

**GROUNDWATER MONITORING PLAN
FOR THE PROPOSED SNOW CAMP QUARRY
SNOW CAMP, ALAMANCE COUNTY, NORTH CAROLINA**

Prepared for:
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A handwritten signature in blue ink that reads "Robert Christian Reinhardt". The signature is fluid and cursive, matching the printed name above it.

Robert Christian Reinhardt – NC Geologist License # 1044

**GROUNDWATER MONITORING PROGRAM
FOR THE PROPOSED SNOW CAMP QUARRY
SNOW CAMP, ALAMANCE COUNTY, NORTH CAROLINA**

Geologists have previously submitted a hydrogeologic study in the vicinity of the proposed Snow Camp Quarry located between Clark Road and Quackenbush road, approximately 2 miles south of the unincorporated town of Snow Camp in Alamance County, North Carolina. The preliminary investigation was based on information provided by Carolina Geological Services, Inc. to support work in the preliminary permitting process for the proposed quarry. The scope of work primarily included the compilation of existing data and the evaluation of new data and field observations collected during several site visits. The report describes the hydrogeology of the area and estimates potential impacts of quarry development on local ground- water resources.

As the quarry operations will require de-watering of the quarry pit, a condition of the mining permit for this facility will require a Groundwater Monitoring Program to be implemented prior to beginning mining operations. Based on conversations with North Carolina Department of Environmental Quality (NCDEQ) personnel in the Division of Land Quality and the Division of Water Resources, the permit will require monitoring groundwater levels and conditions in the vicinity of the quarry. The NCDEQ is especially concerned where private water supply wells may be impacted by quarry operations.

Based on a review of the Alamance County GIS aerial map for the vicinity surrounding the proposed quarry, there do not appear to be any residential properties within 500 feet of the proposed mining limit and parts of 7 additional properties between 500 feet and 1,000 feet. A public water supply is not available in the area and the county records for existing water supply well are incomplete. **Figure 1** indicates the 1,000 foot radius of the mining limit and shows properties with confirmed and/or suspected water supply wells.

Mr. Chad Threatt, a representative of Snow Camp Property Development, met with this geologist on site and led a tour of the property, provided information regarding several old, out of use wells on the property. He indicated that he did not think there were any active residential water supply wells within 1,000 feet of the proposed mining limit. The Alamance County GIS records showed portions of 7 properties within the 1,000 foot radius but only one of those properties (Map #3) was listed as having a well. Based on a driving reconnaissance of the area, there may be 2 additional residences (Map # 4 and #5) with wells near the 1,000 foot radius limit.

A full local well search should be conducted prior to beginning mining activities. Other wells in the area should be confirmed and additional information about well details should be collected. Any properties with access to a public water supply should be identified, as well. The table with Figure 1 indicates residential properties within 1,000 feet of the quarry.

Monitoring Plan

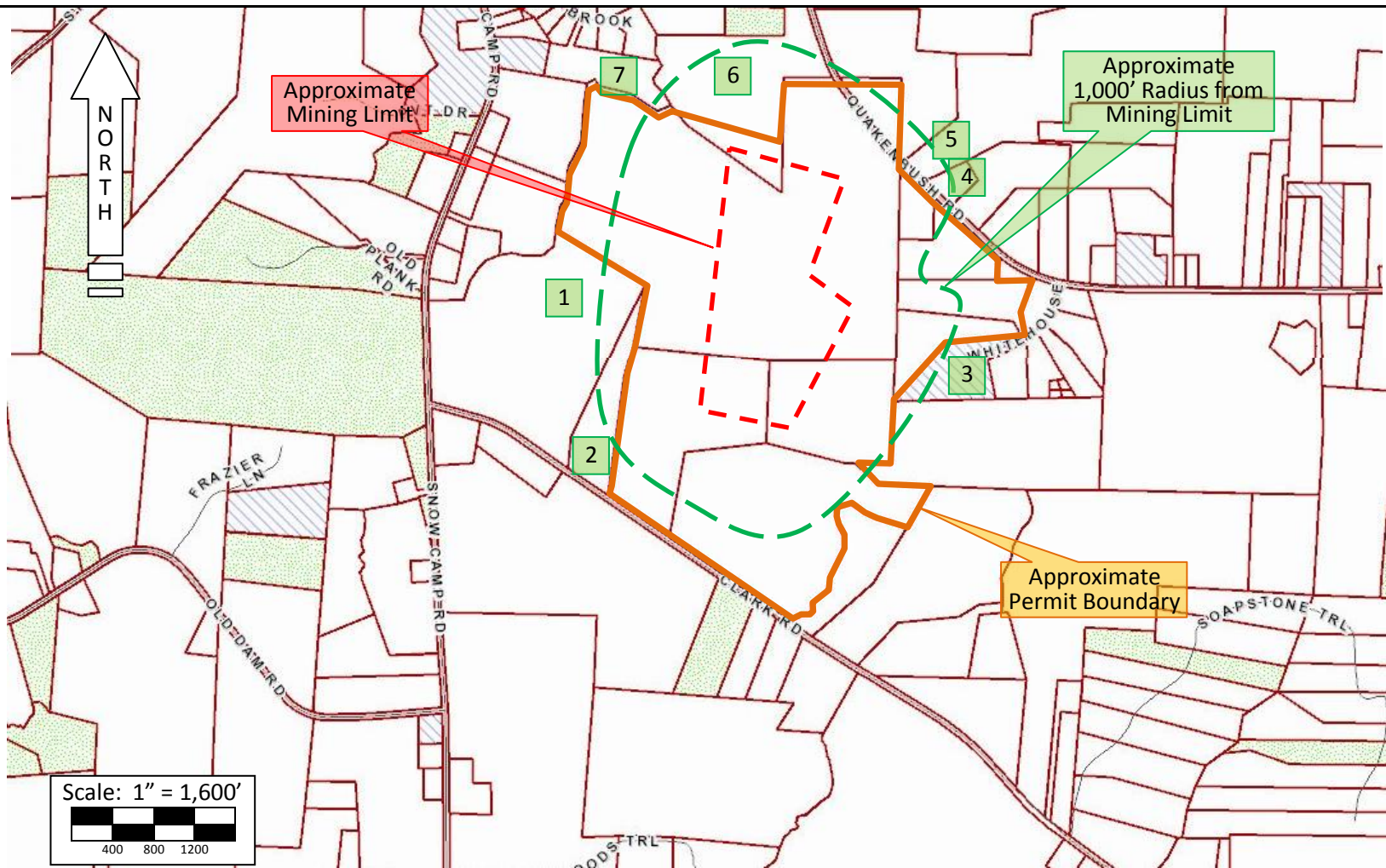
The proposed groundwater monitoring well network for the Snow Camp Quarry will, if possible, incorporate the 2 of the 3 existing in-active water supply wells already located on the quarry property. During the site reconnaissance, water levels were measured in 2 existing, in-active water supply wells on the property near the southern and northern edges of the property (**Figure 2**). Construction details or other information about the wells such as total depth, casing depth, and yield were not available. However, the drilled water supply wells could likely be converted to monitoring wells and they are located at prime spots for continued long term monitoring of the site. Before incorporating them into a monitoring network, the wells will need to be sounded for depth and obstructions, and we recommend a downhole video screening of each well to confirm well conditions and suitability for conversion to monitoring wells. If the wells are in an acceptable condition, we recommend converting them to monitoring wells as they are well placed to determine the influence of quarry dewatering on the adjacent properties.

The recommended monitoring plan will include 2 monitoring wells at each of the existing in-active well locations north and south of the quarry pit and 2 wells each at locations on the east and west sides of the property. One well at each location will be completed in the overburden/saprolite and will likely be approximately 30 feet to 40 feet deep. The second well at each location will be completed in fractured bedrock and will likely be finished to a depth of between 100 feet to 150 feet. All new wells will be constructed of 2 inch ID PVC screen and riser, with a coarse sand filter pack, bentonite seal and grout to land surface. The wells should be completed with riser extending above land surface with a protective steel casing. Additional protective structures (bollards, etc.) should be placed around the well heads to protect from vehicular traffic. All wells will be installed under the supervision of a licensed NC Geologist and constructed by a certified driller in accordance with North Carolina Well Constructions Standards (15A NCAC 2C).


As the main concern for groundwater impact to surrounding properties is the lowering of the water table, periodic monitoring of water levels in the wells will be required. The frequency for monitoring and reporting will be included in the permits issued for quarry operations. The Division of Water Resources has recommended monthly water level

measurements which would be recorded and reported with the pumping data from the quarry dewatering. No water quality monitoring is recommended for the monitoring well network.

Prepared 09/22/2018



	Parcel ID	Parcel Address	Owner Name	Owner Address	Acres	Well/Septic*
1	102698	CLARK RD	MILLS, STEPHEN D, WENDIE ANN EGGLESTON	PO BOX 520, SNOW CAMP, NC 27349	67.715	No Record
2	102697	262 CLARK RD	JACKSON, NORMAN F JR	PO BOX 740, SNOW CAMP, NC 27349	7.285	No Record
3	102764	9065 WHITEHOUSE CT	MULROONEY, TIMOTHY J, MULROONEY, CELESTE M	9065 WHITEHOUSE CT, SNOW CAMP, NC 27349	10.5	Y / N
4	102769	1732 QUAKENBUSH RD	LEE, BRIAN J & CARRIE T	1732 QUAKENBUSH RD, SNOW CAMP, NC 27349	2.33	No Record
5	102799	1720 QUAKENBUSH RD	CAUSEY, PAMELA A REVOC TRUST	6144 SMITHWOOD RD, LIBERTY, NC 27298	68.92	No Record
6	102733	1503 QUAKENBUSH RD	STUART, DANNY RAY	1503 QUAKENBUSH RD, SNOW CAMP, NC 27349	66	No Record
7	102715	7561 SOUTHBROOK LN	FAIN, MICHAEL T & DANIELLE M	PO BOX 667, SNOW CAMP, NC 27349	9.65	No Record

 Parcel Boundary Scale: As Shown	Properties Within 1,000 Feet Of Proposed Mining Limit Proposed Snow Camp Quarry		 Robert Christian Reinhardt, PG Geology • Hydrogeology • Environmental Science 7620 Mine Valley Road, Raleigh, NC 27615 rein82@bellsouth.net
	* Source: Alamance County GIS Database	RCR Project No. 18-M-14-02	

