

**SINKHOLE MONITORING REPORT  
EVALUATION PERFORMED ON  
DECEMBER 15, 2021  
ANDREWS QUARRY  
WILLIAMSBURG COUNTY, SC**



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**SINKHOLE MONITORING REPORT  
EVALUATION PERFORMED ON  
DECEMBER 15, 2021  
ANDREWS QUARRY  
WILLIAMSBURG COUNTY, SC**

Prepared for

American Materials Company  
1410 Commonwealth Drive, Ste. 201  
Wilmington, North Carolina 28403

Prepared by

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Greenville, North Carolina 27834

March 10, 2022

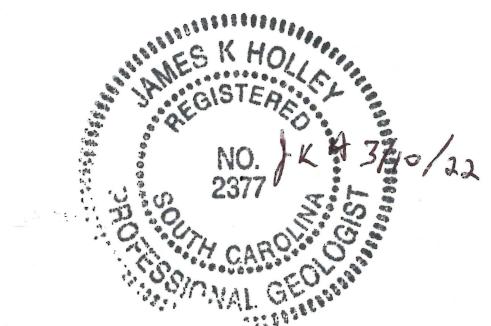


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Figure 1. Site Location of the Andrews Quarry

Figure 2. Previous Sinkhole Features Identified

Figure 3. Map of Monitoring Wells at the Andrews Quarry Site

Attachment I. Survey Data of the Eight Sinkhole Features Identified at the Andrews Quarry Site

Attachment II. Site Photos Collected on 12/15/2021

Attachment III. Rainfall and Drought Records

Attachment IV. Water-Level Records of Limestone Monitoring Wells.

## **1.0 Introduction**

American Materials Company (AMC) operates a limestone aggregate quarry in Williamsburg County, South Carolina known as the Andrews Quarry. AMC operates the quarry under a modified Mining Permit and Permit Maps dated August 13, 2020.

The Mining Permit includes multiple environmental compliance requirements, one of which is the identification and monitoring of sinkhole depressions in accordance with the Revised Sinkhole Monitoring Plan (SMP) dated February 22, 2019. AMC contracted Groundwater Management Associates, Inc. (GMA) to assist with evaluation of potential sinkholes at the Andrews Quarry. GMA completed a Baseline Sinkhole Monitoring Report on February 5, 2021 that identified karst features on the property that existed prior to the commencement of mine dewatering activities. Field assessment conducted during the baseline assessment identified 8 sinkhole depressions that were prioritized for regular monitoring during mine dewatering to evaluate whether or not these features become reactivated sinkholes in response to groundwater withdrawals from the mine. The SMP incorporated a schedule of quarterly inspections of these features as a routine monitoring program once mine dewatering activities commenced.

AMC began reporting monitoring well water-level data in the second quarter of 2021, including sharing the data to the AMC website. Limited mine dewatering occurred in the second quarter of 2021 with an initial sump opening followed by cessation of dewatering for a period of time. Dewatering resumed in late summer of 2021 with more dedicated stockpiling of material, but water withdrawals from the pit were sporadic in late 2021. By December of 2021, AMC had not begun selling aggregate from the quarry, but some material had been mined and used to improve the Jumpin Run Road entry to the mine, and to begin stockpiling product for future sale after the weigh scales were in place. The subject report presents the First Quarterly Sinkhole Evaluation of the Andrews Quarry performed by GMA on December 15, 2021.

## **2.0 Baseline Sinkhole Features Identified**

The initial baseline sinkhole evaluations were performed by GMA in October of 2017. The initial investigation targeted features evaluated from available LIDAR data. A subsequent aerial drone survey was completed by AMC after significant timbering was completed of the Andrews Quarry site. The reduced vegetation cover provided good visibility over much the property, and the aerial drone survey revealed 22 depressions on the property that were evaluated by ground-truthing. In December of 2020, a team of GMA geologists visited all 22 depressions to determine if any of the features exhibited the characteristics of sinkhole depressions.

The baseline evaluations of surface depressions at the Andrews Quarry site revealed 8 depression ponds that exhibit the characteristics of sinkhole depressions (See Figure 2) (GMA, 2021). These closed depressions (named Sinkhole Pond 1 through 8) are deeper than other

depressions at the site, they have relatively steeper sides, and they have few to no mature trees in the middle of the depressions. None of the sinkhole depressions exhibited obvious evidence of active subsidence.

AMC had all the newly identified sinkholes surveyed and the perimeters were staked and control points established in August of 2021. Attachment I includes the surveyed control points and elevations of all 8 sinkholes. In addition, surveyed maps of each of the 8 sinkholes are included in Attachment I.

### **3.0 Field Reconnaissance**

A SC Professional Geologist (James Holley) employed by GMA visited the Andrews Quarry on December 15, 2021. The geologist visited each of the 8 sinkhole features identified in the baseline sinkhole monitoring report. Notes and photographs of each sinkhole feature are included as Attachment II. No evidence of new subsidence, instability, or reactivation of the sinkhole features was recognized during the site visit. The only substantive change between the baseline investigation and the December 2021 observations is that the ponds were all dry. Williamsburg County was under severe drought conditions in December of 2021 (see Attachment III), which explains the low water-level conditions observed at the 8 sinkhole features.

### **4.0 Review of Groundwater Level Data**

AMC collects water-level data from their monitoring well network via pressure transducers. These data are compiled quarterly and shared with the public via the AMC website. GMA reviewed water-level data for the 13 wells open to the Chicora limestone for the period from September 15, 2021 through December 15, 2021. Groundwater levels documented in the SMWS well series (SWMS100D through SMWS103D) exhibit approximately 9 to 10 feet of water-level decline since March of 2021. The SMWS series wells are closest to the active mine pit. The Perimeter Monitoring Well series (PMWD1 through PMWD9) exhibit an average water-level decline of about 5 to 6 feet since March of 2021. One of these wells (PMW1D) is located across Murray Swamp from the active mine site, and that well exhibited approximately 5.5 feet of water-level decline between March December of 2021. Based upon available data, GMA attributes the majority of this decline to the severe drought that occurred in the 4<sup>th</sup> quarter of 2021. Attachment IV includes graphs depicting water-level elevations in monitoring wells at the AMC Andrews Quarry Site.

During GMA's site visit, AMC was not actively pumping groundwater from the pit. GMA observed the water level in the open pit to be approximately at the top of the limestone. Attachment IV includes an image of the active mine pit showing the water level during the December 15, 2021 site visit. It appears that, as of December 2021, mining activities have had a minor effect of about 3 feet of decline in water levels in the limestone monitoring wells closest

to the pit. Approximately 5 feet of the water-level declines observed in perimeter monitoring wells appear to be drought-related.

## **5.0 Conclusions**

Groundwater Management Associates, Inc. has completed the first quarterly sinkhole monitoring event at the AMC Andrews Quarry site. The 8 depressions that were identified as karst features from the Baseline Sinkhole Monitoring report were evaluated in December of 2021. All of the features were dry. None of the karst features exhibited evidence of subsidence or renewed sinkhole activity. As of December of 2021, the water levels in all perimeter limestone monitoring wells at the site had declined by an average of about 5 feet. Wells closest to the active mine pit (the SMWS series wells and well PMW2D) exhibited additional water-level declines of about 3 feet that appears to be attributable to the initial mine dewatering. GMA concludes that the 8 sinkhole ponds observed in December of 2021 were stable, and there had been no observed new sinkhole activity at the site after one quarter of active mining.

GMA is scheduled to perform additional quarterly site visits to observe the 8 sinkhole features identified in the baseline evaluation. These site visits will occur in March of 2022, June of 2022, and September of 2022. The September 2022 event will occur closely behind an updated aerial drone survey of the property. The September 2022 monitoring event will also include field observations of other areas of interest on the property based upon the updated aerial survey.

## **6.0 Report Certification**

This report was prepared by Groundwater Management Associates, Inc., a professional corporation that employs South Carolina Registered Professional Geologists. I, James K. Holley, a South Carolina Registered Professional Geologist employed by GMA, do certify that the information in this report is correct and accurate to the best of my knowledge.

Groundwater Management Associates, Inc.

*James K. Holley*

James K. Holley, PG (#2377)  
Senior Hydrogeologist



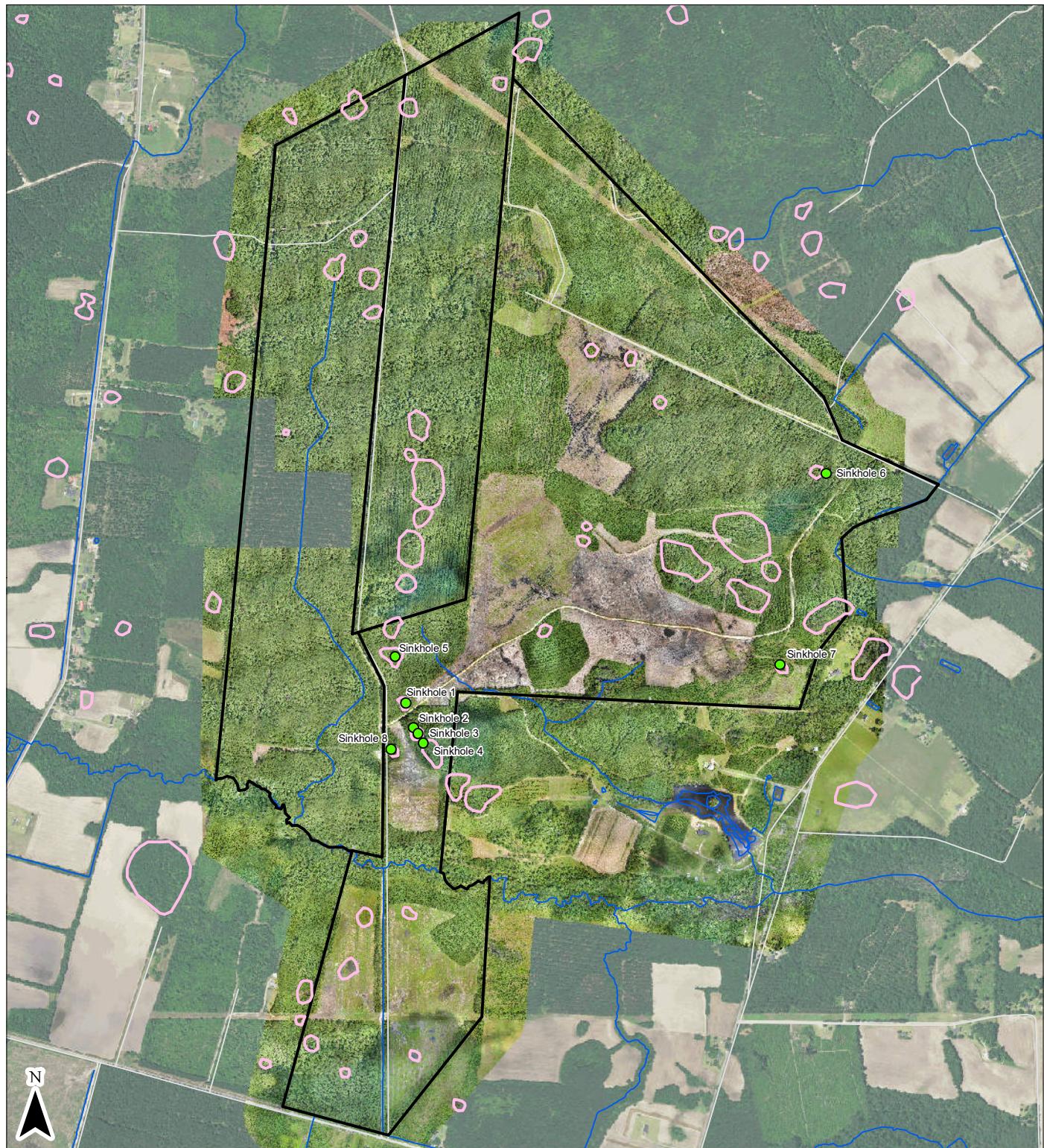
## **7.0 References**

Groundwater Management Associates, Inc., 2017, "Hydrogeologic Evaluation of the RDA, LLC Property, Williamsburg County, South Carolina", April 11, 2017, GMA Project 158007, 10 pages of text plus figures, tables, and appendices.

Groundwater Management Associates, Inc., 2021, "Baseline Sinkhole Monitoring Report - Andrews Quarry, Williamsburg County, SC", February 5, 2021, 5 pages of text plus figures, tables, and appendices.

## **Figures**





#### LEGEND

■ SINKHOLES WITH CORRESPONDING  
DATABASE NUMBER

■ INTERPRETED KARST FEATURE

— AMC PROPERTY

— ROADS

— STREAMS

Feet  
750 0 750 1,500



Path: Z:\Drawings\163703-AMC  
Sinkhole Monitoring\FIG5\_Final  
Assessment of Sinkholes.mxd

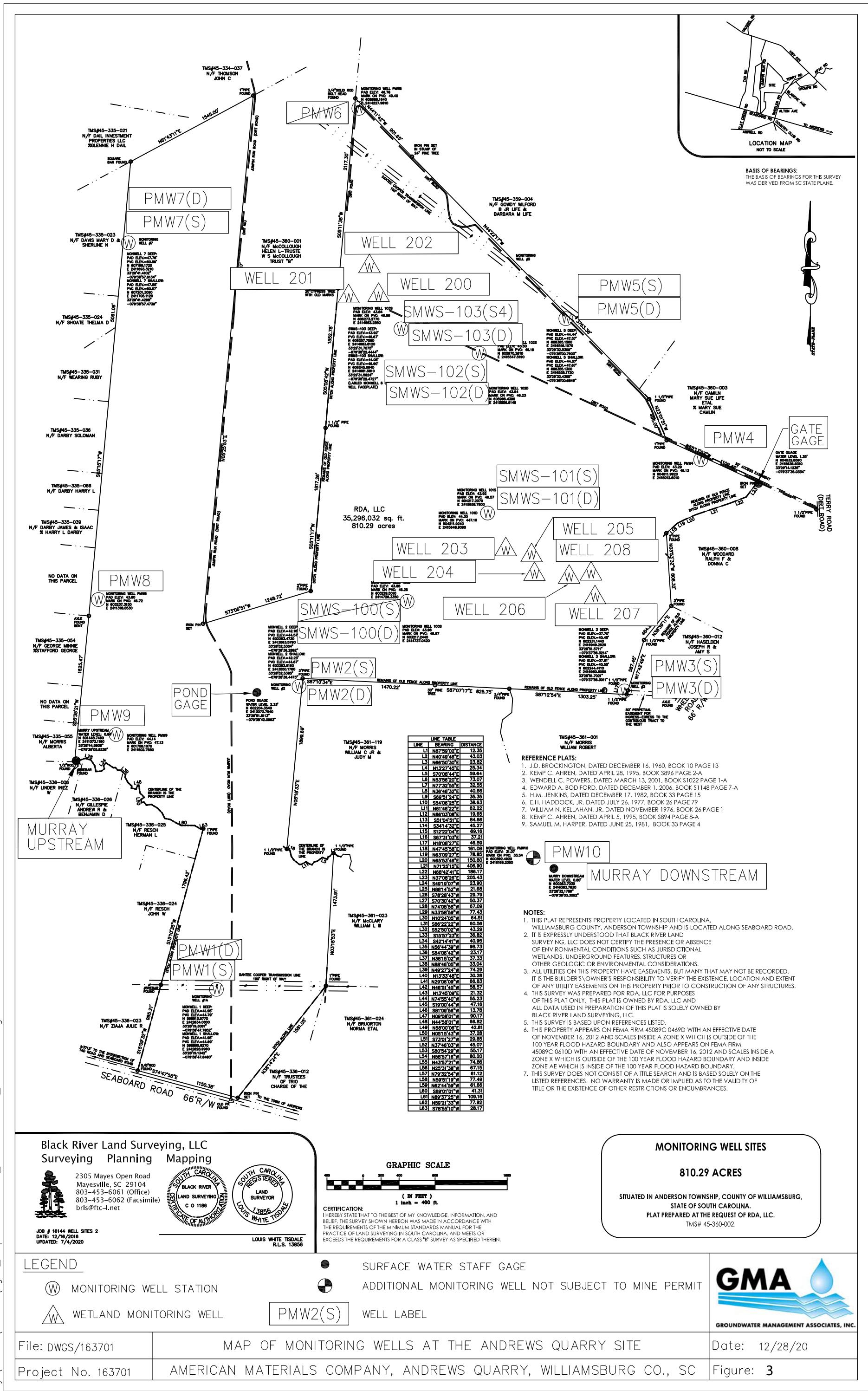
Existing Sinkhole Features at the Andrews Quarry

DATE: 2/16/2022

PROJECT NO. 163703

AMERICAN MATERIALS COMPANY, WILLIAMSBURG CO., SC

FIGURE 2

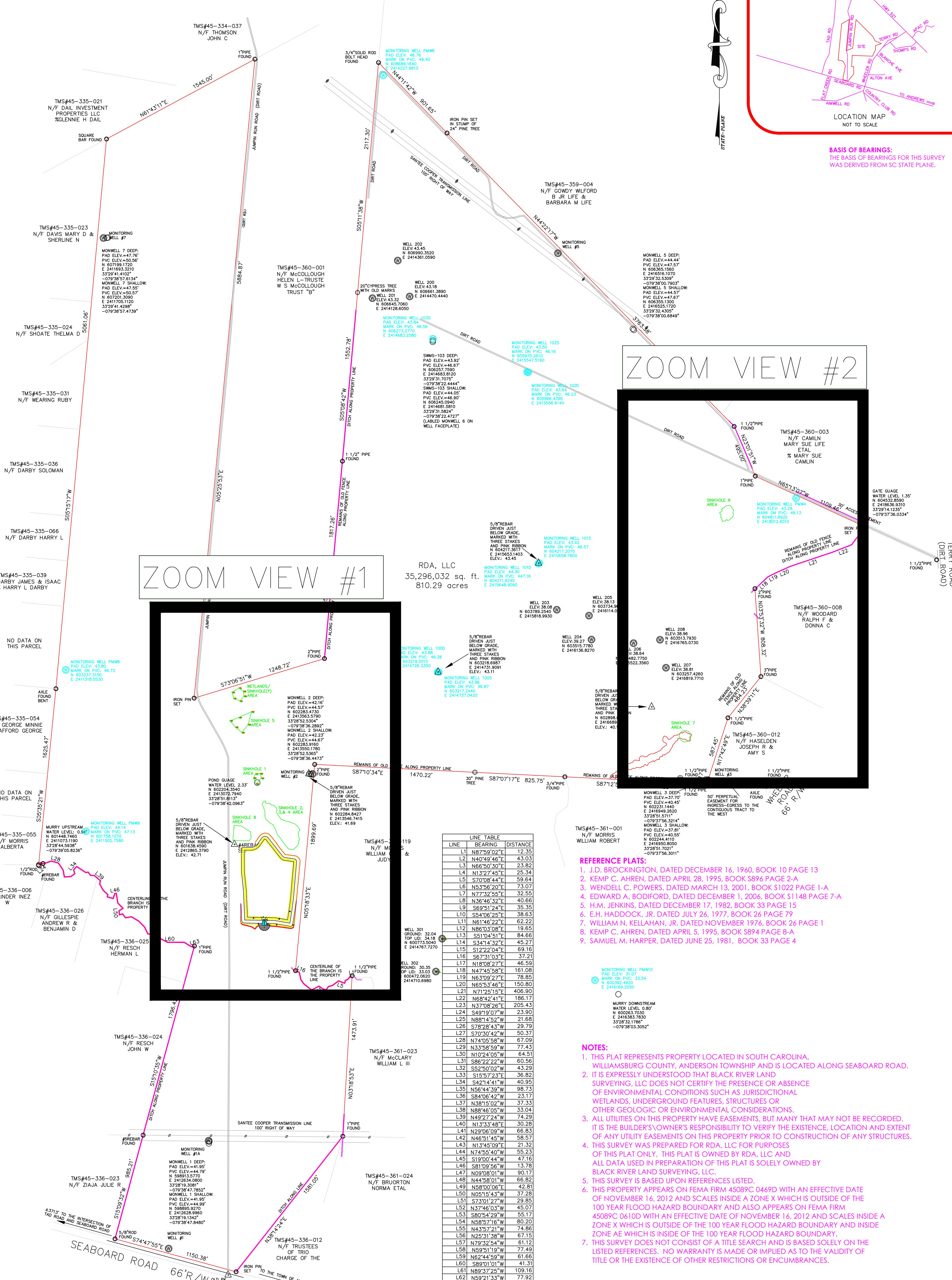


**Attachment I**

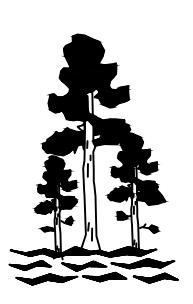
**Survey Data of the Eight Sinkhole Features Identified at the Andrews Quarry Site**

pt	northing	easting	msl	location
499	602192.902	2413063.276	39.022	sinkhole 1
500	602245.086	2413111.107	38.088	sinkhole 1
501	602286.951	2413099.634	38.833	sinkhole 1
502	602284.920	2413057.374	37.699	sinkhole 1
503	602246.485	2413039.380	37.528	sinkhole 1
108	601899.248	2413117.567	38.852	sinkhole 2
109	601840.590	2413150.956	38.460	sinkhole 2
110	601838.140	2413238.574	37.699	sinkhole 2
111	601894.663	2413253.064	38.534	sinkhole 2
112	601956.874	2413243.996	38.259	sinkhole 2
113	601988.873	2413218.938	38.148	sinkhole 2
114	601996.266	2413174.948	38.072	sinkhole 2
115	601981.660	2413141.289	37.776	sinkhole 2
505	602663.516	2412932.390	39.466	sinkhole 5
506	602712.689	2412874.094	39.958	sinkhole 5
507	602771.278	2412822.794	39.617	sinkhole 5
508	602801.750	2412905.919	40.049	sinkhole 5
509	602853.983	2413021.296	40.534	sinkhole 5
511	602736.954	2412989.330	40.289	sinkhole 5
142	604647.262	2417438.374	40.605	sinkhole 6
143	604668.125	2417450.936	40.831	sinkhole 6
144	604687.162	2417463.272	41.434	sinkhole 6
145	604708.003	2417453.122	41.341	sinkhole 6
146	604731.528	2417423.847	40.823	sinkhole 6
147	604740.420	2417399.268	40.932	sinkhole 6
148	604745.225	2417374.614	41.272	sinkhole 6
149	604732.612	2417350.102	40.773	sinkhole 6
150	604708.441	2417332.214	40.679	sinkhole 6
151	604684.716	2417324.629	40.748	sinkhole 6
152	604660.406	2417322.634	41.049	sinkhole 6
153	604622.944	2417341.984	40.877	sinkhole 6
154	604613.381	2417367.160	41.076	sinkhole 6
155	604621.251	2417412.106	40.696	sinkhole 6
131	602658.148	2417033.881	36.123	sinkhole 7
132	602624.912	2417004.036	34.457	sinkhole 7
133	602606.577	2417012.218	35.268	sinkhole 7
134	602592.339	2417023.940	35.703	sinkhole 7
135	602588.187	2417040.396	35.893	sinkhole 7
136	602598.960	2417049.994	35.891	sinkhole 7
137	602630.388	2417040.476	35.178	sinkhole 7
138	602646.716	2417022.801	35.161	sinkhole 7
139	602648.157	2417000.261	35.415	sinkhole 7
140	602634.571	2416994.162	35.030	sinkhole 7
141	602622.776	2417019.548	33.129	sinkhole 7
116	601786.173	2412940.762	38.005	sinkhole 8
117	601791.136	2412896.543	38.030	sinkhole 8

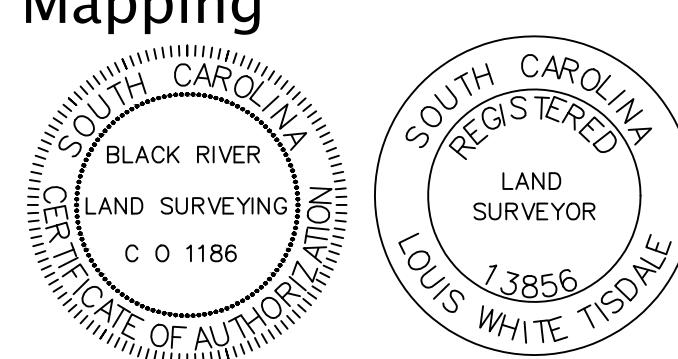
118	601762.880	2412864.200	38.017	sinkhole 8
119	601734.251	2412865.938	37.784	sinkhole 8
120	601707.417	2412868.199	38.721	sinkhole 8
121	601691.273	2412881.804	39.460	sinkhole 8
122	601684.179	2412908.713	39.122	sinkhole 8
123	601678.891	2412953.320	39.269	sinkhole 8
124	601685.915	2412990.093	39.766	sinkhole 8
125	601704.234	2413015.836	38.909	sinkhole 8
126	601732.330	2413038.967	38.431	sinkhole 8
127	601758.653	2413033.650	38.753	sinkhole 8
128	601779.199	2413010.225	38.024	sinkhole 8
130	601793.574	2412980.626	38.191	sinkhole 8



**Black River Land Surveying, LLC**  
Surveying Planning Mapping

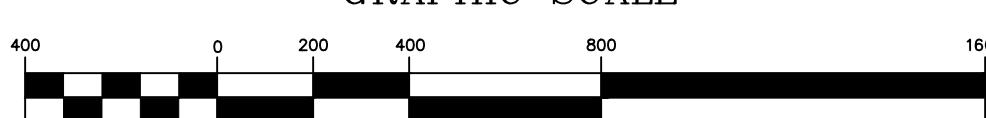


2305 Mayes Open Road  
Mayesville, SC 29104  
803-453-6061 (Office)  
803-453-6062 (Facsimile)  
brls@ftc-i.net



JOB # 16144 WELL SITES 2  
DATE: 12/16/2016  
UPDATED: 7/4/2020

#### GRAPHIC SCALE



**CERTIFICATION:**  
I HEREBY STATE THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF, THE SURVEY SHOWN HEREON WAS MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MINIMUM STANDARDS MANUAL FOR THE PRACTICE OF LAND SURVEYING IN SOUTH CAROLINA, AND MEETS OR EXCEEDS THE REQUIREMENTS FOR A CLASS "B" SURVEY AS SPECIFIED THEREIN.

#### MONITORING WELL SITES

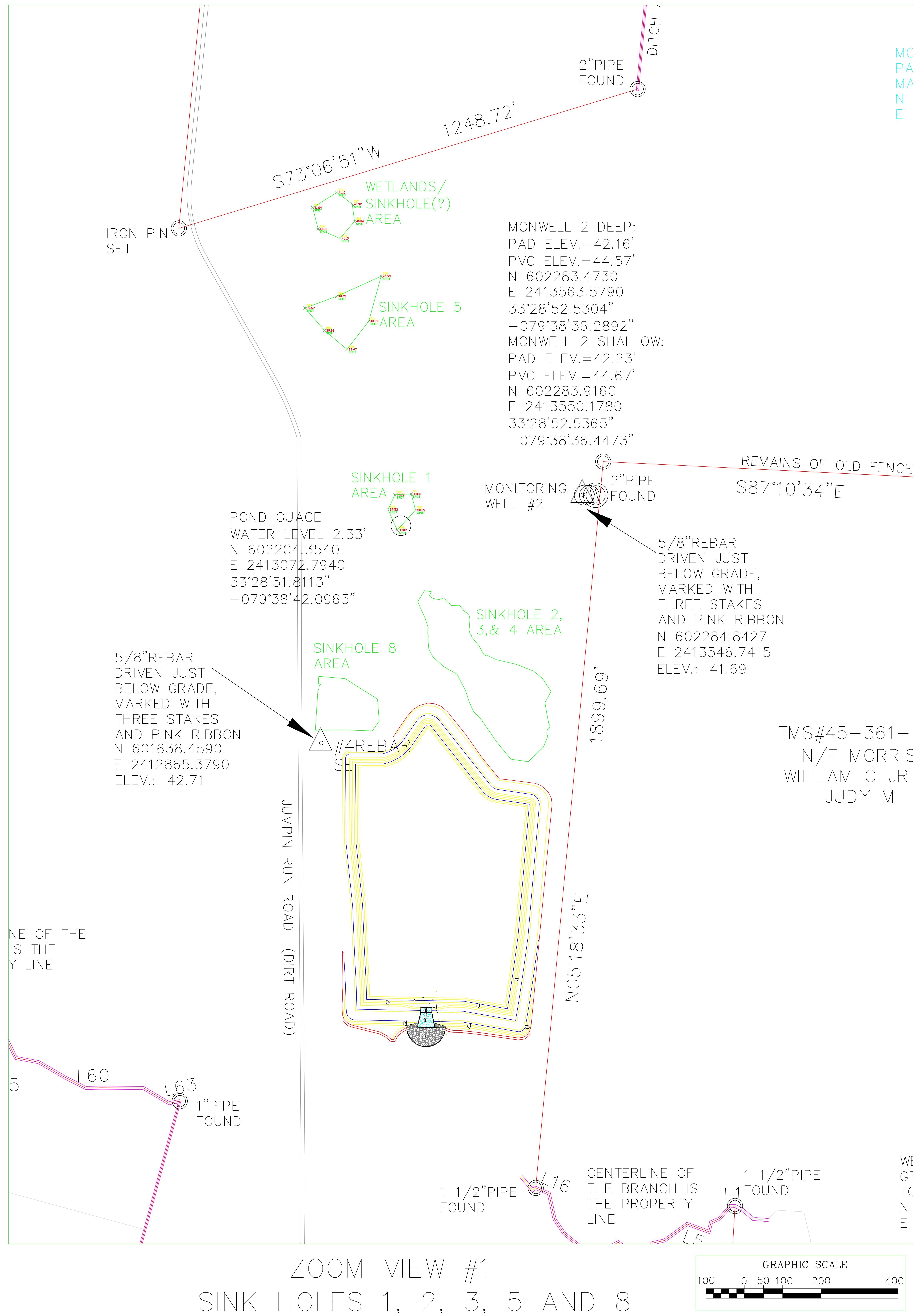
##### 810.29 ACRES

SITUATED IN ANDERSON TOWNSHIP, COUNTY OF WILLIAMSBURG,  
STATE OF SOUTH CAROLINA.  
PLAT PREPARED AT THE REQUEST OF RDA, LLC.  
TMS# 45-360-002.

MC  
PA  
MA  
NE

TMS#45-361-  
N/F MORRIS  
WILLIAM C JR  
JUDY M

WE  
GF  
TC  
NE



% MARY SUE  
CAMLIN

1" PIPE  
FOUND

SINKHOLE 6  
AREA

MONITORING WELL PMW4  
PAD ELEV: 43.29  
MARK ON PVC: 46.13  
N 604811.9920  
E 2418012.6010

IRON PIN  
SET

REMAINS OF OLD FENCE  
ALONG PROPERTY LINE  
DITCH ALONG PROPERTY LINE

L22

L21

L20

L19

2" PIPE  
FOUND

N 03°53'32" W  
808.32'

3" PIPE  
FOUND

REMAINS OF OLD  
FENCE ALONG  
PROPERTY LINE  
484.23'

1 1/2" PIPE  
FOUND

TMS#45-360-008  
N/F WOODARD  
RALPH F &  
DONNA C

(W)

WELL 206  
ELEV: 38.64  
N 603482.7750  
E 2416522.3560

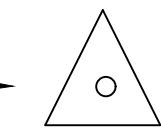
(W)

WELL 208  
ELEV: 38.96  
N 603513.7930  
E 2416765.0730

(W)

WELL 207  
ELEV: 38.81  
N 603257.4260  
E 2416819.7710

EBAR  
N JUST  
V GRADE,  
ED WITH  
STAKES  
PINK RIBBON  
898.8475  
6689.8327  
40.12



SINKHOLE 7  
AREA

587.45'  
N 17°42'49"E

TMS#45-360-012  
N/F HASELDEN  
JOSEPH R &  
AMY S

1 1/2" PIPE  
FOUND

1 1/2" PIPE  
FOUND

MONITORING  
WELL #3

AXLE  
FOUND

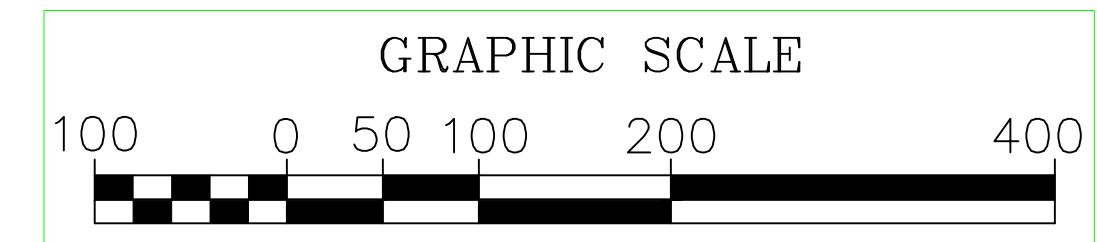
1 1/2" PIPE  
FOUND  
WHEELER  
ROAD  
R/W

1303.25'

MONWELL 3 DEEP:  
PAD ELEV.=37.70'  
PVC ELEV.=40.45'

ZOOM VIEW #2

SINK HOLES 6 AND 7



**Attachment II**

**Site Photos Collected on 12/15/2021**



*Picture 1: Sinkhole #1 with no signs of water or sinkhole activity. Note the dry staff gage installed by AMC.*



*Picture 2: Sinkhole #1 with no signs of water or sinkhole activity*



*Picture 3: Sinkhole #1 with no signs of water or sinkhole activity*



*Picture 4: Sinkhole #1 with no signs of water or sinkhole activity*



*Picture 5: Sinkhole #2 with no signs of water or sinkhole activity*



*Picture 6: Sinkhole #2 with no signs of water or sinkhole activity*



*Picture 7: Sinkhole #2 with no signs of water or sinkhole activity*



*Picture 8: Sinkhole #2 with no signs of water or sinkhole activity*



*Picture 9: Sinkhole #3 with no signs of water or sinkhole activity*



*Picture 10: Sinkhole #3 with no signs of water or sinkhole activity*



*Picture 11: Sinkhole #3 with no signs of water or sinkhole activity*



*Picture 12: Sinkhole #3 with no signs of water or sinkhole activity*



*Picture 13: Sinkhole #4 with no signs of water or sinkhole activity*



*Picture 14: Sinkhole #4 with no signs of water or sinkhole activity*



*Picture 15: Sinkhole #4 with no signs of water or sinkhole activity*



*Picture 16: Sinkhole #4 with no signs of water or sinkhole activity*



*Picture 17: Sinkhole #5 with no signs of water or sinkhole activity*



*Picture 18: Sinkhole #5 with no signs of water or sinkhole activity*



*Picture 19: Sinkhole #5 with no signs of water or sinkhole activity*



*Picture 20: Sinkhole #5 with no signs of water or sinkhole activity*



*Picture 21: Sinkhole #6 with no signs of water or sinkhole activity*



*Picture 22: Sinkhole #6 with no signs of water or sinkhole activity*



*Picture 23: Sinkhole #6 with no signs of water or sinkhole activity*



*Picture 24: Sinkhole #6 with no signs of water or sinkhole activity*



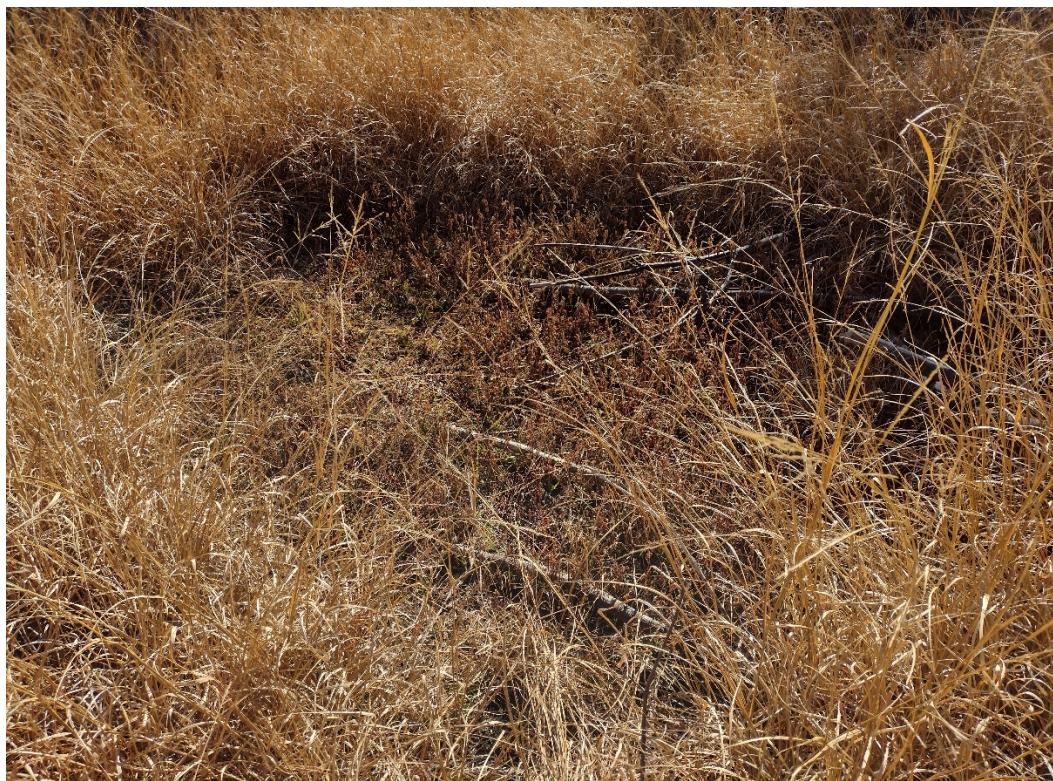
*Picture 25: Sinkhole #7 with no signs of water or sinkhole activity*



*Picture 26: Sinkhole #7 with no signs of water or sinkhole activity*



Picture 27: Sinkhole #7 with no signs of water or sinkhole activity



Picture 28: Sinkhole #7 with no signs of water or sinkhole activity



*Picture 29: Sinkhole #8 with no signs of water or sinkhole activity*



*Picture 30: Sinkhole #8 with no signs of water or sinkhole activity*



*Picture 31: Sinkhole #8 with no signs of water or sinkhole activity*



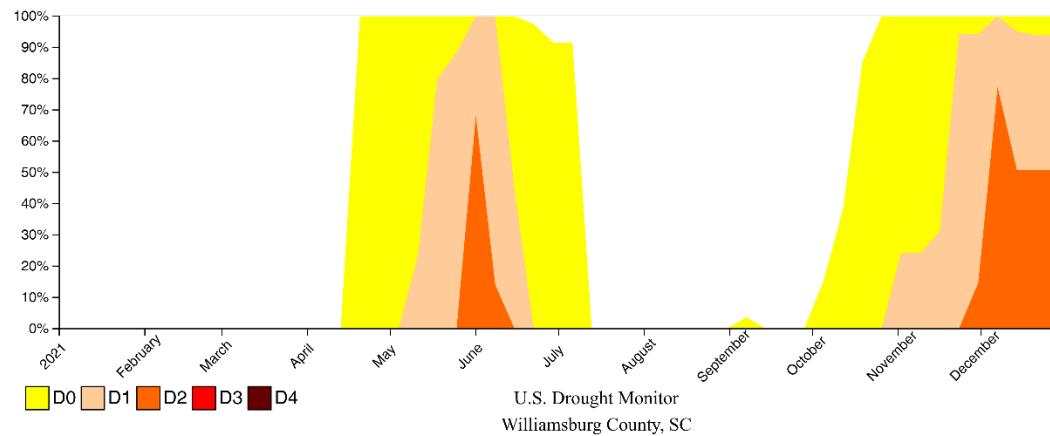
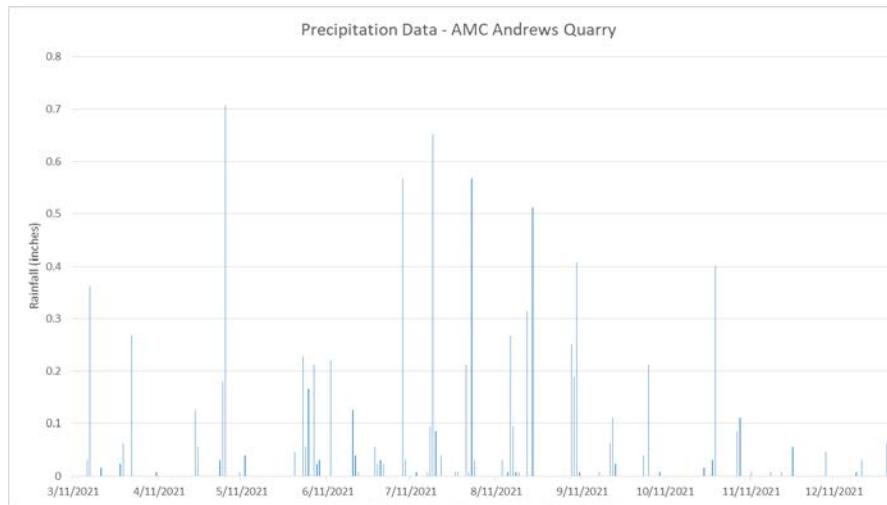
*Picture 32: Sinkhole #8 with no signs of water or sinkhole activity*



*Active Mine Pit Showing Water Level near the Top of the Limestone Ore*

### Attachment III

#### Rainfall and Drought Records



Drought Records from Williamsburg County Collected from <https://www.drought.gov/states/south-carolina/county/williamsburg>

## Attachment IV

### Water-Level Records of Limestone Monitoring Wells

