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Groundwater Management Associates, Inc.

March 26, 2013

Ms. Gabrielle Chianese  
Hydrogeologist – CCPCUA Administration  
North Carolina Division of Water Resources  
1611 Mail Service Center  
Raleigh, NC 27699-1611

**RECEIVED**  
APR 2 2013  
DIVISION OF WATER RESOURCES

Re: Response to your letter of September 24, 2012 regarding the renewal of CCPCUA Permit No. CU3148, Martin Marietta Materials Vanceboro Quarry.

Dear Gabrielle,

We enjoyed meeting with you and Nat Wilson on January 31, 2013 to discuss your September 24, 2012 letter to Nuwan Wijesuriya. During the meeting, we discussed each of the five items outlined in your letter.

Herewith, we present a summary of the responses to each item, and we outline the proposed plans for future groundwater monitoring well stations to be installed.

- 1) *“Please document how Martin Marietta will mitigate adverse impacts to existing ground water users if it occurs?”* Martin Marietta Materials has developed a written plan outlining how Martin Marietta will respond to and mitigate adverse impacts that may occur. A copy of the draft plan was provided to NCDWR at the meeting on January 31, 2013. Martin Marietta will provide a final plan to NCDWR under a separate cover letter.
- 2) *“More detailed well construction information other than total depth needs to be provided for wells labeled TW-28, TW-29, TW-30, and TW-31.”* GMA, on behalf of Martin Marietta Materials, contacted PCS Phosphate Company in Aurora to request data on these wells. The wells were installed in 1965 as a part of exploration work conducted by NC Phosphate Company (NCPC). PCS Phosphate merged with NCPC, and all records from NCPC were transferred to PCS Phosphate. However, PCS Phosphate has not retained well construction records for TW-28 through TW31 because these wells are no longer monitored. PCS Phosphate provided a summary table of well depths, locations, and top of casing elevations for these old monitoring wells. Depths provided by PCS Phosphate agreed relatively closely to well depths that GMA measured in 2007. These wells are 4-inch diameter open-hole wells. However, PCS Phosphate did not know the casing depths on the wells. GMA contacted the North Carolina Geological

Survey (NCGS) and requested access to well logs that they have in their archives. NCGS provided limited drilling information and geophysical logs for three wells that appear to correspond to wells TW-28, TW-30, and TW31. Data provided included an indication of well casing depths for TW-28, and TW31. The attached Table 1 presents a summary of data collected from the wells in question. We are unable to confirm with certainty the casing depths for any of the wells.

At the meeting, we discussed the need for monitoring of these wells in the future. It was decided that well TW30 was close enough to the Wilmar Station that future monitoring of TW30 would not be necessary. However, future monitoring of TW-28, TW-29, and TW31 would be appropriate. In order to understand water-level data collected from these three wells in the future, NCDWR requested that casing depths on these wells be verified through a video inspection and geophysical logging. Martin Marietta Materials agreed to gathering casing depth information on these wells in the future, provided that PCS Phosphate Company will provide permission to Martin Marietta to enter the wells, inspect the wells, and perform routine monitoring of these wells in the future as a part of the CCPCUA permit compliance for the Vanceboro Quarry operation.

- 3) *"NCDWR feels it is important to have a more complete monitoring well network to track the cone of depression once the mine becomes active."* NCDWR provided Martin Marietta Materials with a map that marked positions of 7 monitoring stations where NCDWR requested clusters of monitoring wells should be installed. At the January 13, 2013 meeting, we discussed the purpose of each monitoring station, and we developed alternative locations and numbers of monitoring wells to be constructed to meet the needs of NCDWR's requested monitoring system. Agreement was reached on reducing the number of stations from 7 to 5. Stations numbered #2 and #3 will remain as originally proposed while stations #4 and #7 will be deleted. The location of stations #1, #5, and #6 will be modified as described below to minimize well construction efforts and costs.

Station #1 – The original location of proposed monitoring Station #1 was on the county line approximately 4 miles from the center of the proposed mine. We discussed moving Station #1 to a position about 7500 feet to the north of the original planned location. With this new position of the proposed monitoring station, we were able to eliminate the need for NCDWR's requested Station #7. We decided to focus our monitoring in areas closer to the mine to determine if the cone of depression expands in a manner consistent with the computer modeling performed for the site. Likewise, we agreed to eliminate Station #4 due to its distance from the mine. During the initiation of mining and associated dewatering, Martin Marietta Materials will closely monitor the water level response in the nearby monitoring stations to determine if the cone of depression is consistent with the model predictions. If it is determined that the cone of depression is expanding significantly more than the model predictions, then Martin Marietta

Materials can consider installing additional monitoring stations at a greater distance from the mine.

NCDWR Proposed Station #5 – In order to make best use of existing monitoring wells, Martin Marietta Materials proposed to move Station #5 to a position beside TW-31. The intent will be to investigate (video log) the casing depth of TW-31, and then convert TW-31 to a Lower Castle Hayne monitoring well by installing a screened liner that discretely monitors a specific (up to 20 feet) section of the Lower Castle Hayne aquifer. Two additional monitoring wells will be constructed next to TW-31, one open to the Upper Castle Hayne and the other open to the Surficial Aquifer. In doing this, Martin Marietta can minimize the amount of drilling required to construct monitoring well Station #5. When constructed, this station would be renamed Station #4.

NCDWR Proposed Station #6 – NCDWR had requested that a monitoring well station be constructed to the east of the proposed mine. After further discussion, we agreed to move the monitoring station to the TW-28 site. TW-28 will be converted into a Lower Castle Hayne monitoring well (with a screened liner that includes not more than 20 feet of screen). Then, an Upper Castle Hayne monitoring well and a Surficial Aquifer well will be constructed beside TW-28. This approach will help to minimize the amount of drilling required to construct Station #6. Station #6 would be renamed Station #5. The plan for modifying TW-28 is based upon the assumption that PCS Phosphate Company provides permission to Martin Marietta Materials to modify the well and use the well for future monitoring.

Martin Marietta Materials is working with PCS on formalizing an agreement to modify existing wells TW-28 and TW-31. The agreement would also allow for video inspection and regular monitoring of TW-29. If such an agreement cannot be reached, then Martin Marietta Materials would look for alternate locations to site monitoring well clusters to achieve the monitoring network desired for these areas.

The attached Figure 1 illustrates the locations of the five monitoring well stations proposed to be installed. Martin Marietta Materials plans to construct the monitoring well system at least 6 months prior to beginning dewatering operations to support the mine. The intent is to obtain baseline (pre-mine) water-level data from each monitoring well for a period of at least 6 months before mine dewatering commences. NCDWR agreed to this intended schedule.

- 4) *“Well construction records for all monitoring wells need to be submitted to DWR”.* Martin Marietta Materials will provide well records for all monitoring wells once the monitoring stations have been built. *“Chloride results from the wells monitoring the lower portion of the Castle Hayne aquifer need to be submitted twice a year”.* We discussed chloride concentrations in the Castle Hayne Aquifer in the area and the need for regular monitoring of chloride to determine if saltwater intrusion is occurring in the area. GMA pointed out that Beaufort County has explored the Beaufort and Peedee


Aquifers at Well Site 62, located approximately 7 miles to the north of the proposed quarry. Beaufort County did not identify the presence of high-chloride water in aquifers below the Castle Hayne Aquifer. There does not appear to be a known potential source of local saltwater intrusion into the lower Castle Hayne Aquifer in the area. Therefore, it was requested that chloride monitoring be limited to annual sampling rather than semi-annual. NCDWR agreed to this reduction in the frequency of chloride monitoring in the lower Castle Hayne aquifer monitoring wells to be installed.

- 5) "Please provide a map of the predicted cone of depression showing 5 ft interval contours from the pit out to the 5 ft drawdown contour in a map similar to Figure 6 in GMA's June 15, 2010 report which contains existing groundwater users and proposed monitoring sites". GMA prepared an updated draft map depicting drawdown contours as requested. The drawdown contours are at 5 feet intervals to 30 feet of drawdown, and then we depict the 40 feet drawdown contour. Additional drawdown contours greater than 40 feet were not depicted due to the closeness of contours that would be necessary near the proposed pit. NCDWR stated that the draft map was acceptable to meet their request. Therefore, GMA has prepared a final version of the requested drawdown map, and the map is included with this letter as Figure 2.

We trust that this correspondence adequately addresses the data requests from your letter of September 24, 2012. We also trust that the discussions from our January 13, 2013 meeting are accurately summarized. If you have any questions, or if our understanding of the agreed-upon decisions needs to be revised, please let us know.

Thank you,

Groundwater Management Associates, Inc.

  
James K. Holley, P.G.  
Senior Hydrogeologist



CC: Brian North, P.E. – Martin Marietta Materials  
Nuwan Wijesuriya – Martin Marietta Materials  
Horace Willson – Martin Marietta Materials  
Bill Lyke, P.E., P.G. – GMA  
Nat Wilson, P.G. – NCDWR  
Richard Spruill, Ph.D., P.G. - GMA

Enclosures: Table 1 – Details of PCS Phosphate Monitoring Wells  
Figure 1 – Proposed Monitoring Well Stations  
Figure 2 – Modeled Drawdown in the Upper Castle Hayne Aquifer

Table 1. Summary of PCS Phosphate Wells Near the Proposed MMM Vanceboro Quarry

Well ID	Latitude	Longitude	Original Well Depth (ft)	Tagged Well Depth (ft) (2007)	Casing Diameter (in)	Casing Depth (ft)	TOC Elevation (ft)	Corresponding NCPC #
PCS TW28 (AKA S-28)	35.370811°	-76.979918°	242	239	4"	136?	38.93	186a
PCS TW29 (AKA S-29)	35.384483°	-77.001850°	160	155.8	4"	?	37.32	?
PCS TW30 (AKA S-30)	35.381917°	-77.075917°	86.5	84.5	4"	?	40.45	187
PCS TW31 (AKA S-31)	35.382283°	-77.028767°	226	217.6	4"	108?	39.51	188

\* Casing depths are based upon well data found from well logs provided by the NC Geological Survey

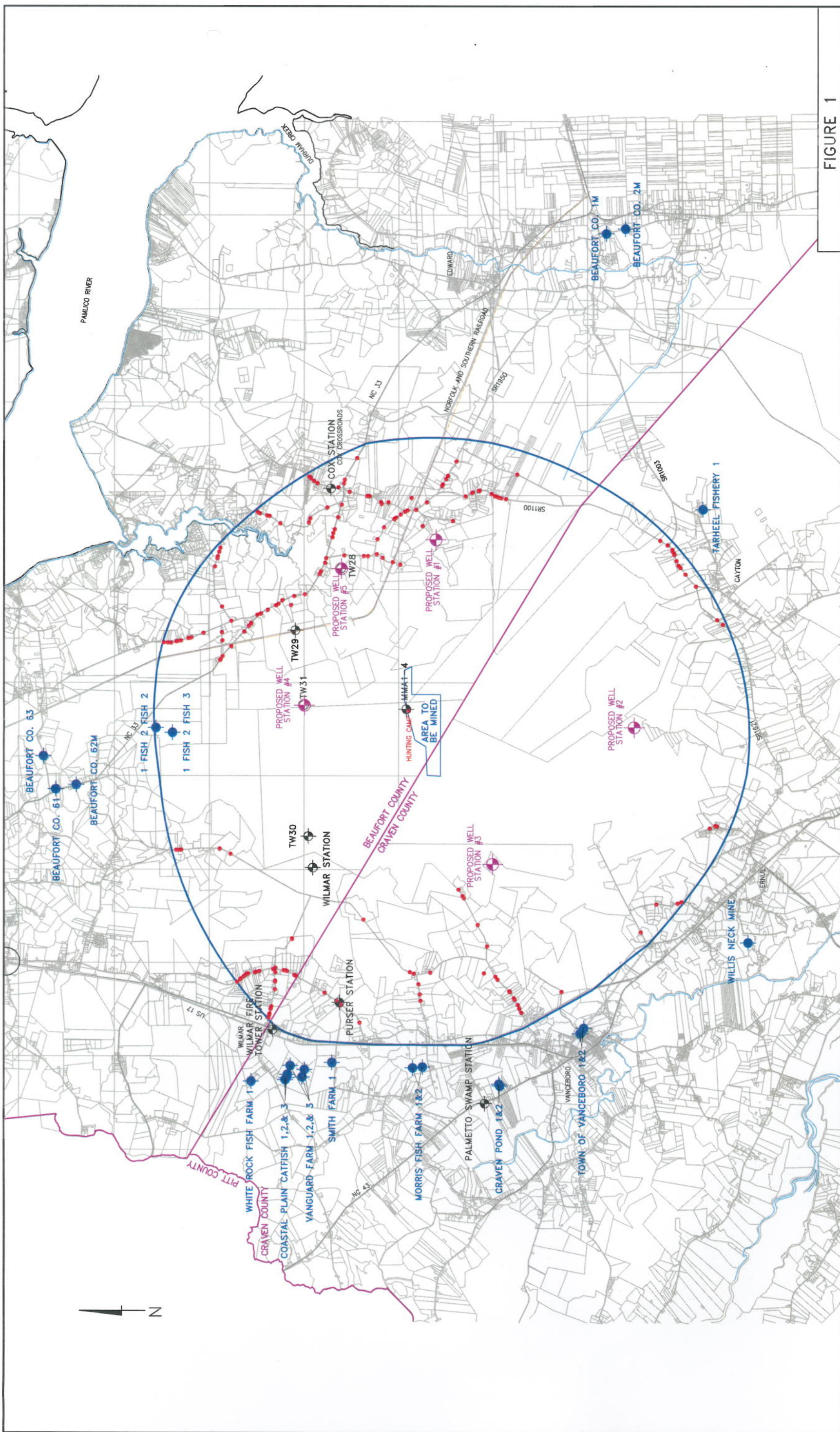


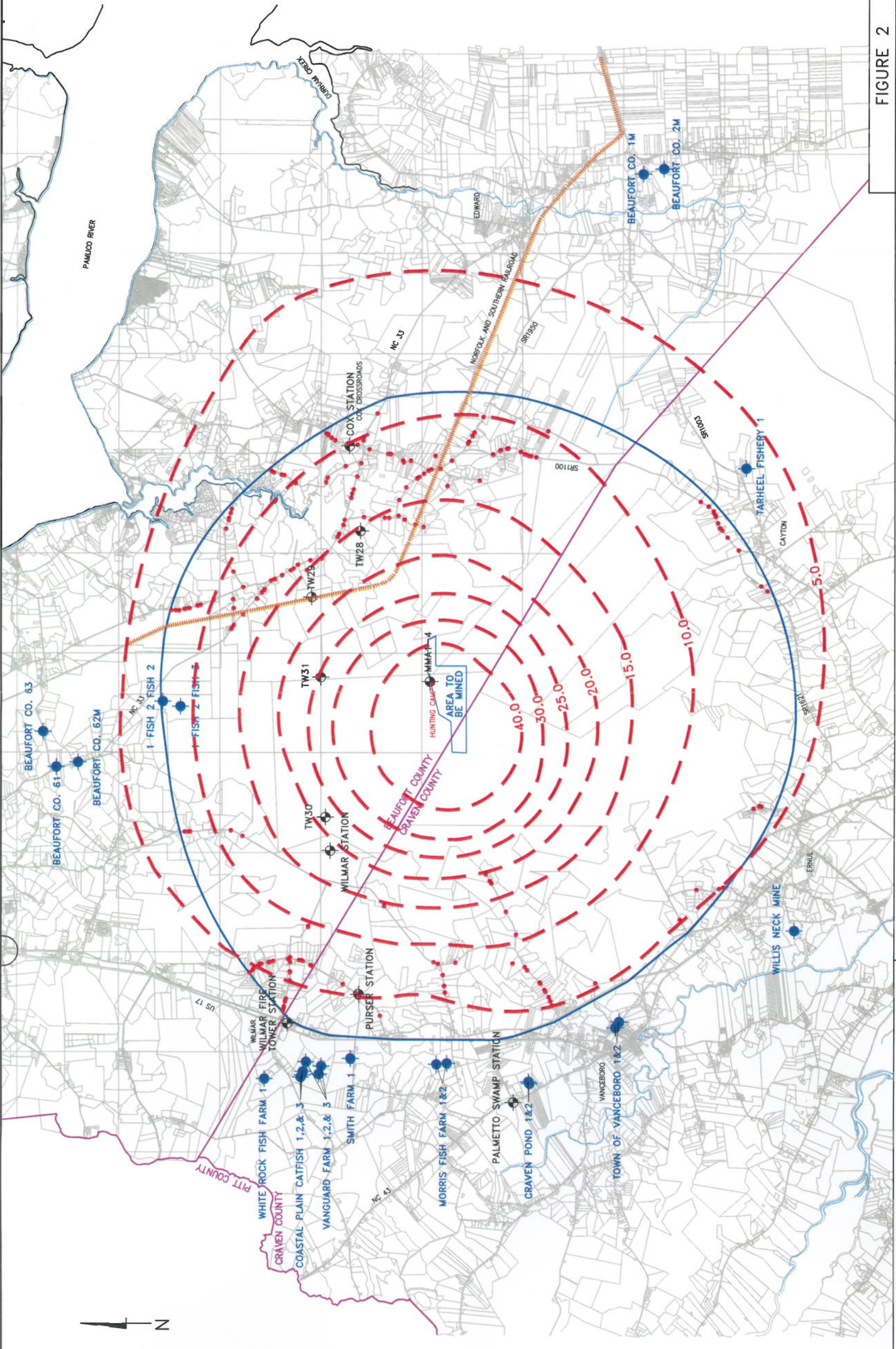
FIGURE 1



PROJECT 62902  
 DATE 2/14/2013  
 SCALE IN FEET  
 0 5000' 10,000'  
 1"=10,000'

PROPOSED VANCEBORO QUARRY MONITORING WELL STATIONS  
 MARTIN MARIETTA AGGREGATES  
 BEAUFORT COUNTY, NC

- LEGEND-
- EXISTING MONITORING WELL
  - PROPOSED MONITORING WELL STATION
  - CASTLE HAYNE AQUIFER CAPACITY USE AREA WATER-SUPPLY SOURCES
  - RESIDENTIAL WATER-SUPPLY WELL



- LEGEND-
- STUDY AREA BOUNDARY
- EXISTING MONITORING WELL
- CASTLE HAYNE AQUIFER CAPACITY USE AREA WATER-SUPPLY SOURCES
- RESIDENTIAL WATER-SUPPLY WELL
- DRAWDOWN IN FEET

**MODELED DRAWDOWN IN THE UPPER CASTLE HAYNE AQUIFER**  
**MARTIN MARIETTA AGGREGATES**  
**BEAUFORT COUNTY, NC**

PROJECT 62902  
 DATE 2/14/2013  
 SCALE IN FEET  
 0 5000' 10,000'  
 1"=10,000'

FIGURE 2

