Chatham County

Environmental Impact Assessment

Ryan's Crossing Subdivision

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List of Acronyms

AQI	Air Quality Index
BMP	Best Management Practice
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DOT	Division of Transportation
EPA	Environmental Protection Agency
ESA	Endangered Species Act
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NCDWR	N.C. Division of Water Resources
NCSWC	North Carolina Surface Water Classification
NHP	Natural Heritage Program
NRCS	Natural Resource Conservation Service
RCP	Reinforced Concrete Pipe
SHPO	State Historic Preservation Office
S&EC	Soil & Environmental Consultants
USACE	Unites States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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1.0 Executive Summary

The purpose of this Environmental Impact Assessment (EIA) is to evaluate the potential environmental impacts associated with the proposed Ryan's Crossing Subdivision as required under the Chatham County Subdivision Ordinance Section 6.2.B. This assessment was completed based on review of public documents and documents developed for Ryan's Crossing.

The proposed Ryan's Crossing project (the Project) is a 114-acre residential subdivision designed to meet the growing demand for residential housing in Chatham County. The Project will include residential homes and approximately 6,411 linear feet of public roads.

The EIA included a review of the potential direct, secondary, and cumulative impacts of the Project throughout the study area. This included information regarding the existing resources, anticipated impacts, avoidance/minimization efforts, and mitigative measures for each of the resource topics listed in section 6.2.B of the Chatham County Subdivision Ordinance.

2.0 Introduction

2.1 Scope of Work

Soil & Environmental Consultants, PA (S&EC) was contracted by Manns Chapel Subdivision LLC to create this EIA. This EIA will be submitted for the proposed Ryan's Crossing Subdivision in accordance with the Chatham County Subdivision Ordinance. An EIA is required for: "any proposed non-residential development project of two (2) contiguous acres or more in extent that disturbs two (2) or more acres" or "any proposed residential development project of two (2) contiguous acres or more in extent that will include fifty (50) or more dwelling units, whether detached single-family residences or in a multifamily structure or structures."

2.2 Limitations

This EIA was prepared by using public documentation, online sources and onsite sampling. This document serves to provide Chatham County with the necessary information needed to evaluate the potential environmental impacts associated with the proposed development at the time of submittal. It is assumed that the development will be constructed in accordance with all applicable local, state and federal regulations.

This report is intended for use only by Chatham County and Manns Chapel Subdivision LLC. The EIA is not intended or recommended for reuse on any other project. S&EC disclaims liability for any third parties use or reliance on this document.

3.0 Proposed Project Description and Need

The proposed Ryan's Crossing Subdivision project is a 114-acre residential subdivision designed to meet the growing demand for residential housing. The development will not connect to any adjacent projects at this time. The site is located approximately 7 miles south of Chapel Hill, North Carolina and approximately 9 miles north of Pittsboro, North Carolina. The majority of the site is bounded by Manns Chapel Road (SR 1532) to the west.

The project site is within the Haw Watershed of the upper Cape Fear River Basin, USGS Hydrologic Unit Code 0303002 (Seaber et al.). The site is depicted on the Bynum, NC USGS topographic quadrangle map located in the exhibits (Exhibit 8). The project drains to Wilkinson Creek which flows just south of the site. Careful consideration has gone into the site plan in order to minimize impacts to surface waters and wetlands. The Project will provide a minimum of 10-foot buffers of undisturbed vegetation around the perimeter of the site to maintain the aesthetic integrity of the property. A minimum of 100-foot riparian buffers will be utilized along perennial streams, 50-foot buffers along intermittent streams and wetlands, and a 30-foot buffer along ephemeral streams to minimize impacts to surface waters.

The project is a conservation subdivision and will preserve 40% of the site area in conservation space. As stated by the Chatham County Subdivision Regulations section 7.7, "A maximum of 20% of the required Conservation Space shall be Open Space and a minimum of 80% of such Conservation Space shall be Natural Space." Over 50% of the proposed Conservation Space will be contiguous as well in order to meet the requirements for a development to be considered a conservation subdivision. The estimated impervious surface post construction will be +/- 16%. There will be approximately 61 single family lots with minimum lot areas of around 30,000 square feet (+/- 0.69 acres). The constructed homes will be approximately 30 feet in height. Lots will be served by public water supplied by Chatham County public works and will have on-site subsurface wastewater (septic) systems on each lot for wastewater treatment. The Project will be built in a single development phase. Land disturbance will occur for the construction of the three residential streets, and storm water BMPs. The approximate area of disturbance for the road right-of-ways and storm water BMPs is 20 acres. An additional 12 acres will be disturbed for construction of the single-family homes and driveways. Storm water BMPs will be constructed as wet detention ponds able to handle the water quality/water quantity required by the Chatham County Storm Water Ordinance. Each residence will have a minimum of a two-car garage and will have the ability to have two cars in the home's driveway. No other visitor spaces or on-street parking spaces are planned (Exhibit 32).

3.1 Purpose and Need

The purpose of this report is to comply with Chatham County Subdivision Regulations Section 6.2.B. Per the U.S. Census, Chatham County's population growth rate expected to continue to increase from its current approximately 72,243 citizens, more residences will be needed to house

these citizens (www.census.gov). This site is an ideal location for accessibility to the Research Triangle Region (Chapel Hill, Durham, Raleigh, Research Triangle Park) and the Piedmont Triad Region (Highpoint, Winston-Salem, Greensboro) and assists with the County's healthy growth in population and economic status. Given the projected demographic growth of the County and the proximity to major business and research centers, the demand for quality community living is also expected to increase. This proposed Project will help address this need for housing in the area while preserving the environmental and aesthetic health and integrity of the County's rural backdrop. The Project's proximity to Highway US 15-501, Manns Chapel Road, and unique rolling topography is desirable to many individuals in search of residential community living within the region.

4.0 Alternative Analysis

The Project Site offers prime conditions for a conservation subdivision with lots utilizing individual on-site wastewater (septic) systems. This planned subdivision offers its residents with access to a public water supply and is readily accessible to major transportation corridors. The site has suitable soils and landscape positions for the disposal of wastewater via individual on-site subsurface wastewater (septic) systems.

4.1 No Action Alternative

Under the no action alternative, the proposed subdivision would not be constructed. Chatham County is rapidly growing and a demand for residential housing is increasing. Due to the subject property's close proximity to Chapel Hill and the Research Triangle Park, this land will likely be developed with single family lots. This type of development would not utilize the land as efficiently as the proposed conservation subdivision and would not achieve Chatham County's land use planning goals which encourage compact communities as the county continues to grow.

4.2 Alternative Sites

It has been determined that this is the preferred site over other locations for several justifiable reasons. The reasons include the existing physical location of the site, ability to avoid impacts to most surface waters, site topography, economic benefit to the County, and accessibility to other areas of the region including key commercial centers. The Project has a main unnamed tributary perennial stream that divides the property which will be protected with minimum 100-foot buffers. The Project is 5 miles upstream from the Haw River and therefore this location would lessen the potential impacts of major water supplies and/or intakes. Due to the minimal amount of old-growth forest within the developed area other than the two road crossings, past selective timber harvesting, and conservation of natural areas, the development of the site would not have an adverse effect on the natural vegetation of the area. The Project will provide the County with sustainable growth while preserving the natural and aesthetic beauty of the region.

5.0 Existing Environment and Project Impacts

For each of the resource topics below we have provided information on the existing condition, anticipated impacts, minimization/avoidance efforts and mitigative measures. Short term and long-term impacts include the construction and permanent impacts associated with two proposed road crossings of the streams and utilizing reinforced concrete pipes (RCP), as well as outlet protection. Locations of these crossings were selected to minimize and or avoid disturbance to the streams, wetlands and riparian buffers. The impact areas will be developed based on the proposed grading plan. The developer will attempt to impact less than 150' of stream for both stream crossings depending on final site plans. Impacts will total less than 300 feet in order to prevent the need for an individual permit. No required mitigation is anticipated at this time. See the attached plan for the approximate graded area for the public road right-of-ways (Exhibit 32). Earthwork computations will be estimated at the time of construction plans. Owners are aware of necessary USACE/DWR permit application requirements and Chatham County buffer crossing authorization and will complete these prior to construction.

5.1 Geography

The site is located in the Carolina Slate Belt geographic ecoregion of NC, which mostly consists of metamorphic rocks derived from metamudstone and metaargillite. This site overlies a pluton of granite to granodiorite geologic material that intruded the Carolina Slate Belt. Based on 2016 USGS NCGS Geologic Map of the Bynum 7.5-Minute Quadrangle, the majority of the underlying geologic material on this site consists of East Farrington pluton main facies (Zefg-m) metamorphic geologic material and there is an area of Alluvium (Qal) sedimentary geologic material in the south west corner of the property (Exhibit 21). The East Farrington pluton was formed during the Neoproterozoic era of geologic time which was about from 1,000 to 550 million years ago. There is also a strike and dip inclined joint surface location on the southern portion of the property. There are many resistant boulders that can be seen along ridges, knolls and hilltops throughout the site. Since the proposed subdivision will receive water from Chatham County, no wells will need to be constructed that would potentially impact the geology of the site.

The East Farrington pluton main facies (Zefg-m) contains "leucocratic, orange pink to pinkish-gray to gray, unfoliated, medium to course grained, equigranular to slightly porphyritic, amphibole (va. hornblende) granite to granodiorite. Amphibole content varies from approximately 5 to 10% by volume and occurs locally as dark green, elongate crystals up to 1.5 cm long and amorphous intergrowths with feldspar and quartz up to 0.5 cm diameter. Dark gray xenoliths/enclaves up to 8 cm in diameter are common. Grain size becomes finer and xenoliths/enclave larger near the plution edge. Cavities, less than 1 mm in diameter, with

euhedral terminating crystals are common in some specimens. In thin section the main facies can be separated into two groups: 1) rocks with a porphyritic texture with orthoclase and plagioclase phenocryst in a groundmass of intergrown orthoclase, plagioclase and quartz with a granophyric texture (micrographic texture) and 2) porphyritic and equigranular rocks consisting of orthoclase, plagioclase and quartz without a granophyric texture in matrix. The two varieties appear to be intermingled throughout the study area and within the adjacent Farrington Quadrangle" (Bradley et al., 2007) (Bradley et al., 2013).

The Alluvium (Qal) geologic material contains "unconsolidated poorly sorted and stratified deposits of angular to sub rounded clay, silt, sand and gravel to cobble sized clasts, in stream drainages. May include point bars, terraces and natural levees along larger stream floodplains. Structural measurements depicted on the map within Qal represent outcrops of crystalline rock inliers surrounded by alluvium" (Bradley et al., 2013).

The Project site is located just north of Wilkinson Creek. The close proximity of the Site to the stream results in a small portion of the property being located in the flood area "AE". See the attached NC Floodplain Mapping Program Map for the exact location (Exhibit 15). This zone depicts areas in a 1% annual chance floodplain (100-Year). This section of the property will remain undeveloped and is included in the portion of the site that will be left as open space.

-5.1.1 Topography

The project site has a rolling terrain with slight to steep slopes with a large stream valley dividing the property (Exhibit 14). The stream valley that divides the property contains, unnamed tributary streams and wetlands that feed to Wilkinson Creek. The site is located in the central piedmont physiographic region. The topography of the site varies from a high elevation of approximately 528 feet above mean sea level (MSL) to a low of approximately 415 feet MSL where the large surface water drainage area exits the property to the south.

During and after construction the existing topography on site will be altered slightly from land clearing, grading and on-site wastewater (septic) system activities associated with development of the planned subdivision (Exhibit 32). The Project has been designed in such a manner so as to retain the topographical character of the site as much as possible. Cut and fill volumes will be balanced, and no soil will be imported to the site or exported from the site. The Project will have no significant adverse impacts on topography or geology.

5.2 Soils and Prime Farmland

Soils on this site are primarily sandy textured due to the weathering of the residual granite to granodiorite parent material. The upland soils mostly consist of soils with a sandy loam surface

and a clay to sandy clay loam subsoil. The lowland soils mostly consist of soils with a sandy loam to loamy surface, a sandy clay loam to sandy loam subsoil, and can be found near the streams and wetlands (Exhibit 3).

According to the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey, the project area contains soils similar to Wedowee sandy loam, Vance sandy loam, Chewacla and Wedhadkee soils. Some soil areas are noted by NRCS to contain boulders. USDA NRCS Farmland Classification indicates that approximately 62.2% of the soils on this site are suited as prime farmland/farmland of statewide importance (under current conditions). In areas suited for agricultural purposes, these soils are typically used for the cultivation of corn, small grains, soybeans, tobacco, vegetables, and/or hay. In areas that prohibit agricultural cultivation due to steep slopes, boulders, and/or drainage features, the primary native vegetation found on these soils is a mix of pine/hardwood tree species. Important Farmlands within North Carolina are organized into three individual categories including Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. Criteria established to determine these classifications was published January 31, 1978 in the Federal Register and amended on June 17, 1994. The North Carolina NRCS State Soils Staff developed the criteria for farmland of statewide importance in 1988. The specific definitions for all three categories are located within the appendix. NRCS does not accurately show soil types/areas or potential prime farm land/farmland of statewide importance due to field discrepancies, map scaling, drainage features, streams, wetlands, etc (Exhibit 19). The subject property contains rock outcrops, drainage features, large hills and a rocky soil surface making the majority of the site unsuitable for farming. Potential farm land could be lost in the proposed construction areas.

Based on the NRCS Soil Survey, all areas containing the Vance and Wedowee Sandy Loam soil series have been determined to be prime farmland if they occur on 2 to 6 percent slopes. All areas containing the Wedowee Sandy Loam soil series with 6 to 15 percent slopes are considered areas with farmland of statewide importance. All areas containing the Chewacla and Wehadkee soils are considered areas with prime farmland if those areas are drained and either protected from flooding or not frequently flooded during the growing season. Soil areas with slopes exceeding 15 percent slope and/or contain boulders have been deemed not prime farmland. The applicability of farmland importance only takes into account agricultural crop commodities, and not silvicultural commodities (i.e., timber harvesting).

Based on preliminary soils and site evaluation for on-site subsurface wastewater (septic) systems and viewing NRCS historical aerial maps of the site, four soil areas were identified as past/former farmland and/or pasture areas. These areas are labeled FA-1 through FA-4 on the Past Farmland Map. Currently, these four areas have thick vegetation, shrubbery, and trees. Approximately 3.75 acres of past/former farmland (FA-1) will be disturbed during the construction of the subdivision. Currently, agricultural Lands do not exist on this site. Since

there no existing farmland will be impacted, no impacts to prime or agricultural lands will occur on this site.

In June 2017, Soil and Environmental Consultants, PA (S&EC) conducted a preliminary soils and site evaluation for on-site subsurface wastewater (septic) systems on this site. S&EC observed upland soils similar to Appling, Pacolet, and Wedowee Soils with inclusions of Helena soils. Several boulders were observed on the property as well as several rocky areas. The soil/site evaluation criteria used to determine suitable soil areas for septic systems are contained in 15A NCAC 18A .1900.

The upland soil constraints for use on onsite septic systems primarily observed on the site are steep slopes, shallow rock, boulders, and drainage features. Additional soil constraints that were observed throughout the site include shallow water table, slowly permeable clay, wetlands, and streams.

The clearing and grading for the proposed site will result in some soil disturbance along the roads and around the storm water BMP devices. However, adequate measures will be taken to minimize erosion such as silt fencing, sand bags and sediment traps. It is typical that a grading operation for the public roads will work to balance earthwork cut and fill. The goal of the earthwork project is to balance on-site soil so no soil would have to be imported or exported from the site. The roads are planned to be shoulder sections (no curb and gutter) with roadside ditches to direct roadway runoff to one of three proposed storm water BMPs within the project. The proposed site plan should have no substantial impact on the soils on each lot or in the open/conservation space (Exhibit 32). The potential for soil contamination is possible due to heavy machinery being utilized for construction. If contamination occurs, spills will be cleaned by certified professionals and disposed of immediately.

5.3 Land Use

Evidence of past timber harvesting (i.e. stumps and lack of old-growth) can be seen throughout the site. It appears that logging occurred due to the heterogeneity of the existing tree age classes on the site. There are also areas with barbed wire on trees, which implies that portions of the tract were in pasture or farmland. There are four areas that were observed in historical aerial maps that appear they were once managed as pasture or farmland (Exhibit 19). Currently, there is a few home sites on the out parcel. There is an old home structure near the northeast corner (Exhibit 25). In addition, a high-power transmission line right-of-way runs east to west through the site as well as a maintained gas pipeline that runs southwest across the property. The remaining property is forested. Surrounding properties are primarily used for residential development with some agricultural areas interspersed.

The current zoning of the property and surrounding area is classified as R-1 with the exception of the abutting Briar Chapel Subdivision which is in district CUD-CC. See the attached Zoning

Map (Exhibit 11). According to the Chatham County Zoning Ordinance R-1 (Residential District) is, "Primarily for low to moderate density residential development within the residential-agricultural areas of the jurisdiction." The zoning area will not need to be changed for the proposed project.

Existing land use will be modified from silvicultural land to a residential subdivision. Large areas of the tract (approximately 40%) will be conserved for open space in the form of recreational areas, riparian buffers, ponds, and wetlands. Portions of the open space areas have hiking trails.

5.4 Existing and Natural Resources

In 2017 S&EC conducted a detailed wetland delineation consistent with the USACE Wetland Delineation Manual (1987) and Eastern Mountains and Piedmont Region Reginal Supplement. S&EC also conducted a Chatham County Stream Buffer evaluation. Copies of the Detailed Delineation Report and Sketch Map are attached. The sketch map depicts surface waters and buffers that have been confirmed with Andy Williams of the USACE and Drew Blake of Chatham County. Andy Williams confirmed jurisdictional features on January 11, 2018. Drew Blake confirmed the Chatham County stream buffers on January 2, 2018. Onsite confirmation of the stream buffers and jurisdictional features has been completed. See the attached buffer letter (1/2/18) and correspondence with Andy Williams regarding jurisdictional feature confirmation (Exhibit 34). The USACE official report is still being processed at this time. Wetland types on-site were identified as primarily bottomland hardwood and headwater forest wetlands (North Carolina Wetland Assessment Method Version 5, February 2016).

The site planning process involved determining ways in which surface water could be avoided. The majority of the jurisdictional waters and buffers are to be avoided completely. Two streams will be impacted along with the associated Chatham County stream buffers during the construction of the public roadways. The developer plans to keep both stream crossings under 150 feet of total impact. Mitigation for the buffer impacts are not anticipated at this point. The owner is aware that stream mitigation may be required from the USACE depending on the final site plan. Appropriate permits (NWP 29 & GC 4139) will be acquired prior to construction.

5.5 Public Lands and Scenic, Recreational, and State Natural Areas

There are no public lands or scenic, recreational, or state natural areas within the project site. One recreational bike route runs along Manns Chapel Road just west of the site. This route will be unaffected by the proposed development. See attached Park Map (Exhibit 12).

5.6 Areas of Archaeological or Historical Value

Cultural Resources are protected by law under the Indian Antiquities Articles of the North Carolina Administrative Code and Section 106 of the National Historic Preservation Act of 1966. Section 106 protects properties that possess significance but have not yet been listed or formally determined eligible for listing in the National Register. The State Historic Preservation Office (SHPO) in Raleigh, North Carolina should be contacted if archeological artifacts are uncovered during the construction.

In December, 2017, S&EC personnel searched the files at the SHPO office for historical sites found within the project's boundaries. No historic records were found in our search. There is one structure on the property that was thought to have the potential to be subject to SHPO regulation and has already been determined as significant to Chatham County Historical Society. See the attached Chatham County Historic Association Notes and Photos (Exhibit 26). The historical site is located near the northeastern property corner and on an upland area between two perennial streams. The historical site within the project site contains an old home site and structure (Exhibits 24, 25, 26). A SHPO project review request was conducted in order to determine if this structure or any other historical resources were of concern to the NC Department of Natural and Cultural Resources. On January 16, 2018 SHPO determined in a letter to S&EC that they, "*Are aware of no historic resources which would be affected by the project*." Please see the SHPO letter in the attachments section (Exhibit 24).

The structure located onsite may be demolished during the construction of the subdivision for safety reasons. The developer will attempt to work with the Chatham County Historical Society to salvage the stone fire place associated with the structure. This is not required by SHPO or Chatham County.

One other home and associated sheds are located on the site. This building is located on the out parcel and is thought to be constructed in the 1980s. There are no plans to demolish these structures at this time.

5.7 Air Quality

Currently, the majority of Chatham County is in attainment status with respect to National Ambient Air Quality Standards. The northeastern portion of Chatham County, Wake County, Orange County, Durham County and the northwestern half of Johnston County are currently within a North Carolina Recommended 8-hour Ozone Non-attainment Boundary. Non-attainment areas are those that have pollutants such as ozone that exceed federal air quality standards. In 2002, the Air Quality Index (AQI) Values for the Greensboro-Winston-Salem-High Point area were typically "Good" to "Moderate" with 1 day recorded as "Unhealthy" (DENR 2000). The 2002 AQI values for the Raleigh/Durham area were generally "Good" to

"Moderate" with 23 days "Unhealthy for Sensitive Groups" and 7 days "Unhealthy." Data from 2003 has not yet been posted and so was unavailable at the time of this report's preparation.

No direct significant negative impacts to air quality are expected as a result from this project following the construction phase. During the construction phase of the Project, machinery utilized will produce emissions resulting from the combustion of petroleum products, much like emissions from previous timber harvesting activities. Construction specifications for the Project will require mechanical equipment to meet emissions standards established by the State of North Carolina for the equipment utilized. Any burning will be conducted under controlled conditions with the appropriate permits from the local authorities if applicable.

Automobile activity will increase after construction as a result of development, but at relatively moderate levels. As stated on the Division of Air Quality's webpage (http://daq.state.nc.us/monitor/aqi/aqi_gen.shtml) "DAQ monitors for carbon monoxide specific areas of NC, but the concentrations have decreased by more than 75% in the last 20 years."

The Project will have no significant adverse impacts on air quality during construction or following completion of development. The Clean Air Act, Environmental Protection Agency (EPA), National Ambient Air Quality Standards (NAAQS) 40 CFR Part 50. North Carolina Ambient Air Quality Standards 15A NCAC 02D .0400

In accordance with North Carolina Open Burning regulations 15A NCAC .02D .1900, all necessary open burn permits will be obtained online from North Carolina Department of Forestry or from one of the several permit agents in Chatham County. When an open burn permit is not necessary then the burning will meet the criteria set forth in Paragraph B of 15A NCAC .02D .1903. Open burning will not occur on the site when a "No Burn Ban" is in effect for this region. Non-vegetative materials will not be burned, such as garbage, lumber, or other synthetic materials.

This project is not subject to North Carolina Control of Odors regulations 15A NCAC 02D.1800. If any odors are released in association with this project, the odors will be temporary and insignificant.

The traffic impact analysis conducted by Kimley-Horn confirmed that no off-site traffic studies are warranted. The analysis states that, "A*ll study intersections are expected to operate at an acceptable LOS at project build-out without queueing issues, and since volumes are not expected to exceed NCDOT Turn Lane Warrant thresholds, no roadway improvements are recommended."* Please see the attached traffic impact analysis and correspondence with the DOT (Exhibit 33).

5.8 Noise Levels

This region of the county is predominately rural and the majority of the noise producing activities are directly related to localized farming and logging operations. The site is vacant other than the home located on the out parcel. The current noise generated on site is primarily the result of minor lawn care operations and noise associated with the home owner's automobile. Currently, noise levels are very low on-site. In the past, noise levels were somewhat higher during timber harvesting which was done between 2010 and 2011.

Noise levels are expected to increase during the construction phase of the project. Temporarily increased noise levels will result from commonly used mechanical equipment that will be utilized to grade the site and construct the road infrastructure and homes. Based on noise calculations, it is believed that the noise produced from this project will not exceed one half mile. No commercial uses are proposed. We are not anticipating any long term negative affects from noise to surrounding properties. Following completion of the project, noise levels will return to normal level typical of a residential subdivision.

5.9 Light Level

Lighting is not required for the subdivision, though the project will likely provide street lighting designed by Duke Energy (Greg Sturkin). The developer will utilize light shields or other methods in order to concentrate light on the street and prevent any undesirable spillage. The lighting will be reviewed by and will meet all Chatham County lighting requirements.

Artificial light has the potential to disorient nocturnal wildlife species that utilize the moon for navigation. The proposed Project will not produce excessive amounts of artificial light and will likely not pose a major threat to wildlife.

5.10 Surface and Groundwater Resources

-5.10.1 Surface Waters

The site is located in the Haw watershed of the upper Cape Fear River Basin, USGS 14-digit Hydrologic Unit Code 03030002-050100 (Seaber *et. al*. 1987) (Exhibit 18). The site contains several un-named tributaries that eventually flow into Wilkinson Creek. The watershed area of this site is approximately 150 acres. N.C. Division of Water Quality (DWQ) stream index numbers for the aforementioned creek is 16-35 (NCSWC 2018). Wilkinson Creek has a best use classification of "WS-IV;NSW" (Exhibit 17). "WS-IV;NSW" classified waters are protected as water supplies that are generally in moderately to highly developed watersheds; point source discharges of treated wastewater are permitted pursuant to Rules .0104 and .0211, local programs to control non-point source and storm water discharge of pollution are required (DEQ

2011). Waters classified as "NSW" or "Nutrient Sensitive Waters" are those that have the potential to exhibit high levels of nutrients. More stringent regulations exist on these waters in order to better protect the water quality downstream. Wilkinson Creek is a tributary of Jordan Lake. Rules have been established to mitigate nutrient pollution entering the lake from waters upstream. The rules were deigned to improve and or maintain water quality in the lake. Buffers are required on all NSW waters and upper tributaries of Jordan Lake. These help to reduce pollutants entering these water bodies. The Ryan's Crossing site will abide by all required buffers and surface water regulations.

-5.10.2 Groundwaters

The Piedmont of North Carolina is underlain by crystalline-rock aquifers. These aquifers are lined by dense, almost impermeable bedrock that yields water from fractures and secondary porosity. Recharge predominately occurs along the interstream areas through porous regolith and fractures in the bedrock. The majority of groundwater moves laterally and enters depressions in the landscape such as stream channels. Solum thickness has a direct correlation to groundwater storage, generally, the thicker the overlying regolith the greater the volume of water storage potential and subsequent well recharge/discharge capacity. Typically, groundwater recharge is greater in valleys and depressional areas due to the thicker regolith, and proximity to fracture zones in the bedrock. Groundwater quality is generally suitable for drinking and other uses, but iron, manganese, and sulfate can occur at undesirable levels (USGS 2001). The groundwater onsite will not be used for drinking as water will be supplied by Chatham County.

Most observable changes in groundwater quality are related to land use and waste disposal patterns. Underground storage tanks, waste lagoons and disposal landfills are commonly responsible for point source contamination. However, more dispersed contamination by non-point sources is increasing and is manifested by petroleum, pesticide and biological contamination. No land uses commonly associated with groundwater contamination were encountered during the field inspections of this site.

Water quality is likely to be temporarily reduced as the result of the grading activities proposed. Construction will likely increase erosion and sedimentation of creeks immediately downstream of the site. Increased sedimentation has the potential to lower dissolved oxygen levels that can be detrimental to aquatic organisms. Utilizing currently accepted and required sediment and erosion prevention techniques; potential adverse effects during the construction will be minimized and isolated. The construction site will employ the necessary and required sediment and erosion control measures as dictated by the North Carolina Division of Land Resources. Immediately following the completion of the project, erosion rates are expected to be reduced. Storm water runoff rates will most likely increase due to the addition of impervious area, which is typically associated with development (i.e., roof tops, asphalt, concrete), but all efforts will be made to control and treat storm water runoff during the design phase of the project.

The Chatham County Watershed Protection Ordinance was revised February 20, 2012 to require stringent buffer requirements around surface water features in the County's jurisdiction. The ordinance requires all stream classifications to be conducted by a qualified professional who has received documented certification of training in classifying streams and surface waters in North Carolina. Additionally, all wetland delineations must be conducted by a qualified professional who has at least 2 years of demonstrated experience in conducting wetland delineations in North Carolina under the Clean Water Act Sections 401 and 404 provisions. All field determinations of streams are subject to review and approval by the County.

The ordinance requires a one hundred (100') foot buffer along each side of perennial streams, or the full horizontal extent of the "Area of Special Flood Hazard 5" as most recently mapped by the North Carolina Floodplain Mapping Program, NC Division of Emergency Management, whichever is greater. Intermittent Streams require a fifty (50') foot riparian buffer along each side. Ephemeral Streams require a thirty (30') foot buffer along each side. Wetlands require a riparian buffer of fifty (50') feet from the delineated boundary, surrounding all features classified as wetlands and linear wetlands.

5.11 Fish and Aquatic Habitats

Wilkinson Creek is the primary perennial, important stream just south of the site. Fish habitats are isolated to small perennial tributaries associated with Wilkinson Creek. Fish species present within these water bodies are typical of the piedmont region and include species such as mosquito fish and creek chub. Macrobenthos were located in low numbers within the southern end of the main perennial feature.

Aquatic Habitat was strongest within the lower reaches of the main perennial drainage. This area contained a strong riffle pool complex as well as ample substrate and aquatic vegetation. The northern sections of the perennial streams and intermittent drainages provide weak aquatic habitat due to a general lack of base flow. The average width of streams onsite is approximately 4 feet with an average depth of around 6 inches (Exhibit 6).

These features will be primarily conserved within the conservations areas with the exception of two road crossings. These crossing will occur in areas where aquatic habitat is of a lower quality while the highest quality habitat on the site will remain undisturbed.

5.12 Wildlife and Natural Vegetation

The site exhibits a sporadically located, heterogeneous mix of plant community types. These plant communities generated through natural succession and were most likely manipulated by past and existing land uses. Examples of manipulation include but are not limited to land clearing for agricultural purposes, clearcutting, fire suppression, power and sewer easements, and dirt road construction and maintenance. The site and the immediate vicinity contain several

dirt trails and roads, ditches, wetlands areas, beaver ponds, stream channels, power and sewer easements, and forested riparian areas. This interspersion of habitat types has a direct correlation to the wildlife population dynamics and the species diversity. Wildlife habitat located in the vicinity include Loblolly Pine Forests, Oak-Hickory communities, mixed hardwood communities, forested wetlands and riparian areas, beaver impoundments, and stream channels.

Portions of the existing vegetation will be removed or modified during construction. After development vegetative areas such as forested buffers and greenways will be maintained throughout the life of the project. Temporarily displaced wildlife are expected to migrate to adjacent habitats during the construction period, however, most species will have adequate resources after development, and may return once the project is complete. The conservations areas will serve as permanent habitat for wildlife. These areas will also maintain the natural vegetation onsite. The highest quality habitat on the site will be encompassed within the conservation area in order to avoid negative impacts.

-5.12.1 Forest Resources

Distribution and composition of the plant communities on and immediately adjacent to the site reflects the landscape variations in topography, soils, hydrology, and past or present land use practices. The plant communities observed within the property were limited due to intense past silvicultural practices, topography, and soils. Most of the site was clear cut between 2010 and 2011. This has resulted in the property containing mostly early successional habitat except in areas that weren't logged predominantly the streamside management zones (SMZ's) along the streams. These undisturbed zones include areas within the stream buffers, around existing structures and on steep hillslopes. See "attached map for the locations of the community types found onsite (Exhibit 23).

Forests located on-site will be impacted by the proposed site plan. Portions of the site were cut and harvested at various times in the past. However, approximately 40% of the site will be preserved in the form of conservation area including the more fragile and older growth communities associated with the surface waters located on the property. No landscaping plans have been created at this time.

The following plant communities based on the community descriptions published within the Classification of the Natural Communities of North Carolina Fourth Approximation were found on the Ryan's Crossing site (Schafale 2012):

Dry-Mesic Oak-Hickory Forest
The Dry Oak-Hickory Forest generally occurs in higher elevation areas onsite away from surface waters. The composition of the canopy, for the most part, does not differ greatly, but the proportions of the species involved does. At Ryan's Crossing, the Dry-Mesic Oak-Hickory

Forest has more southern red oak (*Quercus falcata*) and black oak (*Quercus velutina*) while the Dry Oak-Hickory community has a greater proportion of scarlet oak and a small component of Post Oak (*Quercus stellata*). The Dry-Mesic Oak-Hickory forest still contains a component of pines throughout a majority of the Site. The subcanopy is primarily the same as in the Dry Oak-Hickory community but beech (*Fagus grandifolia*) does contribute to the composition. The shrub and herb layer is slightly more diverse containing additional species such as *Viburnum rafinesquianum*, Christmas fern (*Polystichum acrostichoides*), and rattlesnake plantain (*Goodyera pubescens*).

Mesic Mixed Hardwood Forest (Piedmont Subtype)
This community type occurs in areas that have a higher moisture regime and nutrient content. The canopy is dominated by mesophytic hardwood species such as American beech, white oak, red oak, tulip poplar, sweet gum, and pignut hickory and a few scattered loblolly pine. The subcanopy is comprised of sourwood, red cedar, American holly, umbrella magnolia (*Magnolia tripetala*), and flowering dogwood. The shrub layer is somewhat diverse with species such as *Viburnum rafinesquianum*, hazelnut (*Corylus americana*) and blueberries. The herb layer is also quite diverse with species such as beech drops (*Epifagus virginiana*), bluets (*Houstonia caerulea*), spotted wintergreen, heartleaf (*Hexastylis arifolia*), cranefly orchid, grapefern (*Botrychium virginianum*), foamflower (*Tiarella cordifolia*), and liverleaf (*Hepatica americana*).

Piedmont/Mountain Bottomland Forest
This community type occupies the floodplain surrounding the larger perennial stream within the Site. The canopy is comprised of tulip poplar, sweetgum, American elm (*Ulmus americana*), river birch (*Betula nigra*), and red maple (*Acer rubrum*). The subcanopy is composed of American Holly and musclewood (*Carpinus caroliniana*). Due to recent disturbance in this community, autumn olive (*Eleagnus umbellata*), has invaded the shrub layer a great deal. In addition, another exotic, *Microstegium virmineum*, comprises much of the herb layer. Other herbaceous species include cranefly orchid, hearts-a-burstin, Christmas fern, greenbrier (*Smilax rotundifolia*), netted chain fern (*Woodwordia areolata*), bedstraw (*Galium tinctorium*), and Japanese honeysuckle (*Lonicera japonica*).

Piedmont/Mountain Semi-permanent Impoundment
Beaver (*Castor canadensis*) activity has resulted in several impounded areas and associated emergent wetlands along Wilkinson Creek. This community is devoid of canopy species and prevalent in hydrophytic vegetation. Woody vegetation along impounded areas include black willow (*Salix nigra*), elderberry (*Sambucus canadensis*), and black chokeberry (*Aroma melanocarpa*). Emergent herbaceous vegetation include cattail (*Typha latifolia*), waterlily (*Nymphaea* spp.), rush (*Juncus effuses*), and bulrush (*Scirpus cyperinus*). This community contained various wildlife associated with water including various turtles, frogs [spring peeper (*Pseudacris crucifer*), upland chorus frog (*Pseudacris feriarum*), northern cricket frog (*Acris crepitans*)], eastern newt (*Notophthalmus viridescens*), wood duck (*Aix sponsa*), red-winged

blackbird (*Agelaius phoeniceus*), belted kingfisher (*Megaceryle alcyon*), Canadian goose (*Branta canadensis*), mallard (*Anas platyrhynchos*) and osprey (*Pandion haliaetus*).

Early Successional Areas

Examples of Early Successional Communities occur within the two utility easements and recent clear-cut areas on the site. The power line right-of-way is maintained and thus weedy species including exotics occupy the easement. Species observed include horseweed (*Erigeron canadensis*), purple top (*Tridens flavus*), plume grass (*Erianthus contortus*), Panicum spp., rabbit tobacco (*Gnaphalium obtusifolium*), young red cedar, broomsedge (*Andropogon virginicus*), wooly mullein (*Verbascum thapsus*), smooth sumac (*Rhus glabra*), and Tree-of-Heaven (*Ailanthus altissima*). The pipeline is also maintained and contains mostly grasses such as fescue (*Festuca elatior*). The clear-cut areas are comprised of sweet gum (*liquidambar styraciflua*) loblolly pine (*Pinus taeda*) and red maple (*Acer rubrum*) saplings. Blackberry (Rubus Spp.) provides nearly 100% of the understory cover. Non-native species also exist in these early successional areas such as Chinese privet (Ligustrum sinense) and Autumn olive (Elaeagnus umbellate).

-5.12.2 Protected Species

Species with Federal classifications of Endangered or Threatened are protected under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). According to a file review completed by S&EC personnel on the NHP (Natural Heritage Program) website and record search for species listed by the U.S. Fish and Wildlife Service (USFWS) on January 18, 2018 threatened, endangered, and Federal Species of Concern are located in Chatham County, however there are no documented occurrences on the Site. The Northern Long Eared Bat is listed as "May affect, but not likely to adversely affect" solely due to the fact that there are potential roost trees on site. No Northern Long Eared Bats or their roost trees have been observed on or near the site. A copy of our review of the NHP files and USFWS Concurrence letter is included in the appendix (Exhibit 27).

On January 18, 2018, S&EC personnel reviewed files at the Natural Heritage Programs office in Raleigh, NC. Although not present on-site, the Cape Fear Shiner (*Notropis mekistocholas*) has been documented within a five-mile radius of the site. Drainage from the site ultimately flows into Wilkinson Creeks before entering the Haw River. Three occurrences of the Cape Fear Shiner have been recorded in the Haw River within the five-mile radius, with one occurrence upstream of the confluence of Dry Creek and the Haw River and two occurrences downstream. The Project does not offer suitable habitat for the Cape Fear Shiner, which utilizes streams with a cobbly or gravelly substrate. The streams onsite are generally silty and contain debris with the exception of the lower reaches of the main perennial drainage. This section of stream however is much too shallow and narrow and does not contain enough pooled areas to support the shiner. In addition, the presence of beaver ponds on the site act as a barrier for migration of this listed species.

A list of expected wildlife within this region of the state is located in the exhibits section. (Exhibit 30) (Martof, Webster amended according to NC Natural History Museum website).

Invasive plant species many times outcompete natives following disturbances such as the clearcutting that took place onsite. This has resulted in many of the early successional areas containing Autumn olive and Chinese privet. Areas of the site also contain Japanese stilt grass where soils have a higher moisture content and light levels are lower. Many are the areas with the proposed development area are overrun with invasive species while some of the better habitat areas onsite containing mostly native species will be left undisturbed.

5.13 Hazardous Materials

When utilizing mechanical construction equipment there is always the potential for accidental spills of fuels such as gasoline or diesel. All re-fueling will occur in designated upland areas, as far as feasible from surface waters. Spills that may occur will be contained immediately by certified personnel and disposed of appropriately. After development, automobiles and typical equipment and chemicals will be utilized to maintain the landscaped open space and subdivision homes. We consider these activities to be of a de minims nature and would be insignificant.

6.0 Conclusion

The Environmental Impact Assessment for the proposed Ryan's Crossing Subdivision was completed to determine the potential environmental effects this development could have on the site and surrounding property.

The Ryan's Crossing Subdivision will contain approximately 61 single family lots and will be developed as a conservation subdivision that will accommodate the increasing population of Chatham County.

Throughout the construction of the subdivision, measures will be taken to ensure impacts to the environment are minimized and development is performed in a practical yet environmentally friendly manor.

References

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State and Federal Permits

(Include but may not be limited to)

- USACE approved stream/wetland delineation
-
- NCDWR 401 Water Quality Certification
- USACE 404 Permit (NWP 29/GC 4139)
- Chatham County Riparian Buffer review
- Chatham County Soil Erosion and Sedimentation Control
- Chatham County Environmental Resources storm water permit
- NCDOT driveway permit
- NCDOT subdivision roadway permit
- NCDOT encroachment agreement
- Chatham County Public Works water system approval
- Chatham County Public Works fire flow analysis
- NCDEQ Public Water Supply water permit
- Chatham County/NCDEQ individual septic permits

Exhibits

Exhibit 1

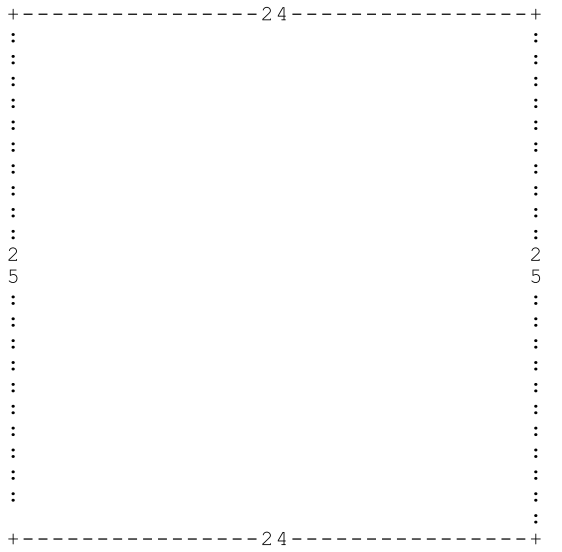
Chatham County Property Record Card

```
DATE 11/03/17                              CHATHAM CO TAX DEPARTMENT                                PAGE     1
TIME 16:11:34                                   PROPERTY CARD                PIN... 9755 00 97 5436 PROG# AS2006
USER NCH                                        FOR YEAR 2018
RYAN LARRY WINSTON                PARCEL ID.. 0001777
                                  LOCATION... 2094 MANNS CHAPEL RD
                                  DEED YEAR/BOOK/PAGE.. 2010 1529   0108     ASSESSMENT AVF  LFT
2094 MANNS CHAPEL RD              PLAT BOOK/PAGE..           2010   0141     OWNER ID.. 1325139
                                  LEGAL DESC:LOT 2                           DISTRICT.. 107  NORTH CHATHAM FIRE DIST

                                  TOWNSHIP...    2 BALDWIN
PITTSBORO                  NC 27312-                                         NBRHOOD... 0246  NORTH WEST BALDWIN
 DESCRIPTION                                                            RESIDENTIAL

MAINTAINED..   6/20/2017 BY KAREN       VALUED..  5/19/2017 BY KAREN
VISITED.....  12/31/2016 BY PAS                                              ROUTING#..
PARCEL STATUS... ACTIVE                                                      CATEGORY.. REAL PROPERTY
        *****
               * LAND VALUED BY NEIGHBORHOOD BASE RATE METHOD *

--------------------------------------------  SALES HISTORY  ----------------------------------------------------
DEED BK/PAGE  SALE DATE  SALES INSTRUMENT DISQUALIFIED    SALE AMOUNT  STAMP AMOUNT          DEED NAME

1529   0108    9/15/2010  WARRANTY DEED    REVENUE STAMPS                                 RYAN LARRY WINSTON
94E    0188    6/21/2010  SPLIT            OTHER                                          RYAN LARRY & KENNETH JR & DWIG
94E    0188   12/31/1996  ESTATE FILE      REVENUE STAMPS                                 RYAN LARRY & KENNETH JR & DWIG

--------------------------------------------  LAND SEGMENTS  ----------------------------------------------------

LND             STRAT      LAND                     AVERAGE                                                      TOT     CURRENT
 #   ZONE        CODE    TYPE/CODE   LAND QTY    LAND RATE   DPT%    SHP%    LOC%    SIZ%    OTH%    TOP%    ADJ        FMV

                                                                                                               .00

 1               100     AC B1          1.000    68,750.00    .00     .00 100.00     .00     .00     .00              68,750
                                                                                                             95.00

 2               100     AC R          25.630    11,468.86    .00     .00 100.00     .00  95.00     .00              279,250
         TOTAL ACRES..                 26.630                                                    TOTAL LAND FMV..    348,000

----------------------------------  IMPROVEMENT #   1  MAJOR IMPR-M    -------------------------------------------------

 MAIN FIN AREA..         600.00     ACT/EFF YR/AGE.. 1978  1978   39        VISITED..           BY
                                                                            MAINTAINED..  6/20/2017

 STRAT.......... 100                DESCRIPT.... BUNGALOW                                                 BY KAREN
 LOCATION #.....           MANNS CHAPEL RD

   COMPONENT TYPE/CODE/DESC    PCT       UNITS          RATE      STR#  STR%  SIZ%   HGT%   PER%  CDS%       COST       %CMPL
   -----------------------------------------------------------------------------------------------------------------------
MA 37M   SINGLE FAMILY UNIT M 100        600.00         95.45     1.00       124.00                          71,014
  EW 01    BRICK              100         98.00           .00                                                     0
- HC 03    RADIANT/ELEC/BB    100        600.00           .00              124.00                                 0
- PL 02    NUMBER OF FIXTURES   0          3.00-      1050.00                                                 3,150-
                                                                                                        ---------------

                        RCN...            PCT COMPLETE               100     x                         67,864
                        QUAL.. QG   D+-   QUALITY GRADE D+-           85.00  x                         57,684
                        DEPR.. AV         DEPRECIATION TO 39 Y        25.00  -          14,421         14,421  T

                      --FMV...                                                                         43,263
```

Chatham County Property Record Card (con't)

DATE 11/03/17 CHATHAM CO TAX DEPARTMENT PAGE 2
TIME 16:11:34 PROPERTY CARD PIN... 9755 00 97 5436 PROG# AS2006
USER NCH FOR YEAR 2018
RYAN LARRY WINSTON PARCEL ID.. 0001777

---------- IMPROVEMENT # 1 MAJOR IMPR-M ----------



---------- MA 37M SINGLE FAMILY UNIT M FLOOR: 1.00 --------- TRAVERSE ----------

TOTAL PARCEL VALUES-- R LAND/ OVRD IMPROVEMENTS /LOVR TOTAL LAND/IMPROVE 2017 VALUE

FMV.....	348,000		43,263	391,263	391,263
APV.....	348,000		43,263	391,263	391,263

---------- COMMENTS - ----------

LOT-1C RD FRONT PB-91/369
KU/62 581/957
**PROCESS FOR 1/2001: 85.00A (84.00A NET) 2% OTHER R/W UTIL
CARDINAL PIPELINE 792/871-875 5/28/99 1.85A; MR 3/7/01
PB 2010/141 LOT 2
ORW-5% 1.32 UTIL ESMT
SPLIT OUT 88505,88506 BY PB 2010/141
SMALL ACREAGE TO 1780 PART OF LOT 4
26.96 26.63 NET

Chatham County Property Record Card

DATE 11/03/17 CHATHAM CO TAX DEPARTMENT PAGE 1
TIME 16:11:34 PROPERTY CARD PIN... 9755 00 95 5335 PROG# AS2006
USER NCH FOR YEAR 2018
RYAN LARRY W PARCEL ID.. 0001780
RYAN HOWARD K LOCATION... 2064 MANNS CHAPEL RD
RYAN DWIGHT C DEED YEAR/BOOK/PAGE.. 2000 282 0463 ASSESSMENT NONE
2094 MANNS CHAPEL RD PLAT BOOK/PAGE.. 2010 0141 OWNER ID.. 1201518
LEGAL DESC:L2-8C DISTRICT.. 107 NORTH CHATHAM FIRE DIST

TOWNSHIP... 2 BALDWIN
PITTSBORO NC 27312- NBRHOOD... 0246 NORTH WEST BALDWIN
DESCRIPTION RESIDENTIAL

MAINTAINED.. 6/20/2017 BY KAREN VALUED.. 5/19/2017 BY KAREN
VISITED..... 12/31/2016 BY PAS ROUTING#..
PARCEL STATUS... ACTIVE CATEGORY.. REAL PROPERTY
*****
* LAND VALUED BY NEIGHBORHOOD BASE RATE METHOD *

SALES HISTORY

DEED BK/PAGE	SALE DATE	SALES INSTRUMENT	DISQUALIFIED	SALE AMOUNT	STAMP AMOUNT	DEED NAME
282 0463	12/30/2000	COMBINE	OTHER			RYAN LARRY W & KENNETH JR & DW
282 0463	12/31/1996	*INVALID	REVENUE STAMPS			RYAN LARRY W

LAND SEGMENTS

LND #	ZONE	STRAT CODE	LAND TYPE/CODE	LAND QTY	AVERAGE LAND RATE	DPT%	SHP%	LOC%	SIZ%	OTH%	TOP%	TOT ADJ	CURRENT FMV
												66.00	
1		100	AC R	41.250	10,249.99	.00	.00	75.00	.00	88.00	.00		279,056

TOTAL PARCEL ACRES... 41.250 LAND /41.250 IMPROVEMENTS / OVR TOTAL LAND/IMPROVE TOTAL LAND FMV 2017 VALUE 279,056
FMV..... 279,056 0 279,056 279,056
APV..... 279,056 0 279,056 279,056

COMMENTS -

PREV LISTED AS 1/3 UNDIV INT IN 42 AC
FOR 1/2001: MERGE PT INT 0001778, 0001779; LIST AS 42.00A W/
792/877-881; NOTICE OF RECOMB SENT 3/26/01; MR
PB 2010/141 LOT 4
ORW-12% 4.18AC DUKE & .98AC GAS UTIL ESMTS
SMALL ACR FROM 1777 PER PB 2010/141

Chatham County Property Record Card

DATE 11/03/17 CHATHAM CO TAX DEPARTMENT PAGE 1
TIME 16:11:34 PROPERTY CARD PIN... 9755 00 97 9689 PROG# AS2006
USER NCH FOR YEAR 2018

RYAN DWIGHT CAREY
RYAN KATHLEEN A

3550 HWY 63

RISON AR 71665-

PARCEL ID.. 0088505
LOCATION... 2206 MANNS CHAPEL RD
DEED YEAR/BOOK/PAGE.. 2010 1529 0113
PLAT BOOK/PAGE.. 2010 0141
LEGAL DESC:LOT 1

TOWNSHIP... 2 BALDWIN

ASSESSMENT NONE
OWNER ID.. 1325140
DISTRICT.. 107 NORTH CHATHAM FIRE DIST

NBRHOOD... 0246 NORTH WEST BALDWIN

DESCRIPTION RESIDENTIAL

MAINTAINED.. 6/20/2017 BY KAREN VALUED.. 5/19/2017 BY KAREN
VISITED..... 12/31/2016 BY PAS PREV PARCEL 0001777 ROUTING#..
PARCEL STATUS... ACTIVE CATEGORY.. REAL PROPERTY
*****
* LAND VALUED BY NEIGHBORHOOD BASE RATE METHOD *

SALES HISTORY

DEED BK/PAGE		SALE DATE	SALES INSTRUMENT	DISQUALIFIED	SALE AMOUNT	STAMP AMOUNT	DEED NAME
1529	0113	9/15/2010	WARRANTY DEED	REVENUE STAMPS			RYAN DWIGHT CAREY ETUX KATHLEE
94E	0188	6/21/2010	SPLIT	OTHER			RYAN LARRY & KENNETH JR & DWIG

LAND SEGMENTS

LND #	ZONE	STRAT CODE	LAND TYPE/CODE	LAND QTY	AVERAGE LAND RATE	DPT%	SHP%	LOC%	SIZ%	OTH%	TOP%	TOT ADJ	CURRENT FMV
												90.00	
1		100	AC R	26.560	11,356.17	.00	90.00	100.00	.00	.00	.00		271,458
TOTAL ACRES...				26.560									271,458

TOTAL PARCEL VALUES---

	LAND / OVR	IMPROVEMENTS / OVR	TOTAL LAND/IMPROVE	TOTAL LAND FMV 2017 VALUE
FMV......	271,458	0	271,458	271,458
APV......	271,458	0	271,458	271,458

COMMENTS -

PB 2010/141 LOT 1
SPLIT OUT OF 1777 BY PB 2010/141
26.96 26.56 NET

Chatham County Property Record Card

DATE 11/03/17 CHATHAM CO TAX DEPARTMENT PAGE 1
TIME 16:11:34 PROPERTY CARD PIN... 9755 00 96 1949 PROG# AS2006
USER NCH FOR YEAR 2018

RYAN HOWARD KENNETH JR PARCEL ID.. 0088506
RYAN KENNETH MARK LOCATION... 2062 MANNS CHAPEL RD
DEED YEAR/BOOK/PAGE.. 2010 1529 0102 ASSESSMENT NONE
411 OLD FAYETTEVILLE RD PLAT BOOK/PAGE.. 2010 0141 OWNER ID.. 1325138
LEGAL DESC:LOT 3 DISTRICT.. 107 NORTH CHATHAM FIRE DIST

TOWNSHIP... 2 BALDWIN
CHAPEL HILL NC 27516- NBRHOOD... 0246 NORTH WEST BALDWIN
DESCRIPTION RESIDENTIAL

MAINTAINED.. 6/20/2017 BY KAREN VALUED.. 5/19/2017 BY KAREN
VISITED..... 12/31/2016 BY PAS PREV PARCEL 0001777 ROUTING#..
PARCEL STATUS... ACTIVE CATEGORY.. REAL PROPERTY
*****
* LAND VALUED BY NEIGHBORHOOD BASE RATE METHOD *

SALES HISTORY

DEED BK/PAGE	SALE DATE	SALES INSTRUMENT	DISQUALIFIED	SALE AMOUNT	STAMP AMOUNT	DEED NAME
1529 0102	9/15/2010	WARRANTY DEED	REVENUE STAMPS			RYAN HOWARD KENNETH JR & KENNE
94E 0188	6/21/2010	SPLIT	OTHER			RYAN LARRY & KENNETH JR & DWIG

LAND SEGMENTS

LND #	ZONE	STRAT CODE	LAND TYPE/CODE	LAND QTY	AVERAGE LAND RATE	DPT%	SHP%	LOC%	SIZ%	OTH%	TOP%	TOT ADJ	CURRENT FMV
												96.00	
1		100	AC R	26.720	11,337.57	.00	.00	100.00	.00	96.00	.00		290,822

TOTAL PARCEL VALUE... LAND /26.720 IMPROVEMENTS / OVR TOTAL LAND/IMPROVE TOTAL LAND FMV 2017 VALUE 290,822
FMV..... 290,822 0 290,822 290,822
APV..... 290,822 0 290,822 290,822

COMMENTS

PB 2010/141 LOT 3
ORW-4% UTIL R/W
26.96 26.72 NET
DB 1529/102;JTW/ROS

Exhibit 2

S&EC

Soil & Environmental Consultants, PA

8412 Falls of Neuse Road, Suite 104, Raleigh, NC 27615 • Phone: (919) 846-5900 • Fax: (919) 846-9467
sandec.com

June 27, 2017
S&EC Project #13203.S1

Alex Barroso & Gary Colen
239 Parker Road,
Chapel Hill, NC 27517

Re: Soil/Site Evaluation on 2206, 2094, 2062 & 2064 Manns Chapel Road Property, 114.67-Acre Site, Chatham County, NC

Dear Mr. Barroso & Mr. Colen:

Soil & Environmental Consultants, PA (S&EC) performed a preliminary soil and site evaluation on the above referenced tract. This was performed at your request as part of the preliminary planning process in order to determine areas of soil that have potential for subsurface wastewater disposal. Fieldwork was performed in June 2017.

S&EC traversed the property and observed landforms (slope, drainage patterns, past use, etc.) as well as soil conditions (depth, texture, structure, seasonal wetness, restrictive horizons, etc.) through the use of hand auger borings. The site was evaluated during moist soil conditions. From these observations, an evaluation of the site was developed, relative to subsurface disposal of wastewater. Soil areas were estimated in the field. The soil/site evaluation criteria used is that contained in 15 A NCAC 18A .1900 "Laws and Rules for Sewage Treatment and Disposal Systems".

FINDINGS

This site is located in the Acid Crystalline region of Chatham County. The upland soils on this tract are similar to the Appling, Pacolet, and Wedowee soil series with inclusions of Helena soil series. The Appling, Pacolet, and Wedowee soil series have a sandy surface material over a clayey subsoil. These soils are at least 24 inches deep to prohibitive soil characteristics and are generally useable for subsurface septic systems. The Helena soil series have slow permeability clayey subsoil and are generally unsuitable for conventional subsurface septic systems. This property has several extremely rocky areas and backhoe pits may be needed to further evaluate these areas.

The accompanying AutoCAD sketch map indicates the estimated areas with potential use for subsurface wastewater disposal. The blue cross hatching indicates areas of soils which are at least 24 to 36+ inches deep to prohibitive soil characteristics and these areas have potential for a conventional septic system, a modified conventional (shallow placed lines with no fill required over the disposal area) or a low pressure pipe system (LPP) and/or ultra-shallow conventional (shallow placed lines with fill required over the disposal field) system. Unit

"UN" on the attached map indicates areas of soils that are less than 24 inches to prohibitive soil characteristics and are generally unsuitable for the type of systems mentioned above. However, they may be suitable for more expensive alternative septic systems, i.e. pretreatment drip or spray irrigation, etc. Such systems are expensive and if requested, S&EC can provide additional information concerning these types of systems. Unit "NE" on the attached map indicates areas that contain thick vegetation and were inaccessible. This property has several extremely rocky areas and backhoe pits may be needed to further evaluate these areas. There may be inclusions of unsuitable soil within suitable soil map units due to soil variability, thick vegetation, and/or rocky conditions.

The site plan for each lot must ensure that adequate soil area for system and repair is unaffected by site elements (house placement, driveway, wells, patios, decks, etc.) on that or adjacent lots. The area ultimately designated by the health department on the site plan for the septic system and repair must remain undisturbed (no mechanical clearing, excavation, heavy traffic or other significant site disturbing activities) until authorized by the health department. A lot with initially adequate useable soil area may be rendered unusable as a result of improper site planning and/or disturbance. A field layout of the proposed septic systems may be required as part of the individual lot development process.

GENERAL WASTEWATER CONSIDERATIONS

Once potentially useable areas are located through vertical borings, the next consideration is the horizontal extent of those areas. The size and configuration of the useable soil area dictate the utility of that area. The size of a subsurface disposal field is determined by: 1) the design flow from the source (120 gallons/bedroom/day in residences), and 2) the long term acceptance rate (LTAR) of the soil (based on the hydraulic conductivity of the soil, a function of the soil's texture, mineralogy, structure, porosity, etc.). The configuration must be such that an efficient layout of disposal lines (on contour) is possible. An additional consideration is the required setbacks for the system from various elements such as wells (100'), streams and ponds (50') or more (depending on watershed regulations), property lines (10'), top of embankment (15'), watershed buffers, etc. (see Attachment 1).

The utility of a potential useable soil area for a subsurface system is most accurately determined by an on-ground layout of the proposed system. The total area needed for system and repair areas will depend upon the system type, the layout of that system and the total design flow (factors mentioned above). A typical area needed for a 4 bedroom residence is approximately 17,000 to 20,000 ft^2 (could be more depending on site features) or 800 to 960 linear feet of conventional line (system and repair) or 1,920 linear feet of LPP line (system and repair). These estimates reference Laws and Rules for Sewage Treatment and Disposal Systems for North Carolina and use a LTAR of 0.25-0.3 gpd/ft^2 for conventional septic systems (.1955), a LTAR of 0.25-0.3 gpd/ft^2 for modified conventional (.1956) and 0.1 gpd/ft^2 for LPP septic systems (.1957a). The ultimate LTAR will be determined by the health department after their lot evaluation. S&EC will be glad to assist in any detailed soils evaluation, system layout, or sizing calculations if requested. If S&EC does any additional fieldwork on this property, some portions of the property may need to be hydro-axed, cleared, and/or made accessible because of the current inaccessible thick vegetation in various locations.

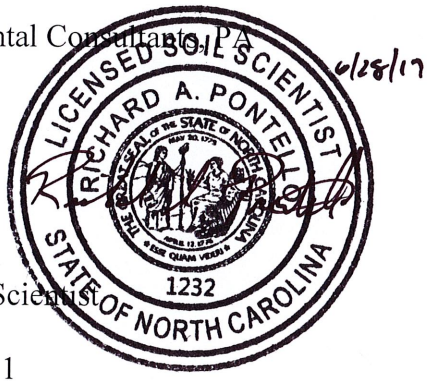
This report discusses the general location of potentially useable soils for on-site subsurface wastewater disposal and, of course, does not constitute or imply any approval or permit as needed by the client from the local health department. S&EC is a professional consulting firm that specializes in the delineation of soil areas for wastewater disposal and the layout and design of wastewater treatment systems. As a professional consulting firm, S&EC is hired for its professional opinion in these matters. The rules governing wastewater treatment (interpreted and governed by local and state agencies) are evolving constantly and, in many cases, affected by the opinions of individuals employed by these governing agencies. Because of this, S&EC cannot guarantee that areas delineated and/or systems designed will be permitted by the governing agencies. As always, S&EC recommends that anyone making financial commitments on a tract be fully aware of individual permit requirements on that tract prior to final action.

This report and site evaluation is not conformant to the Engineered Option Permit (EOP) process. Additional site testing and evaluations will be required to utilize the EOP process. The soil report and map associated with this project is for the exclusive use of the addressee and the use or reliance by all others is expressly denied without the written consent of S&EC.

An individual septic system permit will be required for each lot prior to obtaining a building permit. This will involve a detailed evaluation by the local health department to determine, among other things, system size and layout, well, drive and house location. Only after developing this information can a final determination be made concerning specifics of system design and site utilization.

Soil & Environmental Consultants, PA is pleased to be of service in this matter and we look forward to assisting in any site analysis needs you may have in the future. Please feel free to call with any questions or comments.

Sincerely,
Soil & Environmental Consultants, PA



6/28/17

Ricky Pontello
NC Licensed Soil Scientist

Cory Connell
Soil Scientist in Training

Encl: Attachment 1
Soil Suitability Map

Attachment 1

.1950 Location of Sanitary Sewage Systems

(c) Every sanitary sewage treatment and disposal system shall be located at least the minimum horizontal distance from the following:

(1)	any private water supply source including a well or spring	100 feet
(2)	any public water supply source	100 feet
(3)	streams classified as WS-I	100 feet
(4)	water classified as S.A.	100 feet from mean high water mark
(5)	Other coastal waters	50 feet from mean high water mark
(6)	any other stream, canal, marsh, or other surface waters	50 feet
(7)	any Class I or Class II reservoir	100 feet from normal pool elevation
(8)	any permanent storm water retention pond	50 feet from flood pool elevation
(9)	any other lake or pond	50 feet from normal pool elevation
(10)	any building foundation	5 feet
(11)	any basement	15 feet
(12)	any property line	10 feet
(13)	top of slope of embankments or cuts of 2 feet or more vertical height	15 feet
(14)	any water line	10 feet
(15)	drainage systems:	
	(A) Interceptor drains, foundation drains and storm water diversions	
	(i) upslope	10 feet
	(ii) sideslope	15 feet
	(iii) downslope	25 feet
	(B) Groundwater lowering ditched and devices	25 feet
(16)	any swimming pool	15 feet
(17)	any other nitrification field (except repair area)	20 feet

(b) Ground absorption, sewage treatment and disposal systems may be located closer than 100 feet from a private well supply, except springs and uncased wells located downslope and used as a source of drinking water, repairs, space limitations and other site-planning considerations but shall be located the maximum feasible distance and, in no case, less than 50 feet.

(c) Nitrification fields and repair areas shall not be located under paved areas or areas subject to vehicular traffic. If effluent is to be conveyed under areas subject to vehicular traffic, ductile iron or its equivalent pipe shall be used. However, pipe specified in Rule .1955 (e) may be used if a minimum of 30 inches of compacted cover is provided over the pipe.

Note: Systems over 3000 GPD or an individual nitrification fields with a capacity of 1500 GPD or more have more restrictive setback requirements, see .1950 (a) (17) (d) for specifics.

Exhibit 3

MANNS CHAPEL ROAD

WELL

WELL

ACCESS FROM BRIAR CHAPEL

N

W E

S

GRAPHIC SCALE
1" = 100'

100 0 100 200

PRELIMINARY SOIL/SITE EVALUATION.
SOIL LINES WERE DELINEATED IN THE FIELD BY S&EC PERSONNEL. THE SOIL LINES WERE SKETCHED ONTO THE MAP BASED ON TOPOGRAPHY, GPS POINTS, AND OTHER SITE FEATURES.

**NOTE: THIS PROPERTY HAS SEVERAL EXTREMELY ROCKY AREAS AND BACKHOE AREAS MAY BE NEEDED TO FURTHER EVALUATE THESE AREAS. THERE MAY BE INCLUSIONS OF UNSUITABLE SOIL WITHIN SUITABLE SOIL MAP UNITS DUE TO SOIL VARIABILITY, THICK VEGETATION, AND/OR ROCKY CONDITIONS.

**THIS MAP AND CORRESPONDING SITE EVALUATION IS NOT CONFORMANT TO THE ENGINEERED OPTION PERMIT (EOP) PROCESS. ADDITIONAL SITE TESTING AND EVALUATIONS WILL BE REQUIRED TO UTILIZE THE EOP PROCESS.

**SUITABLE FOR PRELIMINARY PLANNING PURPOSES ONLY. SITE WILL REQUIRE APPROVAL BY THE COUNTY HEALTH DEPARTMENT ON A CASE BY CASE BASIS. THIS MAP SHOULD BE USED AS A GENERAL GUIDE. SOME ADJUSTMENTS WILL BE NECESSARY IN THE FIELD DUE TO SOIL VARIABILITY AND TOPOGRAPHIC IRREGULARITIES. THIS MAP ONLY REFLECTS EXISTING SOIL SUITABILITY FOR ON-SITE SEPTIC TANK SYSTEMS. SOME OTHER CONSIDERATIONS THAT AFFECT SITE SUITABILITY THAT SHOULD BE CONSIDERED IN DEVELOPMENT DESIGN ARE:

1) 10' SETBACK FROM PROPERTY LINE
2) 100' SETBACK FROM ANY WELL
3) 25' SETBACK FROM DRAINAGE DITCHES.

SEE ACCOMPANYING S&EC REPORT.

NOT A SURVEY.
2-FOOT CONTOURS FROM NCDOT GIS.
PARCEL BOUNDARIES FROM CHATHAM COUNTY GIS. 2013 AERIAL FROM NCONEMAP.COM.

LEGEND

	Areas contain soils with 24 to 30 inches or more of useable material and have the potential for conventional, modified conventional, ultra-shallow and/or low pressure pipe septic systems.
UN	Unsuitable areas due to soil wetness condition, soil depth, clay mineralogy, and/or landscape position.
NE	Areas that were not evaluated due to existing thick vegetation, structures, drives, wells, etc.
	Existing private well, (100' system & repair) septic system setback.
	Extremely rocky areas; Backhoe pits maybe needed to further evaluate these areas.
	Soil boring locations that contain soil with 24 to 30 inches or more of useable material and have the potential for conventional, modified conventional, ultra-shallow and/or low pressure pipe septic systems. Additional soil borings are needed near these borings to determine whether there is enough suitable soil area for septic systems.

Sheet No.: 1 of 1

Date: NOVEMBER 2017

Field Work: JM,CC

Drawn: JM,CC

Project Manager: DW

Project No.: 13203.51

Project: 2206, 2094, 2062, 2064 MANNS CHAPEL RD PROPERTIES

Location: CHATHAM CO., NC

Sheet Title: PRELIMINARY SOILS/SITE EVALUATION MAP

Client: ALEX BORROSO & GARY COLEN

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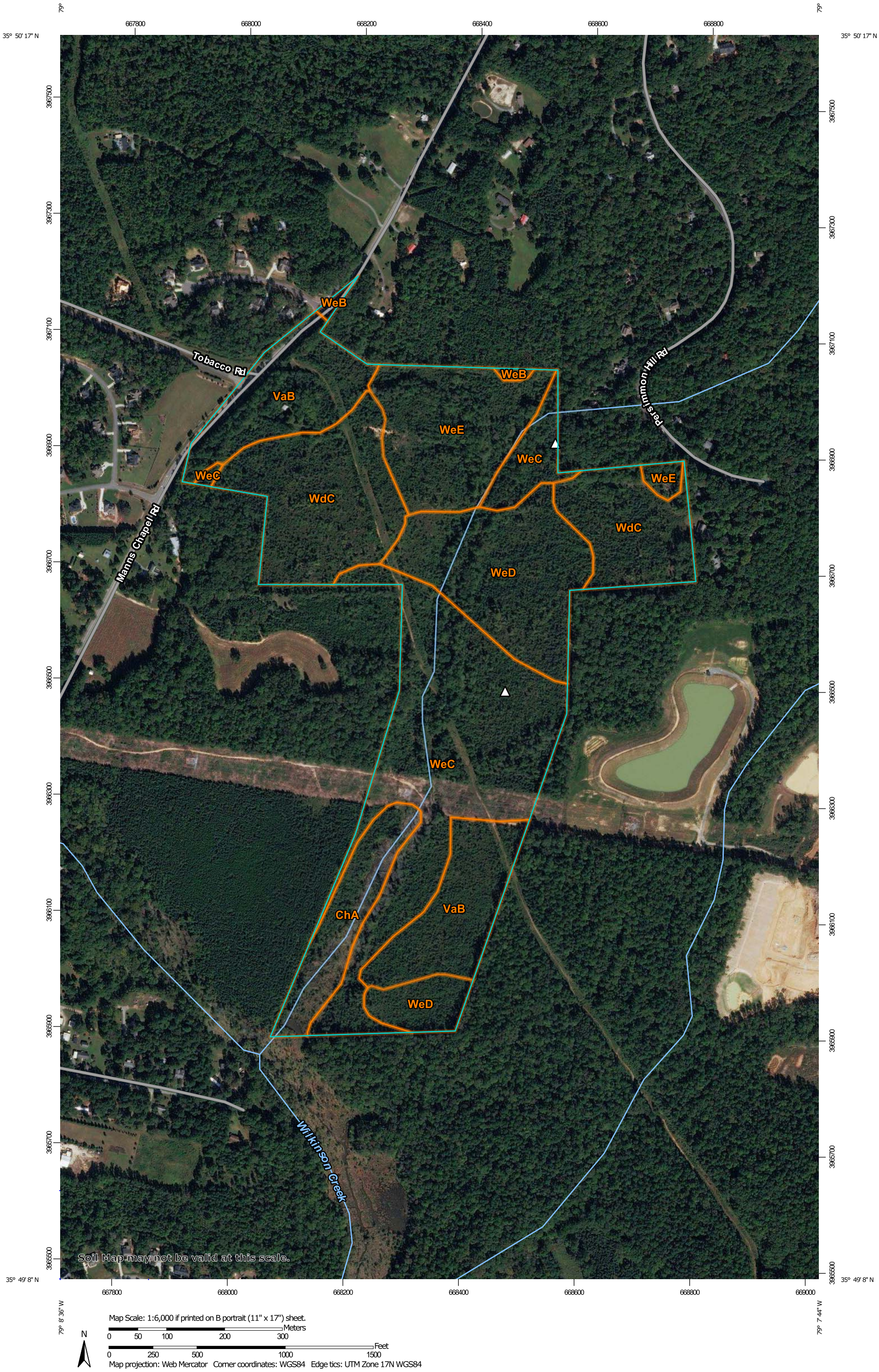
Exhibit 4

Soil Map—Chatham County, North Carolina
(Ryan's Crossing Subdivision)



Map Scale: 1:6,000 if printed on B portrait (11" x 17") sheet.

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Chatham County, North Carolina
Survey Area Data: Version 20, Sep 26, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2014—Feb 4, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	7.5	6.1%
VaB	Vance sandy loam, 2 to 6 percent slopes	20.0	16.2%
WdC	Wedowee sandy loam, 2 to 15 percent slopes, bouldery	25.4	20.6%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	0.6	0.5%
WeC	Wedowee sandy loam, 6 to 10 percent slopes	35.3	28.5%
WeD	Wedowee sandy loam, 10 to 15 percent slopes	20.0	16.1%
WeE	Wedowee sandy loam, 15 to 25 percent slopes	14.8	12.0%
Totals for Area of Interest		**123.7**	**100.0%**