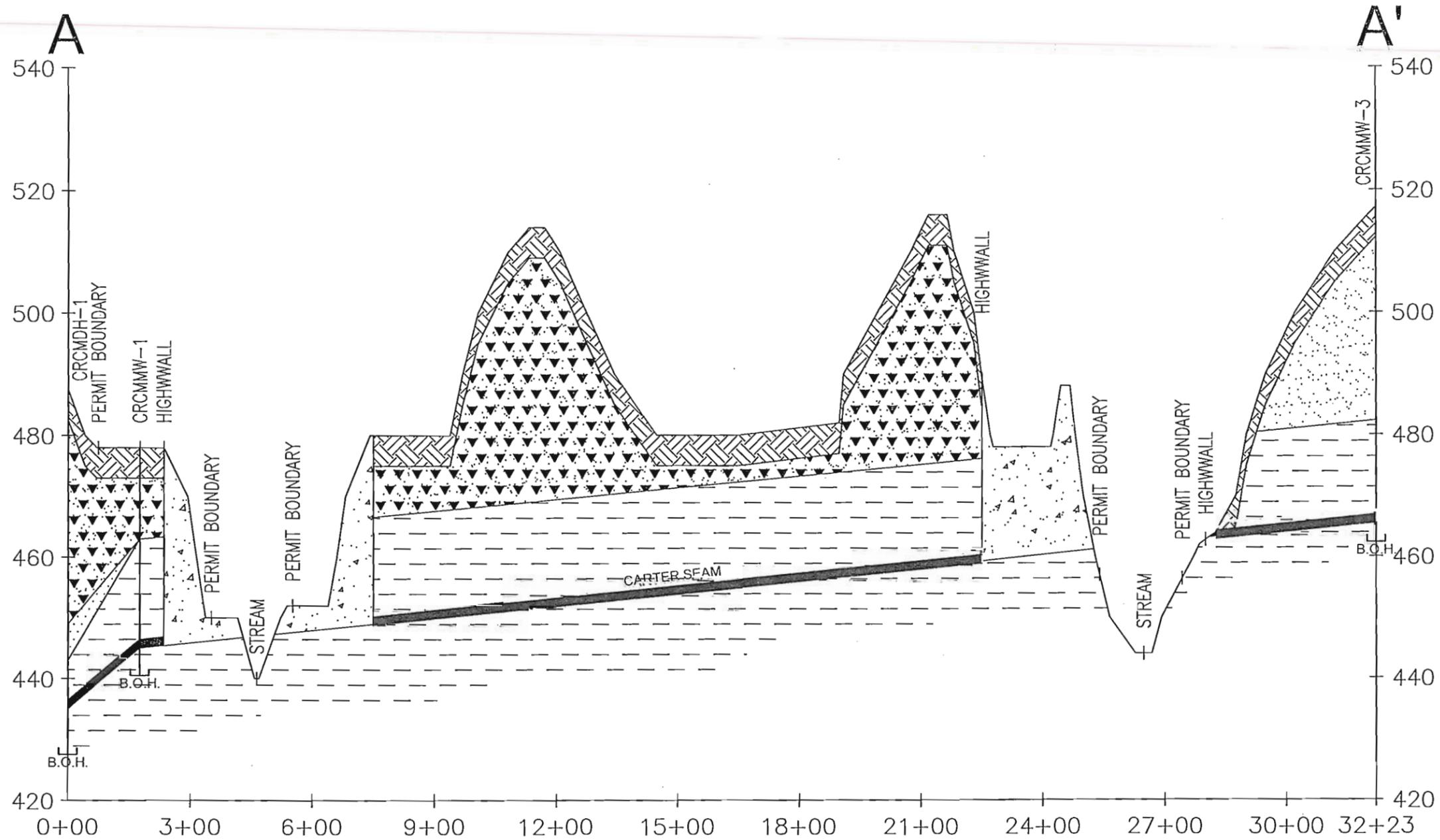


PERC
ENGINEERING CO., INC.
3008 Hwy. 78 West Jasper, AL 35001/P.O. Box 1719-33302
(202) 384-3253 Office (202) 890-3114 Fax

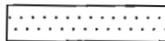
**CAHABA RESOURCES, LLC
CARTER MINE
POTTSVILLE-CRETACEOUS
CONTACT MAP**

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.DWG NAME:	CR Carter Mine	DATE:	04-02-2015
DRAWN BY:	S.A.E.	SCALE:	1"=500'
APPROVED BY:	T.S.T.	JOB NUMBER:	13-04068-001



LEGEND

-  Surface Material
-  Cretaceous Sediments
-  Shale
-  Sandstone
-  Coal
-  Unknown



**CAHABA RESOURCES, LLC
CARTER MINE
FENCE DIAGRAM A - A'**

DWG NAME:	CR Carter Mine	DATE:	03-31-2015
.CRD NAME:	CR CARTER MINE		
DRAWN BY:	S.A.E.	SCALE:	1"=300'
APPROVED BY:	T.S.T.		

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CERTIFICATION STATEMENT:

The preceding geologic section was prepared for Cahaba Resources, LLC. at the Carter Mine site by, or under the direction of a qualified professional and I hereby certify that it is true and correct to the best of my knowledge or belief.

Date: _____

TIMOTHY S. THOMAS
PROFESSIONAL ENGINEER
LICENSE NO. 18830