Natural Resources Report and Preliminary Assessment

UNC HCS – Eastowne Campus / July 2019 / EMA-17000

McAdams

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A. Introduction and Purpose

UNC Healthcare Systems (UNC-HCS) plans to redevelop and expand their Eastowne Campus located within the Town of Chapel Hill's (Town) zoning jurisdiction. After an initial site investigation and as part of a preliminary master planning effort, UNC-HCS is taking steps to develop conceptual master plans and engage the Town and community to negotiate a Development Agreement for full build-out of the property. Town staff recommended submitting a natural resource report/preliminary assessment to provide stakeholders a baseline of the existing conditions and to inform the conceptual master plan development and development agreement process. Additional analysis will be necessary to assess the possible impacts and opportunities once one or more conceptual master plan scenarios are advanced.

B. Site Description

The Eastowne Campus site is located on the north side of U.S. 15-501, southwest of the I-40 interchange in Chapel Hill, North Carolina (**Figure 1**). The project area consists of five parcels that have a combined area of approximately 48-acres bounded by Eastowne Drive, U.S. 15-501, and I-40. These parcels are identified by the following parcel identification numbers (PINs): 9890911209, 9890807564, 9890802764, 9890800643 and 9890800195.

An aerial map (**Figure 2**) of the project area shows that four of the five parcels that compose the overall project area are currently developed with seven medical office buildings, along with associated parking and utility infrastructure. The largest parcel of the five, located at the northeast corner of the intersection of Eastowne Drive and U.S. 15-501, is currently undeveloped and forested.

C. Topography

The site lies within the Piedmont physiographic province of North Carolina. Elevations on the property range from approximately 262 to 338 feet above mean sea level. Site topography is characterized by broad ridges dissected by minor drainageways with relatively broad valley bottoms, as shown in **Figure 3**.

The Town's Land Use Management Ordinance (LUMO) Section 5.3.1 –Erosion and Sedimentation Control aims to protect water bodies and wetlands from erosion, protect the plant and animal habitat of steep slopes, and preserve the natural beauty and economic value of the town's hillsides by restricting land disturbance on steep slopes (defined as being equal to or steeper than 15 percent). Development of sites with slopes steeper than 15 percent require an application to the Town providing information regarding topography, slope categories, streams and stormwater drainage, land use cover, soils and proposed conditions and a slope limit on new cut and fill slopes. Additionally, no more than 25 percent of the total combined area of 25 percent (or steeper) slopes may be disturbed. Steep slope categories within the project area that are subject to these requirements are provided on the Site Topography & Steep Slopes Map (**Figure 3**). This information is overlaid on aerial imagery to reflect the land use cover and areas of steep slope from roads, parking lots and driveways that are manmade not subject to this section of the LUMO.

D. Soils

Soil series mapped by the Natural Resource Conservation Service (NRCS) on the property are Chewacla, Goldston, and White Store. Chewacla soils have formed from recent alluvium and occur in long flat areas parallel to major streams. Goldston soils have formed in residuum weathered from fine grained felsic slates and occur on narrow interstream ridges and sides of ridges between streams. White Store soils have formed in weathered shale, mudstone and sandstone. **Figure 4** shows the subject property overlaid with the most recently published Orange County and Web soil survey showing the soil map units that occur with the project area (NRCS 1977, NRCS 2019). The information provided for the map units within the project area was obtained from the NRCS Web Soil Survey. Erosion hazard ratings provided below indicate the hazard of erosion based on slope and soil erosion factor K. Soil loss occurs by sheet or rill erosion where 50 to 75 percent of the surface has been exposed by disturbance (NRCS 2019).

Chewacla loam, 0 to 2 percent slopes, frequently flooded (Ch) – This nonhydric, floodplain soil is typically found on slopes ranging from zero to two percent. It is classified as somewhat poorly drained soil with a moderately high to high permeability, moderately high to high available water capacity and a water table about six to 24 inches below the soil surface. This map unit has a surface runoff classification of low and a slight erosion hazard rating.

Goldston channery silt loam, 15 to 45 percent slopes (GIF) – This upland soil is typically found on slopes ranging from 15 to 45 percent. It is classified as well drained soil with a very low to high permeability, very low available water capacity and a water table of more than 80 inches below the soil surface. This map unit has a surface runoff classification of high and a moderate erosion hazard rating.

White Store loam, 2 to 6 percent slopes (WsB) – This upland soil is typically found on slopes ranging from two to six percent. It is classified as moderately well drained soil with a very low to high permeability, moderate available water capacity and a water table of about six to 18 inches below the soil surface. This map unit has a surface runoff classification of very high and a slight erosion hazard rating.

White Store clay loam, 6 to 15 percent slopes, moderately eroded (WtC2) - This upland soil is typically found on slopes ranging from six to 15 percent. It is classified as moderately well drained soil with a very low to moderately low permeability, moderate available water capacity and a water table of about six to 18 inches below the soil surface. This map unit has a surface runoff classification of very high and a slight erosion hazard rating.

Project area soils have a slight erosion hazard rating except for Goldston soils, which have a moderate rating. Natural Resource Conservation Service states that a rating of slight indicates that erosion is likely under ordinary climatic conditions, and moderate indicates that some erosion is likely and erosion control measures may be needed (2019).

E. Protected Species + Natural Heritage Areas

On June 13, 2019, McAdams used the US Fish and Wildlife (USFWS) Information for Planning and Consultation (IPaC) website to obtain a list of threatened and endangered species that may occur in the project area and/or may be affected by the proposed project. This process generates an Official Species List that is shown in Table 1 below and provided in Appendix A. No critical habitats were identified within or within the vicinity of the project area.

Table 1. Federally Protected Species for the Project Area (6/13/2019)		
Scientific Name	**Common Name**	**Federal Status**
Clams		
Fusconaia masoni	Atlantic pigtoe	Proposed Threatened
Flowering Plants		
Echinacea laevigata	Smooth Coneflower	Endangered
Rhus michauxii	Michaux's Sumac	Endangered

A map and list of natural heritage resources was obtained from the NC Natural Heritage Program (NHP) on June 12, 2019 (Appendix B). These results are shown on an annotated Natural Heritage Map provided as **Figure 5**. Conservation/managed areas identified outside of the project area and along Dry Creek include Town of Chapel Hill Open Space and Durham County Open Space. An occurrence of Piedmont Swamp Forest is approximately 925 feet northwest of the project area along Dry Creek. Occurrences of Piedmont Bottomland and Levee Forest are designated within the Dry Creek/Mount Moriah and New Hope Creek Bottomland Forest Natural Areas.

A portion of the Dry Creek/Mount Moriah Bottomland Natural Area occurs on the forested parcel of the project area located between Eastowne Drive and Interstate 40. This natural area has an overall rating of moderate based on the higher of the representational and collective ratings (general and moderate, respectively) assigned to this natural area. Within this parcel, field observations of dominant or co-dominant overstory tree species in order of abundance, dominant species of mid-story, shrub and herbaceous layers and size range of overstory trees [diameter at breast height (dbh)] were collected to classify and map natural communities as provided in **Appendix C**. Natural communities on this parcel include Dry-Mesic Oak Hickory Forest (Piedmont Subtype) on ridges and side slopes, Piedmont Bottomland Forest (High Subtype) within the lower section of the stream valley and Mesic Mixed Hardwood Forest (Piedmont Subtype) in the upper section of the stream valley as shown in **Figure 6**. Photographs representative of each of these communities are provided in **Appendix D**. Although included as part of the Dry Creek/Mt. Moriah Bottomland natural area, most of the parcel between Eastowne Drive and I-40 is classified Dry-Mesic Oak Hickory Forest (Piedmont Subtype). A review of aerial imagery back to 1938 shows the forest on this parcel has been largely undisturbed for over 80 years except for two roads and a two-acre field on the ridge near the eastern parcel boundary. The maturity of this forest is reflected its species diversity and in the presence of individual trees with a dbh in excess of 30 inches.

Shallow seeps where gray petaltail dragonfly (*Tachopteryx thoreyi*) breed are found in this natural area according to the Inventory of Natural Areas and Wildlife Habitats for Orange County, North Carolina (2005). Stephen Hall, one of the authors of this publication, was contacted and explained that the gray petaltail was considered to be a very rare species when the Orange County inventory was first conducted during the 1980s. Populations have since been found over most of the state. The Natural Heritage Program no longer tracks this species as a Significantly Rare Species but does consider it to be a habitat specialist (Hall 2019). McAdams observed one seep within the project area located on the west side of Stream X approximately 525 feet upstream of where this feature joins the parcel boundary. The location of this seep is shown on **Figure 6**.

The NHP report did not identify element occurrences of state or federally listed species within the project area. Occurrences of federally protected species located within one mile of the project area are discussed below. Occurrences of state protected species located within one mile of the project area are shown in Table 2 below.

Table 2. State Protected Species for the Project Area (6/13/2019)

Scientific Name	Common Name	State Status
Butterfly		
Erynnis martialis	Mottled Duskywing	Significantly Rare
Dragon or Dameselfly		
Somatochlora georgiana	Coppery Emerald	Significantly Rare
Vascular Plant		
Liatris squarrulosa	Earle's Blazing-star	Significantly Rare Peripheral
Orbexilum pedunculatum	Sampson's Snakeroot	Significantly Rare Peripheral
Parthenium auriculatum	Glade Wild Quinine	Significantly Rare Throughout
Scutellaria leonardii	Shale-barren Skullcap	Endangered
Tridens chapmanii	Chapman's Redtop	Threatened

McAdams staff compiled information regarding the appearance and habitat for each federally protected plant species identified by IPaC. Before beginning a field survey for the protected species that may occur within the project area, McAdams staff observed the listed plant species at the NC Botanical Garden to help establish the most appropriate search image for these species. On June 14, 2019, a McAdams staff member walked a transect through each area of the site that includes suitable habitat for protected plant species; these areas include a powerline easement, a sanitary sewer easement and other open areas lacking a tree canopy. Photographs taken during the field survey are provided in **Appendix E**. Common plants within the survey area included Virginia creeper (*Parthenocissus quinquefolia*), woodland sunflower (*Helianthus divaricatus),* Muscadine (*Vitis rotundifolia*), Japanese stiltgrass (*Mictrostegium vimineum*) and common greenbrier (*Smilax rotundifolia*).

Atlantic Pigtoe (*Fusconaia masoni*) – Proposed Threatened
Biological Opinion: Not likely to adversely affect
"Appearance: The shell of the Atlantic pigtoe is a chunky, rhombus shape, like that of a pig's hoof/toe. There is a distinct posterior ridge. The outer surface of the shell is yellow to dark brown and parchment-like, while the inner layer is iridescent blue to salmon, white, or orange. Although larger specimens exist, the Atlantic pigtoe rarely exceeds 2 inches in length. Young individuals may have greenish rays across the entire shell surface. When collected fresh, the interior surface (nacre) in the shell tends to be salmon colored and sometimes iridescent. Atlantic pigtoe has interlocking hinge 'teeth' on the inside of the shell to help keep the two valves in proper alignment.

"The preferred habitat of the Atlantic pigtoe is coarse sand and gravel, and rarely in silt and detritus. Historically, the best populations existed in small creeks to larger rivers with excellent water quality, where flows were sufficient to maintain clean, silt-free substrates." (USFWS 2018)

McAdams checked the USFWS's MaxentAquatics predictive habitat GIS maps and found Dry Creek identified as potentially suitable for Atlantic pigtoe. Dry Creek runs along the northeastern property boundary of the forested parcel between Eastowne Drive and Interstate 40. During our June field visit, Dry Creek in this area was observed to be turbid with a clayey substrate. Lenat reported Upper Dry Creek, upstream of project area, had very high conductivity at 288-320 umho/cm (2014). Near the project area Dry Creek also receives stormwater runoff from Interstate 40. This portion of Dry Creek is not likely to be suitable habitat for Atlantic pigtoe due to clayey substrate and poor water quality. Atlantic pigtoe would not likely be adversely affected by development within the project area.

Smooth Coneflower (*Echinacea laevigata*) – Endangered
Biological Opinion: Not likely to adversely affect
"Description: Smooth coneflower is a perennial herb in the Aster family (Asteraceae) that grows up to 3.3 feet tall from a vertical root stock. The large elliptical to broadly lanceolate basal leaves may reach eight inches in length and three inches in width and taper into long petioles toward the base. They are smooth to slightly rough in texture. The stems are smooth, with few leaves. The mid-stem leaves are smaller than the basal leaves and have shorter petioles. Flower heads are usually solitary. The rays of the flowers (petal-like structures) are light pink to purplish in color, usually drooping, and 2 to 3.2 inches long. Flowering occurs from late May through mid-July and fruits develop from late June to September. The fruiting structures often persist through the fall. Reproduction is accomplished both sexually (by seed) and asexually (by rhizome)."

"Habitat: Smooth coneflower is typically found in open woods, glades, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium and calcium rich soils associated with amphibolite, dolomite or limestone (in Virginia), gabbro (in North Carolina and Virginia), diabase (in North Carolina and South Carolina), and marble (in South Carolina and Georgia). Smooth coneflower occurs in plant communities that have been described as xeric hardpan forests, diabase glades or dolomite woodlands. Optimal sites are characterized by abundant sunlight and little

competition in the herbaceous layer. Natural fires, as well as large herbivores, historically influenced the vegetation in this species' range. Many of the herbs associated with Smooth coneflower are also sun-loving species that depend on periodic disturbances to reduce the shade and competition of woody plants." (USFWS 2017b)

Powerline and sanitary sewer easements, roadsides and maintained areas around parking lots within the project area contain suitable habitat for smooth coneflower, as shown on the Aerial Imagery Map (**Figure 2**). NCNHP data from June 2019 indicates one documented occurrence of smooth coneflower within one mile of the project study area that has since been destroyed. The optimal survey window for this species is late May to October. McAdams staff conducted a field survey of the suitable habitat as described above during the optimal survey window for this species and did not observe smooth coneflower.

Michaux's Sumac (*Rhus michauxii*) – Endangered
Biological Opinion: Not likely to adversely affect
"Description: Michaux's sumac is a rhizomatous, densely hairy shrub, with erect stems from one to three feet in height. The compound leaves contain evenly serrated, oblong to lanceolate, acuminate leaflets. Most plants are unisexual; however, more recent observations have revealed plants with both male and female flowers on one plant. The flowers are small, borne in a terminal, erect, dense cluster, and colored greenish yellow to white. Flowering usually occurs from June to July, while the fruit, a red drupe, is produced through the months of August to October." (USFWS 2017a)

"Habitat: Michaux's sumac grows in sandy or rocky open woods in association with basic soils. Apparently, this plant survives best in areas where some form of disturbance has provided an open area" (USFWS 2017a). Although the USFWS website states that Michaux's sumac grows in open woods in association with basic soils, the species recovery plan states that the species grows in "open woods on acidic soils with low cation exchange capacity" (USFWS 1993).

Powerline and sanitary sewer easements, roadsides and maintained areas around parking lots within the project area contain suitable habitat for Michaux's sumac, as shown on the Aerial Imagery Map (**Figure 2**). NCNHP data from June 2019 indicates no documented occurrences of Michaux's sumac within one mile of the project study area. The optimal survey window for this species is May to October. McAdams staff conducted a field survey of the suitable habitat as described above during the optimal survey window for this species and did not observe Michaux's sumac.

Bald and Golden Eagle Protection Act
The bald eagle is protected under the Bald and Golden Eagle Protection Act, which is enforced by the USFWS. Foraging habitat for the bald eagle primarily consists of mature forests in proximity to large bodies of open water. Large dominant trees are utilized for nesting sites, typically within 1.0 mile of open water.

A review of the NHP database on June 12, 2019 revealed no known occurrences of this species within 1.0 mile of the project study area. A desktop GIS assessment of the project area, as well as the area within a 1.0-mile radius of the project limits, was performed on June 12, 2019 using 2017 color aerial imagery. Three ponds approximately two acres or larger are located within a 1.0-mile radius, south of the project limits. A survey to identify bald eagle nests in the project area and within 660 feet of the project area should be conducted with binoculars in the fall or winter after the trees have lost their leaves to ensure nests would not be disturbed by the project.

F. Forest Resources + Wildlife Habitat

Mature, mixed hardwood/pine forest covers over half of the project area (29 acres), including the approximately 20-acre parcel between Eastowne Drive and Interstate 40 that is part of the Dry Creek/Mt. Moriah Bottomland discussed previously. The remaining portion of the property is developed with medical office buildings and parking lots interspersed with patches of mature, mixed pine/hardwood. Although not visible in the aerial imagery used for this report, redevelopment of the southwestern parcel is currently under construction (MOB1). The project area and the surrounding landscape are considerably fragmented by existing development.

NC Wildlife Resource Commission prioritizes conservation of high-quality forests to benefit terrestrial wildlife species—especially "area sensitive" species that are highly sensitive to conversion of large areas of habitat into smaller patches (NCWRC 2012). Large trees mixed with standing snags and large woody debris are reliable indicators of high-quality forests. As shown in the Forest Stand Age Map (**Figure 7**), McAdams used historical aerial photographs from 1938, 1955 and 1975 to delineate forested stands outside of the previously developed portion of the project area into the following three age classes:

- 44-64-years,
- 64-80 years and
- >80 years.

The forested area immediately west of Eastowne Drive's northern intersection with US Highway 15-501 and most of the forested parcel to the east of Eastowne Drive, included in the Dry Creek/Mt. Moriah Bottomland natural area, is over 80 years old. Approximately 20 acres of the project area appears to have remained undisturbed through much of the last century.

A high degree of diversity was observed in the tree species present in these areas. McAdams observed a mature hardwood forest, including many trees measuring upwards of 25 inches in diameter and several above 30 inches. Standing snags and large woody debris were common throughout these forested areas.

Forest fragmentation occurs when an area of contiguous forest is broken into isolated patches surrounded by non-forest ecosystems, usually as a byproduct of urbanization or agricultural land use (Kimmins 2004). The fragmentation of forested land results in a reduction of forest interior habitat and an increase in the total amount of forest edge habitat. According to Kimmins (2004) and Burgess and

Sharpe (1981), the reduction of the total area of the interior forest condition exposes organisms within to a range of influences including non-forest microclimates, increased solar radiation, increased evapotranspiration, more xeric soils, reduced connectivity between patches and populations, edge predators, and infiltration by species of the surrounding habitat types. Many plant, mammal and bird species have evolved to become specialists on the forest interior habitat and cannot tolerate more open habitat types. Generally, these forest interior specialists are negatively affected by forest fragmentation and the encroachment of forest edge into the interior of the forest.

Collinge (2009) hypothesizes that "habitat fragments connected by corridors should support larger populations, and perhaps a higher number of species, than completely isolated fragments of equal size" because natural corridors offer increased connectivity between patches of forest and allow animals to disperse from one patch to another more easily. This also allows for the intermingling of populations of a species which can lead to an increase in genetic diversity. The forested parcel between Eastowne Drive and I-40 is part of and connected to the Dry Creek/Mt. Moriah Bottomland; the narrowest part of the connection is about 150 feet wide. The Dry Creek/Mt. Moriah Bottomland is in turn connected to the New Hope Bottomland Forest. This extensive connectivity increases the importance of the forested parcel to wildlife habitat.

Forest edges have primarily been thought of as ecotones, or transition zones between habitat types. However, forest edges create gradients in microclimate, vegetation and wildlife, resulting in a physical environment that differs from the urban, field and interior forest habitats (Burgess and Sharpe 1981). Like other habitats, some species are adapted to thrive in the forest edge. When fragmentation occurs, forest edge specialists, as well as generalist species, increase in numbers. While the forest interior represents a diversity of plants and animals that have adapted to specialize on that habitat, the forest edge is also seen as an area of heavy use by wildlife and high tree cover density (Burgess and Sharpe 1981). Where shade-tolerant and generalist plant species thrive in the forest interior, many shade-intolerant trees and herbs find a foothold in edges.

McAdams utilized National Agriculture Imagery Program (NAIP) derived tree cover for North Carolina to map the forest cover within a two-mile radius of the project area. The Conservation Recommendations for Priority Terrestrial and Wildlife Species and Habitats in North Carolina (2012) estimates that "edge effects" extend 350 feet from a forest's edge into the interior. Smaller forest patches may also lack the structural characteristics of the forest interior and may be considered entirely "edge" (Burgess and Sharpe 1981). Because the forest within the Eastowne Drive loop consists of small patches, the tree cover data was used to analyze the interior and edge habitat of the forest parcel located between Eastowne Drive and I-40, as shown on the Forest Interior/Edge Map (**Figure 8**). The areas within this forested parcel shown as not forested are a result of pine stands being misclassified, which is a limitation of the NAIP tree cover dataset. This parcel consists mostly of edge habitat with approximately 1.7 acres of interior habitat in the center of the parcel. Although not connected to other interior forest, together the mature interior and the forest's edge support a wide array of plant species, indicating the wildlife that this forest supports is diverse.

Limited forest interior was reflected in the wildlife observed during a field visit completed on June 6, 2019. Of the ten bird species observed, two species—the scarlet tanager (*Piranga olivaea*) and northern parula (*Setophaga americana*)—were interior specialists while the remaining eight species were either edge specialists or habitat generalists. One species previously reported in the area of the study site but known to be intolerant to forest fragmentation, the hooded warbler (*Setophaga citrina*), was not observed. These observations are in line with other animal signs observed. White-tailed deer tracks and bones were observed, as were wild turkey scratch spots and one box turtle shell. Each of these species is a habitat generalist which thrives in the forest edge. The absence of mesic soils through large portions of the site also indicates a predominately forest edge condition. In general, edges appear to act as "terminators for specialist species, but refugia for generalist species" (Sanderson and Harris 2000). The abundance of edge and generalist species observed by McAdams relative to forest interior specialists corroborates this finding.

G. Water Resources

The project area lies within the Cape Fear Basin in the Headwaters New Hope Creek subwatershed (12-digit HUC 030300020601). Stream features within the study area are Dry Creek and its tributaries (DWR Stream Index Number 16-41-1-(0.5)) and have a stream classification of Class WS-V and Nutrient Sensitive Waters (NSW). Waters designated WS-V waters are protected as water supplies, which are generally upstream and draining to Class WS-IV waters (water supply for drinking, culinary or food processing purposes where a WS-I, II or III classification is not feasible) or waters used by industry to supply their employees with drinking water or waters formerly used as a water supply. There is a FEMA floodplain mapped along Dry Creek and its tributary located on the undeveloped, forested parcel between Eastowne Drive and I-40 (FIRM Map Numbers 3710989000M, effective 10/19/2018).

Surface waters (i.e. streams and a pond) and wetlands under Clean Water Act jurisdiction (jurisdictional) were delineated by McAdams and verified by the U.S. Army Corps of Engineers (USACE) in 2016. The USACE issued a preliminary jurisdictional determination for the project area on May 19, 2017 (**Appendix F**). A determination of the stream channels subject to the Town's LUMO Section 5.18 Jordan Watershed Riparian Buffer Protection and Section 3.6.3 Resource Conservation District (RCD) was issued for the parcels within the Eastowne Drive loop on December 18, 2017, and the undeveloped, forested parcel located between Eastowne Drive and Interstate 40 on May 3, 2019 (**Appendix G**). These features and the FEMA floodplain are shown on the Jurisdictional Waters, Wetlands and Riparian Buffers Map provided as **Figure 9**. In June 2019, McAdams completed assessments of the wetlands and Streams C and X in accordance with North Carolina Wetland and Stream Assessment Methods (NCWAM & NCSAM), respectively. Table 3 provides the hydrology, water quality and habitat assessment ratings for each resource, as well as the overall quality rating. Photographs of streams and wetlands assessed are provided in Appendix H. NCSAM field forms and results are provided in **Appendix I**. NCWAM field forms and results are provided in **Appendix J**.

Table 3. Quality Assessment Results				
Name	**Hydrology**	**Water Quality**	**Habitat**	**Overall**
Streams				
C - upstream	medium	medium	low	medium
C - downstream	medium	low	low	low
X - upstream	high	medium	medium	medium
X - downstream	high	medium	high	high
Wetlands				
A - bottomland	medium	medium	low	medium
C1 - headwater	high	high	low	high
C2 - emergent	high	high	medium	high

1. Streams

There are four jurisdictional stream channels within or immediately adjacent to the project area. Two were verified by the USACE as intermittent streams exhibiting no more than minimal aquatic function, and two were verified as perennial streams exhibiting important aquatic function. The USACE does not require mitigation for permanent impacts to streams exhibiting no more than minimal aquatic function. Impacts to streams must be avoided and minimized to the maximum extent practicable regardless of their aquatic function.

Stream C begins at the toe of the dam of Pond A and flows generally west into a culvert under Eastowne Drive. The bed and bank of this stream is moderately developed, has a clayey to silty substrate with some coarse sand deposits and ranges from two to six feet in width. This stream lacks a forested buffer adjacent to the parking area. Strong water flow and weak to moderate presence of macrobenthos have been observed during winter months, but the lower section has been observed to be dry in summer months. Because the character of the upper section of this stream had a stronger bed and bank, contained water and had a forested riparian buffer along both sides of the channel, the upper section was assessed separately from the lower section. The overall quality of Stream C is low in the lower section and medium in the upper section.

Stream X, located on the undeveloped, forested parcel east of Eastowne Drive, begins approximately 370 feet northwest of US Highway 15-501 and runs northwest before turning north towards Interstate 40. This stream is characterized by alternating sections of well-developed bed and bed with sandy substrate and weakly developed bed and bank with a loamy substrate and regular deposits of sand. The valley of this stream becomes broader downstream, with increasingly longer sections of poorly developed bed and bank. Jurisdiction of this stream stops near the project boundary in the area where the stream divides into several channels above the bottom of a former pond with a breeched dam. Stream X was assessed above the point of jurisdiction separately from the jurisdictional section of this channel. The overall quality of Stream X is high in the lower section and medium in the upper section.

Stream A (Dry Creek) and B have been classified as perennial streams by both the USACE and Town staff. These streams are outside the project area except where they run along the northern property boundary. Because impacts to these streams are not anticipated due to the presence of a 150-foot RCD, assessments were not completed.

2. Wetlands

Wetland A is a bottomland hardwood forest wetland along two perennial streams (Dry Creek – A & Stream B) located in the northern corner of the undeveloped parcel. This seasonally flooded wetland has mostly medium to large sweet gum, green ash and tulip poplar trees with a sparse shrub and mid-story layer. The dense herbaceous layer consists of Japanese stiltgrass, poison ivy, Virginia creeper, an unidentified grass and jewelweed with a few patches of lizard tail. The overall quality of Wetland A is rated as medium.

Wetland B is a freshwater marsh wetland at the head of Pond A. The surrounding upland canopy shades this semi-permanently flooded wetland area, resulting in less than 25 percent herbaceous cover of false nettle, an unidentified grass and Japanese stiltgrass. Because Wetland B is similar in type, character and landscape position to the emergent portion of Wetland C, the rating result for Wetland B can be used to approximately describe Wetland C, as well.

Wetland C grades from headwater forest to a freshwater marsh wetland at the head of Pond A. The saturated to temporarily flooded headwater forest portion of this wetland consists of a sweet gum, red maple and green ash canopy and mid-story. Autumn olive and multiflora rose dominate the shrub layer and Japanese stiltgrass and multiflora rose dominate the herbaceous layer. The semipermanently flooded freshwater marsh portion of this wetland has a few black willows but consists primarily of Japanese stiltgrass, false nettle and an unidentified grass with a few scattered saplings of green ash and black willow. The overall quality of the emergent and headwater forest portions of Wetland C is rated as high.

H. Conclusions

Steep slopes and Goldston soils with a moderate erosion hazard rating will require development restrictions and extra consideration for developing a sediment and erosion control plan for the project. No federally protected plant species were found within the project area. The proposed project is not anticipated to affect Atlantic pigtoe due to a lack of suitable habitat. A survey is necessary to ensure the project would not affect bald eagle nests. The parcel between Eastowne Drive and I-40 is included with the Dry Creek/Mt. Moriah Bottomland natural area, but contains Piedmont Bottomland Forest only within one minor drainageway; Dry-Mesic Oak Hickory forest covers most of the rest of the parcel. However, this parcel contains high-quality forest habitat that provides a connection to other designated natural areas. A small portion of this parcel includes interior forest important to area specialists, but this important habitat is isolated from other interior forest habitat by surrounding development, major roadways and edge habitat. Most of the wetlands and streams within the project area have overall quality ratings of medium to high. The exception is the lower portion of Stream C within the existing development that received a low overall quality rating.

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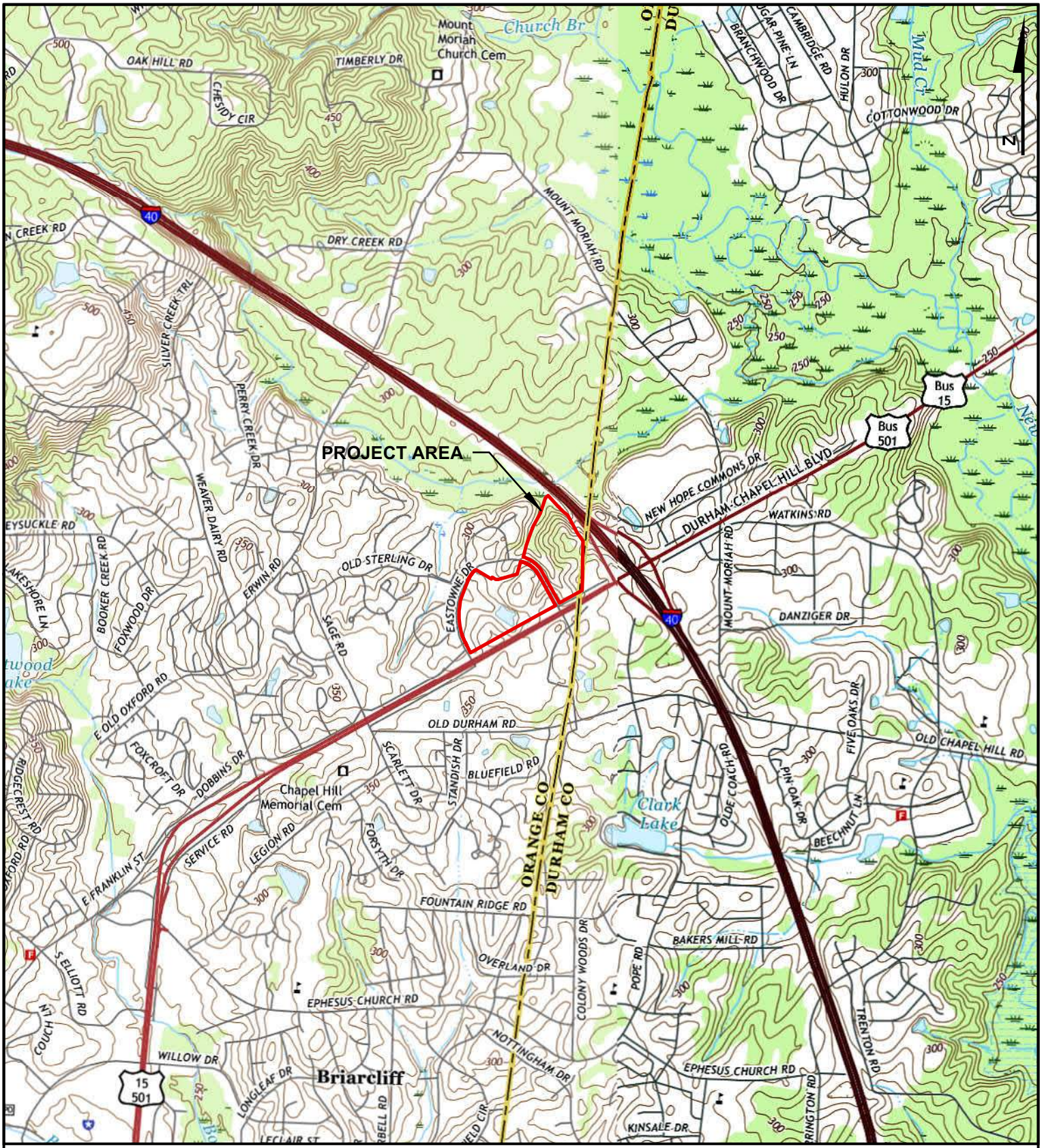
U.S. Fish and Wildlife Service/Raleigh Ecological Services Field Office. 2017a. Michaux's Sumac | Species Information, https://www.fws.gov/raleigh/species/es_michauxs_sumac.html.

U.S. Fish and Wildlife Service/Raleigh Ecological Services Field Office. 2017b. Smooth Coneflower | Species Information, www.fws.gov/raleigh/species/es_smooth_coneflower.html.

U.S. Fish and Wildlife Service/Southeast Region. 2018. Atlantic pigtoe | Species Information, https://www.fws.gov/southeast/wildlife/mussels/atlantic-pigtoe/.



NOTES:
1. USGS; 7.5 MINUTE, QUAD, "CHAPEL HILL", NORTH CAROLINA; 2016
2. LAT: 35.950231, LONG: -79.004279

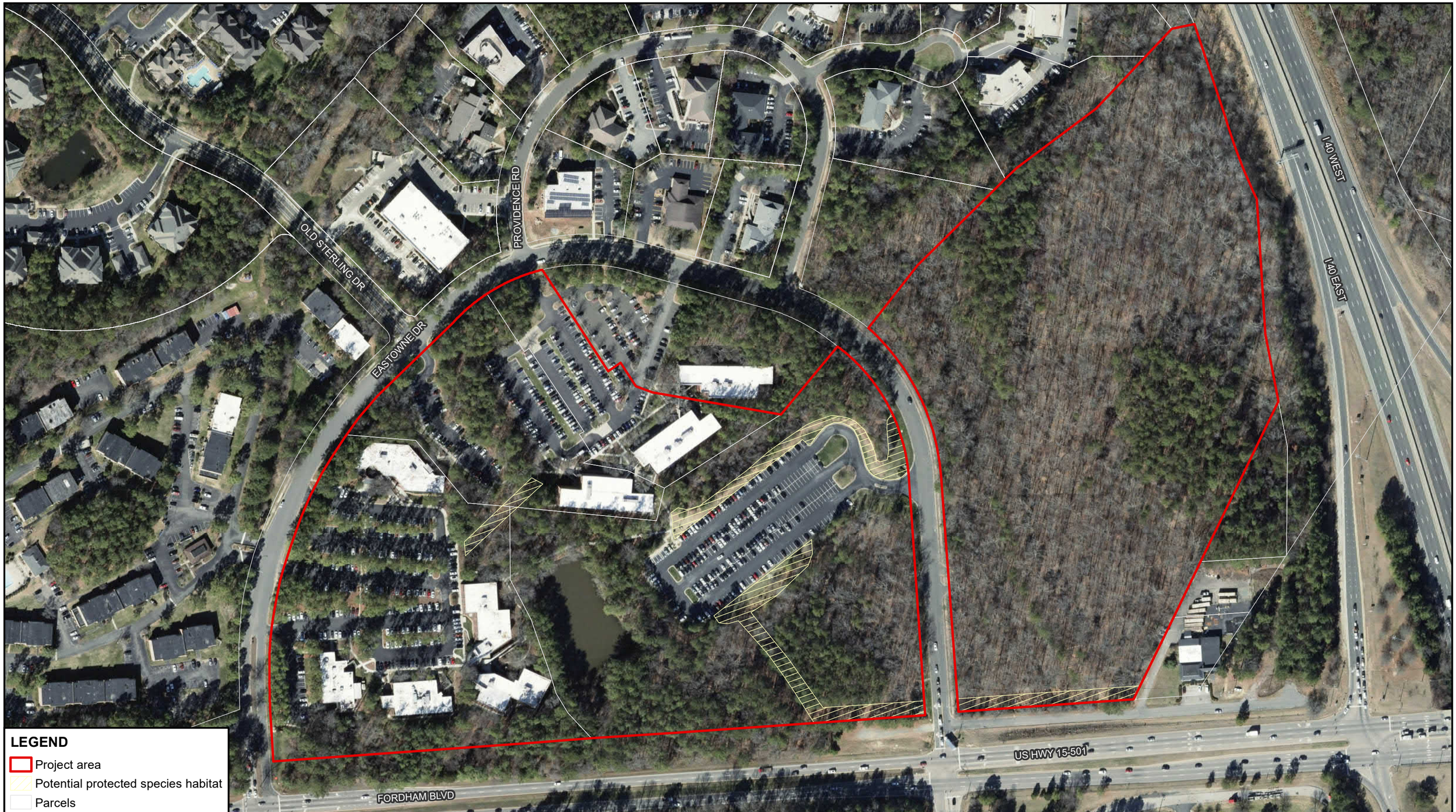
McADAMS

FIGURE 1. USGS TOPOGRAPHIC VICINITY MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

0 1,000 2,000 Feet
1 inch = 2,000 feet

VERSION:	1
DATE:	6/13/2019
JOB NO:	EMA-17000
DRAWN BY:	roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 1 USGS.mxd, 6/13/2019 8:37:34 AM, roth



MCADAMS

FIGURE 2. AERIAL IMAGERY MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

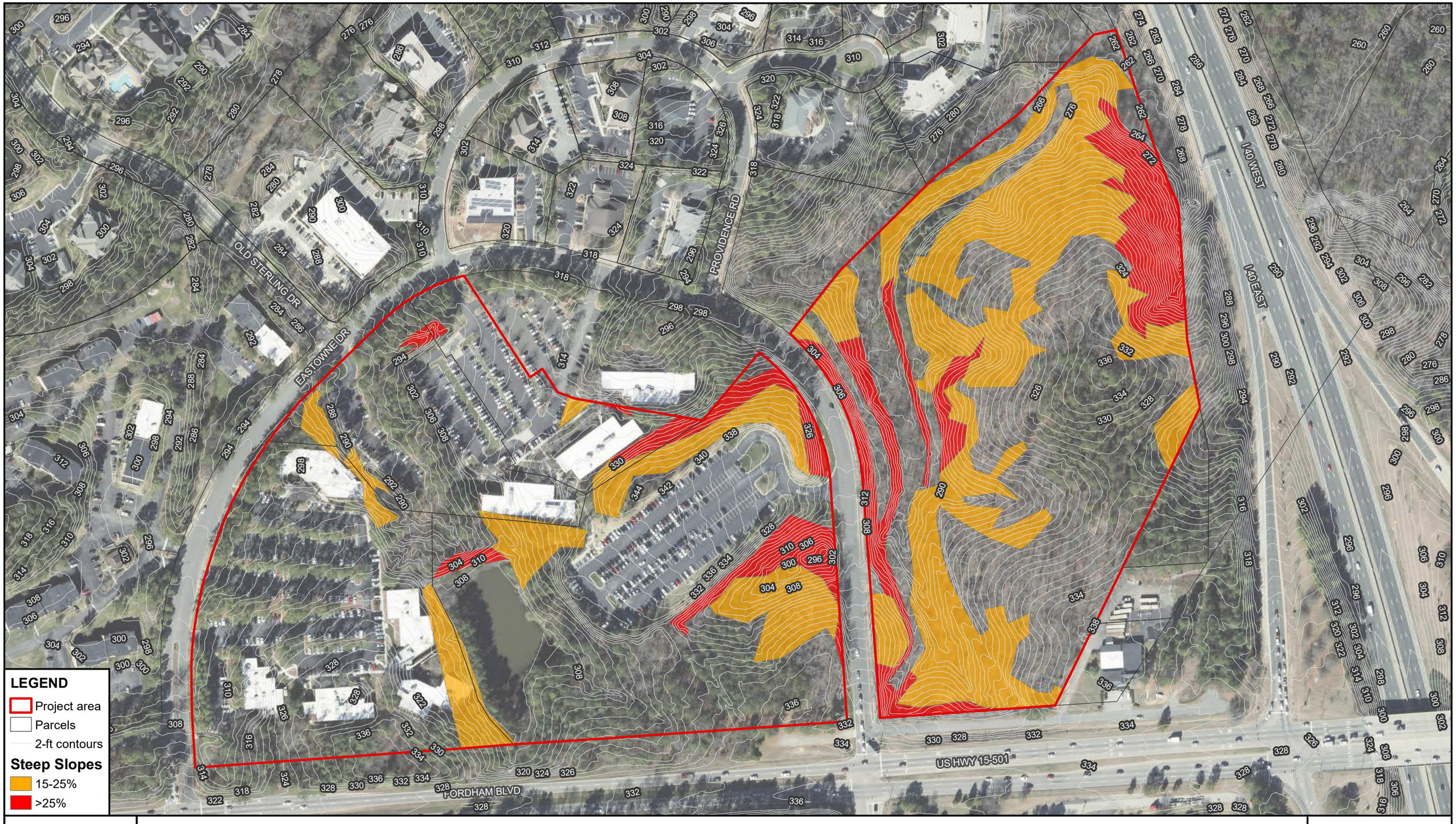
Aerial Imagery: 2017 NC OneMap Orthoimagery

N

0 100 200 Feet
1 inch = 200 feet

VERSION: 1
DATE: 6/13/2019
JOB NO: EMA-17000
DRAWN BY: roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 2 Aerial Map.mxd, 6/13/2019 4:15:31 PM, roth



McADAMS

FIGURE 3. SITE TOPOGRAPHY & STEEP SLOPES MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

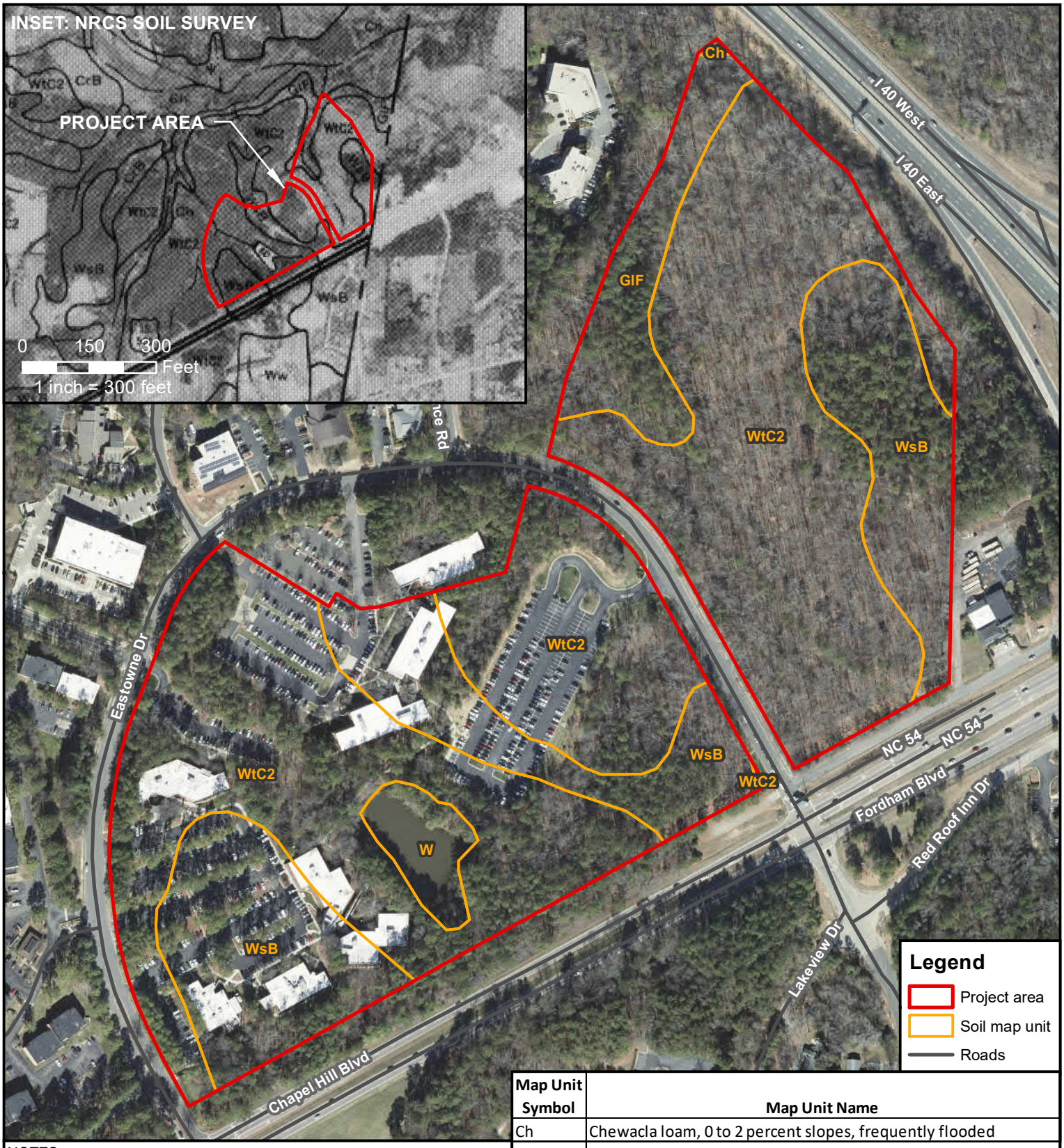
Aerial Imagery: 2017 NC OneMap Orthoimagery

N

0 100 200 Feet
1 inch = 200 feet

VERSION:	1
DATE:	6/18/2019
JOB NO:	EMA-17000
DRAWN BY:	roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 3 Steep Slopes.mxd, 6/18/2019 4:22:04 PM, roth



Map Unit Symbol	Map Unit Name
Ch	Chewacla loam, 0 to 2 percent slopes, frequently flooded
GIF	Goldston channery silt loam, 15 to 45 percent slopes
W	Water
WsB	White Store loam, 2 to 6 percent slopes
WtC2	White Store clay loam, 6 to 15 percent slopes, moderately eroded

NOTES:
1. NRCS WEB SOIL SURVEY; ORANGE COUNTY, NC (NC135); SPATIAL VERSION 4, DEC 21, 2013
2. INSET: NRCS; SOIL SURVEY SHEET 27, ORANGE COUNTY, NC (1977)

McAdams

FIGURE 4. SOIL SURVEY MAPS - WEB SOIL SURVEY & ORANGE COUNTY (1977) UNC HCS - EASTOWNE CAMPUS CHAPEL HILL, ORANGE COUNTY, NC

0 750 1,500
Feet
1 inch = 1,500 feet

VERSION: 1
DATE: 6/13/2019
JOB NO: EMA-17000
DRAWN BY: roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 2 Soil Survey.mxd, 6/13/2019 9:47:06 AM, roth

New Hope Creek Slopes
CPF/New Hope Creek Aquatic Habitat

Henry J. Oosting
Natural Area

I-40

US 15-501

New Hope Creek
Bottomland Forest

Dry Creek/Mount
Moriah Bottomland

NC-751

NC-86

ORANGE

DURHAM

US 15-501

I-40

NC-54

NC Center for Geographic Information & Analysis

Legend

- Stream
- Waterbodies
- Project area
- Chapel Hill jurisdictional limits
- County boundary
- Major roads

NHP Natural Areas

Top Rating

- Exceptional
- Very High
- High
- Moderate
- General

NHP Managed Areas

- Conservation Easement
- Registered Heritage Area

Owner type

- Federal
- Local Government
- Private
- State

McADAMS

FIGURE 5. NATURAL HERITAGE AREAS MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

Aerial Imagery: 2017 NC OneMap Orthoimagery

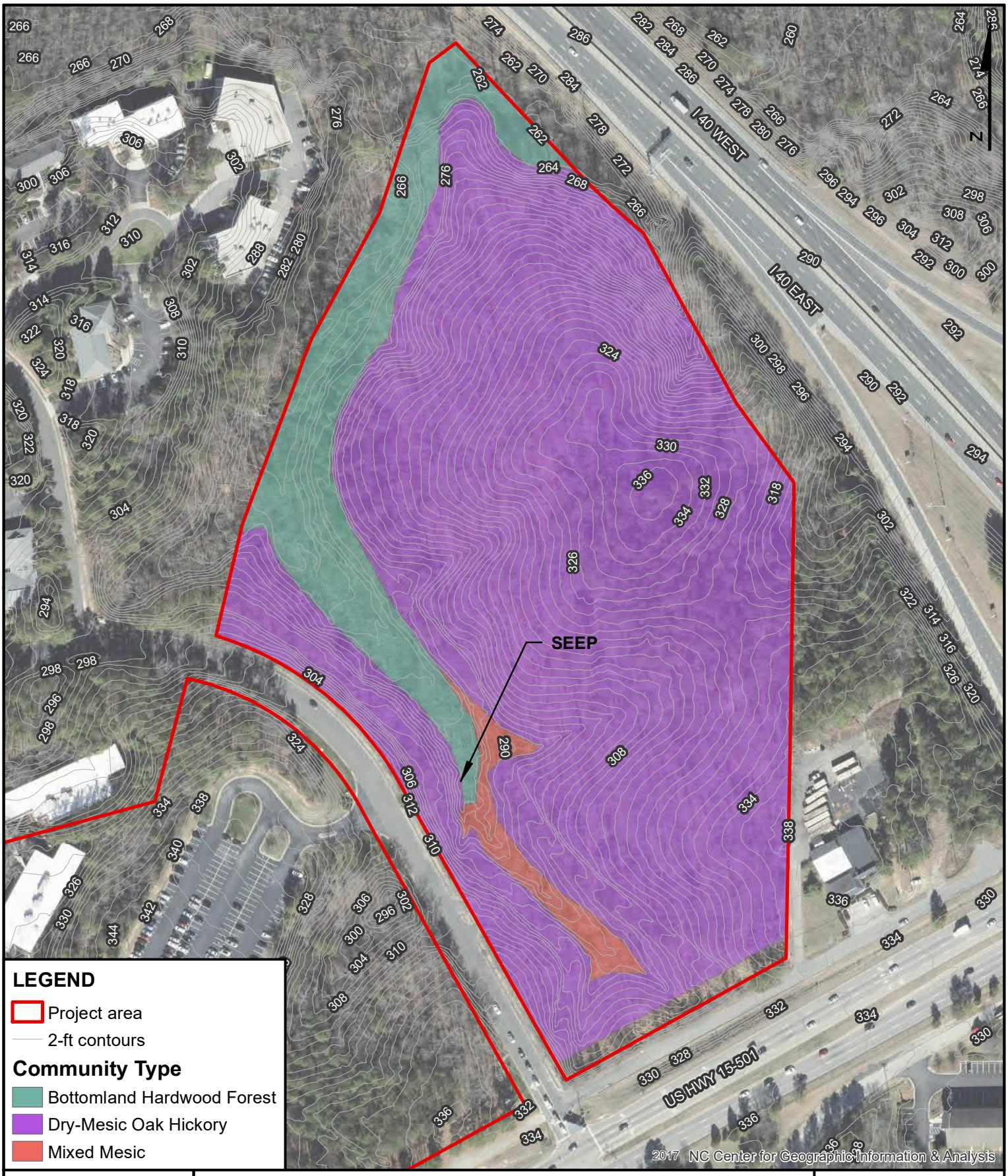
N

0 0.25 0.5 Miles

1 in = 0.5 miles

VERSION:	1
DATE:	6/14/2019
JOB NO:	EMA-17000
DRAWN BY:	roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 5 Natural Heritage Areas.mxd, 6/14/2019 12:35:21 PM, roth



McADAMS

FIGURE 6. NATURAL COMMUNITIES MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

0 100 200 Feet
1 inch = 200 feet

VERSION: 1
DATE: 6/18/2019
JOB NO: EMA-17000
DRAWN BY: burdette

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 6 Natural Communities.mxd, 6/18/2019 4:33:51 PM, burdette

McADAMS

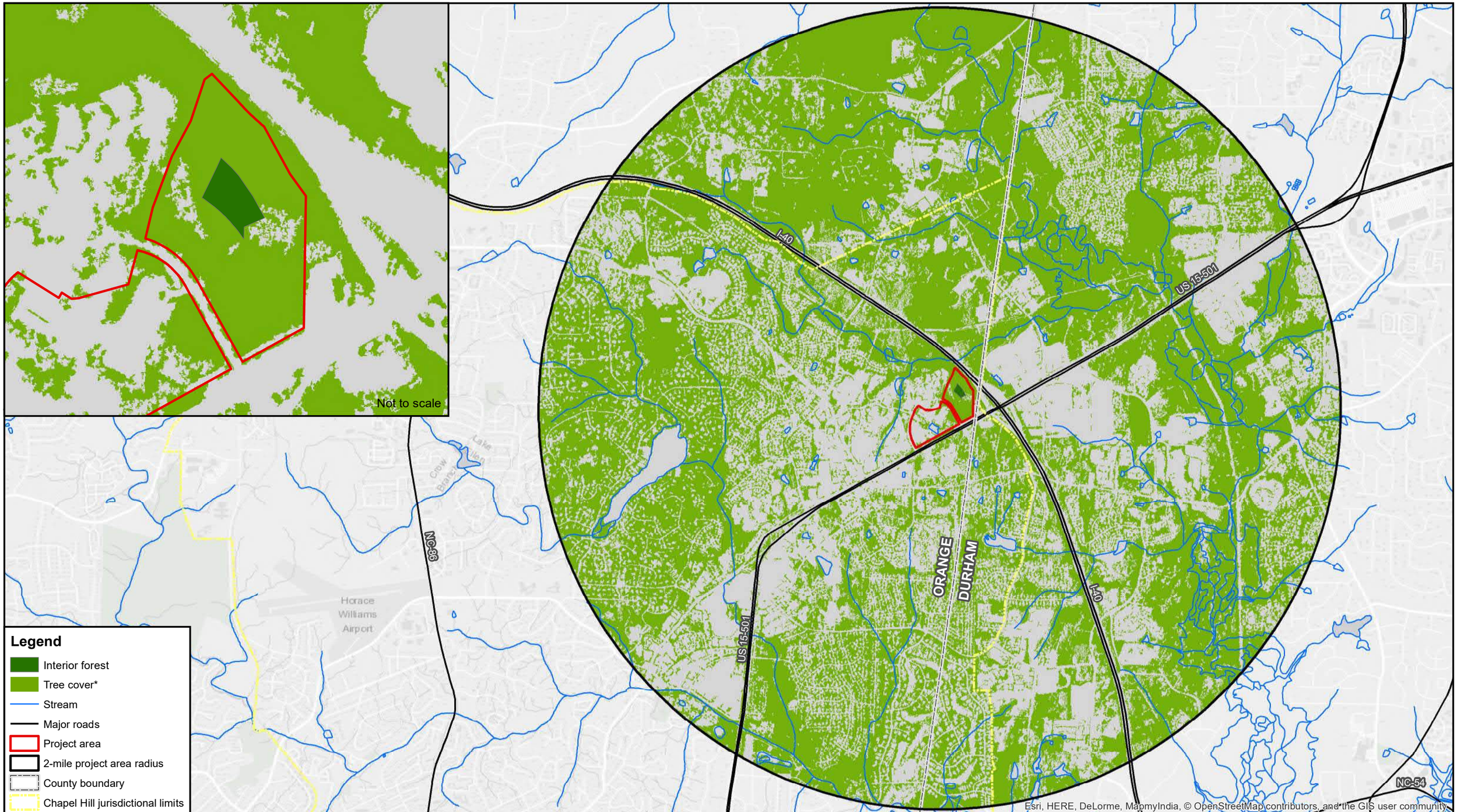
FIGURE 7. FOREST STAND AGE MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

Aerial Imagery: 2017 NC OneMap Orthoimagery

0 100 200 Feet
1 inch = 200 feet

VERSION:	1
DATE:	6/14/2019
JOB NO:	EMA-17000
DRAWN BY:	roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 7 Forest Stand Age.mxd, 6/14/2019 2:37:03 PM, roth



McADAMS

FIGURE 8. FOREST INTERIOR/EDGE MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

*Tree Cover Data: NAIP-Derived Tree Cover for North Carolina, NC OneMap 2017, NC Department of Agriculture and Consumer Services

N

0 0.25 0.5 Miles
1 in = 0.5 miles

VERSION:	1
DATE:	6/14/2019
JOB NO:	EMA-17000
DRAWN BY:	roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 8 Forest Edge Map.mxd, 6/14/2019 4:54:03 PM, roth

Jurisdictional Feature A
(Dry Creek) - Perennial
+/- 315 lf

Wetland A
Bottomland Hardwood Forest
+/- 0.509 ac.

FEMA Floodplain

End Jurisdictional
Feature B

End Jurisdictional
Feature A

Start Jurisdictional
Feature B - Perennial
+/- 295 lf

End Jurisdictional
Feature X

End Jurisdictional
Feature C

Start Jurisdictional
Feature C - Intermittent
+/- 550 lf

Start Jurisdictional
Feature X - Intermittent
+/- 950 lf

Pond A
+/- 1.031 ac.

Wetland B
Freshwater Marsh
+/- 0.033 ac.

Wetland C1
Freshwater Marsh
+/- 0.077 ac.

Wetland C2
Headwater Forest
+/- 0.152 ac.

Pinegate
Apartments

MOB1

PROVIDENCE RD

OLD STERLING DR

I 40 WEST

I 40 EAST

EASTOWNE DR

US HWY 15-501

FORDHAM BLVD

ORANGE COUNTY

DURHAM COUNTY

LEGEND

- Jurisdictional channel
- Jurisdictional pond
- Jurisdictional wetland
- Jordan buffer
- Chapel Hill RCD
- 100-year floodplain
- Project area
- County boundary
- Parcels
- 2-ft contours

McADAMS

FIGURE 9. JURISDICTIONAL WATERS, WETLANDS AND RIPARIAN BUFFERS MAP
UNC HCS - EASTOWNE CAMPUS
CHAPEL HILL, ORANGE COUNTY, NC

N

0 100 200 Feet
1 inch = 200 feet

VERSION: 1
DATE: 6/17/2019
JOB NO: EMA-17000
DRAWN BY: roth

X:\Projects\EMA\EMA-17000\Storm\Wetlands\GIS\EMA17000_Figure 9 Jurisdictional Waters Map.mxd, 6/17/2019 7:39:35 AM, roth

Appendix A: US Fish and Wildlife Service Official Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Phone: (919) 856-4520 Fax: (919) 856-4556

In Reply Refer To: June 13, 2019
Consultation Code: 04EN2000-2019-SLI-1036
Event Code: 04EN2000-2019-E-02370
Project Name: Eastowne

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The species list generated pursuant to the information you provided identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or

evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

Not all Threatened and Endangered Species that occur in North Carolina are subject to section 7 consultation with the U.S Fish and Wildlife Service. Atlantic and shortnose sturgeon, sea turtles,when in the water, and certain marine mammals are under purview of the National Marine Fisheries Service. If your project occurs in marine, estuarine, or coastal river systems you should also contact the National Marine Fisheries Service, http://www.nmfs.noaa.gov/

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office. If you have any questions or comments, please contact John Ellis of this office at john_ellis@fws.gov.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

Project Summary

Consultation Code: 04EN2000-2019-SLI-1036

Event Code: 04EN2000-2019-E-02370

Project Name: Eastowne

Project Type: ** OTHER **

Project Description: The Eastowne Campus site is on the north side of U.S. 15-501, just southwest of the I-40 interchange in Chapel Hill, North Carolina. The project area consists of five parcels that have a combined area of approximately 48-acres bounded by Eastowne Drive, U.S. 15-501, and I-40. Four of the five parcels that compose the overall project area are currently developed with seven medical office buildings, along with associated parking and utility infrastructure. The largest parcel of the five, located at the northeast corner of the intersection of Eastowne Drive and U.S. 15-501, is currently un-developed and is in a wooded condition. After an initial site investigation and preliminary master planning effort, UNC HCS desires to further refine the conceptual master plan and engage the Town and the public to negotiate a Development Agreement for the full build out of the property.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/35.949416192182596N79.0054916174457W

Counties: Durham, NC | Orange, NC

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Clams

NAME	STATUS
Atlantic Pigtoe *Fusconaia masoni* There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5164	Proposed Threatened

Flowering Plants

NAME	STATUS
Michaux's Sumac *Rhus michauxii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5217	Endangered
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix B: NC Natural Heritage Program Report

NC DEPARTMENT OF
NATURAL AND CULTURAL RESOURCES

Roy Cooper, **Governor**
Susi Hamilton, **Secretary**
Walter Clark, **Director, Land and Water Stewardship**

NCNHDE-9256

June 12, 2019

Alec Pierzga
The John R. McAdams Company
2905 Meridian Pkwy
Durham, NC 27713
RE: UNC HCS - Eastowne Campus; EMA-17000

Dear Alec Pierzga:

The North Carolina Natural Heritage Program (NCNHP) appreciates the opportunity to provide information about natural heritage resources for the project referenced above.

A query of the NCNHP database indicates that there are records for rare species, important natural communities, natural areas, and/or conservation/managed areas within the proposed project boundary. These results are presented in the attached 'Documented Occurrences' tables and map.

The attached 'Potential Occurrences' table summarizes rare species and natural communities that have been documented within a one-mile radius of the property boundary. The proximity of these records suggests that these natural heritage elements may potentially be present in the project area if suitable habitat exists. Tables of natural areas and conservation/managed areas within a one-mile radius of the project area, if any, are also included in this report.

If a Federally-listed species is documented within the project area or indicated within a one-mile radius of the project area, the NCNHP recommends contacting the US Fish and Wildlife Service (USFWS) for guidance. Contact information for USFWS offices in North Carolina is found here: https://www.fws.gov/offices/Directory/ListOffices.cfm?statecode=37.

Please note that natural heritage element data are maintained for the purposes of conservation planning, project review, and scientific research, and are not intended for use as the primary criteria for regulatory decisions. Information provided by the NCNHP database may not be published without prior written notification to the NCNHP, and the NCNHP must be credited as an information source in these publications. Maps of NCNHP data may not be redistributed without permission.

Also please note that the NC Natural Heritage Program may follow this letter with additional correspondence if a Dedicated Nature Preserve, Registered Heritage Area, Clean Water Management Trust Fund easement, or an occurrence of a Federally-listed species is documented near the project area.

If you have questions regarding the information provided in this letter or need additional assistance, please contact Rodney A. Butler at rodney.butler@ncdcr.gov or 919-707-8603.

Sincerely,
NC Natural Heritage Program

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Intersecting the Project Area
UNC HCS - Eastowne Campus
Project No. EMA-17000
June 12, 2019
NCNHDE-9256

Element Occurrences Documented Within Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Natural Community	29173	Piedmont Swamp Forest	---	2010	CD	3-Medium	---	---	G3G4	S2

Natural Areas Documented Within Project Area

Site Name	Representational Rating	Collective Rating
Dry Creek/Mount Moriah Bottomland	R5 (General)	C4 (Moderate)

Managed Areas Documented Within Project Area*

Managed Area Name	Owner	Owner Type
Durham County Open Space	Durham County: multiple local government	Local Government
Town of Chapel Hill Open Space	Town of Chapel Hill	Local Government

*NOTE: If the proposed project intersects with a conservation/managed area, please contact the landowner directly for additional information. If the project intersects with a Dedicated Nature Preserve (DNP), Registered Natural Heritage Area (RHA), or Federally-listed species, NCNHP staff may provide additional correspondence regarding the project.

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on June 12, 2019; source: NCNHP, Q2 Apr 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

Natural Heritage Element Occurrences, Natural Areas, and Managed Areas Within a One-mile Radius of the Project Area
UNC HCS - Eastowne Campus
Project No. EMA-17000
June 12, 2019
NCNHDE-9256

Element Occurrences Documented Within a One-mile Radius of the Project Area

Taxonomic Group	EO ID	Scientific Name	Common Name	Last Observation Date	Element Occurrence Rank	Accuracy	Federal Status	State Status	Global Rank	State Rank
Butterfly	34564	Erynnis martialis	Mottled Duskywing	1952-07-01	H	5-Very Low	---	Significantly Rare	G3	S2
Dragonfly or Damselfly	33764	Somatochlora georgiana	Coppery Emerald	2004-Pre	H?	5-Very Low	---	Significantly Rare	G3G4	S2?
Natural Community	28797	Piedmont Bottomland Forest (High Subtype)	---	2010	BC	3-Medium	---	---	G3G4	S2
Natural Community	14132	Piedmont Bottomland Forest (Typic Low Subtype)	---	2017-09-22	A	2-High	---	---	G2?	S2
Natural Community	30519	Piedmont Bottomland Forest (Typic Low Subtype)	---	2010	BC	3-Medium	---	---	G2?	S2
Natural Community	30518	Piedmont Levee Forest (Beech Subtype)	---	2010	A	4-Low	---	---	G3?	S2
Natural Community	29173	Piedmont Swamp Forest	---	2010	CD	3-Medium	---	---	G3G4	S2
Vascular Plant	3598	Echinacea laevigata	Smooth Coneflower	1922-05-27	X	3-Medium	Endangered	Endangered	G2G3	S1S2
Vascular Plant	3221	Liatris squarrulosa	Earle's Blazing-star	1944-10-07	H	4-Low	---	Significantly Rare Peripheral	G4G5	S2
Vascular Plant	36779	Orbexilum pedunculatum	Sampson's Snakeroot	1898-07	H	5-Very Low	---	Significantly Rare Peripheral	G5	S1
Vascular Plant	5981	Parthenium auriculatum	Glade Wild Quinine	1949-05-08	X?	4-Low	---	Significantly Rare Throughout	G3G4	S3
Vascular Plant	1157	Scutellaria leonardii	Shale-barren Skullcap	1988-06-14	E	4-Low	---	Endangered	G4T4	S2
Vascular Plant	22304	Tridens chapmanii	Chapman's Redtop	1894-08-21	H	5-Very Low	---	Threatened	G5T3	S1S2

Natural Areas Documented Within a One-mile Radius of the Project Area

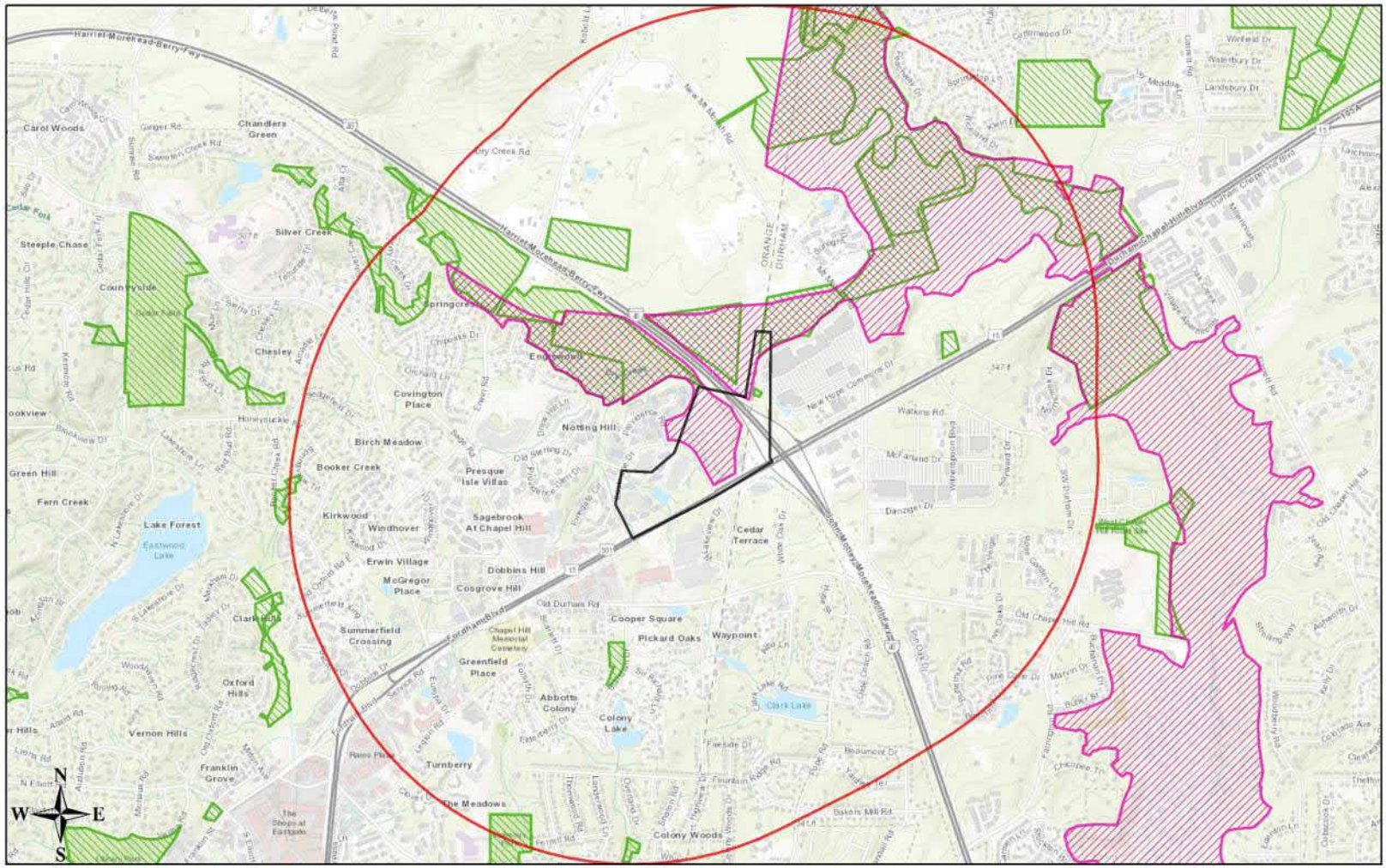
Site Name	Representational Rating	Collective Rating
Dry Creek/Mount Moriah Bottomland	R5 (General)	C4 (Moderate)
New Hope Creek Bottomland Forest	R1 (Exceptional)	C3 (High)

Managed Areas Documented Within a One-mile Radius of the Project Area

Managed Area Name	Owner	Owner Type
NC Clean Water Management Trust Fund Easement	NC DNCR, Clean Water Management Trust Fund	State
NC Division of Mitigation Services Easement	NC DEQ, Division of Mitigation Services	State
Durham County Open Space	Durham County: multiple local government	Local Government
Orange County Open Space	Orange County: multiple local government	Local Government
Town of Chapel Hill Open Space	Town of Chapel Hill	Local Government

Definitions and an explanation of status designations and codes can be found at https://ncnhde.natureserve.org/content/help. Data query generated on June 12, 2019; source: NCNHP, Q2 Apr 2019. Please resubmit your information request if more than one year elapses before project initiation as new information is continually added to the NCNHP database.

NCNHDE-9256: UNC HCS - Eastowne Campus



June 12, 2019

- Project Boundary
- Buffered Project Boundary
- NHP Natural Area (NHNA)
- Managed Area (MAREA)

1:26,709

0 0.225 0.45 0.9 mi

0 0.35 0.7 1.4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Appendix C: Species Data

Trees			
Species	**Size Range (inches dbh)**	**Mid-story/ Shrub Species**	**Herb Species**
Dry Mesic Oak-Hickory Forest			
White oak (*Quercus alba*)	8-27	Green ash (*Fraxinus pennsylvanica*) American beech (*Fagus grandifolia*) Mockernut hickory (*Carya tomentosa*) Red maple (*Acer rubrum*) Flowering dogwood (Cornus florida) Winged elm (*Ulmus alata*) Sweet gum (*Liquidambar styraciflua*) Ironwood (*Carpinus caroliniana*)	*Hexastylus* spp. Muscadine (*Vitis rotundifolia*) Mockernut hickory (*Carya tomentosa*) Maple leaf viburnum (*Viburnum acerifolium*) Lowbush blueberry (*Vaccinium angustifolium*) Blackhaw (*Viburnum prunifolium*) Virginia creeper (*Parthenocissus quinquefolia*) Deertongue (*Dichanthelium clandestinum*) Black oak (*Quercus velutina*)
Loblolly pine (*Pinus taeda*)	7-25		
Mockernut hickory (*Carya tomentosa*)	4-6		
Black oak (*Quercus velutina*)	8-13		
Green ash (*Fraxinus pennsylvanica*)	6-15		
American beech (*Fagus grandifolia*)	7-28		
Piedmont Bottomland Forest (High Subtype)			
Tulip poplar (*Liriodendron tulipifera*)	10-32	Ironwood (*Carpinus caroliniana*) American elm (*Ulmus americana*) Green ash (*Fraxinus pennsylvanica*) Pawpaw (*Asimina triloba*) Red maple (*Acer rubrum*) Spicebush (*Lindera benzoin*) Flowering dogwood (*Cornus florida*) Deciduous holly (*Ilex decidua*) Mockernut hickory (*Carya tomentosa*)	Virginia creeper (*Parthenocissus quinquefolia*) Japanese stiltgrass (*Microstegium vimineum*) Christmas fern (*Polystichum acrostichoides*) *Carex* spp. Poison ivy (*Toxicodendrons radicans*) Deertongue (*Dichanthelium clandestinum*) Multiflora rose (*Rosa multiflora*) Common greenbrier (*Smilax rotundifolia*)
Sycamore (*Platanus occidentalis*)	8-32		
Sweet gum (*Liquidambar styraciflua*)	10-34		
Green ash (*Fraxinus pennsylvanica*)	8-17		
American elm (*Ulmus americana*)	6-11		
Loblolly pine (*Pinus taeda*)	28-35		
Black oak (*Quercus velutina*)	6-10		
Overcup oak (*Quercus lyrata)*	31		
Swamp oak (*Quercus michaxii*)	32		
Mixed Mesic Forest			
Tulip poplar (*Liriodendron tulipifera*)	11-27	Ironwood (*Carpinus caroliniana*) Deciduous holly (*Ilex decidua*) Pawpaw (*Asimina triloba*) Blackhaw (*Viburnum prunifolium*)	Muscadine (*V. rotundifolia*) Japanese honeysuckle (*Lonicera japonica*) Virginia creeper (*Parthenocissus quinquefolia*) Multiflora rose (*Rosa multiflora*) Redbud (*Cercis canadensis*) Deertongue (*Dichanthelium clandestinum*) Christmas fern (*Polystichum acrostichoides*)
Mockernut hickory (*Carya tomentosa*)	6-20		
Sweet gum (*Liquidambar styraciflua*)	5-15		
White oak (*Quercus alba*)	10-32		
American beech (*Fagus grandifolia*)	5-10		
Red oak (*Quercus falcata*)	9-22		

Appendix D: Natural Community Photographs

Photo 1: Dry-Mesic Oak-Hickory Community

Photo 2: Bottomland Hardwood Forest Community

Photo 3: Mixed Mesic Community

Appendix E: Protected Species Survey Photographs

Photo 1: Suitable habitat at south end of forested parcel facing NE with US Hwy 15-501 to the right

Photo 2: Suitable habitat at south end of parcel facing SW with US Hwy 15-501 to the left

Photo 3: Suitable habitat facing away from parking lot on Eastowne Drive

Photo 4: Suitable habitat on southeastern corner of eastern parcel facing SW with US Hwy 15-501 on the left

Appendix F: Preliminary Jurisdictional Determination

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2016-02109** County: **Orange** U.S.G.S. Quad: **Chapel Hill**

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: **Health System Properties, LLC**
Mr. W.L. Roper
Address: **3rd Floor Med Wing 3, Campus Box 7600**
Chapel Hill, North Carolina 27514

Authorized Agent: **The John R. McAdams Company, Inc.**
Mr. George Buchholtz
Address: **2905 Meridian Parkway**
Durham, North Carolina 27713

Size (acres)	**48**	Nearest Town	**Chapel Hill**
Nearest Waterway	**New Hope Creek**	River Basin	**Cape Fear**
USGS HUC	**03030002**	Coordinates	Latitude: **35.94943**
			Longitude: **-79.0051**

Location description: **The UNC Hospitals – Eastowne Campus project area is identified as an approximate 48 acre tract of land, located on Orange County, North Carolina Parcels 9890911209, 9890807564, 9890802764, 9890800643, and 9890800195. These parcels are located near the intersection of Eastowne Drive and Durham Chapel Hill Blvd, Chapel Hill, Orange County, North Carolina. Waters on-site drain into New Hope Creek of the**

Indicate Which of the Following Apply:

A. Preliminary Determination

X There are waters, including wetlands, on the above described project area, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). The waters, including wetlands, have been delineated, and the delineation has been verified by the Corps to be sufficiently accurate and reliable. Therefore this preliminary jurisdiction determination may be used in the permit evaluation process, including determining compensatory mitigation. For purposes of computation of impacts, compensatory mitigation requirements, and other resource protection measures, a permit decision made on the basis of a preliminary JD will treat all waters and wetlands that would be affected in any way by the permitted activity on the site as if they are jurisdictional waters of the U.S. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction.

_ There are wetlands on the above described property, that may be subject to Section 404 of the Clean Water Act (CWA)(33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). However, since the waters, including wetlands, have not been properly delineated, this preliminary jurisdiction determination may not be used in the permit evaluation process. Without a verified wetland delineation, this preliminary determination is merely an effective presumption of CWA/RHA jurisdiction over all of the waters, including wetlands, at the project area, which is not sufficiently accurate and reliable to support an enforceable permit decision. We recommend that you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are waters of the U.S., including wetlands, on the above described project area subject to the permit requirements of Section 404 of the Clean Water Act (CWA) (33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We recommend you have the waters of the U.S. on your property delineated. As the Corps may not be able to accomplish this wetland delineation in a timely manner, you may wish to obtain a consultant to conduct a delineation that can be verified by the Corps.

_ The waters of the U.S., including wetlands, on your project area have been delineated and the delineation has been verified by the Corps. If you wish to have the delineation surveyed, the Corps can review and verify the survey upon completion. Once verified, this survey will provide an accurate depiction of all areas subject to CWA and/or RHA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S., including wetlands, have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management in Morehead City, NC, at (252) 808-2808 to determine their requirements.

Placement of dredged or fill material within waters of the US, including wetlands, without a Department of the Army permit may constitute a violation of Section 301 of the Clean Water Act (33 USC § 1311). Placement of dredged or fill material, construction or placement of structures, or work within navigable waters of the United States without a Department of the Army permit may constitute a violation of Sections 9 and/or 10 of the Rivers and Harbors Act (33 USC § 401 and/or 403). If you have any questions regarding this determination and/or the Corps regulatory program, please contact **Ms. Samantha Dailey at (919) 554-4884, ext. 22 or Samantha.J.Dailey@usace.army.mil.**

C. Basis For Determination: **Refer to the enclosed Preliminary Jurisdictional Determination Form and Figure 3. Existing Conditions.**

D. Remarks:

E. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

F. Appeals Information **(This information applies only to approved jurisdictional determinations as indicated in B. above)**

This correspondence constitutes an approved jurisdictional determination for the above described site. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and request for appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by _____.
It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: DAILEY.SAMANTHA.J.1387567948 Digitally signed by DAILEY.SAMANTHA.J.1387567948 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DAILEY.SAMANTHA.J.1387567948 Date: 2017.05.19 11:35:35 -04'00'

Date: **May 19, 2017** Expiration Date: **N/A**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

APPENDIX 2

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD): May 19, 2017

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

Property Owner: **Health System Properties, LLC**
Mr. W.L. Roper
Address: **3rd Floor Med Wing 3, Campus Box 7600**
Chapel Hill, North Carolina 27514

Authorized Agent: **The John R. McAdams Company, Inc.**
Mr. George Buchholtz
Address: **2905 Meridian Parkway**
Durham, North Carolina 27713

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Wilmington, UNC Hospitals – Eastowne Campus, Health System Properties, LLC, Orange County, SAW-2016-02109

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)
State: **NC** County/parish/borough: **Orange** City: **Chapel Hill**
Center coordinates of site (lat/long in degree decimal format): Lat. **35.94943°N**, Long. **79.0051° W**.
Universal Transverse Mercator:
Name of nearest water body: **New Hope Creek**

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLIES):
☒ Office (Desk) Determination. Date: **May 19, 2017**
☒ Field Determination. Date(s): **November 17, 2016**

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION

Site Number	Latitude (°N)	Latitude (°W)	Estimated Amount of Aquatic Resources in Review Area		Type of aquatic resource (i.e. wetland vs. non-wetland)	Geographic authority to which the aquatic resource "may be" subject (i.e. Section 404 or Section 10/404)
			Linear Feet	Acres		
Wetland A	35.959723	-79.002904		0.51	PFO Wetland	Section 404
Wetland B	35.949054	-79.005070		0.03	PFO Wetland	Section 404
Wetland C	35.948631	-79.005333		0.23	PFO Wetland	Section 404
Stream A	35.954034	-79.003305	272		Perennial Stream	Section 404
Stream B	35.953574	-79.002634	108		Intermittent Stream	Section 404
Stream C	35.949699	-79.006447	559		Intermittent Stream	Section 404
Stream X	35.95143	-79.00250	877		Intermittent Stream	Section 404
Pond A	35.949085	-79.005628		1.03	Open Water	Section 404

1. The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7)whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply): Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor: **The John R. McAdams Company, Inc., submitted a Jurisdictional Determination Request on October 7, 2016, with revisions received on February 10, 2017.**
☒ Data sheets prepared/submitted by or on behalf of the PJD requestor.
  ☒ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☐ U.S. Geological Survey Hydrologic Atlas: .
  ☐ USGS NHD data.
  ☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: **1:24K, NC-Chapel Hill**
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: **Web Soil Survey: November 2016**.
☒ National wetlands inventory map(s). Cite name: **Corps of Engineers SimSuite – November 2016**.
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodetic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
  or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Other information (please specify): .

1 Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Aquatic Resource feature Stream X exhibits a surface hydrological surface connection to Wetland A and Stream A. Approximately 397 linear feet separate the features. A defined bed and bank and ordinary high water mark was not observed through the 397 linear feet.

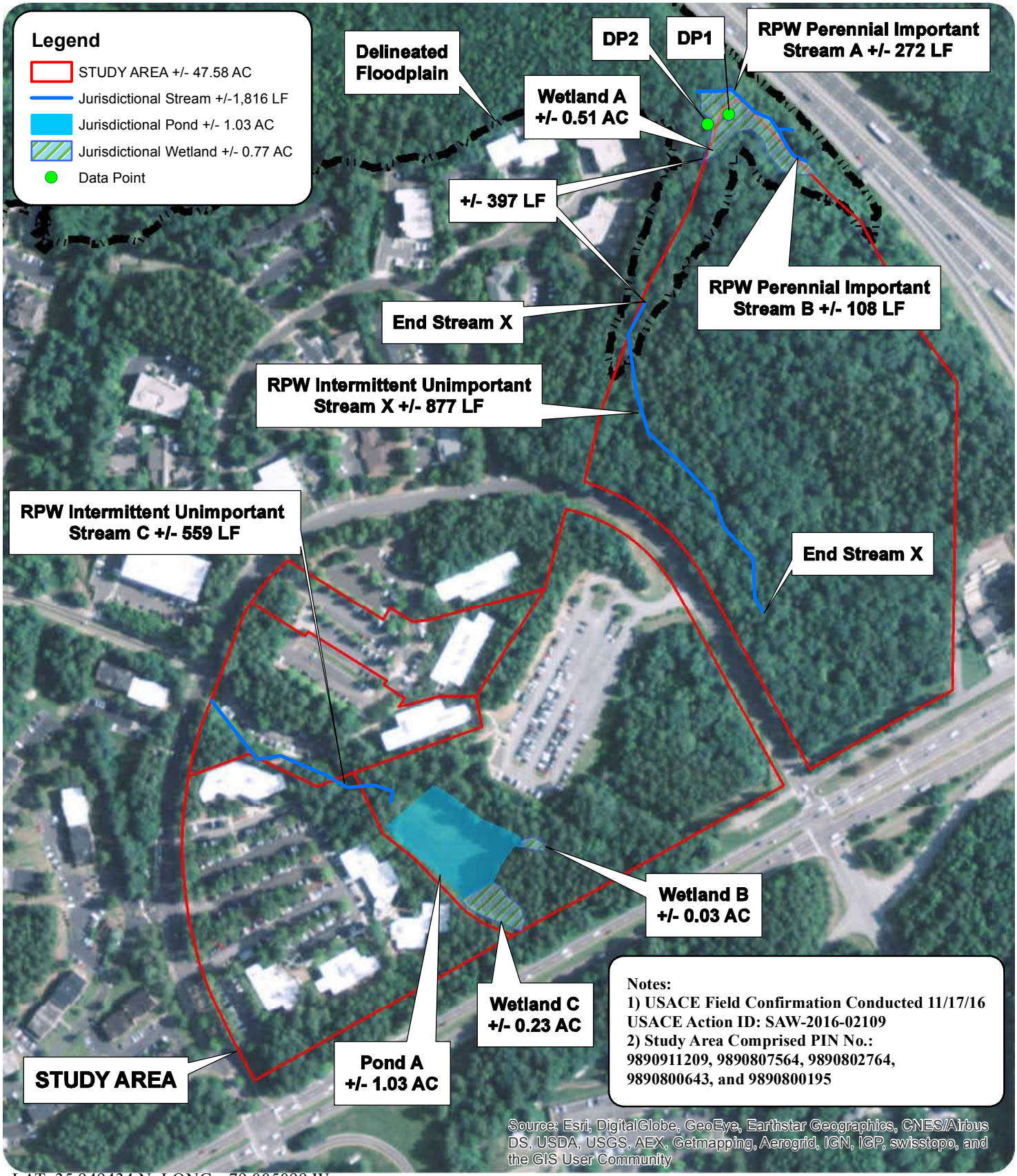
DAILEY.SAMANTHA.J.1387567948

Digitally signed by DAILEY.SAMANTHA.J.1387567948
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DAILEY.SAMANTHA.J.1387567948
Date: 2017.05.19 11:26:26 -04'00'

Signature and date of Regulatory Project Manager (REQUIRED)

Signature and date of person requesting preliminary JD (REQUIRED, unless obtaining the signature is Impracticable)

1 Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.



LAT: 35.949434 N, LONG: -79.005099 W

N

DATE: 02/10/17

0 200 400 800 Feet

1 inch = 400 feet

UNC HOSPITALS - EASTOWNE CAMPUS

WETLAND/STREAM DELINEATION

FIGURE 3. EXISTING CONDITIONS

PROJECT #: EMA-16000

CHAPEL HILL, NORTH CAROLINA

McADAMS

Appendix G: Town of Chapel Hill Buffer Determinations

Stream Determination Area Map

- Unclassified Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream
- Culverts
- 2-foot Contours
- 10-foot Contours
- Buildings
- Parcels
- Approximate Jordan Buffer
- Subject Property

Flood Zones

- 500-year floodplain
- 100-year floodplain

- Ephemeral Breakpoint
- Intermittent Breakpoint
- Perennial Breakpoint

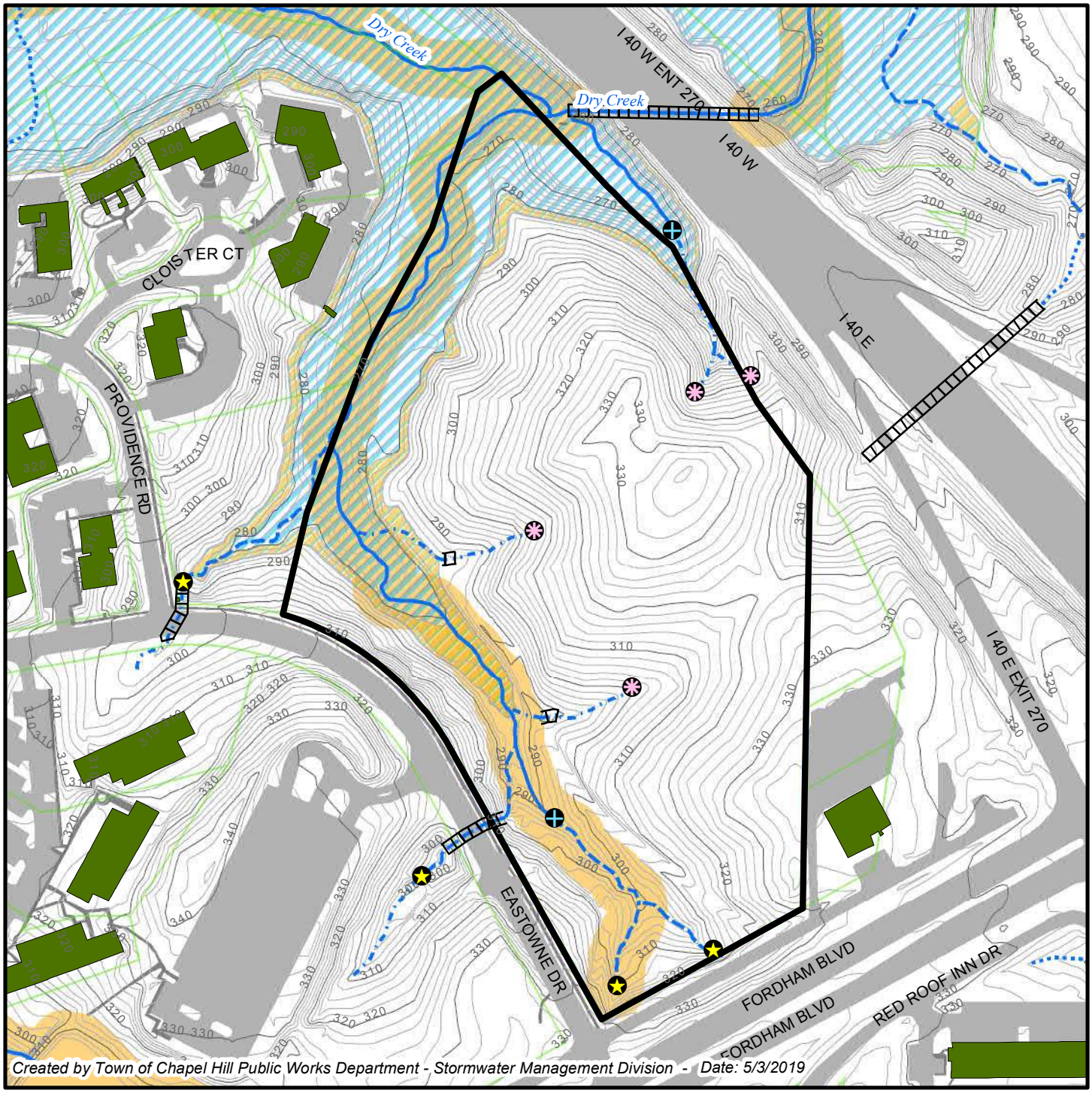
Address: Between Eastowne Dr & I-40
Chapel Hill, NC

Parcel ID: 9890-91-1209

0 125 250 500 Feet

1 inch = 250 feet

**Stream locations are approximate and must be verified by survey.
Buffers are measured from top of bank. RCD buffers may apply.
Please contact the Town of Chapel Hill Planning Department to verify.**



Created by Town of Chapel Hill Public Works Department - Stormwater Management Division - Date: 5/3/2019

Stream Determination Area Map

- Unclassified Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream
- Culverts
- 2-foot Contours
- 10-foot Contours
- Buildings
- Parcels
- Subject Property
- Possible Jurisdictional Wetlands
- Perennial Waterbody
- Approximate Jordan Buffer
- Ephemeral Breakpoint
- Intermittent Breakpoint
- Perennial Breakpoint

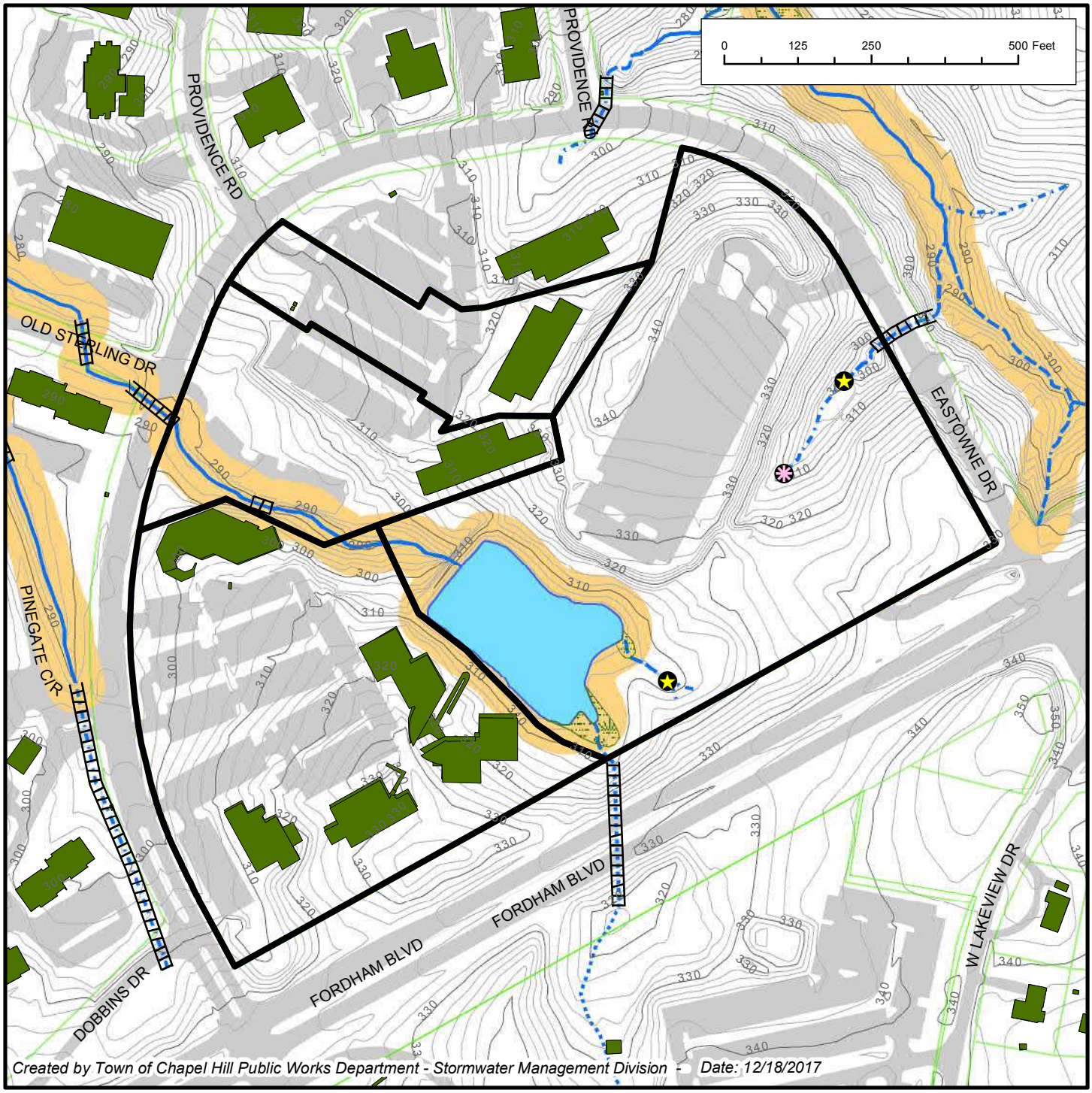
Address: 100, 600, 700 Eastowne Drive, Chapel Hill, NC

Parcel ID: 9890-80-7564, 9890-80-0195, 9890-80-0643, 9890-80-2764

Stream and wetland locations are approximate and must be verified by survey. Buffers are measured from top of bank. RCD buffers may apply. Please contact theTown of Chapel Hill Planning Department to verify.

N

1 inch = 245 feet



Created by Town of Chapel Hill Public Works Department - Stormwater Management Division - Date: 12/18/2017

Appendix H: Streams and Wetlands Photographs

Photo 1: Stream C lower section

Photo 2: Stream C upper section

Photo 3: Stream X

Photo 4: Stream X

Photo 5: Wetland A – Bottomland Hardwood Forest

Photo 6: Wetland C1 – Headwater Forest section facing away from pond edge

Photo 7: Wetland C2 – Emergent fringe at pond edge

Appendix I: NCSAM Forms & Results

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Eastowne Stream C - DS
2. Date of evaluation: 6/7/2019
3. Applicant/owner name: UNC Health Systems
4. Assessor name/organization: McAdams
5. County: Orange
6. Nearest named water body on USGS 7.5-minute quad: Dry Creek
7. River basin: Cape Fear
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.949499, -79.006413

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Stream C - DS
10. Length of assessment reach evaluated (feet): 390
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 0.4-0.5 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4-5
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☐Perennial flow ☒Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐A  (more sinuous stream, flatter valley slope)
☒B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐Section 10 water ☐Classified Trout Waters ☒Water Supply Watershed (☐I ☐II ☐III ☐IV ☒V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☒NCDWR Riparian buffer rule in effect ☒Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☒Yes ☐No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)
☐A Water throughout assessment reach.
☒B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric
☒A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☐B Not A

3. Feature Pattern – assessment reach metric
☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒B Not A

4. Feature Longitudinal Profile – assessment reach metric
☐A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☒B Not A

5. Signs of Active Instability – assessment reach metric
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
☒A < 10% of channel unstable
☐B 10 to 25% of channel unstable
☐C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☒C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.

- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☒B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☐F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: _____ (explain in "Notes/Sketch" section)
- ☐J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☐B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☐D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☒E Little or no habitat

Check for Tidal Marsh Streams Only

- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**************************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS************************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☐	☒	☐	☐	☐	Gravel (2 – 64 mm)
☐	☒	☐	☐	☐	Sand (.062 – 2 mm)
☐	☐	☐	☐	☒	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☐	☒	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☒	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☒	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☐A	☐A	Little or no alteration to water storage capacity over a majority of the streamside area
☒B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☒C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☐A	Streams and/or springs (jurisdictional discharges)
☒B	Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C	Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☒D	Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E	Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F	None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A	Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☒B	Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☒C	Urban stream (≥ 24% impervious surface for watershed)
☒D	Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E	Assessment reach relocated to valley edge
☐F	None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☐A	Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☒B	Degraded (example: scattered trees)
☐C	Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
☐A	☐A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☒D	☒D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☒E	☒E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☐A	☐A	Mature forest
☒B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☒C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☐

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☒B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☐A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☒C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☐A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☒C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☒B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☐C	☒C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:
-evaluated reach includes Stream C downstream of utility easement crossing
-water in <10% of channel - only in upper part of reach evaluated
-riffles burried in sediment
-3-5 mosquito fish and several frogs observed

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Eastowne Stream C - DS	Date of Assessment	6/7/2019
Stream Category	Pb1	Assessor Name/Organization	McAdams

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	**MEDIUM**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**MEDIUM**	**MEDIUM**
(3) Streamside Area Attenuation	**LOW**	**LOW**
(4) Floodplain Access	**MEDIUM**	**MEDIUM**
(4) Wooded Riparian Buffer	**LOW**	**LOW**
(4) Microtopography	NA	NA
(3) Stream Stability	**HIGH**	**HIGH**
(4) Channel Stability	**HIGH**	**HIGH**
(4) Sediment Transport	**LOW**	**LOW**
(4) Stream Geomorphology	**HIGH**	**HIGH**
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**LOW**	**LOW**
(3) Upland Pollutant Filtration	**LOW**	**LOW**
(3) Thermoregulation	**MEDIUM**	**MEDIUM**
(2) Indicators of Stressors	**NO**	**NO**
(2) Aquatic Life Tolerance	**LOW**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**LOW**	**LOW**
(2) In-stream Habitat	**LOW**	**LOW**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**HIGH**	**HIGH**
(3) In-stream Habitat	**LOW**	**LOW**
(2) Stream-side Habitat	**LOW**	**LOW**
(3) Stream-side Habitat	**LOW**	**LOW**
(3) Thermoregulation	**MEDIUM**	**MEDIUM**
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone	NA	NA
Overall	**LOW**	**LOW**

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Eastowne Stream C - US
2. Date of evaluation: 6/7/2019
3. Applicant/owner name: UNC Health Systems
4. Assessor name/organization: McAdams
5. County: Orange
6. Nearest named water body on USGS 7.5-minute quad: Dry Creek
7. River basin: Cape Fear
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.949562, -79.006820

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Stream C - US
10. Length of assessment reach evaluated (feet): 210
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 0.25-0.4 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☐Perennial flow ☒Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☐A  (more sinuous stream, flatter valley slope)
☒B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
☐Section 10 water ☐Classified Trout Waters ☒Water Supply Watershed (☐I ☐II ☐III ☐IV ☒V)
☐Essential Fish Habitat ☐Primary Nursery Area ☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property ☒NCDWR Riparian buffer rule in effect ☒Nutrient Sensitive Waters
☐Anadromous fish ☐303(d) List ☐CAMA Area of Environmental Concern (AEC)
☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☒Yes ☐No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)
☒A Water throughout assessment reach.
☐B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric
☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒B Not A

3. Feature Pattern – assessment reach metric
☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒B Not A

4. Feature Longitudinal Profile – assessment reach metric
☒A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☐B Not A

5. Signs of Active Instability – assessment reach metric
Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).
☐A < 10% of channel unstable
☐B 10 to 25% of channel unstable
☒C > 25% of channel unstable

6. **Streamside Area Interaction – streamside area metric**
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☐A	☐A	Little or no evidence of conditions that adversely affect reference interaction
☒B	☒B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. **Water Quality Stressors – assessment reach/intertidal zone metric**
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in “Notes/Sketch” section.
- ☐F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in “Notes/Sketch” section)
- ☒J Little to no stressors

8. **Recent Weather – watershed metric (skip for Tidal Marsh Streams)**
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. **Large or Dangerous Stream – assessment reach metric**
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. **Natural In-stream Habitat Types – assessment reach metric**

10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☐B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*****************************

11. **Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**

11a. ☐Yes ☒No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☐A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☐	☒	☐	☐	☐	Cobble (64 – 256 mm)
☐	☒	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☒	☐	☐	Sand (.062 – 2 mm)
☐	☐	☐	☒	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☐	☒	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☐A	☐A	Little or no alteration to water storage capacity over a majority of the streamside area
☒B	☒B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

☐A Streams and/or springs (jurisdictional discharges)
☒B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
☐D Evidence of bank seepage or sweating (iron in water indicates seepage)
☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
☒B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
☒C Urban stream (≥ 24% impervious surface for watershed)
☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
☐E Assessment reach relocated to valley edge
☐F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
☐B Degraded (example: scattered trees)
☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
☐A	☐A	☐A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☒B	☒B	☒B	☒B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☒

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☒B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☒B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☒C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:
-evaluated reach includes Stream C upstream of utility easement crossing and downstream of pond dam
-very low flow to stagnant water throughout channel

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Eastowne Stream C - US	Date of Assessment	6/7/2019
Stream Category	Pb1	Assessor Name/Organization	McAdams

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**MEDIUM**	**MEDIUM**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**MEDIUM**	**MEDIUM**
(3) Streamside Area Attenuation	**MEDIUM**	**MEDIUM**
(4) Floodplain Access	**MEDIUM**	**MEDIUM**
(4) Wooded Riparian Buffer	**HIGH**	**HIGH**
(4) Microtopography	NA	NA
(3) Stream Stability	**MEDIUM**	**MEDIUM**
(4) Channel Stability	**LOW**	**LOW**
(4) Sediment Transport	**HIGH**	**HIGH**
(4) Stream Geomorphology	**MEDIUM**	**MEDIUM**
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**MEDIUM**	**MEDIUM**
(3) Upland Pollutant Filtration	**MEDIUM**	**MEDIUM**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Indicators of Stressors	**NO**	**NO**
(2) Aquatic Life Tolerance	**LOW**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**HIGH**	**HIGH**
(2) In-stream Habitat	**HIGH**	**HIGH**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**HIGH**	**HIGH**
(3) Stream Stability	**LOW**	**LOW**
(3) In-stream Habitat	**HIGH**	**HIGH**
(2) Stream-side Habitat	**HIGH**	**HIGH**
(3) Stream-side Habitat	**HIGH**	**HIGH**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone	NA	NA
Overall	**MEDIUM**	**MEDIUM**

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Eastowne Stream X - DS
2. Date of evaluation: 6/11/2019
3. Applicant/owner name: UNC Health Systems
4. Assessor name/organization: McAdams
5. County: Orange
6. Nearest named water body on USGS 7.5-minute quad: Dry Creek
7. River basin: Cape Fear
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.951582, -79.003851

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Stream X - DS
10. Length of assessment reach evaluated (feet): 865
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 0.25 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 4-5
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☐Perennial flow ☒Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**): ☒A  (more sinuous stream, flatter valley slope) ☐B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.
    - ☐Section 10 water
    - ☐Classified Trout Waters
    - ☒Water Supply Watershed (☐I ☐II ☐III ☐IV ☒V)
    - ☐Essential Fish Habitat
    - ☐Primary Nursery Area
    - ☐ High Quality Waters/Outstanding Resource Waters
    - ☐Publicly owned property
    - ☒NCDWR Riparian buffer rule in effect
    - ☒Nutrient Sensitive Waters
    - ☐Anadromous fish
    - ☐303(d) List
    - ☐CAMA Area of Environmental Concern (AEC)
    - ☐Documented presence of a federal and/or state listed protected species within the assessment area. List species:
    - ☐Designated Critical Habitat (list species)
19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☒Yes ☐No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

- ☒A Water throughout assessment reach.
- ☐B No flow, water in pools only.
- ☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

- ☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
- ☒B Not A

3. Feature Pattern – assessment reach metric

- ☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
- ☒B Not A

4. Feature Longitudinal Profile – assessment reach metric

- ☐A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
- ☒B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

- ☒A < 10% of channel unstable
- ☐B 10 to 25% of channel unstable
- ☐C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.

- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☐F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: _____ (explain in "Notes/Sketch" section)
- ☒J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.

- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**

- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☒C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only

- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

**************************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS*********************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☒Yes ☐No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**

- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☐	☒	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☐	☒	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☐	☒	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☒	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☒B	☒B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☐C	☐C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

- ☐A Streams and/or springs (jurisdictional discharges)
- ☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- ☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- ☒D Evidence of bank seepage or sweating (iron in water indicates seepage)
- ☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
- ☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

- ☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- ☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- ☒C Urban stream (≥ 24% impervious surface for watershed)
- ☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- ☐E Assessment reach relocated to valley edge
- ☐F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

- ☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- ☐B Degraded (example: scattered trees)
- ☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated LB	Vegetated RB	Wooded LB	Wooded RB	
☒A	☒A	☒A	☒A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☐B	☐B	☐B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☒

Abuts LB	Abuts RB	< 30 feet LB	< 30 feet RB	30-50 feet LB	30-50 feet RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☒B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☒A	☒A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☐B	☐B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☐C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:
-bedform absent in riffle/run sections
-the site experienced heavy rain on 6/8/2019

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Eastowne Stream X - DS	Date of Assessment	6/11/2019
Stream Category	Pa1	Assessor Name/Organization	McAdams

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	**HIGH**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**HIGH**	**HIGH**
(3) Streamside Area Attenuation	**HIGH**	**HIGH**
(4) Floodplain Access	**HIGH**	**HIGH**
(4) Wooded Riparian Buffer	**HIGH**	**HIGH**
(4) Microtopography	**HIGH**	**HIGH**
(3) Stream Stability	**HIGH**	**HIGH**
(4) Channel Stability	**HIGH**	**HIGH**
(4) Sediment Transport	**HIGH**	**HIGH**
(4) Stream Geomorphology	**HIGH**	**HIGH**
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**MEDIUM**	**MEDIUM**
(3) Upland Pollutant Filtration	**MEDIUM**	**MEDIUM**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Indicators of Stressors	**NO**	**NO**
(2) Aquatic Life Tolerance	**LOW**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**HIGH**	**HIGH**
(2) In-stream Habitat	**MEDIUM**	**MEDIUM**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**HIGH**	**HIGH**
(3) In-stream Habitat	**HIGH**	**HIGH**
(2) Stream-side Habitat	**HIGH**	**HIGH**
(3) Stream-side Habitat	**HIGH**	**HIGH**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone	NA	NA
Overall	**HIGH**	**HIGH**

NC SAM FIELD ASSESSMENT RESULTS
Accompanies User Manual Version 2.1

USACE AID #: NCDWR #:

INSTRUCTIONS: Attach a sketch of the assessment area and photographs. Attach a copy of the USGS 7.5-minute topographic quadrangle, and circle the location of the stream reach under evaluation. If multiple stream reaches will be evaluated on the same property, identify and number all reaches on the attached map, and include a separate form for each reach. See the NC SAM User Manual for detailed descriptions and explanations of requested information. Record in the "Notes/Sketch" section if supplementary measurements were performed. See the NC SAM User Manual for examples of additional measurements that may be relevant.

NOTE EVIDENCE OF STRESSORS AFFECTING THE ASSESSMENT AREA (do not need to be within the assessment area).

PROJECT/SITE INFORMATION:

1. Project name (if any): Eastowne Stream X - US
2. Date of evaluation: 6/11/2019
3. Applicant/owner name: UNC Health Systems
4. Assessor name/organization: McAdams
5. County: Orange
6. Nearest named water body on USGS 7.5-minute quad: Dry Creek
7. River basin: Cape Fear
8. Site coordinates (decimal degrees, at lower end of assessment reach): 35.950503, -79.002960

STREAM INFORMATION: (depth and width can be approximations)

9. Site number (show on attached map): Stream X - US
10. Length of assessment reach evaluated (feet): 425
11. Channel depth from bed (in riffle, if present) to top of bank (feet): 0.25 ☐Unable to assess channel depth.
12. Channel width at top of bank (feet): 3-4
13. Is assessment reach a swamp steam? ☐Yes ☐No
14. Feature type: ☐Perennial flow ☒Intermittent flow ☐Tidal Marsh Stream

STREAM CATEGORY INFORMATION:

15. NC SAM Zone: ☐ Mountains (M) ☒ Piedmont (P) ☐ Inner Coastal Plain (I) ☐ Outer Coastal Plain (O)
16. Estimated geomorphic valley shape (**skip for Tidal Marsh Stream**):
☒A  (more sinuous stream, flatter valley slope)
☐B  (less sinuous stream, steeper valley slope)
17. Watershed size: **(skip for Tidal Marsh Stream**) ☒Size 1 (< 0.1 mi^2) ☐Size 2 (0.1 to < 0.5 mi^2) ☐Size 3 (0.5 to < 5 mi^2) ☐Size 4 (≥ 5 mi^2)

ADDITIONAL INFORMATION:

18. Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐Section 10 water	☐Classified Trout Waters	☒Water Supply Watershed (☐I ☐II ☐III ☐IV ☒V)
☐Essential Fish Habitat	☐Primary Nursery Area	☐ High Quality Waters/Outstanding Resource Waters
☐Publicly owned property	☒NCDWR Riparian buffer rule in effect	☒Nutrient Sensitive Waters
☐Anadromous fish	☐303(d) List	☐CAMA Area of Environmental Concern (AEC)

☐Documented presence of a federal and/or state listed protected species within the assessment area.
List species:
☐Designated Critical Habitat (list species)

19. Are additional stream information/supplementary measurements included in "Notes/Sketch" section or attached? ☒Yes ☐No

1. Channel Water – assessment reach metric (skip for Size 1 streams and Tidal Marsh Streams)

☐A Water throughout assessment reach.
☒B No flow, water in pools only.
☐C No water in assessment reach.

2. Evidence of Flow Restriction – assessment reach metric

☐A At least 10% of assessment reach in-stream habitat or riffle-pool sequence is severely affected by a flow restriction or fill to the point of obstructing flow or a channel choked with aquatic macrophytes or ponded water or impoundment on flood or ebb within the assessment reach (examples: undersized or perched culverts, causeways that constrict the channel, tidal gates, debris jams, beaver dams).
☒B Not A

3. Feature Pattern – assessment reach metric

☐A A majority of the assessment reach has altered pattern (examples: straightening, modification above or below culvert).
☒B Not A

4. Feature Longitudinal Profile – assessment reach metric

☐A Majority of assessment reach has a substantially altered stream profile (examples: channel down-cutting, existing damming, over widening, active aggradation, dredging, and excavation where appropriate channel profile has not reformed from any of these disturbances).
☒B Not A

5. Signs of Active Instability – assessment reach metric

Consider only current instability, not past events from which the stream has currently recovered. Examples of instability include active bank failure, active channel down-cutting (head-cut), active widening, and artificial hardening (such as concrete, gabion, rip-rap).

☒A < 10% of channel unstable
☐B 10 to 25% of channel unstable
☐C > 25% of channel unstable

6. Streamside Area Interaction – streamside area metric
Consider for the Left Bank (LB) and the Right Bank (RB).

LB	RB	
☒A	☒A	Little or no evidence of conditions that adversely affect reference interaction
☐B	☐B	Moderate evidence of conditions (examples: berms, levees, down-cutting, aggradation, dredging) that adversely affect reference interaction (examples: limited streamside area access, disruption of flood flows through streamside area, leaky or intermittent bulkheads, causeways with floodplain constriction, minor ditching [including mosquito ditching])
☐C	☐C	Extensive evidence of conditions that adversely affect reference interaction (little to no floodplain/intertidal zone access [examples: causeways with floodplain and channel constriction, bulkheads, retaining walls, fill, stream incision, disruption of flood flows through streamside area] or too much floodplain/intertidal zone access [examples: impoundments, intensive mosquito ditching]) or floodplain/intertidal zone unnaturally absent or assessment reach is a man-made feature on an interstream divide

7. Water Quality Stressors – assessment reach/intertidal zone metric
Check all that apply.
- ☐A Discolored water in stream or intertidal zone (milky white, blue, unnatural water discoloration, oil sheen, stream foam)
- ☐B Excessive sedimentation (burying of stream features or intertidal zone)
- ☐C Noticeable evidence of pollutant discharges entering the assessment reach and causing a water quality problem
- ☐D Odor (not including natural sulfide odors)
- ☐E Current published or collected data indicating degraded water quality in the assessment reach. Cite source in "Notes/Sketch" section.
- ☐F Livestock with access to stream or intertidal zone
- ☐G Excessive algae in stream or intertidal zone
- ☐H Degraded marsh vegetation in the intertidal zone (removal, burning, regular mowing, destruction, etc)
- ☐I Other: ____________________ (explain in "Notes/Sketch" section)
- ☒J Little to no stressors

8. Recent Weather – watershed metric (skip for Tidal Marsh Streams)
For Size 1 or 2 streams, D1 drought or higher is considered a drought; for Size 3 or 4 streams, D2 drought or higher is considered a drought.
- ☐A Drought conditions and no rainfall or rainfall not exceeding 1 inch within the last 48 hours
- ☐B Drought conditions and rainfall exceeding 1 inch within the last 48 hours
- ☒C No drought conditions

9. Large or Dangerous Stream – assessment reach metric
☐Yes ☒No Is stream is too large or dangerous to assess? If Yes, skip to Metric 13 (Streamside Area Ground Surface Condition).

10. Natural In-stream Habitat Types – assessment reach metric
10a. ☐Yes ☐No Degraded in-stream habitat over majority of the assessment reach (examples of stressors include excessive sedimentation, mining, excavation, in-stream hardening [for example, rip-rap], recent dredging, and snagging) **(evaluate for Size 4 Coastal Plain streams only, then skip to Metric 12)**

10b. **Check all that occur** (occurs if > 5% coverage of assessment reach) **(skip for Size 4 Coastal Plain streams)**
- ☐A Multiple aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
- ☒B Multiple sticks and/or leaf packs and/or emergent vegetation
- ☐C Multiple snags and logs (including lap trees)
- ☒D 5% undercut banks and/or root mats and/or roots in banks extend to the normal wetted perimeter
- ☐E Little or no habitat

Check for Tidal Marsh Streams Only
- ☐F 5% oysters or other natural hard bottoms
- ☐G Submerged aquatic vegetation
- ☐H Low-tide refugia (pools)
- ☐I Sand bottom
- ☐J 5% vertical bank along the marsh
- ☐K Little or no habitat

***********************************REMAINING QUESTIONS ARE NOT APPLICABLE FOR TIDAL MARSH STREAMS******************************

11. Bedform and Substrate – assessment reach metric (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)

11a. ☒Yes ☐No Is assessment reach in a natural sand-bed stream? **(skip for Coastal Plain streams)**

11b. Bedform evaluated. **Check the appropriate box(es).**
- ☒A Riffle-run section **(evaluate 11c)**
- ☒B Pool-glide section **(evaluate 11d)**
- ☐C Natural bedform absent **(skip to Metric 12, Aquatic Life)**

11c. In riffle sections, check all that occur below the normal wetted perimeter of the assessment reach – whether or not submerged. **Check at least one box in each row (skip for Size 4 Coastal Plain streams and Tidal Marsh Streams)**. Not Present (NP) = absent, Rare (R) = present but ≤ 10%, Common (C) = > 10-40%, Abundant (A) = > 40-70%, Predominant (P) = > 70%. Cumulative percentages should not exceed 100% for each assessment reach.

NP	R	C	A	P	
☒	☐	☐	☐	☐	Bedrock/saprolite
☒	☐	☐	☐	☐	Boulder (256 – 4096 mm)
☒	☐	☐	☐	☐	Cobble (64 – 256 mm)
☒	☐	☐	☐	☐	Gravel (2 – 64 mm)
☐	☐	☐	☒	☐	Sand (.062 – 2 mm)
☐	☐	☐	☒	☐	Silt/clay (< 0.062 mm)
☐	☒	☐	☐	☐	Detritus
☒	☐	☐	☐	☐	Artificial (rip-rap, concrete, etc.)

11d. ☐Yes ☒No Are pools filled with sediment? (**skip for Size 4 Coastal Plain streams and Tidal Marsh Streams**)

12. Aquatic Life – assessment reach metric (skip for Tidal Marsh Streams)

12a. ☒Yes ☐No Was an in-stream aquatic life assessment performed as described in the User Manual?
If No, select one of the following reasons and skip to Metric 13. ☐No Water ☐Other: _____

12b. ☒Yes ☐No Are aquatic organisms present in the assessment reach (look in riffles, pools, then snags)? If Yes, check all that apply. If No, skip to Metric 13.

1	>1	Numbers over columns refer to "individuals" for Size 1 and 2 streams and "taxa" for Size 3 and 4 streams.
☒	☐	Adult frogs
☐	☐	Aquatic reptiles
☐	☐	Aquatic macrophytes and aquatic mosses (include liverworts, lichens, and algal mats)
☐	☐	Beetles
☐	☐	Caddisfly larvae (T)
☐	☐	Asian clam (*Corbicula*)
☐	☐	Crustacean (isopod/amphipod/crayfish/shrimp)
☐	☐	Damselfly and dragonfly larvae
☐	☐	Dipterans
☐	☐	Mayfly larvae (E)
☐	☐	Megaloptera (alderfly, fishfly, dobsonfly larvae)
☐	☐	Midges/mosquito larvae
☐	☐	Mosquito fish (*Gambusia*) or mud minnows (*Umbra pygmaea*)
☐	☐	Mussels/Clams (not *Corbicula*)
☐	☐	Other fish
☐	☐	Salamanders/tadpoles
☐	☐	Snails
☐	☐	Stonefly larvae (P)
☐	☐	Tipulid larvae
☐	☐	Worms/leeches

13. Streamside Area Ground Surface Condition – streamside area metric (skip for Tidal Marsh Streams and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB). Consider storage capacity with regard to both overbank flow and upland runoff.

LB	RB	
☒A	☒A	Little or no alteration to water storage capacity over a majority of the streamside area
☐B	☐B	Moderate alteration to water storage capacity over a majority of the streamside area
☐C	☐C	Severe alteration to water storage capacity over a majority of the streamside area (examples: ditches, fill, soil compaction, livestock disturbance, buildings, man-made levees, drainage pipes)

14. Streamside Area Water Storage – streamside area metric (skip for Size 1 streams, Tidal Marsh Streams, and B valley types)
Consider for the Left Bank (LB) and the Right Bank (RB) of the streamside area.

LB	RB	
☐A	☐A	Majority of streamside area with depressions able to pond water ≥ 6 inches deep
☐B	☐B	Majority of streamside area with depressions able to pond water 3 to 6 inches deep
☒C	☒C	Majority of streamside area with depressions able to pond water < 3 inches deep

15. Wetland Presence – streamside area metric (skip for Tidal Marsh Streams)
Consider for the Left Bank (LB) and the Right Bank (RB). Do not consider wetlands outside of the streamside area or within the normal wetted perimeter of assessment reach.

LB	RB	
☐Y	☐Y	Are wetlands present in the streamside area?
☒N	☒N	

16. Baseflow Contributors – assessment reach metric (skip for Size 4 streams and Tidal Marsh Streams)
Check all contributors within the assessment reach or within view of <u>and</u> draining to the assessment reach.

- ☐A Streams and/or springs (jurisdictional discharges)
- ☐B Ponds (include wet detention basins; do not include sediment basins or dry detention basins)
- ☐C Obstruction passing flow during low-flow periods within the assessment area (beaver dam, leaky dam, bottom-release dam, weir)
- ☒D Evidence of bank seepage or sweating (iron in water indicates seepage)
- ☒E Stream bed or bank soil reduced (dig through deposited sediment if present)
- ☐F None of the above

17. Baseflow Detractors – assessment area metric (skip for Tidal Marsh Streams)
Check all that apply.

- ☐A Evidence of substantial water withdrawals from the assessment reach (includes areas excavated for pump installation)
- ☐B Obstruction not passing flow during low-flow periods affecting the assessment reach (ex: watertight dam, sediment deposit)
- ☒C Urban stream (≥ 24% impervious surface for watershed)
- ☐D Evidence that the streamside area has been modified resulting in accelerated drainage into the assessment reach
- ☐E Assessment reach relocated to valley edge
- ☐F None of the above

18. Shading – assessment reach metric (skip for Tidal Marsh Streams)
Consider aspect. Consider "leaf-on" condition.

- ☒A Stream shading is appropriate for stream category (may include gaps associated with natural processes)
- ☐B Degraded (example: scattered trees)
- ☐C Stream shading is gone or largely absent

19. Buffer Width – streamside area metric (skip for Tidal Marsh Streams)
Consider "vegetated buffer" and "wooded buffer" separately for left bank (LB) and right bank (RB) starting at the top of bank out to the first break.

Vegetated		Wooded		
LB	RB	LB	RB	
☒A	☐A	☒A	☐A	≥ 100 feet wide or extends to the edge of the watershed
☐B	☒B	☐B	☒B	From 50 to < 100 feet wide
☐C	☐C	☐C	☐C	From 30 to < 50 feet wide
☐D	☐D	☐D	☐D	From 10 to < 30 feet wide
☐E	☐E	☐E	☐E	< 10 feet wide or no trees

20. Buffer Structure – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Vegetated" Buffer Width).

LB	RB	
☒A	☒A	Mature forest
☐B	☐B	Non-mature woody vegetation or modified vegetation structure
☐C	☐C	Herbaceous vegetation with or without a strip of trees < 10 feet wide
☐D	☐D	Maintained shrubs
☐E	☐E	Little or no vegetation

21. Buffer Stressors – streamside area metric (skip for Tidal Marsh Streams)
Check all appropriate boxes for left bank (LB) and right bank (RB). Indicate if listed stressor abuts stream (Abuts), does not abut but is within 30 feet of stream (< 30 feet), or is between 30 to 50 feet of stream (30-50 feet).
If none of the following stressors occurs on either bank, check here and skip to Metric 22: ☒

Abuts		< 30 feet		30-50 feet		
LB	RB	LB	RB	LB	RB	
☐A	☐A	☐A	☐A	☐A	☐A	Row crops
☐B	☒B	☐B	☐B	☐B	☐B	Maintained turf
☐C	☐C	☐C	☐C	☐C	☐C	Pasture (no livestock)/commercial horticulture
☐D	☐D	☐D	☐D	☐D	☐D	Pasture (active livestock use)

22. Stem Density – streamside area metric (skip for Tidal Marsh Streams)
Consider for left bank (LB) and right bank (RB) for Metric 19 ("Wooded" Buffer Width).

LB	RB	
☒A	☒A	Medium to high stem density
☐B	☐B	Low stem density
☐C	☐C	No wooded riparian buffer or predominantly herbaceous species or bare ground

23. Continuity of Vegetated Buffer – streamside area metric (skip for Tidal Marsh Streams)
Consider whether vegetated buffer is continuous along stream (parallel). Breaks are areas lacking vegetation > 10 feet wide.

LB	RB	
☒A	☒A	The total length of buffer breaks is < 25 percent.
☐B	☐B	The total length of buffer breaks is between 25 and 50 percent.
☐C	☐C	The total length of buffer breaks is > 50 percent.

24. Vegetative Composition – streamside area metric (skip for Tidal Marsh Streams)
Evaluate the dominant vegetation within 100 feet of each bank or to the edge of the watershed (whichever comes first) as it contributes to assessment reach habitat.

LB	RB	
☐A	☐A	Vegetation is close to undisturbed in species present and their proportions. Lower strata composed of native species, with non-native invasive species absent or sparse.
☒B	☒B	Vegetation indicates disturbance in terms of species diversity or proportions, but is still largely composed of native species. This may include communities of weedy native species that develop after clear-cutting or clearing or communities with non-native invasive species present, but not dominant, over a large portion of the expected strata or communities missing understory but retaining canopy trees.
☐C	☐C	Vegetation is severely disturbed in terms of species diversity or proportions. Mature canopy is absent or communities with non-native invasive species dominant over a large portion of expected strata or communities composed of planted stands of non-characteristic species or communities inappropriately composed of a single species or no vegetation.

25. Conductivity – assessment reach metric (skip for all Coastal Plain streams)
25a. ☐Yes ☒No Was conductivity measurement recorded?
If No, select one of the following reasons. ☐No Water ☐Other: _____

25b. Check the box corresponding to the conductivity measurement (units of microsiemens per centimeter).
☐A < 46 ☐B 46 to < 67 ☐C 67 to < 79 ☐D 79 to < 230 ☐E ≥ 230

Notes/Sketch:
-channel structure alternates between sections with undercut banks and pool-glide structure and sections with no bed and bank structure
-there are old road beds on both side of the channel and there are invasive species growing adjacent to the channel
-the site experienced heavy rain on 6/8/2019

Draft NC SAM Stream Rating Sheet
Accompanies User Manual Version 2.1

Stream Site Name	Eastowne Stream X - US	Date of Assessment	6/11/2019
Stream Category	Pa1	Assessor Name/Organization	McAdams

Notes of Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Additional stream information/supplementary measurements included (Y/N)	YES
NC SAM feature type (perennial, intermittent, Tidal Marsh Stream)	Intermittent

Function Class Rating Summary	USACE/ All Streams	NCDWR Intermittent
(1) Hydrology	**HIGH**	**HIGH**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Flood Flow	**HIGH**	**HIGH**
(3) Streamside Area Attenuation	**HIGH**	**HIGH**
(4) Floodplain Access	**HIGH**	**HIGH**
(4) Wooded Riparian Buffer	**HIGH**	**HIGH**
(4) Microtopography	**HIGH**	**HIGH**
(3) Stream Stability	**HIGH**	**HIGH**
(4) Channel Stability	**HIGH**	**HIGH**
(4) Sediment Transport	**HIGH**	**HIGH**
(4) Stream Geomorphology	**HIGH**	**HIGH**
(2) Stream/Intertidal Zone Interaction	NA	NA
(2) Longitudinal Tidal Flow	NA	NA
(2) Tidal Marsh Stream Stability	NA	NA
(3) Tidal Marsh Channel Stability	NA	NA
(3) Tidal Marsh Stream Geomorphology	NA	NA
(1) Water Quality	**LOW**	**LOW**
(2) Baseflow	**MEDIUM**	**MEDIUM**
(2) Streamside Area Vegetation	**MEDIUM**	**MEDIUM**
(3) Upland Pollutant Filtration	**MEDIUM**	**MEDIUM**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Indicators of Stressors	**NO**	**NO**
(2) Aquatic Life Tolerance	**LOW**	**NA**
(2) Intertidal Zone Filtration	NA	NA
(1) Habitat	**LOW**	**HIGH**
(2) In-stream Habitat	**LOW**	**MEDIUM**
(3) Baseflow	**MEDIUM**	**MEDIUM**
(3) Substrate	**LOW**	**LOW**
(3) Stream Stability	**HIGH**	**HIGH**
(3) In-stream Habitat	**MEDIUM**	**HIGH**
(2) Stream-side Habitat	**HIGH**	**HIGH**
(3) Stream-side Habitat	**HIGH**	**HIGH**
(3) Thermoregulation	**HIGH**	**HIGH**
(2) Tidal Marsh In-stream Habitat	NA	NA
(3) Flow Restriction	NA	NA
(3) Tidal Marsh Stream Stability	NA	NA
(4) Tidal Marsh Channel Stability	NA	NA
(4) Tidal Marsh Stream Geomorphology	NA	NA
(3) Tidal Marsh In-stream Habitat	NA	NA
(2) Intertidal Zone	NA	NA
Overall	**LOW**	**HIGH**

Appendix J: NCWAM Forms & Results

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Eastowne	Date of Evaluation	06/11/19
Applicant/Owner Name	UNC Health	Wetland Site Name	Wetland A
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	K. Roth & J. Burdette
Level III Ecoregion	Piedmont	Nearest Named Water Body	Clark Lake
River Basin	Cape Fear	USGS 8-Digit Catalogue Unit	03030002
County	Orange	NCDWR Region	Raleigh
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.953952, -79.003303

Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☒ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☒ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☒C	☒C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☒B Evidence that maximum depth of inundation is between 1 and 2 feet
☐C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☒A	☒A	☒A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☒B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☒D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☒H	☒H	☒H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☒D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☒C	☒C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☒C	☒C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☒A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

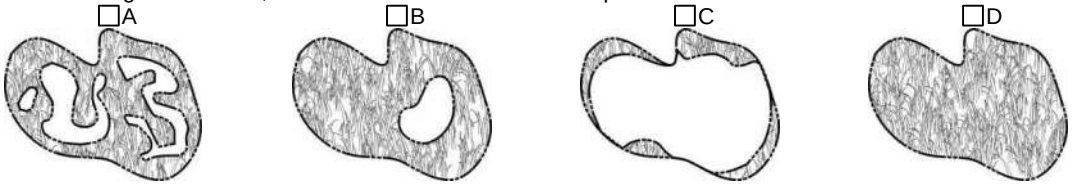
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☒A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☐A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☒C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes
Sparse privet; microstegium 80%

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland A	Date of Assessment	06/11/19
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	K. Roth & J. Burdette

Notes on Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence (Y/N)	**NO**
Habitat	Condition	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Eastowne	Date of Evaluation	06/11/19
Applicant/Owner Name	UNC Health	Wetland Site Name	Wetland C1
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	K. Roth & J. Burdette
Level III Ecoregion	Piedmont	Nearest Named Water Body	Clark Lake
River Basin	Cape Fear	USGS 8-Digit Catalogue Unit	03030002
County	Orange	NCDWR Region	Raleigh
☐ Yes ☒ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.948612, -79.005295

Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☒ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☒B Evidence that maximum depth of inundation is between 1 and 2 feet
☐C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☒A Soil ribbon < 1 inch
- ☐B Soil ribbon ≥ 1 inch

4c.
- ☐A No peat or muck presence
- ☒B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☒A	☒A	☒A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☒A ≥ 50 feet
- ☐B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐≤ 15-feet wide ☐> 15-feet wide ☒ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☒B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☒D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☒I	☐I	From 0.1 to < 0.5 acre
☒J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☒E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☒Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☒B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☒A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☐A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☐B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☐A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

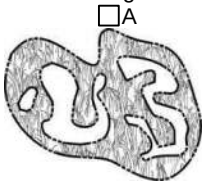
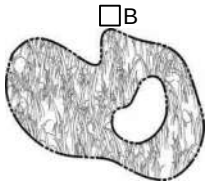
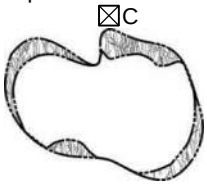
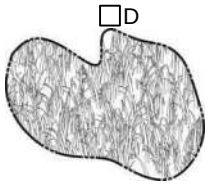
☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☐B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A 
☐B 
☒C 
☐D 

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes
W2 is similar to W1 Emergent except it has less veg (<25% cover) & has canopy cover from adjacent uplands

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland C1	Date of Assessment	06/11/19
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	K. Roth & J. Burdette

Notes on Field Assessment Form (Y/N)	YES
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	NA
	Sub-surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**

NC WAM FIELD ASSESSMENT FORM
Accompanies User Manual Version 5.0

USACE AID #		NCDWR#	
Project Name	Eastowne	Date of Evaluation	06/11/19
Applicant/Owner Name	UNC Health	Wetland Site Name	Wetland C2
Wetland Type	Headwater Forest	Assessor Name/Organization	K. Roth & J. Burdette
Level III Ecoregion	Piedmont	Nearest Named Water Body	Clark Lake
River Basin	Cape Fear	USGS 8-Digit Catalogue Unit	03030002
County	Orange	NCDWR Region	Raleigh
☒ Yes ☐ No	Precipitation within 48 hrs?	Latitude/Longitude (deci-degrees)	35.948500, -79.005204

Evidence of stressors affecting the assessment area (may not be within the assessment area)

Please circle and/or make note on the last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

Regulatory Considerations - Were regulatory considerations evaluated? ☒Yes ☐No If Yes, check all that apply to the assessment area.

☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☒ NCDWR riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric

Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence an effect.

GS	VS	
☒A	☐A	Not severely altered
☐B	☒B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric

Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (skip for all marshes)

Check a box in each column. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒D	☒D	Depressions able to pond water < 3 inches deep

3b. ☐A Evidence that maximum depth of inundation is greater than 2 feet
☐B Evidence that maximum depth of inundation is between 1 and 2 feet
☒C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric (skip for all marshes)

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the top 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐A Sandy soil
- ☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐C Loamy or clayey soils not exhibiting redoximorphic features
- ☐D Loamy or clayey gleyed soil
- ☐E Histosol or histic epipedon

4b.
- ☐A Soil ribbon < 1 inch
- ☒B Soil ribbon ≥ 1 inch

4c.
- ☒A No peat or muck presence
- ☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric (skip for non-riparian wetlands)

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M).

WS	5M	2M	
☒A	☒A	☒A	≥ 10% impervious surfaces
☐B	☐B	☐B	Confined animal operations (or other local, concentrated source of pollutants
☐C	☐C	☐C	≥ 20% coverage of pasture
☐D	☐D	☐D	≥ 20% coverage of agricultural land (regularly plowed land)
☐E	☐E	☐E	≥ 20% coverage of maintained grass/herb
☐F	☐F	☐F	≥ 20% coverage of clear-cut land
☐G	☐G	☐G	Little or no opportunity to improve water quality. Lack of opportunity may result from little or no disturbance in the watershed or hydrologic alterations that prevent drainage and/or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric (skip for non-riparian wetlands)

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is wetland? (Wetland buffer need only be present on one side of the .water body. Make buffer judgment based on the average width of wetland. Record a note if a portion of the buffer has been removed or disturbed.)
- ☐A ≥ 50 feet
- ☒B From 30 to < 50 feet
- ☐C From 15 to < 30 feet
- ☐D From 5 to < 15 feet
- ☐E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is stream or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex condition metric (evaluate WT for all marshes and Estuarine Woody Wetland only; evaluate WC for Bottomland Hardwood Forest, Headwater Forest, and Riverine Swamp Forest only)

Check a box in each column for riverine wetlands only. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment area (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☒B	From 80 to < 100 feet
☒C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☐G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric (skip for non-riparian wetlands)

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric (skip for non-riparian wetlands and all marshes)

Consider recent deposition only (no plant growth since deposition).

☐A Sediment deposition is not excessive, but at approximately natural levels.
☒B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☒I	☐I	From 0.1 to < 0.5 acre
☒J	☐J	☒J	From 0.01 to < 0.1 acre
☐K	☐K	☐K	< 0.01 acre or assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin type is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column).** Involves a GIS effort with field adjustment. This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, maintained fields (pasture and agriculture), or open water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☒E	☐E	< 10 acres
☐F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes and Estuarine Woody Wetland)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors, and clear-cuts. Consider the eight main points of the compass. Artificial edge occurs within 150 feet in how many directions? If the assessment area is clear cut, select option "C."

☐A 0
☒B 1 to 4
☐C 5 to 8

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition, or expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species), or exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (< 10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (> 50 % cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?
☒Yes ☐No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.
☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☐C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☒B	☒B	Moderate density mid-story/sapling layer
	☐C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☒A	☒A	Dense shrub layer
	☐B	☐B	Moderate density shrub layer
	☐C	☐C	Shrub layer sparse or absent
Herb	☒A	☒A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☐C	Herb layer sparse or absent

18. Snags – wetland type condition metric (skip for all marshes)

☐A Large snags (more than one) are visible (> 12 inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric (skip for all marshes)

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12 inch DBH.
☐C Majority of canopy trees are < 6 inches DBH or no trees.

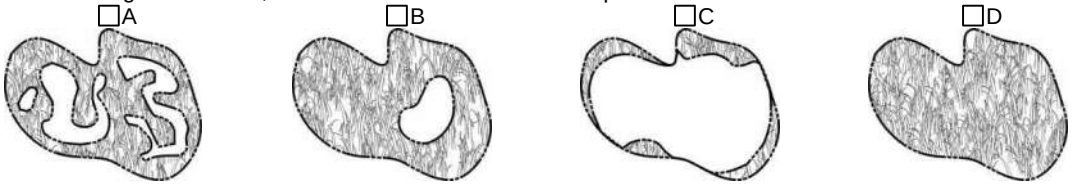
20. Large Woody Debris – wetland type condition metric (skip for all marshes)

Include both natural debris and man-placed natural debris.
☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D



22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands and Salt/Brackish Marsh only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision. Documentation required if evaluated as B, C, or D.
☒A Overbank and overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 5.0

Wetland Site Name	Wetland C2	Date of Assessment	06/11/19
Wetland Type	Headwater Forest	Assessor Name/Organization	K. Roth & J. Burdette

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
	Soluble Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence (Y/N)	**YES**
Habitat	Condition	**LOW**

Overall Wetland Rating **HIGH**