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April 9, 2021

Mr. Warren Mitchell
104 Amber Wood Run
Chapel Hill, NC 27516

Re: Hydrogeologic Evaluation Report, Pyewacket Subdivision, Chatham County, NC

Dear Mr. Mitchell:

Groundwater Management Associates, Inc. (GMA) completed a hydrogeological evaluation of the Pyewacket Subdivision property in Chatham County, NC (Figure 1). Using existing mapping by others that you provided to us, and a geophysical survey of the area conducted by Geo-Solutions, Ltd., GMA selected two potential water-supply well site areas that will hopefully fulfill your needs for this development. Based on our investigation, we believe these two areas have the potential to provide the highest well yields of accessible locations on the site. Both sites are associated with interpreted fracture trends, as described below, and both locations are indicated on the attached map.

On March 22, 2021, GMA and Geo-Solutions personnel conducted a simultaneous geologic and geophysical investigation of the site. Our investigation focused on areas where diabase dikes had been mapped or inferred by others. We also evaluated stream valleys where GMA infers the presence of fractures in the bedrock. Furthermore, GMA focused on the initial well locations you identified on your subdivision plat site plan (see Figure 1) as your preferred drilling sites. During our site visit, GMA conducted a visual inspection of rock types, site soils, and topography on the property.

Site Geology

The geology of the site is very similar to the geology of the Morgan Ridge Subdivision property located adjacent to the Pyewacket Subdivision site. GMA prepared a hydrogeologic report for the Morgan Ridge Subdivision dated February 9, 2021, and we provided a description of the geology of the area. The basic geology of the site is shown in the NC Geologic Map of the Bynam Quadrangle provided to you by the NC Geologic Survey (NCGS Open-File Report 2013-03).

The Pyewacket Subdivision site is within the fractured bedrock aquifer system of North Carolina. The igneous rocks that underlie much of this site are composed of granodiorite. This granodiorite formed from slow cooling of magma beneath the land surface about 600 million years ago. This granodiorite weathers into boulders that are common across the site. Bedrock on this site is very shallow, indicating that a weathered rock zone above the bedrock (also known as saprolite) is thin. In fractured bedrock systems of North Carolina, this saprolite is considered the primary storage area for water in the groundwater system (U.S. Geological Survey Water-Supply Paper 2242, by Ralph Heath).

Near the very northern portion of the Pyewacket Subdivision there is a change in the bedrock from granodiorite to metamorphosed volcaniclastic sedimentary and pyroclastic rock types (Figure 2). This rock type may be more conducive to developing a thicker saprolite zone than the granodiorite. The contact between the granodiorite and the metavolcanic rocks could represent a positive target area for a water-supply well location. The location of the contact between these rock types is variable, but in the Pyewacket Subdivision it appears to be approximately 1,000 feet southeast of Jones Ferry Road, and roughly parallel to the road.

The NC Geological Survey mapped a thin, tabular, nearly vertical mafic igneous rock intrusion on the site called a gabbro dike that generally trends northeast to southwest (oriented generally North 45 degrees East) across the Morgan Ridge site and only a portion of the Pyewacket Subdivision site (Figure 2). The dike is located just west of the higher elevations of the hill tops. The dike appears to have a horizontal (lateral) thickness of about 20 feet, where present. According to the geologic map of the site, this gabbro dike is nearly vertical, with a slight dip toward the northwest. The geophysical data collected by Geo Solutions Ltd (Figure 2) indicates the gabbro dike either disappears or is more deeply buried below land surface as one traverses north into the Pyewacket Subdivision. The gabbro was not observed at land surface over much of the site.

Magmatic upwelling during the Mesozoic Era (about 200 million years ago) injected local nearly vertical tabular mafic igneous rock intrusions of diabase. Diabase is similar in composition to gabbro, but the magma cooled at shallower depths, and the crystals are finer-grained. These diabase intrusions caused local thermal alterations and fracturing of the adjacent older Piedmont Rocks. Diabase also commonly exhibits fractures associated with cooling of the rock. Drilling wells into diabase rocks can often produce better well yields than drilling into older, more massive Piedmont rocks, such as granites. However, as a result of our investigation, GMA did not observe diabase at the land surface on this site. The magnetometer survey conducted by Geo-Solutions also did not confirm diabase dikes on the site. Figure 2 presents the geophysical data collected by Geo-Solutions superimposed onto your site plan. The magnetometer survey did however detect separate magnetic anomalies in the central and southern portions of the site (see Figure 2). Those anomalies are not linear. Rather, they appear randomly placed throughout the pluton mapped by the NCGS as the Eastern Farrington Pluton. So the potential presence of diabase dikes on this site has been discounted based on

GMA's geologic reconnaissance and Geo Solutions Ltd's geophysical survey. Therefore, GMA's recommendations for potential water-supply well placements do not target previously indicated diabase areas.

Suggested Well Locations

GMA has identified potential well sites based on topographic indications of fracture zones as well as lithologic contacts as indicated by the magnetometry results. The potential well locations have been chosen based on close proximity to stream intersections (confluences), and hill-slope locations. Stream valleys are areas indicative of more abundant fractures in the bedrock. Abundant fractures provide conduits for water movement in the bedrock. Deeper weathering of the rock occurs in the areas with more abundant fracturing, and the weathered rocks are subject to enhanced erosion to form stream valleys.

There are two stream valleys of primary interest on the Pyewacket Subdivision. GMA identified a potential well site labelled A (Figure 2). That well location is close to a well location you included in your concept plan (Figure 1) along the ridge line. However, we prefer to place the well southwest of the road and farther down the stream valley to a location near the confluence of that stream with another. While the original location you choose may provide an adequate well, GMA believes this new location is better suited to tap into a possible larger fracture system. A connection to a larger fracture system may be important to the success of this well due to the general limited water-storage capabilities associated with the thin saprolite in this area where the granodiorite pluton has been mapped by NCGS.

GMA also identified three potential well locations on the northern portion of the subdivision. All three locations, locations B, C, and D (Figure 2), are associated with the confluence of streams and the contact between the granodiorite and metamorphosed volcanoclastic sedimentary and pyroclastic rocks. Location B is located north of one of the well locations you included in your concept plan (Figure 1). Location C is located at yet another well location you included in your concept plan. Location D is located in the same stream valley near the stream confluence.

GMA chose several well locations in that area so that the client could pick one or two that best fit into the subdivision design. However, GMA recommends no more than two wells be constructed in this northern area due to the close proximity of wells to each other and the fact that they each may tap into the same fracture sets. Fractures in the bedrock in this area may connect to potentially thicker saprolite development in the area north and west of the site which would provide greater water storage to support water withdrawals.

At this time, access to any potential well site will likely require some tree clearing and possibly an All-Terrain Vehicle type drill rig. The final placement of any well site also has to meet State setbacks for well head protection (i.e., set distances from property lines, structures, roads, septic fields, etc.). Prior to drilling, any well site location will have to be approved by the

NCDEQ Public Water Supply Section, and a well permit from the NCDEQ will have to be obtained.

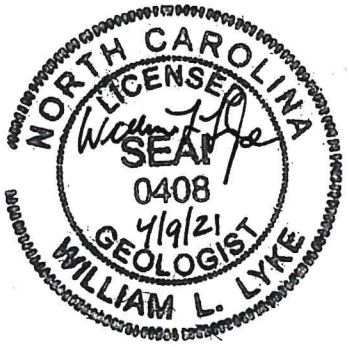
As you are aware, developing a groundwater system as a source of water supply for subdivisions in the fractured rock aquifers in North Carolina can be difficult and somewhat unpredictable. Therefore, GMA does not guarantee successful well installation at any well sites we have proposed. GMA has selected the sites that we believe have a higher probability of providing you the highest well yields available at this site.

GMA appreciates the opportunity to provide this information to you, and we look forward to continue working with you on this project as needed. If you have any questions, please feel free to contact me.

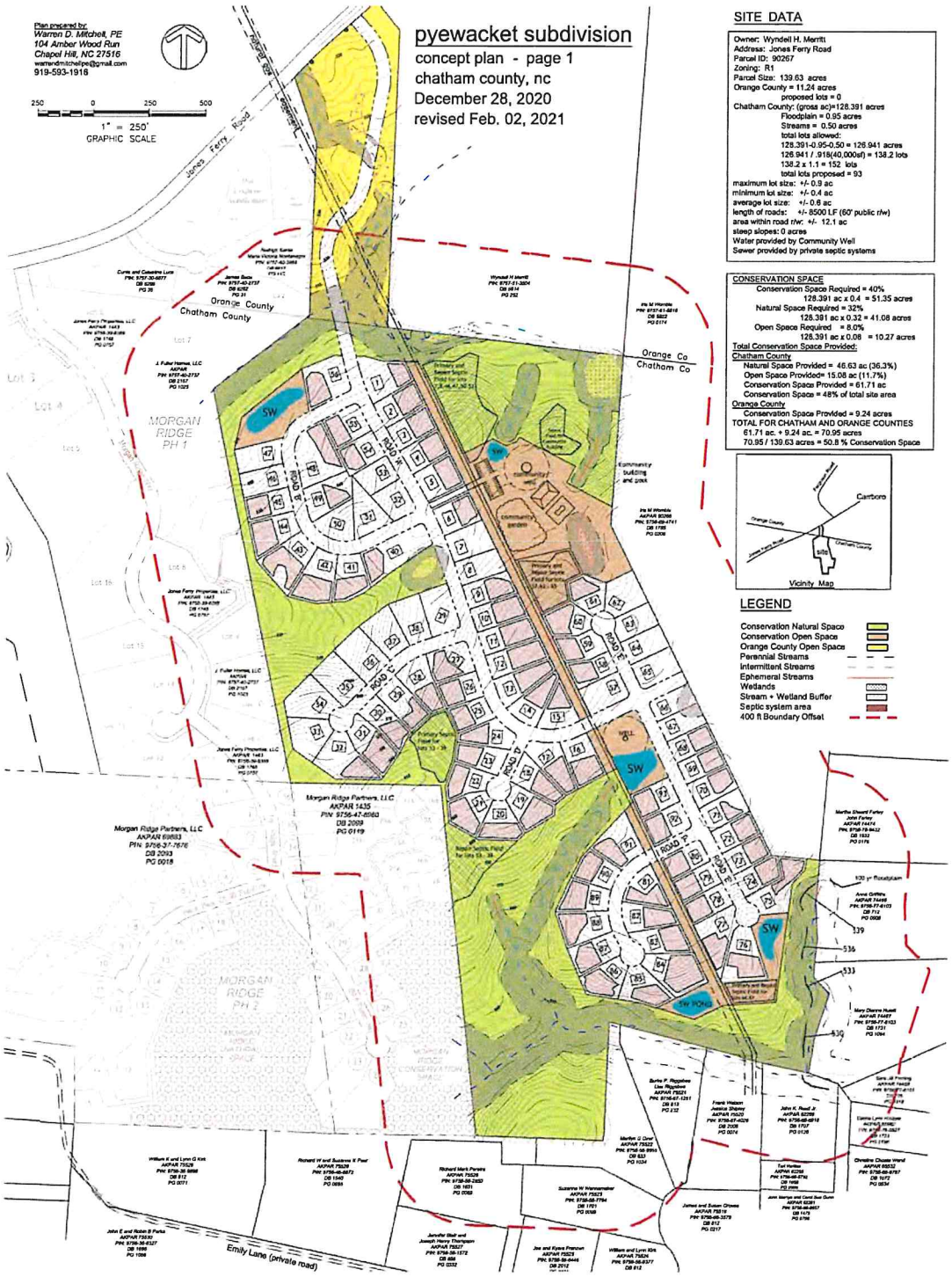
Best Regards,

Groundwater Management Associates, Inc.

William L. Lyke, P.G., P.E.
Senior Hydrogeologist/Civil Engineer



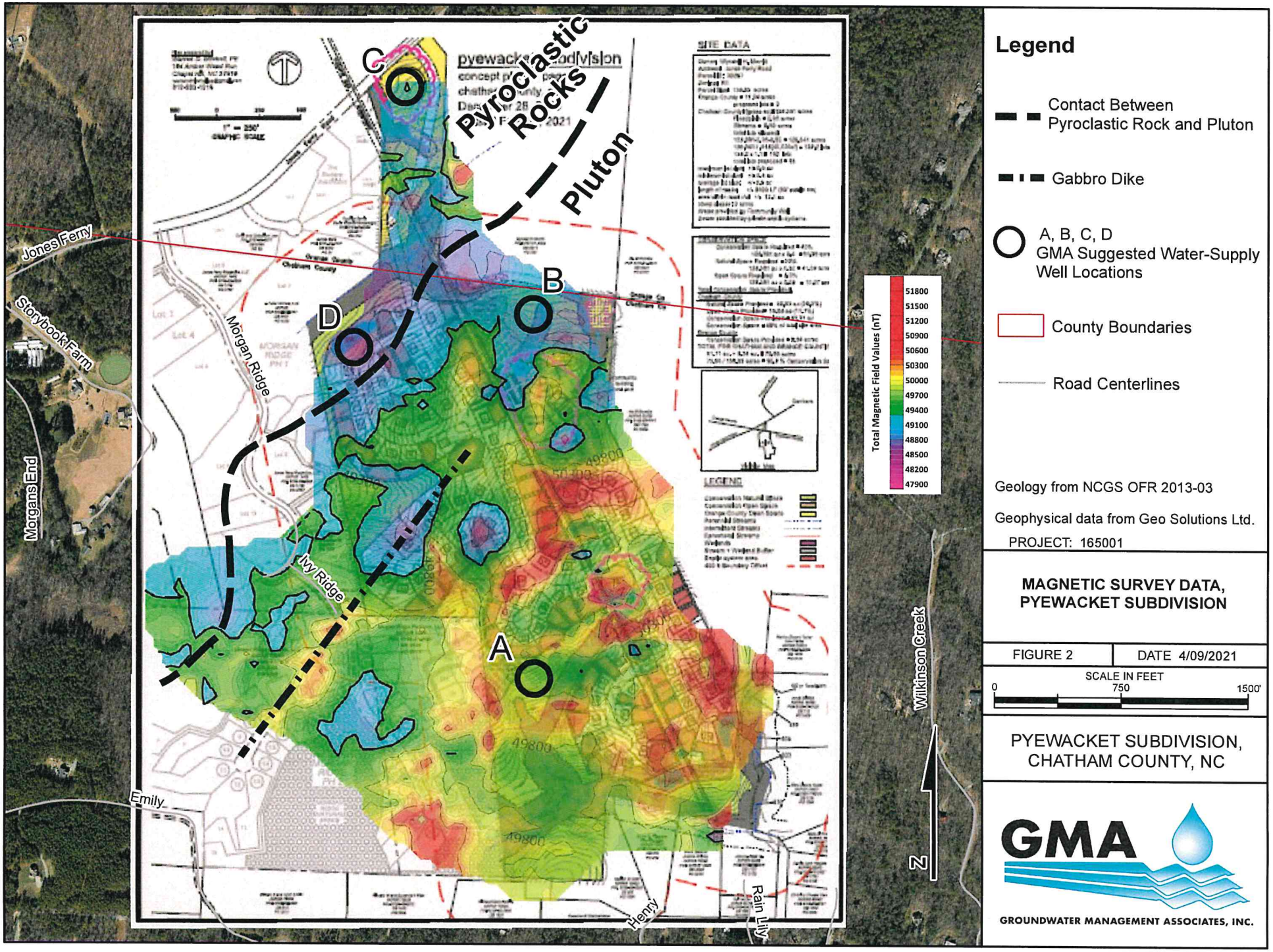
CC: James K. Holley, P.G., GMA, Greenville
Amy Cressman, GMA, Greenville



LOCATION MAP

GMA
GROUNDWATER MANAGEMENT ASSOCIATES, INC.

File: DRAWINGS/165001 FIGURE 1 LOCATION MAP	MAP SOURCE: WARREN MITCHELL	DATE: 04/09/2021
PROJECT 165001	PYEWACKET SUBDIVISION, CHATHAM COUNTY, NC	FIGURE 1



Legend

- Contact Between Pyroclastic Rock and Pluton
- Gabbro Dike
- A, B, C, D GMA Suggested Water-Supply Well Locations
- County Boundaries
- Road Centerlines

Geology from NCGS OFR 2013-03

Geophysical data from Geo Solutions Ltd.

PROJECT: 165001

MAGNETIC SURVEY DATA, PYEWACKET SUBDIVISION

FIGURE 2	DATE 4/09/2021

SCALE IN FEET
0 750 1500'

PYEWACKET SUBDIVISION, CHATHAM COUNTY, NC

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