Natural Resources Technical Report

Gaston East-West Connector
Gaston and Mecklenburg Counties

TIP No. U-3321
WPS Element No. 34922.1.1
State Project No. 8.2812501
FAP No. STP-1213(6)

North Carolina Turnpike Authority
5400 Glenwood Avenue, Suite 400
Raleigh, North Carolina 27612

NORTH CAROLINA
Turnpike Authority

February 2008

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1.0 INTRODUCTION

This Natural Resources Technical Report is submitted to the North Carolina Turnpike Authority preliminary to the preparation of an Environmental Impact Statement (EIS) for the proposed project.

1.1 Project Description

The North Carolina Turnpike Authority proposes to improve east-west travel between I-85 west of Gastonia in Gaston County and I-485/NC 160 in Mecklenburg County. The Gaston East-West Connector is designated as TIP Project No. U-3321 in the NCDOT's *2007-2013 Transportation Improvement Program* (STIP). **Figure 1** shows the general project location. The Project length is approximately 72 miles and the average corridor width is 1,400 feet. The corridor width is wider around potential interchange locations.

The purpose of the proposed action is to improve east-west transportation mobility in the area around the City of Gastonia, between Gastonia and the Charlotte metropolitan area in general, and particularly to establish direct access between the rapidly growing area of southeast Gaston County and west Mecklenburg County. This project purpose is based on the following needs:

* Need to improve mobility, access and connectivity within southern Gaston County and between southern Gaston County and Mecklenburg County.

* Need to reduce congestion and improve traffic flow on the sections of I-85, US 29-74 and US 321 in the project study area; improve high-speed, safe regional travel service along the US 29-74 intrastate corridor; and generally improve safety and reduce above average accident rates in the study area.

1.2 Project Alternatives

There are sixteen new location Detailed Study Alternatives (DSA) under consideration for the proposed project. The corridor segments comprising these sixteen DSAs are shown in **Table 1** and on **Figure 2**.

Table 1. Corridor Segments Comprising Each Detailed Study Alternative

Detailed Study Alternative #	West Area - generally west of US 321	Central Area – Generally east of US 321 and west of NC 279 or the South Fork Catawba River	East Area – generally east of NC 279 or the South Fork Catawba River
	H Segments	J Segments	K Segments
4	H2A-H3	J4A-J4B-J2C-J2D-J5A-J5B	K2A-KX1-K3B-K3C
5	H2A-H3	J4A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K4A
6	H2A-H3	J4A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K1D
9	H2A-H3	J4A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K3A-K3B-K3C
22	H2A-H2B-H2C	J3-J2C-J2D-J5A-J5B	K2A-KX1-K3B-K3C
23	H2A-H2B-H2C	J3-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K4A
24	H2A-H2B-H2C	J3-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K1D

Table 1. Corridor Segments Comprising Each Detailed Study Alternative

Detailed Study Alternative #	West Area - generally west of US 321	Central Area – Generally east of US 321 and west of NC 279 or the South Fork Catawba River	East Area – generally east of NC 279 or the South Fork Catawba River
	H Segments	J Segments	K Segments
27	H2A-H2B-H2C	J3-J2C-J2D-JX4-J1E-J1F	K1A-K3A-K3B-K3C
58	H1A-H1B-H1C	J1A-JX1-J2D-J5A-J5B	K2A-KX1-K3B-K3C
64	H1A-H1B-H1C	J1A-J1B-J1C-J1D-J1E-J1F	K1A-K1B-K1C-K4A
65	H1A-H1B-H1C	J1A-J1B-J1C-J1D-J1E-J1F	K1A-K1B-K1C-K1D
68	H1A-H1B-H1C	J1A-J1B-J1C-J1D-J1E-J1F	K1A-K3A-K3B-K3C
76	H1A-HX2	J2A-J2B-J2C-J2D-J5A-J5B	K2A-KX1-K3B-K3C
77	H1A-HX2	J2A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K4A
78	H1A-HX2	J2A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K1B-K1C-K1D
81	H1A-HX2	J2A-J2B-J2C-J2D-JX4-J1E-J1F	K1A-K3A-K3B-K3C

1.3 Project Purpose

The purpose of this technical report is to inventory, catalog, and describe the various natural resources likely to be impacted by the proposed action. This report attempts to identify and estimate the probable consequences of the anticipated impacts to these resources. These descriptions are relevant only in the context of current design concepts. If design parameters and criteria change, additional field investigations will need to be conducted.

1.4 Methodology

Published information and resources were collected prior to the field investigation. Information sources used to prepare this report include the following:

- United States Geological Survey (USGS) 7.5’ quadrangle map (Bessemer City 1973, Charlotte West 1968, Gastonia South 1973, Kings Mountain 1971).
- NCDOT aerial photography of project study area.
- North Carolina Natural Heritage Program Element Occurrence Data (October 2006).
- Soil Survey of Gaston County (Soil Conservation Service, 1989).
- Soil Survey of Mecklenburg County (Soil Conservation Service, 1980).
- North Carolina Department of Environment and Natural Resources (NCDENR) Basinwide Assessment Report - Catawba River Basin - June 2003 (NCDENR 2003).
- US Fish and Wildlife Service (USFWS) list of protected and candidate species (April 27, 2006).
- US Fish and Wildlife Service (USFWS) National Wetlands Inventory mapping (Bessemer City, Charlotte West, Gastonia South, Kings Mountain).
- North Carolina Wildlife Resources Commission (NCWRC) proposed Critical Habitat for aquatic species.

Water resource information was obtained from publications posted on the World Wide Web by NCDENR Division of Water Quality (DWQ). Information concerning the occurrence of federally protected species in the study area was obtained from the USFWS list of protected and candidate species (List updated May 10, 2007), posted on the World Wide Web by the Ecological Services branch of the USFWS office in North Carolina. Information concerning species under state protection was obtained from the NHP database of rare species and unique habitats. Files from the NHP were reviewed for documented sightings (August 27, 2007) of species on state or federal lists and locations of significant natural areas.

Field surveys have been performed by a number of individuals beginning in 2005. These surveys include the following:

- Surveys for threatened and endangered plant species were conducted in September and October 2005. The results of the survey are summarized in this report and detailed in the March 2006 Protected Plant Species Surveys report (PBS&J, 2006). A copy of this report is provided in **Appendix A**.
- Surveys for the Carolina Heelsplitter (*Lasmigona decorata*) were conducted in September 2005 by NC Department of Transportation biologists. The results of the survey are summarized in this report and detailed in an October 2005 memorandum (NCDOT, 2005). A copy of this report is provided in **Appendix A**.
- Wetland delineations and stream surveys were performed from October 2006 through March 2007 by biologists with Catena Group, J. A. Carter and Associates, and S&ME. The results of those surveys are presented in this report. Water resources were identified and their physical characteristics were recorded. Jurisdictional wetlands were delineated and evaluated based on criteria established in the *U.S. Army Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Wetlands were classified based on Cowardin *et al.* (1979).
- Field jurisdictional verifications for streams and wetlands were performed on April 12 and 13; May 2, 3, 10 and 11; and June 25 and 26, 2007. Mr. Steve Lund was the USACE representative and Ms. Polly Lespinasse was the NCDWQ representative that performed the field verifications. No written confirmation or verification has been issued by the US Army Corps of Engineers. Written verification was received from DWQ by letter dated August 2, 2007.
- A general field survey was conducted by Earth Tech biologists from October 16, 2006 to November 8, 2006.
- Surveys for bald eagle nests were performed by Earth Tech biologists. Aerial surveys were first performed on December 19, 2006. Nests observed during the aerial survey were field-checked from the ground on February 8, 2007. A copy of a memo describing this survey is provided in **Appendix A**.

For the purposes of this study, a brief habitat assessment was performed within the project study area. Plant communities and their associated wildlife were identified using a variety of observation techniques, including active searching, visual observations, and identifying characteristic signs of wildlife (sounds, tracks, scats, and burrows). Terrestrial community classifications generally follow Schafale and Weakley (1990), where appropriate. Plant nomenclature follows the National Plant Data Center PLANTS Database (USDA, NRCS 2006). Vertebrate names follow Rohde *et al.* (1994), Conant *et al.* (1998), the American Ornithologists' Union (2001), Thorpe and Covich (1991), and Webster *et al*. (1985). Vegetative communities were mapped using aerial photography of the project site. Predictions regarding wildlife community composition involved general qualitative habitat assessment based on existing vegetative communities.

1.5 Qualifications of the Principal Investigators

Work performed for this Natural Resources Technical Report was performed by seven separate environmental consulting firms along with the North Carolina Department of Transportation. Endangered species surveys for plants were conducted by Earth Tech, Environmental Services, Inc., HW Lochner, Inc., and, Kimley-Horn and Associates in the late summer and fall of 2005. Surveys for endangered mussels were performed by the North Carolina Department of Transportation Natural Environment Unit in September 2005. Wetland and stream delineations were performed by S&ME, Inc., J. Carter and Associates, and The Catena Group, in late 2006 and early 2007. A listing of Individuals involved with the various investigations and their qualifications is provided as **Appendix B**.

The Principle Investigators that prepared this report are as follows:

Investigator: Ron Johnson
Education: M.S., Biological Sciences, Illinois State University
Experience: Biologist, Earth Tech 20 years
Expertise: Natural resources surveys, wetland and stream mitigation

Investigator: Kevin Lapp
Education: M.S., Biology, Appalachian State University
Experience: Biologist, Earth Tech 2 years
Expertise: Conservation and Natural Resources Management

Investigator: Rachael Thorn
Education: B.S., Earth Science, University of North Carolina at Asheville
Experience: Biologist, Earth Tech 2 years
Expertise: Stream channel restoration, groundwater and soil sampling

1.6 Terminology and Definitions

For the purposes of this report, the following terms are used for describing the limits of natural resources investigations. "Project study area" denotes the area within the study corridors and includes the 16 alternatives. The study corridor is braided in most places and the average width is approximately 1,400 feet (426 m). The study corridors are expanded at potential interchange areas (Figure 1). The "project vicinity" is an area extending 0.5 mile (0.8 km) on all sides of the project study area, and "project region" is an area equivalent in size to the area represented by a 7.5-minute USGS quadrangle map (about 61.8 square miles) with the project study area occupying the central position.

2.0 PHYSICAL RESOURCES

The project study area is in south-central North Carolina within the Piedmont physiographic province in the Catawba River drainage basin. The topography of the project vicinity is nearly level in the vicinity of stream floodplains to moderately steep and rolling. Elevations in the project study area range from approximately 550 to 900 feet (168 to 274 m) (United States Geological Survey).

The proposed project study area is a mixture of urban, suburban, and rural areas. Areas around the outskirts of Belmont and Gastonia are relatively rural and characterized by low density residential and agricultural areas. Areas in or adjacent to the city limits of Belmont and Gastonia are characterized by moderate to high density residential areas or small businesses.

2.1 Soils

Information about soils in the project study area was taken from the *Soil Survey of Gaston County, North Carolina* (USDA 1989) and *Soil Survey of Mecklenburg County, North Carolina* (USDA 1980).

2.1.1 Soil Associations

Soil associations are groupings of soils with similar geology and landscape occurrence across the region. Broad soil management practices can be applied within each association. The inclusion of dissimilar soils is somewhat limited, usually to specific landscape features. Most of these soils are in use as pasture, row crops, woodland, or urban use. The following soil associations occur within the project study area.

Cecil. This association occurs throughout Mecklenburg County and occurs on gently to strongly sloping landscapes. It has soils that are well drained and have a clay loam surface and predominately clayey subsoil.

Cecil-Pacolet. This association is primarily in the central and northwestern parts of Gaston County and southwestern parts of Mecklenburg County. It occurs on gently sloping to steep landscapes that are well drained. The soils have a loamy surface layer and predominately clayey subsoil.

Cecil-Urban land. This association is in the commercial, industrial, and residential areas of Gastonia and other communities. It occurs on gently sloping to strongly sloping landscapes that are well drained or contain impervious urban land. The soils have a loamy surface layer and predominately clayey subsoil.

Gaston-Winnsboro-Cecil. These soils are mainly in the eastern part of Gaston County and occur on gently sloping to moderately steep landscapes. These are well drained soils that have a loamy surface layer and predominately clayey subsoil.

Tatum. This association occurs on gently sloping to moderately well drained areas mainly in the southwestern to west central part of Gaston County. These soils are well drained and have a gravelly loamy surface layer and predominately clayey subsoil.

Appling-Wedowee-Pacolet. This association occurs on gently sloping to steep landscapes mainly in the eastern part of Gaston County. These soils are well drained and have a loamy surface layer and predominately clay subsoil.

Madison. This soil group is found on gently sloping to moderately steep landscapes. These soils are well drained and have a loamy surface layer and predominately clayey subsoil.

Chewacla-Congaree. This association is found on floodplains along major streams. It has soils on nearly level landscapes that are somewhat poorly drained with a loamy, sandy loam or clay loam underlying material. The Chewacla soils are found in low lying areas away from the larger stream channels. The Congaree soils are well drained or moderately well drained and are found in slightly higher places near the larger stream channels. Congaree soils have a loam surface layer and a sandy to silty clay loam underlying layer.

2.1.2 Soil Map Units

The soil map unit offers greater detail of soil within the project study area. They also show the range of soils within the association. Due to heterogeneous nature of soils, each map unit approximates the general features found. Small inclusions of dissimilar soils still occur because of the level of mapping. The map unit details provide adequate information to list specific management concerns that can be expected. Because of the size of the project a number of individual map units can be found in the project study area. The following provides descriptions of the map units:

Alamance Variant gravelly loam (2 to 8 percent slopes) is a well drained soil found on broad ridges in the Kings Mountain belt. Permeability of this soil is moderate and the water table is not within a depth of 6 feet.

Appling sandy loam (1 to 6 percent slopes) is a well drained soil on broad smooth ridges. Permeability of this soil is moderate and the water table is not within a depth of 6 feet.

Cecil sandy clay loam (2 to 8 percent slopes and 8 to 15 percent slopes) is a well drained soil found on broad ridges and side slopes. Permeability is moderate and the water table is not within a depth of 6 feet.

Cecil-Urban land complex (2 to 8 percent slopes and 8 to 15 percent slopes) consists of intermingled areas of Cecil soil and Urban land. Cecil soil is well drained and on narrow ridges and side slopes. Cecil soil has moderate permeability and the water table is not within a depth of 6 feet. Areas of Urban land are covered with buildings, streets, driveways, and parking lots.

Chewacla loam is a somewhat poorly drained soil found on nearly level floodplains along creeks and rivers. Permeability is moderate and the seasonal high water table is within 1.5 feet of the surface, and this soil is subject to frequent flooding for brief periods mostly during the winter and spring. Chewacla is considered a hydric soil when frequently flooded and the most common hydric component of Chewacla soil is Wehadkee soils, which is found in depressions and in floodplains.

Congaree loam is a well or moderately drained soil found in nearly level areas on floodplains along creeks and rivers. Permeability is moderate and the seasonal high water table is at a depth of 2.5 to 4.0 feet, and this soil is subject to occasional flooding for brief periods during winter and spring.

Davidson sandy clay loam (2 to 8 percent slopes and 8 to 15 percent slopes, 15 to 25 percent slopes) is a well drained soil on side slopes and broad ridges on the uplands. Permeability is moderate and the water table is below 6 feet.

Enon sandy loam (2 to 8 percent and 8 to 15 percent slopes) is a well drained soil on broad ridges and side slopes on the uplands. Permeability is slow and the water table is below 6 feet.

Gaston sandy clay loam (2 to 8 percent slopes, 8 to 15 percent slopes) is a well drained soil found on broad ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Gaston loam (15 to 25 percent slopes) is a well drained soil on side slopes and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Helena sandy loam (1 to 6 percent slopes) is a moderately well drained soil on smooth ridges, toe slopes, and along drainage ways. Permeability is slow and the seasonal high water table is at a depth of 1.5 to 2.5 feet. Hydric components of Worsham soils may occupy approximately 2% of the Helena sandy loam series, primarily in depressions.

Lignum silt loam (1 to 6 percent slopes) is a moderately well drained to somewhat poorly drained soil on smooth ridges, toe slopes and along drainage ways. Permeability is very slow and the seasonal perched water table is within a depth of 1.0 to 2.5 feet. Hydric components of Roanoke soils may occupy approximately 5% of the Helena sandy loam series, primarily in depressions and along streams.

Madison sandy clay loam (2 to 8 percent slopes and 8 to 15 percent slopes) is a well drained soil on side slopes, broad ridges and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Madison sandy loam (15 to 25 percent slopes) is a well drained soil on side slopes and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Mecklenburg fine sandy loam (8 to 15 percent slopes) is a well drained soil on side slopes on the uplands. Permeability is slow and the water table is below 6 feet.

Monacan loam is a somewhat poorly drained soil found in nearly level areas on floodplains along streams and drainage ways. Permeability is moderate and the seasonal high water table depth is 0.5 to 2 feet in winter and early spring. Hydric components of Wehadkee soils may occupy approximately 5% of the Monacan loam series in depressions and along floodplains.

Pacolet sandy clay loam (8 to 15 percent slopes) is a well drained soil found on side slopes and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Pacolet sandy loam (15 to 25 percent slopes and 25 to 45 percent slopes) is a well drained soil on side slopes and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Tatum gravelly loam (2 to 8 percent slopes, 8 to 15 percent slopes and 15 to 25 percent slopes) is a well drained soil on broad ridges, side slopes, and narrow ridges of the Kings Mountain belt. Permeability is moderate and the water table is not within a depth of 6 feet.

Udorthents consist of areas where the original soil has been altered by cutting, filling, and shaping. It includes borrow areas, landfills, mine tailings, fly ash deposits, and cut and fill areas.

Urban land consists of areas where more than 85 percent of the surface is covered with asphalt, concrete, buildings, or other impervious cover.

Uwharrie stony loam (25 to 45 percent slopes) is a well drained soil on the narrow ridgetops and side slopes in the Kings Mountain belt. Permeability is moderate and the water table is not within a depth of 6 feet.

Vance sandy loam (2 to 8 percent slopes and 8 to 15 percent slopes) is a well drained soil on broad ridges, side slopes, and narrow ridges. Permeability is slow and the water table is not within a depth of 6 feet.

Wedowee sandy loam (6 to 15 percent slopes) is a well drained soil on side slopes and narrow ridges. Permeability is moderate and the water table is not within a depth of 6 feet.

Wilkes loam (6 to 15 percent slopes and 15 to 30 percent slopes) is a well drained soil on broad to narrow ridges and side slopes. Permeability is moderately slow and the water table is not within a depth of 6 feet.

Winnsboro loam (2 to 8 percent slopes and 8 to 15 percent slopes) is a well drained soil on broad to narrow ridges and side slopes. Permeability is slow and the water table is not within a depth of 6 feet.

Worsham loam (0 to 2 percent slopes) is a poorly drained soil on uplands around intermittent drainage ways. Permeability is very slow and the seasonal high water table is within a depth of 1 foot mostly during winter and spring. Worsham loam is a hydric soil series that occurs in depressions and may consist of approximately 80 % hydric soils.

Site index is a measure of soil productivity and is the average tree height (in feet) that dominant and co-dominant trees of a given species attain in a specific time frame (typically 50 years). The site index applies to fully-stocked, even-aged, unmanaged stands. Site indices of soils in the project study area are listed in **Table 2**.

Table 2. Project Soils Site Indices

Soil Map Unit	Loblolly Pine	Shortleaf Pine	Virginia Pine	White Oak	Yellow Poplar	N. Red Oak
Alamance Varian gravelly loam	77	66	-	71	-	-
Appling sandy loam	83	65	74	64	90	-
Cecil sandy clay loam	72	66	65	-	87	77
Cecil-Urban land complex	-	-	-	-	-	-
Chewacla loam	96	-	-	-	100	-
Congaree loam	90	-	-	-	107	-
Davidson sandy clay loam	81	68	-	71	80	86
Enon sandy loam	71	60	65	-	-	-
Gaston sandy clay loam	85	70	-	-	-	-
Gaston loam	90	75	-	-	-	-
Helena sandy loam	80	63	-	-	-	-
Lignum silt loam	76	66	74	-	-	68
Madison sandy clay loam	72	61	66	81	91	83
Madison sandy loam	79	66	71	80	96	88
Mecklenburg fine sandy loam	75	67	-	71	89	-
Monacan soils	95	-	-	90	100	-
Pacolet sandy clay loam	70	60	-	-	80	-

Soil Map Unit	Loblolly Pine	Shortleaf Pine	Virginia Pine	White Oak	Yellow Poplar	N. Red Oak
Pacolet sandy loam	78	70	-	-	90	-
Tatum gravelly loam	78	68	68	-	83	72
Uwharrie stony loam	-	-	-	-	96	-
Vance sandy loam	76	68	-	76	-	72
Wedowee sandy loam	80	69	70	65	-	68
Wilkes loam	75	63	-	60	-	-
Winnsboro loam	73	63	63	69	88	-
Worsham loam	88	-	80	-	91	80

2.2 Water Resources

This section contains information concerning water resources likely to be impacted by the proposed project. Water resource assessments include the physical characteristics (determined by field survey), best usage classifications, and water quality aspects of the water resources. Probable impacts to surface waters are also discussed, as well as measures to minimize impacts. Numerous streams were identified in the project study area and are shown on **Figure 3a-3w**.

2.2.1 Physical Characteristics of Surface Waters

The project is located in the Catawba River basin (US Geologic Survey Hydrologic Unit Codes 03050101, 03050102, 03050103, DWQ subbasins 03-08-34, 03-08-36, 03-08-37). The area has rolling topography dissected by wide floodplains along larger streams. The named streams within the project study area are typically larger channels. Twelve named streams (on either USGS topographic maps or NCDWQ hydrology data) occur in the project study area. One of these occurs in Mecklenburg County (Beaverdam Creek) and ten other named streams occur in Gaston County. The last, the Catawba River/Lake Wylie, divides the two counties (**Table 3**).

Table 3. Streams within the Project Study Area

Surface Water Name	Hydrologic Unit	Substrate	Channel Width (ft)	Bank Height (ft)	Current Classification	Stream Index #
Beaverdam Creek	03050103	sand to boulder and bedrock	8 - 10	3 - 5	C	11-126
Catawba River/Lake Wylie	03050103	NA	800 - 2000	NA	WS-V, B	11-(123.5)
South Fork Catawba River	03050102	NA	600 -1200	NA	WS-V	11-129-(15.5)
Catawba Creek	03050101	sand and gravel	20 - 50	3 - 6	C	11-130
Crowders Creek	03050101	sand and cobble	40 - 50	10 - 15	C	11-135
Abernethy Creek	03050101	cobble	30 - 40	4 - 5	C	11-135-4
Blackwood Creek	03050101	sand and gravel	24 - 32	8	C	11-135-7
Ferguson Branch	03050101	cobble, boulder, and bedrock	4 - 12	4 - 8	C	11-135-8
McGill Branch	03050101	sand and cobble	6	4	C	11-135-9
Mill Creek	03050101	Sand, gravel, cobble, boulder	1.5 - 10	1 - 4	C	11-131

Surface Water Name	Hydrologic Unit	Substrate	Channel Width (ft)	Bank Height (ft)	Current Classification	Stream Index #
Oates Creek (Branch)	03050101	cobble	8 - 12	4	C	11-135-5-1
Bessemer Branch	03050101	cobble, bedrock	12	44	C	11-135-5

Numerous unnamed perennial and intermittent tributaries are also present in the project study area. Information concerning these streams is presented in **Appendix C**.

2.2.2 Best Usage Classification

Surface waters in North Carolina are assigned a classification by the DWQ that is designed to maintain, protect, and enhance water quality within the state (NCDENR 2006a). The majority (10 of 12) of the named streams in the project study area are classified as C. Class C waters are protected for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture. Secondary recreation includes wading, boating, and other uses involving human body contact with water where such activities take place in an infrequent, unorganized, or incidental manner. There are no restrictions on watershed development activities. These waters are suitable for all Class C uses. If a stream is not classified it assumes the classification of its receiving stream. Therefore, the small unnamed tributaries that flow into these streams carry the same classification.

The other two named water bodies, the Catawba River/Lake Wylie and the South Fork Catawba River, carry surface water designations indicating uses as drinking water sources. The Catawba River/Lake Wylie [Index # 11-(123.5)] is designated as WS-V, B and South Fork Catawba River [Index # 11-129- (15.5)] is designated as WS-V. WS-V waters are protected as water supplies which are generally upstream of WS-IV waters (water protected as water supplies which are generally in moderately to highly developed watersheds). No categorical restrictions on watershed development or treated wastewater discharges shall be required, however, the Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters. The B designation indicates freshwaters protected for primary recreation which includes swimming on a frequent or organized basis and all Class C uses.

No waters classified as High Quality Water (HQW), Water Supplies (WS-I or WS-II) or Outstanding Resource Waters (ORW) occur within 1.0 miles (1.6 km) of the project study area.

2.2.3 Water Quality

This section describes the quality of the water resources within the project study area. Potential impacts to water quality from point and non-point sources are evaluated. Water quality assessments are based upon published resource information and field study observations.

2.2.3.1 General Watershed Characteristics

The project is located in a watershed with a wide variety of land uses. Some large tracts are still forested or in agricultural production (largely hay). A large proportion of the watershed is moderately developed as residential or industrial. Many of the waterways and wetlands within the watershed remain forested although some of the streams have minimal riparian buffers at best. This is most common in the suburban, urban, and industrial areas. Potential threats to water quality in this area are agricultural practices, development, and land clearing which may contribute to soil erosion and increases in chemical runoff and nutrient input.

2.2.3.2 Basin-wide Assessment Report

Basin-wide water quality assessments are conducted by the Environmental Sciences Branch, Water Quality Section of the DWQ. The program has established monitoring stations for sampling selected benthic macroinvertebrates and fish, which are known to have varying levels of tolerance to water pollution. An index of water quality can be derived from the number of taxa present and the ratio of tolerant to intolerant taxa. Streams can then be given a bioclassification ranging from Poor to Excellent.

The project runs through 3 basins in the Catawba River basin: 30834, 30836, and 30837. Sampling in subbasin 30834 is limited to a sample location on Lake Wylie in York County, South Carolina. This reservoir was monitored in 2001 and 2002 and was classified as eutrophic. Percent oxygen saturation at the surface exceeded the water quality standard for dissolved gases (NCDENR, 2003).

Two fish community monitoring sites and one benthic macroinvertebrate monitoring site were sampled from Catawba River Subbasin 30837 in 2002. The benthic macroinvertebrate monitoring site is located on SC 564 where it crosses Crowders Creek. It received a Fair rating both in 1997 and 2002. This stream formerly had problems associated with effluent from a chicken processing plant and Bessemer City, both of which have now ceased. Although the bioclassification rating remained the same from 1997 to 2002, several metrics improved. The fish community sampling station on Crowder's Creek is located at SR 1108 and received a Fair rating in both 1997 and 2002. More species and fish were collected in 2002 than in 1997 but there was a decline in the diversities of suckers and sunfish and an absence of piscivores. Only one specimen of a darter and an intolerant species were present in 2002. There are seven National Pollutant Discharge Elimination System (NPDES) permitted dischargers within the site's watershed with a combined discharge of 1.02 MGD (NCDENR, 2003).

A fish sampling site on Catawba Creek rated good-Fair in 1997 but dropped to Fair in 2002. Three small NPDES permitted dischargers operate within the watershed and the stream and riparian zone are degraded by poor land use and livestock access to the stream. As in Crowders Creek, there were more fish collected in 2002 but the community shifted towards one with a greater percentage of herbivores and omnivores. Intolerant species were absent in both 1997 and 2002 (NCDENR, 2003).

2.2.3.3 Impaired Waters

The *North Carolina Water Quality Assessment and Impaired Waters List* (NCDENR 2006b) is an integrated report that includes both the 305(b) and 303(d) reports. The 305(b) report is compiled biennially to update the assessment of water quality in North Carolina and to meet the Section 305(b) reporting requirement of the Clean Water Act. In general, 305(b) reports have described the quality of surface waters, groundwaters, and wetlands, and existing programs to protect water quality. The 305(b) reports present how well waters support designated uses (e.g., swimming, aquatic life support, water supply), as well as likely causes (e.g., sediment, nutrients) and potential sources of impairment. The 303(d) list is a comprehensive public accounting of all impaired waterbodies that is derived from the 305(b) report/Use Support. An impaired waterbody is one that is damaged by pollutants, such as nitrogen, phosphorus, and fecal coliform bacteria, and by pollution such as hydromodification and habitat degradation. The source of impairment might be from point sources, non-point sources, and atmospheric deposition. The standards violation might be due to an individual pollutant, multiple pollutants, or an unknown cause of impairment. This list is compiled by the DWQ and submitted to the Environmental Protection Agency (EPA) by April 1 of every even year.

Within the project study area three of the water resources described in Section 2.2.1 are designated as biologically impaired water bodies regulated under the Final 2006 provisions of the Clean Water Act (CWA) 303(d). Abernethy Creek, Catawba Creek, and Crowders Creek, are listed on the Final 2006 303(d) list as having impaired biological integrity (NCDENR 2006b). The potential source of impairment for all of these streams is urban runoff and storm sewers. There are no additional streams within 1 mile of the project study area listed on the 303(d) list.

Two additional water resources, Blackwood Creek and Catawba River/Lake Wylie, are listed in the 305(b) integrated report but do not occur on the 303(d) list. These are waters that are not supporting one or more of their designated use, but may not be sufficiently degraded to occur on the 303(d) list.

2.2.3.4 Point Source Discharge Permits

Point source discharges in North Carolina are regulated through the NPDES program administered by the DWQ. All dischargers are required to obtain a permit to discharge. As of July 30, 2007 (NCDENR 2007), there are 35 permitted discharges into streams in the project study area. They are listed in **Table 4** below.

Table 4. NPDES Permits

Permit #	Permitee	Permitted Facility	Receiving Stream	Subbasin	Permitted Discharge
NC0004979	Duke Energy Corporation	Plant Allen Steam Station	Catawba River/Lake Wylie	30834	1,000,000
NC0021181	City of Belmont	Belmont WWTP[1]	Catawba River/Lake Wylie	30834	5,000,000
NC0005274	Yorkshire Americas Inc.	Yorkshire Americas WWTP	South Fork Catawba River	30836	400,000
NC0004812	Pharr Yarns Inc.	Pharr Yarns Industrial WWTP	South Fork Catawba River	30836	1,000,000
NC0006033	Town of Cramerton	Eagle Road WWTP	South Fork Catawba River	30836	4,000,000
NC0020052	Town of McAdenville	McAdenville WWTP	South Fork Catawba River	30836	130,000
NC0020966	Town of Spencer Mountain	Spencer Mountain WWTP	South Fork Catawba River	30836	50,000
NC0025861	City of Lowell	Lowell WWTP	South Fork Catawba River	30836	600,000
NC0066141	Town of Spencer Mountain	Spencer Mountain WTP[2]	South Fork Catawba River	30836	10,000

Permit #	Permitee	Permitted Facility	Receiving Stream	Subbasin	Permitted Discharge
NC0077763	City of Belmont	Belmont WTP	South Fork Catawba River	30836	Not limited
NC0084662	Textron, Inc.	Textron remediation site	Crowders Creek	30837	300,000
NC0074799	Pines Mobile Home Park	Pines Mobile Home Park	Crowders Creek	30837	11,000
NC0004260	SKF USA Inc.	SKF Gastonia Facility	Crowders Creek	30837	14,4000
NC0005177	FMC Corporation	Lithium division Plant	Abernethy Creek	30837	615,000
NC0060755	Carolina Water Service, Inc. of North Carolina	Saddlewood WWTP	Crowders Creek	30837	9,000
NC0062278	Berkley Oaks LLC	Berkley Oaks WWTP	McGill Branch	30837	36,000
NC0069035	Heater Utilities Inc.	Southgate WTP	Catawba Creek	30837	Not limited
NC0069175	Ridge Community Sewer Association	Ridge Community WWTP	Blackwood Creek	30837	10,000
NC0072061	Heater Utilities, Inc.	Fox Run WTP	Crowders Creek	30837	Not limited
NC0074268	City of Gastonia	Crowders Creek WWTP	Crowders Creek	30837	6,000,000
NC0084468	Heater Utilities, Inc.	Keltic Meadows WTP #2	Catawba Creek	30837	Not limited
NC0086142	Heater Utilities, Inc.	Oakley Park WTP	McGill Branch	30837	1,000
NC0086193	Heater Utilities, Inc.	Maplecrest WTP	Catawba Creek	30837	Not limited
NC0084638	Rhodia, Inc.	Rhodia remediation site	Crowders Creek	30837	194,000
NC0085928	American Truetzschler, Inc.	Truetzchler remediation site	Catawba River	30834	50,000
NC0004375	Clariant Corporation	Mount Holly East (MHE) Facility	Catawba River	30834	3,900,000
NC0028711	Mecklenburg County Schools	Berryhill Elementary School WWTF	Catawba River	30834	6,000
NC0057401	Go Go Properties LLC	The Hideaways WWTP	Catawba River	30834	200,000
NC0058084	Gough Econ, Inc.	Gough Econ WWTP	Catawba River	30834	1,200
NC0059579	Carolina Water Service, In. of North Carolina	Emerald Point WWTP	Catawba River	30834	60,000
NC0062383	Carolina Water Service, In. of North Carolina	Queens Harbor WWTP	Catawba River	30834	100,000

Permit #	Permitee	Permitted Facility	Receiving Stream	Subbasin	Permitted Discharge
NC0063860	Heater Utilities, Inc.	Harbor Estates WWTP	Catawba River	30834	75,000
NC0068705	Mariners Watch Homeowners Association	Mariners Watch WWTP	Catawba River	30834	2,500
NC0071242	Carolina Water Service, Inc. of North Carolina	Riverpointe WWTP	Catawba River	30834	100,000
NC0084280	Plantation Pipe Line Company	Stifford Ferry Road site	Catawba River	30834	72,000

Notes: 1 - WWTP – Waste Water Treatment Plant
2 – WTP – Water Treatment Plant

2.2.3.5 Non-Point Source Discharge

Unlike pollution from industrial and sewage treatment, non-point source (NPS) pollution comes from many non-discrete sources. As rainfall or snowmelt runoff moves over the earth's surface, natural and man-made pollutants are picked up, carried, and ultimately deposited into lakes, rivers, wetlands, coastal waters, and groundwater. Non-point source pollution includes fertilizers, herbicides, and insecticides from farms and residential areas; hydrocarbons and chemicals from urban runoff; sediments from construction sites, land clearing, and eroding stream banks; bacteria and nutrients from livestock, animal wastes, and faulty septic systems; and atmospheric deposition. The effects of NPS pollutants on water resources vary, and in many instances, may not be known. These pollutants generally have harmful effects on drinking water supplies, recreation, wildlife, and fisheries.

Earth Tech biologists conducted a general visual observation of potential NPS discharges located within and near the project study area. Atmospheric deposition from passing vehicles; fertilizers, herbicides, and insecticides from nearby agricultural and residential areas; and hydrocarbon and chemical runoff from nearby roadways and residential driveways were identified as potential sources of NPS pollution near the project study area. Overall, the threat of non-point source discharge is above average because of the high density of impervious surfaces found near streams within the project study area.

2.2.3.6 National Marine Fisheries Service Essential Fish Habitat

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) set forth new requirements for the National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other Federal agencies to identify and protect important marine and anadromous fish habitat. These amendments established procedures for the identification of Essential Fish Habitat (EFH) and a requirement for interagency coordination to further the conservation of federally managed fisheries. Gaston and Mecklenburg Counties are not in Essential Fish Habitat identified counties and do not border the ocean or estuarine waters. Neither the Catawba River nor any of its tributaries are considered estuarine waters; therefore; there will be no EFH impacts associated with this project.

2.2.4 Summary of Anticipated Impacts

Both temporary and permanent impacts to the water quality of the project study area will occur from the project. Potential short-term impacts to water resources in the project study area will include increased sedimentation and turbidity from construction-related erosion. To help mitigate potential temporary impacts, Best Management Practices (BMP) for sedimentation and erosion control should be implemented during construction activities.

Project construction may result in the following impacts to surface water resources:

- Increased sediment loading and siltation as a consequence of watershed vegetation removal, erosion, and/or construction.
- Decreased light penetration/water clarity from increased sedimentation.
- Changes in water temperature with vegetation removal.
- Changes in the amount of available organic matter with vegetation removal.
- Increased concentration of toxic compounds from highway runoff, construction activities and construction equipment, and spills from construction equipment.
- Alteration of water levels and flows as a result of interruptions and/or additions to surface and groundwater flow from construction.

Non-point source discharges from the highway surface can be partially mitigated by the construction of filter strips of vegetation adjacent to the highway. Best Management Practices (BMPs) during construction may include strict erosion and sediment control procedures, careful containment of oil, gasoline, and other hazardous materials, and reduced canopy removal within riparian fringes along the streams.

Construction impacts may not be restricted to the communities in which the construction activity occurs but may also affect downstream communities. Efforts will be made to ensure that no sediment leaves the construction site. NCDOT's *Best Management Practices for the Protection of Surface Waters* will be implemented, as applicable, during the construction phase of the project to ensure that no sediment leaves the construction site.

3.0 BIOTIC RESOURCES

Terrestrial and aquatic communities are included in the description of biotic resources. Living systems described in the following sections include communities of associated plants and animals. These descriptions refer to the dominant flora and fauna in each community and the relationships of these biotic components. Descriptions of the terrestrial systems are presented in the context of plant community classifications. These classifications follow Schafale and Weakley (1990) where possible. They are also cross-referenced to *The Nature Conservancy International Classification of Ecological Communities (ICEC): Terrestrial Vegetation of the Southeastern United States* (Weakley *et al*., 1998) (NatureServe 2006), which has been adopted as the standard land cover classification by the Federal Geographic Data Committee. Representative animal species that are likely to occur in these habitats (based on published range distributions) are also cited. Scientific nomenclature and common names (when applicable) are used for the plant and animal species described. Subsequent references to the same species are by the common name only. Fauna observed during field investigations are denoted with an asterisk (*).

3.1 Terrestrial Communities

Nine terrestrial communities were identified within the project study area; agricultural, clearcut, hardwood forest, Mesic Mixed Hardwood Forest, mixed pine-hardwood forest, pine forest, pine plantation, successional, and disturbed, (**Figure 4A-4W**). Dominant faunal components associated with these terrestrial areas will be discussed following the community description. Many species are adapted to the entire range of habitats found along the project alignment but may not be mentioned separately for each community.

3.1.1 Disturbed Community

The majority of the terrestrial communities found in the project study area are this type of community. This community type includes four types of habitat that have recently been or are currently impacted by human disturbance including regularly maintained roadside shoulder, mining, commercial development, and residential areas. A few areas that have been recently clear-cut are included in this disturbed community. These habitats are kept in a low-growing, early successional state by regular maintenance (except clear-cuts). The regularly maintained roadside shoulder is mowed frequently and is dominated by herbaceous vegetation. The dominant species include broom sedge (*Andropogon virginicus*), fescue (*Festuca* sp.), Japanese honeysuckle (*Lonicera japonica*) and various annual and perennial herbaceous weed species. A representative example of this community type is located south of Exit 13 on I-85 in a subdivision along Bright Avenue (Figure 4A).

The commercial and residential area includes maintained lawns and waste places near outbuildings and parking areas. Most of these areas are maintained on a regular basis by either mowing or herbicide application. Residential areas are dominated by various turf grasses, ornamental shrubs, and large shade trees including red maple (*Acer rubrum*), northern red oak (*Quercus rubra*) and southern red oak (*Quercus falcata*). Commercial areas can resemble residential areas if fastidiously maintained or may develop into an early successional habitat if left fallow.

3.1.2 Agricultural Land

This community is not a natural community but one that is planted and/or maintained by humans for the purpose of growing food crops or livestock. The most common crop encountered in the project study area include pasture grasses for the purpose of growing hay. Cattle and horses were also being raised in a few locations in the project study area. These pasturelands were composed of grasses as well as annual and perennial herbaceous species. A representative concentration of this community type is located north of Exit 13 on I-85 and consists of a large network of pastures (Figure 4A).

3.1.3 Clearcut

This community is an artificially created community as a result of a recent timber harvest. Typically clearcuts are composed of early regenerating trees and shrubs, large amounts of leftover downed woody debris, and numerous colonizing herbaceous species. Common herbaceous species in clearcuts include pokeberry (*Phytolacca americana*), fireweed (*Erechtites hieracifolia*), broomsedge, and asters. Many tree and shrub seedlings begin to sprout following a clearing and common species include red maple, sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), shortleaf pine (*Pinus echinata*), and loblolly pine (*Pinus taeda*). A representative example of this community type is located east of Homewood Drive and South of Linwood Road SR 1133 (Figure 4D).

3.1.4 Hardwood Forest

The hardwood forest is dominated by a mixture of oaks, tulip poplar, sweetgum and red maple. This community is found throughout the project study area and consists mostly of mature forests. Forests described as hardwood forests in the project study area are most similar to those described by Schafale and Weakley as Dry Mesic Mixed Oak Hickory Forest (Natureserve community Piedmont Dry Mesic Oak Hickory Forest CEGL008475) or Mesic Mixed Hardwood Forest (Natureserve community Piedmont Acidic Mesic Mixed Hardwood Forest CEGL008465) in upland areas and piedmont/mountain bottomland forest in floodplains that are adjacent to larger stream channels. The piedmont/mountain bottomland forest did not match a community type as described by Natureserve.

Species currently found in the canopy include northern red oak, southern red oak, sweetgum, and red maple. Because of past disturbance, an occasional Virginia pine (*Pinus virginiana)* or shortleaf pine is often found scattered within this community. Understory species include red maple, flowering dogwood (*Cornus florida*), and American holly (*Ilex opaca*). Shrubs include blueberries (*Vaccinium* sp.) and strawberry bush (*Euonymus americana*). Herbaceous vegetation is usually sparse although it can be locally diverse and includes crane-fly orchid (*Tipularia discolor*), spotted wintergreen (*Chimaphila maculatum*), and ebony spleenwort (*Asplenium platyneuron*). Exotics can be problematic in these communities with Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), autumn olive (*Eleagnus sp*.) and Japanese honeysuckle (*Lonicera japonica*) being the most common species encountered. Large examples of this community type are located on either side of Lewis Road SR 1126 (Figure 4G).

3.1.5 Mesic Mixed Hardwood Forest (Piedmont Subtype)

This community is uncommon in the project study area and is distinguished from the previously described hardwood forest in that it is relatively mature and closely matches the community type as described by Schafale and Weakley (1990). This mature forested community occurs in mesic areas on lower slopes, steep north facing slopes, and ravines on acidic soils. The canopy is dominated by mesophytic species such as American beech (*Fagus grandifolia*), yellow poplar, red maple, and red oak (*Quercus rubra*). Understory species include flowering dogwood, American holly and red maple. The shrub and herb layer ranges from sparse to fairly dense. Common shrub species include strawberry bush and blueberries. Typical herbs include Christmas fern (*Polystichum acrostichoides),* wild ginger (*Hexastylis arifolia*), and lion's foot (*Prenanthes serpentaria*). One of the few examples of this community is located along Chapel Grove Road SR 1131 (Figure 4E).

This community was described by Schafale and Weakley (1990) and the Natureserve equivalent of this forest is most likely a Piedmont Acidic Mesic Mixed Hardwood Forest (CEGL008465).

3.1.6 Mixed Pine-Hardwood Forest

The mixed pine-hardwood forest is found in both upland and wetland communities having hardwoods with a larger component of pines than the previously described hardwood forest approaching an even mixture of pines and hardwoods. This community is typically found on upland areas throughout the project study area. These communities usually contain younger trees and past disturbances have created the mixture of tree species. Typical canopy species include tulip poplar, sweetgum, red maple and the oaks found in the upland hardwood forest (Section 3.1.4) with an important component of pine as well. These pines include Virginia pine, shortleaf pine, and occasionally loblolly pine. Understory trees found in this community include red maple, flowering dogwood, and American holly. Shrubs are often dense and species include strawberry bush, blueberry. Vines are usually a strong component of these communities and include muscadine grape (*Vitis rotundifolia*) and cat greenbrier (*Smilax rotundifolia*). Herbaceous vegetation is usually sparse and exotic vegetation is often present in highly disturbed examples of this community and includes Japanese honeysuckle, Chinese privet, autumn olive, and multiflora rose.

A comparable community type is not described by Schafale and Weakley (1990) due to this community's large degree of manipulation. Some less disturbed examples of this community resemble a Dry-Mesic-Oak Hickory Forest with a considerable pine influx. The less disturbed examples of this community type are most similar to the Piedmont Dry Mesic Oak Hickory Forest (CEGL008475) community type as described by Natureserve. A representative example of this community type is located between Double Oaks Road and Dorchester Road SR 3076 (Figure 4M).

3.1.7 Pine Forest

Scattered throughout the project are pine forests that appear associated with abandoned agricultural land, unmanaged clearcuts, and unmaintained pine plantations. This community is differentiated from pine plantations in that they are not heavily managed for timber production. These pine forests are typically young, closed canopy forests containing primarily Virginia pine, shortleaf pine, or loblolly pine. Pine forests typically have a canopy that is dominated by pine species with only a negligible component of hardwoods in the canopy as compared to mixed pine-hardwood forest that has a relatively even mixture of pines and hardwoods in the canopy. In younger stands the understory may be dense but becomes more open in older stands. Other early successional trees such as red maple, sweetgum, and tulip poplar may also be present either in the understory or scattered in the canopy.

A comparable community type is not described by Schafale and Weakley (1990) due to these communities' large degree of manipulation. This community type also did not match a community type as described by Natureserve but some stands resemble the Virginia Pine Forest Alliance as described by Natureserve. A representative example of this community type is located north of Bayshore Drive SR 3018 (Figure 4R).

3.1.8 Pine Plantation

This community is an artificial community that consists of planted pine stands that are managed for timber production. These vary in age depending on the stage of production and range from young stands with the canopy beginning to close to mature stands ready for harvest. The most commonly encountered species in plantations were loblolly pine and shortleaf pine. These stands varied from an open to densely stocked nature depending on the degree and stage of management.

A comparable community type is not described by Schafale and Weakley (1990) due to these communities' large degree of manipulation. This community type also did not match a community type as described by Natureserve. A representative example of this community type is located west of the intersection of Worrells River Road and NC 279 (Figure 4R).

3.1.9 Successional Community

The successional community includes those communities that follow a natural or artificial disturbance and are in an early successional state. This community, like the clearcut, is composed of colonizing species and is characterized by a lack of a tree canopy. These communities develop into a variety of communities when in a mature state but are difficult to assign to a described natural community when in an early successional state. Species commonly found in successional communities are blackberries (*Rubus sp*.), pokeberry, broomsedge, sweetgum, red maple, shortleaf pine, Virginia pine, muscadine grape, and silverling (*Baccharis halimifolia*). A dense group of this community type is located southwest of Exit 13 on I-85 along a powerline right-of-way (Figure 4A).

3.1.10 Faunal Component

Species that prefer open areas for feeding and nesting can be found in the successional, clearcut, and disturbed communities. The animal species present in these habitats are opportunistic and capable of surviving on a variety of resources, ranging from vegetation to both living and dead faunal components. Fauna or tracks observed in the field are indicated with an asterisk. The European starling (*Sturnus vulgaris*), northern mockingbird* (*Mimus polyglottos*), and field sparrow (*Spizella pusilla*) are common birds that use these habitats to find insects, seeds, or worms. The American crow* (*Corvus brachyrhynchos*), mourning dove* (*Zenaida macroura*), American robin* (*Turdus migratorius*), raccoon* (*Procyon lotor*), and the Virginia opossum (*Didelphis virginiana*) are true opportunists and will eat virtually any edible items including vegetation, fruits, seeds, insects, and carrion. Large open expanses are often used by raptors such as the red-shouldered hawk (*Buteo lineatus*) and scavengers such as the turkey vulture (*Cathartes aura*).

Many species are highly adaptive and may utilize the edges of forests and clearings or prefer a mixture of habitat types. The eastern cottontail (*Sylvilagus floridanus*) and raccoon* prefer a mix of herbaceous and woody vegetation and may be found in the dense shrub vegetation, along roadsides, and in residential areas. White-tailed deer* (*Odocoileus virginianus*) will utilize the forested areas as well as the adjacent open areas. The black rat snake* (*Elaphe obsoleta obsoleta*) will utilize forested habitat and open areas to forage for rodents. Blue jays (*Cyanocitta cristata*), northern bobwhite (*Colinus virginianus*), eastern towhee (*Pipilo erythrophthalmus*), song sparrows (*Melospiza melodia*), Carolina chickadees (*Poecile carolinensis*), white-throated sparrows (*Zonotrichia albicollis*), and bluebirds (*Sialia sialis*) are likely species that occur in the project study area and utilize edge habitat. Five-lined skinks (Eumeces fasciatus) and black racers (*Coluber constrictor*) are common reptile species that utilize a mixture of habitat types.

Mature pine, hardwood, and mixed forest habitats are important habitat for many species. Neotropical migratory birds, in particular, are extremely dependent on these areas. Species such as pileated woodpecker (*Dryocopus pileatus*) and barred owls (*Strix varia*) prefer forested riparian areas while neotropical migrant species such as the ovenbird (*Seiurus aurocapillus*), wood thrush (*Hylocichla mustelina*), and Acadian flycatcher (*Empidonax virescens*) prefer the upland woods. In the leaf litter of the forested habitats, the southern short-tailed shrew (*Blarina carolinensis*) and the white-footed mouse (*Peromyscus leucopus*) may be found. Gray squirrels* (*Sciurus carolinensis*) are often observed in wooded areas. The spring peeper (*Pseudacris crucifer*) can be found under forest litter and in brushy undergrowth. The eastern box turtle (*Terrapene carolina*) is a terrestrial turtle but will be found near streams in hot, dry weather. The ground skink (*Scincella lateralis*) may also be found in forested communities. Forested wetlands are especially appealing to great blue herons* (*Ardea herodias*), mud salamanders (*Pseudotriton montanus*), southern cricket frogs (*Acris gryllus*), and green frogs (*Rana clamitans melanota*).

3.2 Aquatic Communities

A variety of flowing and stillwater habitats occur in the project study area. Within the project study area the streams range from small intermittent channels to large perennial streams and stillwater habitats range from small farm ponds to Lake Wylie, a large water supply reservoir. This allows for a variety of aquatic communities to be present throughout the project study area.

The smaller stream channels are first- or second-order tributaries and bed material typically consists of sand, gravel, and cobble. On the more impacted channels, sand and sediments are common. Most of the streams are clear to moderately turbid. Riparian buffers along these streams varied from being almost nonexistent along some smaller more urban streams to extensive forested buffers along streams in more remote rural locations. Incision has constricted or eliminated the overbank flow of many of the smaller streams resulting in channel depths that can approach 4 feet or more.

All streams in the study area are designated as warmwater habitats by the NC Division of Water Quality (NCEEP, 2007). Based on range maps in Menhinick (1991) it can be presumed that the following fish species occur in project study area streams; redbreast sunfish (*Lepomis auritus*), bluegill* (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), rosyside dace*(*Clinostomus funduloides*), eastern mosquitofish (*Gambusia holbrooki*), bluehead chub (*Nocomis leptocephalus*), greenfin shiner (*Notropis analostanus*), spottail shiner (*Notropis hudsonius*), brown bullhead (*Ictalurus nebulosus*), and tessellated darter (*Etheostoma olmstedi*). Streams also support a diverse assemblage of invertebrate life and semi-aquatic vertebrates. Common types of adult and larval invertebrates encountered include snails* (Physidae), crayfish* (Decapoda), stoneflies (Plecoptera), mayflies* (Ephemeroptera), caddisflies* (Trichoptera), water pennies* (Coleoptera), dobsonfly* (Corydalidae), scud* (Amphipoda), dragonflies* (Anisoptera), and damselflies* (Zugoptera). Semi-aquatic amphibians typically associated with streams include southern two-lined salamanders* (*Eurycea cirrigera*), dusky salamander* (*Desmognathus fuscus*), and green frogs* (*Rana clamitans*). Asiatic clams* (*Corbicula fluminea*) were a very common exotic mollusk species in project streams.

Additionally numerous farm ponds and a large reservoir occur in the project study area. Usually farm ponds are stocked with a low diversity of game species. Typical species found in farm ponds include largemouth bass, bluegill, channel catfish (*Ictalurus punctatus*), and mosquitofish (*Gambusia holbrooki*). Lake Wylie is a large reservoir that supports a thriving recreational fishery. Popular target species found in the lake include largemouth bass, bluegill, black crappie (*Poxomis nigromaculatus*), white crappie (*Poxomis annularis*), white perch *(Morone americana*), blue catfish (*Ictalurus furcatus*), and channel catfish .

3.3 Summary of Anticipated Impacts

Project construction will have various impacts to the previously described terrestrial and aquatic communities. Any construction activities in or near these resources have the potential to impact biological functions. This section quantifies and qualifies potential impacts to the natural communities within the project study area in terms of the area impacted and the plants and animals affected. Temporary and permanent impacts are considered here along with recommendations to minimize or eliminate impacts.

3.3.1 Terrestrial Communities

Both direct and indirect impacts will occur to the terrestrial communities and the animals that inhabit them. Terrestrial communities in the project study area will be impacted permanently by project construction from clearing and paving. **Table 5** provides the acreage of terrestrial communities by habitat type that will be impacted by each alternative. These impacts are calculated based upon preliminary design as of January 1, 2007 and is the area contained within the proposed right-of-way.

Table 5. Estimated Impacts (Acres) to Terrestrial Communities within Study Alternatives (ROW)

Community Type	**Alternative**															
	4	5	6	9	22	23	24	27	58	64	65	68	76	77	78	81
Agricultural	121	142	148	177	121	142	148	177	153	220	227	256	128	148	155	184
Clearcut	0	0	0	20	4	4	4	24	0	0	0	20	0	0	0	20
Disturbed	552	562	560	547	540	550	548	536	513	535	534	522	514	523	522	509
Mesic Mixed Hardwood Forest	3	7	0	0	10	14	7	7	3	7	0	0	3	7	0	0
Hardwood Forest	268	260	232	236	307	300	271	276	456	483	454	459	354	347	318	323
Pine Hardwood Forest	512	526	547	533	541	555	576	562	448	396	416	403	488	502	522	509
Pine Forest	126	106	128	113	120	100	122	106	118	99	121	105	116	96	118	103
Pine Plantation	4	3	4	0	4	3	4	0	17	23	25	20	4	3	4	0
Successional	155	128	117	114	125	99	87	85	149	117	105	102	156	130	118	115
Open Water	22	26	26	21	22	26	26	21	22	26	25	21	22	26	26	21
Total Area	**1764**	**1760**	**1762**	**1762**	**1796**	**1793**	**1795**	**1794**	**1879**	**1906**	**1908**	**1908**	**1785**	**1780**	**1783**	**1784**

Destruction of natural communities along the project alignment will result in the loss of foraging and breeding habitats for the various animal species that utilize the area. Animal species will be displaced into surrounding communities. Adult birds, mammals, and some reptiles are mobile enough to avoid mortality during construction. Young animals and less mobile species, such as many amphibians, may suffer direct loss during construction. The plants and animals that are found in the upland communities are generally common throughout central North Carolina.

Impacts to terrestrial communities, particularly in locations having steep to moderate slopes, can result in the aquatic community receiving heavy sediment loads as a consequence of erosion. Construction impacts may not be restricted to the communities in which the construction activity occurs but may also affect downstream communities. Efforts should be made to ensure that no sediment leaves the construction site.

Indirect impacts will occur from forest fragmentation. Forest fragmentation occurs when large, contiguous forests are divided into smaller patches by urbanization, roads, and agriculture. This process reduces the forest’s function as a habitat for many plant and animal species and has been shown to reduce biodiversity by altering the amount of forest interior habitat reducing the amount of habitat available for species requiring large uninterrupted tracts.

When habitat is fragmented, the amount of edge habitat increases at the expense of interior habitat. Species dependant upon interior habitat suffer (such as many migratory or neo-tropical birds), while edge dependant species including invasive species and predators thrive. Highly fragmented forests cannot provide the food, cover, or reproduction needs of interior forest species. The road itself can also provide a physical barrier to the movement of mammals, reptiles, and amphibians along wildlife corridors and from one forest patch to another.

3.3.2 Aquatic Communities

Impacts to aquatic communities include fluctuations in water temperature as a result of the loss of riparian vegetation. Shelter and food resources, both in the aquatic and terrestrial portions of these organisms' life cycles, will be affected by losses in the terrestrial communities. The loss of aquatic plants and animals will affect terrestrial fauna that rely on them as a food source.

Temporary and permanent impacts to aquatic organisms may result from increased sedimentation. Aquatic invertebrates may drift downstream during construction and recolonize the disturbed area once it has been stabilized. Sediments have the potential to affect fish and other aquatic life in several ways including the clogging and abrading of gills and other respiratory surfaces, affecting the habitat by scouring and filling of pools and riffles, altering water chemistry, and smothering different life stages. Increased sedimentation may cause decreased light penetration through an increase in turbidity.

Wet concrete should not come into contact with surface water during bridge construction as it can adversely affect aquatic life. Potential adverse effects can be minimized through the implementation of NCDOT *Best Management Practices for Protection of Surface Waters*.

4.0 JURISDICTIONAL TOPICS

This section provides inventories and impact analyses for two federal and state regulatory issues: "Waters of the United States" and federally protected species.

4.1 Waters of the United States

Wetlands and surface waters fall under the broad category of "Waters of the United States" as defined in 33 CFR § 328.3 and in accordance with provisions of Section 404 of the CWA (33 U.S.C. 1344). These waters are regulated by the U.S. Army Corps of Engineers (USACE). Any action that proposes to dredge or place fill material into surface waters or wetlands falls under these provisions.

4.1.1 Characteristics of Wetlands and Surface Waters

Jurisdictional wetlands were identified within the project study area (**Figure 3a-3w**). Many of the wetlands are small headwater systems associated with the numerous tributaries. Larger bottomland hardwood wetland systems are associated with some of the larger streams and Lake Wylie. Field jurisdictional verifications for streams and wetlands were performed on April 12 and 13; May 2, 3, 10 and 11; and June 25 and 26, 2007. Mr. Steve Lund was the USACE representative and Ms. Polly Lespinasse was the NCDWQ representative that performed the field verifications. No written confirmation or verification has been issued by the US Army Corps of

Engineers. The DWQ issued a letter on August 2, 2007 indicating that the DWQ will consider all sites identified in the revised jurisdictional verification package (dated 7/25/07) as accurate.

Appendix D contains USACE Wetland Determination forms for each wetland and **Appendix E** contains the DWQ rating form. Wetlands were also assigned a quality rating of Low, Medium, or High. In general wetlands that received a score of 0 to 40 were considered Low Quality. Wetlands with scores ranging from 40 to 64 were rated Medium Quality, and wetlands with scores of 65 or greater received a High Quality rating. Some wetland quality ratings were adjusted up or down based upon professional judgment. A table listing each wetland, the DWQ rating and wetland type (Cowardin Classification) can be found in **Appendix C**. **Table 6** presents the quality and number of wetlands in each alternative. It should be noted that not all wetlands within the approximate 1,400-foot study corridor will be impacted by construction of the project.

Table 6. Quality of Wetlands by Alternative

Detailed Study Alternative	Low	Medium	High	Total
4	91	58	11	160
5	108	42	11	161
6	109	50	11	170
9	114	41	14	169
22	86	64	13	163
23	103	48	13	164
24	104	56	13	173
27	109	47	16	172
58	95	74	6	175
64	113	53	8	174
65	114	61	8	183
68	119	52	11	182
76	83	69	8	160
77	100	53	8	161
78	101	61	8	170
81	106	52	11	169

The following provides a general description of each wetland type.

PEM1 - These are palustrine emergent wetlands consisting of persistent emergent vegetation. These wetlands are located in areas such as pastures, road sides or maintained easements typically in headwaters or along floodplains of streams. Some common species in these wetlands include soft rush (*Juncus effusus*), bulrush (*Scirpus validus*), beggar's ticks (*Bidens aristosa*), bushy seedbox (*Ludwigia alternifolia*), netted chain fern, (*Woodwardia areolata*), cinnamon fern (*Osmunda cinnamomea*), giant cane (*Arundinaria gigantea*), cattail (*Typha latifolia*), blackberry (*Rubus sp.*), tag alder (*Alnus serrulata*), and black willow (*Salix nigra*). Hydrology is dependant upon landscape position and is typically groundwater or flood driven due to the location of these wetlands along streams. These areas can be saturated (PEM1B), seasonally flooded (PEM1C), semi-permanently flooded (PEM1F), intermittently exposed (PEM1G), and intermittently flooded (PEM1J). A good example of this wetland type is Wetland 159.

PFO1 - These are palustrine forested wetlands consisting of broad leaved deciduous vegetation. Many of these wetlands are in the headwaters or floodplains of streams and are hydrologically driven by groundwater or flooding. Typical vegetation species include red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), willow oak (*Quercus phellos*), tulip poplar (*Liriodendron tulipifera*), spicebush (*Lindera benzoin*), downy arrowwood (*Viburnum dentatum*), Chinese privet (*Ligustrum sinense*), Japanese grass (*Microstegium vimineum*), and netted chain fern. Hydrology is dependant upon landscape position and is typically groundwater or flood driven due to the location of these wetlands along streams. These wetlands can be temporarily flooded (PFO1A), saturated (PFO1B), seasonally flooded (PFO1C), a combination of seasonally flooded or saturated (PFO1E), semi-permanently flooded (PFO1F), intermittently exposed (PFO1G), and intermittently flooded (PFO1J). A good example of this wetland type is Wetland 34.

PSS1 - These are palustrine shrub-scrub wetlands composed of broad-leaved deciduous vegetation that is less than 20 feet in height. Many of these wetlands are in the headwaters or floodplains of streams and are hydrologically driven by groundwater or flooding. Species common to these wetlands include tag alder, willow oak, Chinese privet, blackberry, and poison ivy (*Toxicodendron radicans*). These often occur along the edges of the emergent wetlands or are forested systems that have been logged. Hydrology is variable and based upon landscape position. These wetlands can be temporarily flooded (PSS1A), saturated (PSS1B), seasonally flooded (PSS1C), and semi-permanently flooded (PSS1F). A good example of this wetland type is Wetland 189.

PSS3C - These are palustrine shrub-scrub wetlands composed of broad-leaved evergreen vegetation that is less than 20 feet in height and are seasonally flooded. Many of these wetlands are in the headwaters or floodplains of streams and are hydrologically driven by groundwater or flooding. Common species include giant cane, Chinese privet, and Japanese honeysuckle. One of the few examples of this wetland type is Wetland 27.

PUBHh - These are palustrine wetlands with unconsolidated bottoms and are permanently flooded due to dikes or impoundments. These are farm ponds or other types of manmade ponds that have been constructed by damming a stream or excavating in the headwaters of a drainage system. A good example of this wetland type is Wetland 119.

All of the named streams, unnamed tributaries, and ponds meet the definition of surface waters, and are therefore, classified as Waters of the United States. Numerous perennial and intermittent streams were identified in the project study area (**Figure 3a-3w**). **Appendix F** contains the NCDWQ Stream Identification forms used to determine intermittent and perennial status. **Appendix G** contains the USACE Stream Quality Assessment Worksheet. Additional information on each stream can be found in **Appendix C**.

In 2006, the Supreme Court addressed the jurisdictional scope of Section 404 of the CWA, specifically the term "the waters of the U.S.," in *Rapanos v. U.S.* and in *Carabell v. U.S.* (hereafter referred to as *Rapanos).* The decision provided two new analytical standards for determining whether water bodies that are not traditional navigable waters (TNWs), including wetlands adjacent to those non-TNWs, are subject to CWA jurisdiction: (1) if the water body is relatively permanent, or if the water body is a wetland that directly abuts (e.g., the wetland is not separated from the tributary by uplands, a berm, dike, or similar feature) a relatively permanent water body (RPW), or (2) if a water body, in combination with all wetlands adjacent to that water body, has a significant nexus with TNWs. As a consequence of the U.S. Supreme Court decision in *Rapanos,* the EPA and the USACE, in coordination with the Office of Management and

Budget (OMB) and the President's Council on Environmental Quality (CEQ), developed the Memorandum Regarding *Clean Water Act Jurisdiction Following Rapanos v. United States*. This guidance requires the application of the two new standards described above, as well as a greater level of documentation, to support an agency JD for a particular water body. Furthermore, this guidance required the USACE and EPA to develop a revised JD form to be used by field staff for documenting assertion or declination of CWA jurisdiction. These forms were completed for project streams and wetlands and are included as **Appendix H.**

Many of the wetlands within the project study area are abutting the stream or surface water body they are associated with. Almost all wetlands that were adjacent (nearby but not directly abutting a stream) were determined to have a significant nexus with the stream and with Navigable Waters of the US. Four wetlands were determined to not have a significant nexus. These wetlands were Wetland 95, Wetland 252, Wetland 253, and Wetland 291.

4.1.2 Catawba River Riparian Buffer Rules

Permanent riparian buffer protection rules were enacted for the main stem of the Catawba River below Lake James to The NC/SC border (NCDWQ, 2004). These rules also encompass the seven mainstem lakes from Lake James to the NC/SC border. Lake Wylie is one of the mainstem lakes in which the buffer rules apply. The buffer protection rules apply within 50 feet of all riparian shorelines along the Catawba River mainstem and the seven mainstem lakes. The buffer is 50 feet wide and is measured from the waters edge (at full pond in the lakes) and has two zones of 30 feet (Zone 1 nearest the water) and 20 feet (Zone 2 landward of Zone 1). Grading and clearing of vegetation in Zone 1 is not allowed except for certain uses. The outer 20-foot zone (Zone 2) can be cleared and graded but it must be revegetated and maintain diffuse flow to Zone 1. Certain activities (including road crossings) may be allowable with mitigation but must first be reviewed and given written approval by DWQ staff. If it can be shown that there are "no practical alternatives" to the proposed activity, a variance may be allowed with mitigation.

The project crosses three water bodies that are part of Lake Wylie in which the Catawba River Riparian Buffer Rules will apply. These are stream segments that are flooded due to the presence of Lake Wylie and are: Catawba Creek, South Fork Catawba River, and the Catawba River. Catawba Creek only occurs on the southern half of the southernmost "alternative segment" and has potential to be avoided during the alternatives analysis.

4.1.3 Summary of Anticipated Impacts

Project construction cannot be accomplished without infringing on the surface waters. Anticipated surface water impacts fall under the jurisdiction of the USACE and the DWQ. Wetlands may be either partially or completely filled. In some instances larger wetland areas may become hydraulically disconnected from an adjacent stream. Streams may be filled, relocated, or culverted by project construction. **Table 7** presents the amount of streams and wetlands that could be potentially impacted by each alternative. Impacts are based upon the preliminary design as of January 1, 2007. The impacts were calculated using the slope stake lines with a 25-foot buffer added to account for future changes in design.

Table 7. Impacts to Waters of the U.S. by Alternative

Alternative	Perennial Stream (linear ft)	Intermittent Stream (linear ft)	Wetland (acres)	Pond (acres)

Alternative	Perennial Stream (linear ft)	Intermittent Stream (linear ft)	Wetland (acres)	Pond (acres)
4	48296	9048	7.4	6.3
5	42737	9501	6.9	5.1
6	40377	9619	10.5	4.1
9	38894	10101	7.5	4.1
22	50100	8953	8.8	5.1
23	44609	9406	8.2	3.9
24	42234	9499	11.8	2.9
27	40766	10006	8.9	2.9
58	50739	9505	12.1	5.5
64	40915	9537	12.5	3.1
65	38666	9504	16.1	2.1
68	37223	9986	13.2	2.1
76	46105	9364	9.7	5.5
77	40033	9678	9.1	6.1
78	38214	9935	12.7	3.2
81	36771	10417	9.8	3.3

4.2 Permit Issues

Impacts to jurisdictional surface waters and protected Catawba River riparian buffers are anticipated from the proposed project. Permits and certifications from various state and federal agencies will be required prior to construction activities.

4.2.1 Required Permits

Stream and wetland impacts will likely exceed the limits allowable under the USACE Nationwide Permit program. Therefore, it will be necessary to submit an Individual 404 Permit application to the USACE for stream and wetland impacts.

This project will also require a 401 Water Quality Certification from the NCDENR prior to issuance of the Individual 404 Permit. Section 401 of the CWA requires that the state issue or deny water certification for any federally permitted or licensed activity that results in a discharge into Waters of the United States. Final permit decision rests with the USACE.

Impacts to the Catawba River riparian buffer rules will likely occur once it is shown that no practicable alternatives exist for the project. The buffer rules state that bridging is an allowable action within the buffers and mitigation will not be required.

4.2.2 Mitigation

The function of avoidance, minimization, and mitigation is to restore and maintain the chemical, biological, and physical integrity of Waters of the United States and Catawba River riparian buffers by avoiding impacts, minimizing impacts, and rectifying impacts. Each of these three aspects (avoidance, minimization, and compensatory mitigation) must be considered sequentially.

4.2.2.1 Avoidance

Avoidance mitigation examines all appropriate and practical possibilities of averting impacts to Waters of the United States and Catawba River riparian buffers. According to a 1990 Memorandum of Agreement (MOA) between the Environmental Protection Agency (EPA) and USACE, in determining "appropriate and practical" measures to offset unavoidable impacts, such measures should be appropriate to the scope and degree of those impacts and practical in terms of costs, existing technology, and logistics in light of overall project purposes.

4.2.2.2 Minimization

Minimization includes the examination of appropriate and practical steps to reduce the adverse impacts to Waters of the United States and Catawba River riparian buffers. Implementation of these steps will be required through project modifications and permit conditions. Practical means to minimize impacts to surface waters and wetlands impacted by the proposed project include:

- Decreasing the footprint of the proposed project through the reduction of median width, right-of-way widths, fill slopes and/or road shoulder widths
- Installation of temporary silt fences, earth berms, and temporary ground cover during construction
- Strict enforcement of sedimentation and erosion control BMPs for the protection of surface waters and wetlands
- Reduction of clearing and grubbing activity in and adjacent to water bodies
- Judicious pesticide and herbicide usage

4.2.2.3 Compensation

Compensatory mitigation is not normally considered until anticipated impacts to Waters of the United States have been avoided and minimized to the maximum extent possible. Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts that remain after all appropriate and practicable minimization has been done. Compensatory actions often include restoration, creation, and enhancement of Waters of the United States. Such actions should be undertaken in areas adjacent to or contiguous to the discharge site (*i.e.*, compensatory on-site mitigation). There are many possible streams in the project study area that restoration of which may qualify as on-site mitigation for stream impacts.

Because this project will likely be permitted under an Individual 404 Permit, mitigation for impacts to surface waters will be required by the USACE and the Division of Water Quality. Furthermore, in accordance with 72 FR 11092; 11198; March 12, 2007, the USACE requires compensatory mitigation when necessary to ensure that adverse effects to the aquatic environment are minimal.

It is anticipated that stream impacts will be greater than USACE and DWQ regulatory thresholds and will require compensatory mitigation. The environmental regulatory agencies will ultimately provide final permit and compensatory mitigation decisions for the project.

It is also anticipated that Catawba River riparian buffers may be impacted. These impacts will be from bridging, which is an allowable impact and does not require mitigation.

4.3 Federally Protected Species

Some populations of plants and animals are declining either as a result of natural forces or their difficulty competing with humans for resources. Rare and protected species listed for Gaston and Mecklenburg Counties, and any likely impacts to these species as a result of the proposed project construction, are discussed in the following sections.

4.3.1 Species Under Federal Protection

Plants and animals with a federal classification of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the Endangered Species Act of 1973, as amended. The USFWS lists three species (list updated May 10, 2007) under federal protection for Gaston County and five species (list updated May 10, 2007) under federal protection for Mecklenburg County. These species are listed in **Table 8**.

Table 8. Federally Protected Species in Gaston and Mecklenburg Counties

Common Name	Scientific Name	County	Status	Habitat Present	Biological Conclusion
Vertebrates					
Bald eagle	*Haliaeetus leucocephalus*	Gaston, Mecklenburg	Delisted	Yes	None Required
Bog turtle	*Clemmys muhlenbergii*	Gaston	T(S/A)	Yes	None Required
Invertebrates					
Carolina heelsplitter	*Lasmigona decorata*	Mecklenburg	E	Yes	No Effect
Vascular Plants					
Michaux's sumac	*Rhus michauxii*	Mecklenburg	E	Yes	No Effect
Schweinitz's sunflower	*Helianthus schweinitzii*	Gaston, Mecklenburg	E	Yes	May Affect/Not Likely to Adversely Affect
Smooth coneflower	*Echinacea laevigata*	Mecklenburg	E	Yes	No Effect

Notes:
E Endangered-A species that is threatened with extinction throughout all or a significant portion of its range.
T Threatened-A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
T(S/A) Similarity of Appearance-Threatened due to similarity of appearance with other rare species and is listed for its protection. These species are not biologically endangered or threatened and are not subject to Section 7 consultation

USFWS: Updated: 05/10/2007
Accessed August 24, 2007

A brief description of the characteristics and habitat requirements of each species follows, along with a conclusion regarding potential project impact. Surveys for federally protected species are valid for two years from the survey date. If the project is not constructed within those two years then the area may need to be resurveyed prior to the let date.

Bald eagle (*Haliaeetus leucocephalus*) **Delisted**

Family: Accipitridae
Date First Listed: March 11, 1967

Date Downlisted: July 12, 1995
Date Delisted: August 8, 2007

The bald eagle is a large raptor with a wingspan reaching 7 feet (2.1 m). Adults have a dark brown body with a pure white head and tail, whereas the juvenile plumage is chocolate brown to blackish with white mottling on the tail, belly and underwings. Adult plumage is fully acquired by the fifth or sixth year.

The bald eagle is primarily associated with coasts, rivers, and lakes, usually nesting near large bodies of water where it feeds. It preys primarily on fish, but will feed on birds, mammals, turtles, and carrion when fish are unavailable.

In the southeast, the nesting and breeding season runs from September to December. Large nests up to 6 feet (2 m) across and weighing hundreds of pounds are constructed from large sticks, weeds, cornstalks, grasses, and sod. Preferred nesting sites are usually within one-half mile of water, have an open view of the surrounding area, and are in the largest living tree, usually a pine or cypress. Excessive human activity may exclude an otherwise suitable site from use. Wintering areas generally have the same characteristics as nesting sites, but may be farther from shores.

The bald eagle ranges throughout all of North America. Breeding sites in the southeast are concentrated in Florida, coastal South Carolina, and coastal Louisiana, and sporadically located elsewhere.

Bald eagles were first listed as Endangered in 1967 due to population decline caused by DDT and other factors. Since this listing the population of eagles in the lower 48 states has increased from 487 breeding pairs to an estimated 9,789 breeding pairs in 2007. Due to this recovery and additional protection provided by the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA), the eagle was removed from the list of endangered species in 2007.

Biological Conclusion **None Required**

An aerial survey of the Lake Wylie area within the project study area and extending outward one mile was performed by helicopter on December 19, 2006. Areas along the shoreline and adjacent to the shoreline were surveyed for the presence of large nests and areas with historical nest data were surveyed thoroughly in an attempt to relocate the nest. Three unoccupied large nests were observed during this survey outside of the project study area. These nests were ground truthed by Earth Tech biologists using a spotting scope and binoculars on February 8, 2007 to determine the species using the nests during the nesting season for the bald eagle. Two of the nests were found to be occupied by great blue herons. The third nest, located in an electrical transmission tower, did not appear to be sufficiently large for bald eagles and is thought to be an osprey nest.

Two documented eagle nests have occurred at one point on Lake Wylie. One confirmed eagle nest was observed in a location that has been tracked by the NC Wildlife Resources Commission (NCWRC). The NCWRC provided location data for this occurrence (Gaston #1) and has tracked fledgling survival during previous years. The nest was observed in a relatively new subdivision southeast of Belmont and is surrounded by homes at the end of Deas Drive (approximately 1.6 miles north of the project study area). Deas Drive is located off of Amanda Lane in Gaston County. Two adult eagles were observed in the general area and one of these eagles was observed on the nest on February 8, 2007. A memorandum documenting the bald eagle surveys is provided in **Appendix A**.

Earth Tech biologists were not able to locate the second documented nest site which is reported to be approximately 0.5 miles south of the project study area boundary on Worrels River Road.

There are no bald eagle nests within the project study area. The closest observed nest is about 1.6 miles north of the project study area. Therefore, it is likely that eagles forage for fish within the project study area. Because the bald eagle is no longer listed as a threatened or endangered species it is no longer protected under the Endangered Species Act. However, the eagle is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Continued coordination with the USFWS is recommended to insure that provisions within these two Acts are met.

Bog turtle (*Clemmys muhlenbergii*) **Threatened (Similarity of Appearance)**

Vertebrate Family: Emydidae
Federally Listed: 1997

The bog turtle is a small freshwater turtle reaching a maximum carapace length of 11.4 cm (4.5 in). These turtles have a domed carapace that is weakly keeled and is light brown to ebony in color. The scutes have a lighter–colored starburst pattern. The plastron is brownish-black with contrasting yellow or cream areas along the midline. This species is distinguished by a conspicuous orange, yellow, or red blotch on each side of the head.

The bog turtle is semi-aquatic and is typically found in freshwater wetlands characterized by open fields, meadows, or marshes with slow-moving streams, ditches, and boggy areas. The bog turtle is also found in wetlands in agricultural areas subject to light to moderate livestock grazing, which helps to maintain an intermediate stage of succession. During the winter, this species hibernates just below the upper surface of mud. Mating occurs in May and June, and the female deposits two to six eggs in sphagnum moss or sedge tussocks in May, June, or July. The diet of the bog turtle is varied, consisting of beetles, lepidopteran and caddisfly larvae, snails, millipedes, pondweed and sedge seeds, and carrion.

The southern population of the bog turtle is listed as Threatened due to Similarity of Appearance to the northern population, therefore, the southern population is not afforded protection under Section 7 of the Endangered Species Act.

Biological Conclusion **None Required**

Potential habitat exists for this species in the project study area. Numerous emergent and shrub scrub wetlands that may be suitable for the species exist in the project study area. Suitability of these wetlands as bog turtle habitat was determined based on descriptions and/or photographs of the wetlands in the delineation reports provided by field crews. Habitat suitability of the wetlands was not field verified and no site specific searches for the bog turtle have been performed. The following emergent wetlands were identified as potential habitat for bog turtles: 1, 8, 19, 25, 31, 35, 58, 64, 73, 78, 110, 117, 141A, 144, 145, 159, 219, 228/229, 230, 231, and 232. The following shrub scrub wetlands were identified as potential habitat for bog turtles: 11, 29, 46, 111, 120, 137, and 233. A search of the NHP database did not reveal any occurrences of the bog turtle within the project study area. There is an occurrence of the bog turtle approximately 2.5 miles NW of the project study area in Gaston County. Two additional occurrences are approximately 4.3 miles northeast of the project study area.

Carolina heelsplitter (*Lasmigona decorata*) **Endangered**

Invertebrate Family: Unionidae
Date Listed: 6-30-93

The Carolina heelsplitter is a greenish brown to dark brown mussel, often with faint greenish brown to black rays on the younger specimens. The unsculptured shell is ovate and trapezoidal. The largest known specimen measures 4.6 inches (114.8 mm) in length, 1.56 inches (39.0 mm) in width, and 2.7 inches (68.0 mm) in height. The nacre is pearly white to bluish white, grading to orange near the umbo. The entire nacre may be mottled orange in older specimens.

Historic records report the Carolina heelsplitter occurring in small to large streams and rivers as well as ponds, probably mill ponds on small streams. Current records report populations occurring in six small streams and one small river. The substrate where the heelsplitter is found is usually mud, muddy sand, or muddy gravel in streams with stable, well-shaded banks. A South Carolina population was found in a sand, gravel, and cobble substrate.

The historic distribution of the Carolina heelsplitter included the Catawba and Pee Dee River systems in North Carolina (Mecklenburg, and the Pee Dee and Savannah River systems and possibly the Saluda River in South Carolina. Currently, only four populations are known to exist. In Union County, NC, two small populations are known from Waxhaw Creek (Catawba River system) and Goose Creek (Pee Dee River system). In Chesterfield, Lancaster, and Kershaw Counties in South Carolina, a third, slightly larger population is known from the Lynches River (Pee Dee River system) and extends into Flat Creek, a tributary of the Lynches River. A fourth population is known from the Turkey Creek (Savannah River system) and two of its tributaries, Mountain Creek and Beaverdam Creek, in Edgefield County.

The decline of the Carolina heelsplitter is attributed to siltation and habitat alterations caused by agricultural, forestry, and development activities; road and golf course construction; runoff and discharge of municipal, industrial, and agricultural pollutants; impoundments, channelization, dredging, and sand mining; and other factors having an adverse effect on the aquatic environment.

Biological Conclusion **No Effect**

A survey for freshwater mussels took place on September 15, 16, and 21 in 2005 by NCDOT biologists. Biologists looked at 28 streams that could be potentially crossed by the proposed Gaston East-West connector. Thirty sites on these streams were assessed utilizing a standard freshwater mussel screening protocol or an assessment of mussel habitat. Named streams surveyed for freshwater mussels included: Oates Creek, Bessemer Branch, Crowder's Creek, McGill Branch, Mill Creek, Myrtle Creek, Catawba Creek, and Beaverdam Creek. No freshwater mussels were found in any of the surveyed streams. A memorandum documenting the surveys can be found in **Appendix A**.

Because freshwater mussels were not found in any of the surveyed streams, it is concluded that the Carolina Heelsplitter does not occur in the project vicinity. The NCNHP does not list any known population up or downstream in any of the above-mentioned streams, which all flow into the Catawba River. There are no known occurrences in the Catawba River up or downstream of the confluences of these streams. The Gaston East-West connector project will have no effect on the Carolina Heelsplitter (NCDOT, 2005).

Michaux's sumac (*Rhus michauxii*) **Endangered**

Family: *Anacardiaceae*
Federally Listed: 1989

Michaux's sumac or false poison sumac is a densely hairy colonial shrub with erect stems, which are 1 to 3 feet in height. The shrub's compound leaves are narrowly winged at their base, dull on their tops, and veiny and slightly hairy on their bottoms. Each leaf is finely toothed on its edges. Flowers are greenish-yellow to white and are 4 to 5-parted. Each plant is unisexual. With a male plant the flowers and fruits are solitary, with a female plant all flowers are grouped in 3 to 5 stalked clusters. The plant flowers from April to June; its fruit, a dull red drupe, is produced in October and November.

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. Most of the plant's remaining populations are on highway rights-of-way, roadsides, or on the edges of artificially maintained clearings. Other populations are in areas with periodic fires, or on sites undergoing natural succession.

Biological Conclusion **No Effect**

Potential habitat for Michaux's sumac occurs throughout the project study area. Surveys of suitable habitat were performed in 2005. No populations of Michaux's sumac were found during these surveys. The NCNHP record for Michaux's sumac is historic and nearly all of the area has been developed, farmed, and otherwise negatively impacted for suitable habitat. NCNHP records did not document the location of any known populations of the sumac within one mile of the project study area. Based on the results of this survey, the project will not impact any Michaux's sumac populations within the area surveyed. This project will have no effect on any populations of Michaux's sumac (PBS & J, 2006). The survey for this species is good for two years. The report documenting the 2005 survey can be found in **Appendix A**.

Schweinitz's sunflower (*Helianthus schweinitzii*) **Endangered**

Plant Family: Asteraceae
Date Listed: 5-7-91

Schweinitz's sunflower is a rhizomatous perennial herb that grows from 3 to 6 ft (1 to 2 m) tall from a cluster of carrot-like tuberous roots. Stems are usually solitary, branching only at or above mid-stem. The stem is usually pubescent but can be nearly glabrous; it is often purple. The lanceolate leaves are opposite on the lower stem, changing to alternate above. They are variable in size, being generally larger on the lower stem, and gradually reduced upwards. The pubescence of the underside of the leaves is distinctive and is one of the best characters to distinguish Schweinitz's sunflower from its relatives. The upper surface of the leaves is rough, with the broad-based spinose hairs directed toward the tip of the leaf. From September to frost, Schweinitz's sunflower blooms with comparatively small heads of yellow flowers.

The species occurs in clearings and edges of upland woods on moist to dryish clays, clay-loams, or sandy clay-loams that often have high gravel content and are moderately podzolized.

Schweinitz's sunflower usually grows in open habitats not typical of the current general landscape in the piedmont of the Carolinas. Some of the associated species, many of which are also rare, have affinities to glade and prairie habitats of the Midwest. Other species are associated with fire-maintained sandhills and savannas of the Atlantic Coastal Plain and piedmont. The habitat of this sunflower tends to be dominated by members of the aster, pea, and grass families, an association emphasizing affinities of the habitat to both longleaf pine-dominated sandhills and savannas of the southeastern coastal plain and to glades, barrens, and prairies of the Midwest and Plains (USFWS, 1994).

Biological Conclusion **May Affect/ Not Likely to Adversely Affect**

The powerlines, roadsides and open areas within the project study area are high probability areas for potentially suitable Schweinitz's sunflower habitat. These high probability areas were surveyed for the presence/absence of Schweinitz's sunflower in 2005. One population of *Helianthus schweinitzii* was observed within the project study area. This population is located on the northern edge of the northernmost Detailed Study Corridor, south of Catawba Creek along the western side of SR 2435 (Union-New Hope Road) (**Figure 5**). Due to its location in the Detailed Study Corridors, it may be possible to avoid all impacts to the observed Schweinitz's sunflower population (PBS & J, 2006). NCNHP records indicate that there is one known Schweinitz’s sunflower population about 4,900 feet south of the project study area. This population is located on SR 2650 approximately 3,650 feet northeast of the intersection of SR 2650 and SR 2431. The survey for this species is good for two years. The report documenting the 2005 survey can be found in **Appendix A**.

Smooth coneflower (*Echinacea laevigata*) **Endangered**
Family: Asteraceae
Date First Listed: October 1992

The smooth coneflower is a rhizomatous perennial herb that grows up to 4.9 feet (1.5 m) tall. The largest leaves are the basal leaves, which reach 7.8 inches (20 cm) in length and 3 inches (7.5 cm) in width. The basal leaves have long stems, are elliptical to broadly lanceolate, tapering to the base, and smooth to slightly rough. The plant has smooth stems with few cauline leaves. The rays of the flowers (petal-like structures) are light pink to purplish, usually drooping, and 1.9 to 3.1 inches (5 to 8 cm) long. Flower heads are usually solitary. Flowering occurs from May through July.

The known range of the smooth coneflower consists of 22 populations found now only in Virginia, North Carolina, South Carolina, and Georgia. Six of the populations are in North Carolina and are found in Durham and Granville counties. Most of the populations are small, containing less than 100 plants each. Four of the populations contain less than 10 plants each.

In North Carolina the habitat of smooth coneflower is open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium- and calcium-rich soils associated with gabbro and diabase. Optimal sites are characterized by full sunlight and little competition in the herbaceous layer (Gaddy 1991). Natural fires, as well as large herbivores, are part of the history of the vegetation in this species' range and many of the associated herbs are also sun-loving species, which depend on periodic disturbances to reduce the shade and competition of woody plants (Kral 1983 and Gaddy 1991).

The major factors contributing to endangered status of this species are collecting, residential and industrial development, shade from woody vegetation, highway construction and improvement, and certain types of roadside and power line right-of-way maintenance. Like most coneflowers, this species is intolerant of dense shade.

Biological Conclusion **No Effect**

Habitat for the smooth coneflower is present in the project study area. Suitable habitat for smooth coneflower within the project study area was surveyed in 2005, but no populations of smooth coneflower were found. NCNHP records did not document the location of any known populations of the smooth coneflower within one mile of the project study area. Based on the results of this survey, the project will not impact the smooth coneflower within the area surveyed. This project will have no effect on any smooth coneflower populations (PBS & J, 2006). The survey for this species is good for two years. The report documenting the 2005 survey can be found in **Appendix A**.

4.3.2 Federal Species of Concern, Candidate and State Status

Federal Species of Concern (FSC) and Candidate (C) species are not legally protected under the Endangered Species Act and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as Threatened or Endangered. **Table 9** includes Candidate and FSC species listed for Gaston and Mecklenburg Counties and their state classifications. Organisms that are listed as State Endangered (E), Threatened (T), or Special Concern (SC) on the North Carolina Natural Heritage Program List of Rare Plant and Animal Species are afforded state protection under the State Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979. However, the level of protection given to state-listed species does not apply to NCDOT activities.

Table 9. Candidate and Federal Species of Concern in Gaston and Mecklenburg Counties

Common Name	Scientific Name	Habitat Present	NC Rank	Federal Rank	Counties of Occurrence
Vertebrate					
American eel	*Anguilla rostrata*	Yes	W1	FSC	Mecklenburg
Carolina darter	*Etheostoma collis collis*	Yes	SC	FSC	Mecklenburg
Invertebrate					
Carolina creekshell	*Villosa vaughaniana*	Yes	E	FSC	Mecklenburg
Vascular Plant					
Georgia aster	*Symphotrichum georgianum*	Yes	T	C	Gaston, Mecklenburg
Dwarf aster	*Eurybia mirabilis*	Yes	SR-T	FSC	Mecklenburg
Prairie birdsfoot-trefoil	*Lotus unifoliatus var. helleri*	Yes	SR-T	FSC	Mecklenburg
Shoals spiderlily	*Hymenocallis coronaria*		Not listed	FSC	Gaston, Mecklenburg
Tall larkspur	*Delphinium exaltatum*	Yes	E-SC	FSC	Mecklenburg
Notes	C FSC E T	Candidate Federal Species of Concern Endangered Threatened			

Common Name		Scientific Name	Habitat Present	NC Rank	Federal Rank	Counties of Occurrence
	SC	Special Concern				
	SR	Significantly Rare				
		Sources: Franklin and Finnegan, ed., 2006; LeGrand, McRae, Hall, and Finnegan, 2006				
		NHP – list updated 1/06, USFWS – list updated 4/27/06				

No FSC species were observed during the site visit. One Candidate species, Georgia aster, was observed in the project study area. This population contained many asters in peak bloom and is located south of I-85 in a powerline right-of-way approximately 2,000 feet WNW from the intersection of Shannon Bradley Road and Crescent Lane in Gaston County.

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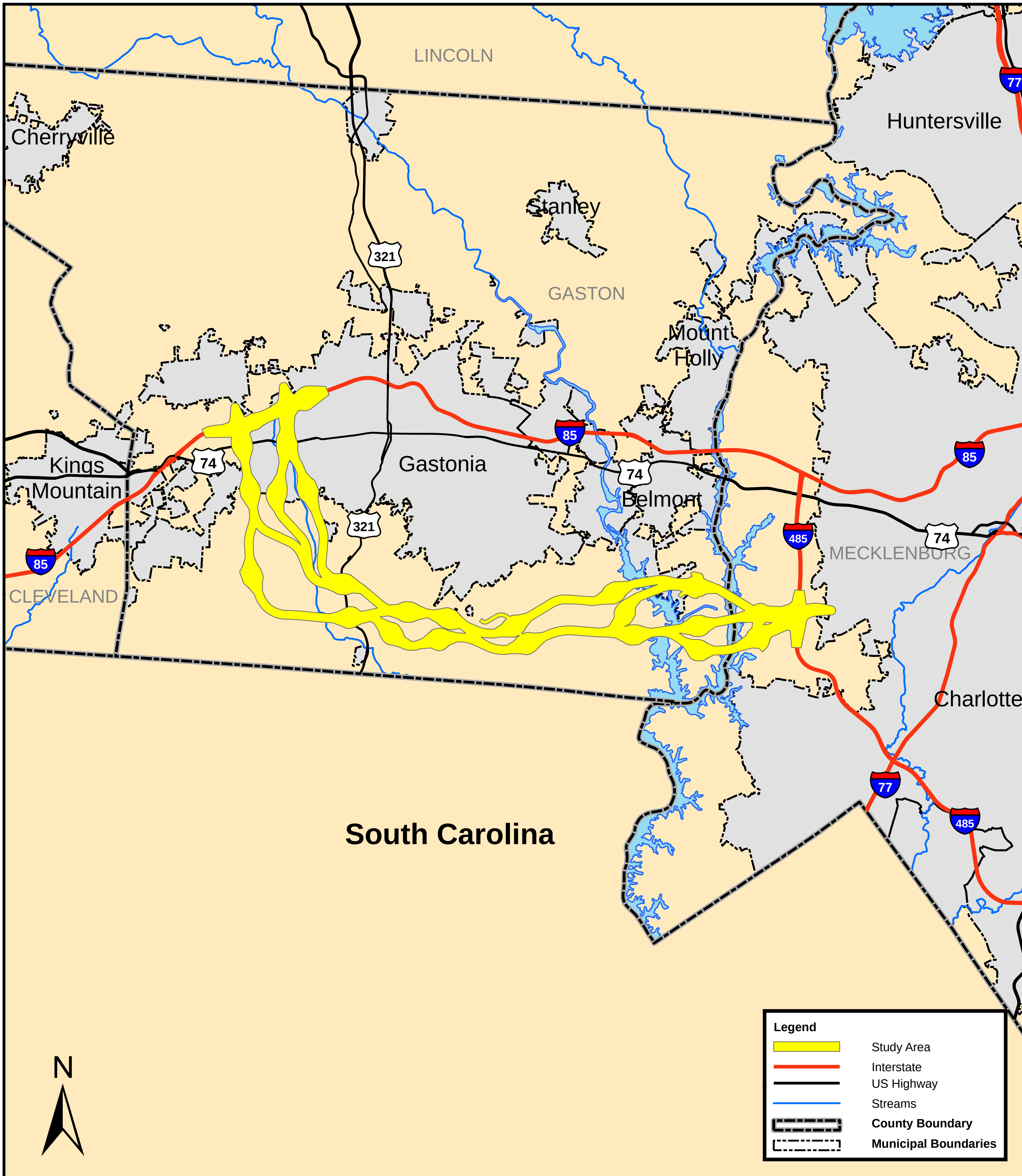
FIGURES



NORTH CAROLINA Turnpike Authority

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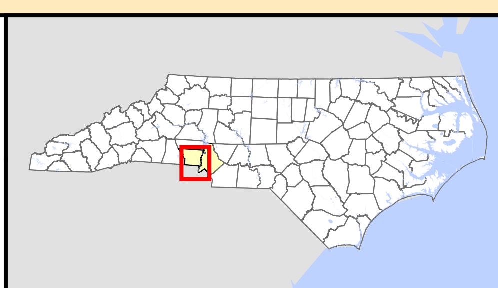

Project Location

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

Sept. 2007

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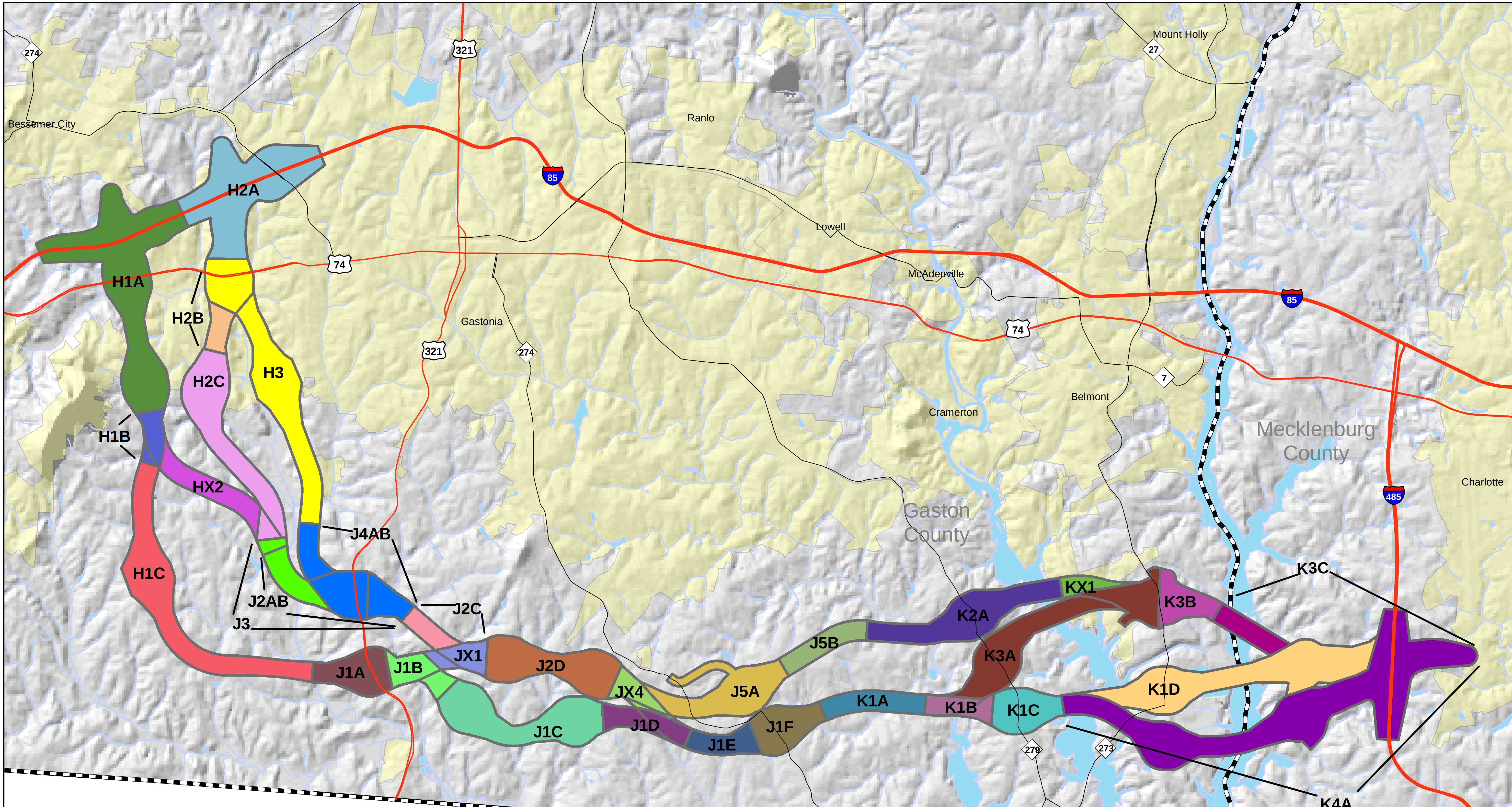
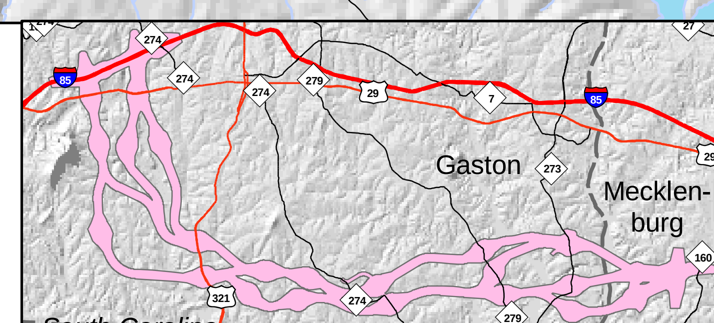
Figure 1



North Carolina Turnpike Authority

Legend

Interstate		Streams	
NC Route		Water Body	
US Route		Municipal Boundary	
County Boundary			



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Project Segments

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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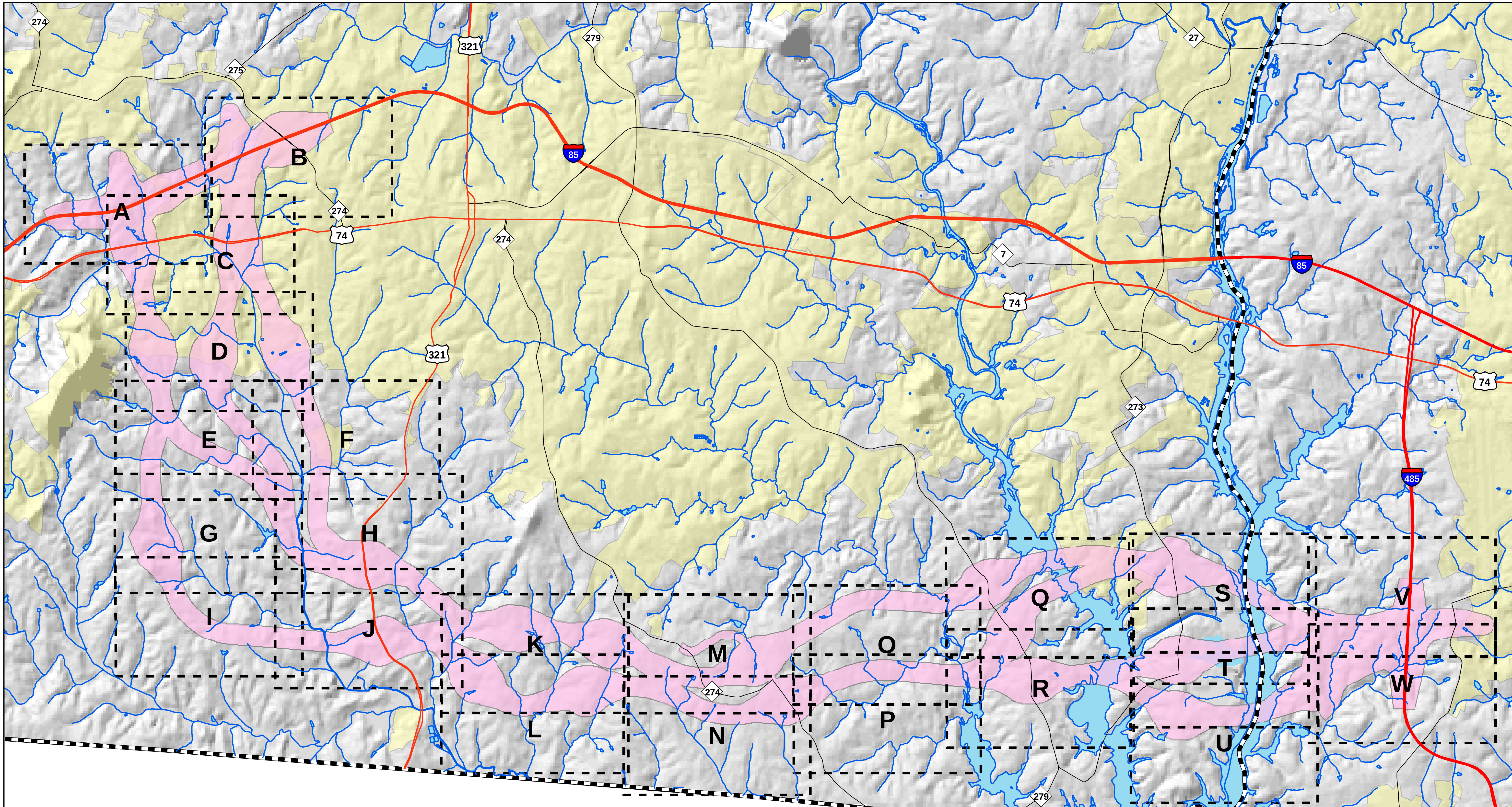
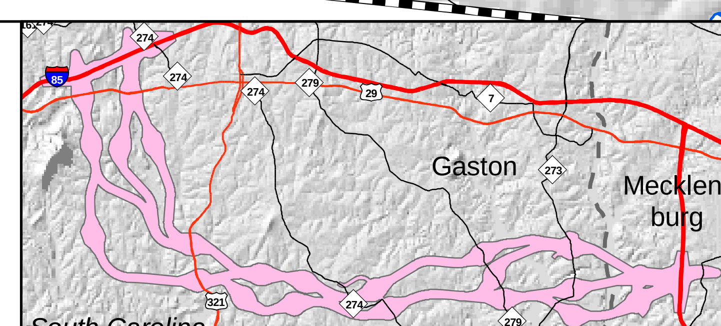
Figure 2



NORTH CAROLINA
Turnpike Authority

Legend

- Interstate
- NC Route
- US Route
- Streams
- County Boundary
- Study Area
- Water Body
- Municipal Boundary
- Map Sheet



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Key to Map Sheets
Figures 3 and 4

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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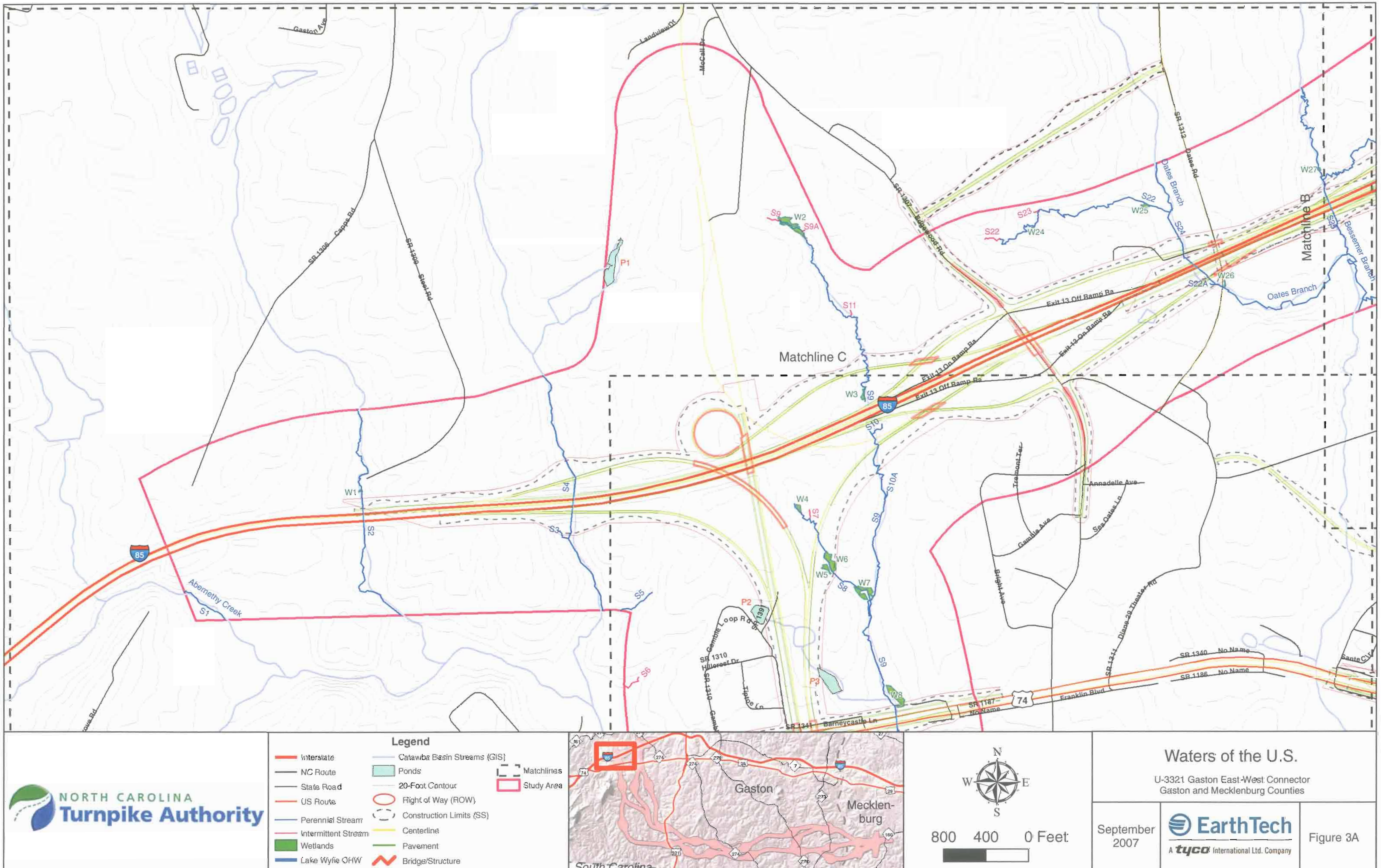
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Matchline B
Gaston Ave
Landview Dr
McCall Dr
SR 1306 Capps Rd
SR 1309 Steel Rd
SR 1307
SR 1312 Oates Rd
Oates Branch
Bessemer Branch
Abernethy Creek
Exit 13 Off Ramp Ra
Exit 13 On Ramp Ra
Annadelle Ave
Tremont Ter
Gamble Ave
Sea Oates Ln
Bright Ave
Diane 29 Theater Rd
SR 1311
SR 1340 No Name
SR 1186 No Name
SR 1187 No Name
Franklin Blvd
SR 1341 Barneycastle Ln
Gamble Loop Rd
SR 1310 Hillcrest Dr
Tipton Ln
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74
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P3
S1
S2
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S4
S5
S6
S7
S8
S9
S9A
S10
S10A
S11
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S23
S24
S25
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W2
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W24
W25
W26
W27
Legend
Interstate
NC Route
State Road
US Route
Perennial Stream
Intermittent Stream
Wetlands
Lake Wylie OHW
Catawba Basin Streams (GIS)
Ponds
20-Foot Contour
Right of Way (ROW)
Construction Limits (SS)
Centerline
Pavement
Bridge/Structure
Matchlines
Study Area
Gaston
Mecklen-burg
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NORTH CAROLINA
Turnpike Authority
Waters of the U.S.
U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties
September 2007
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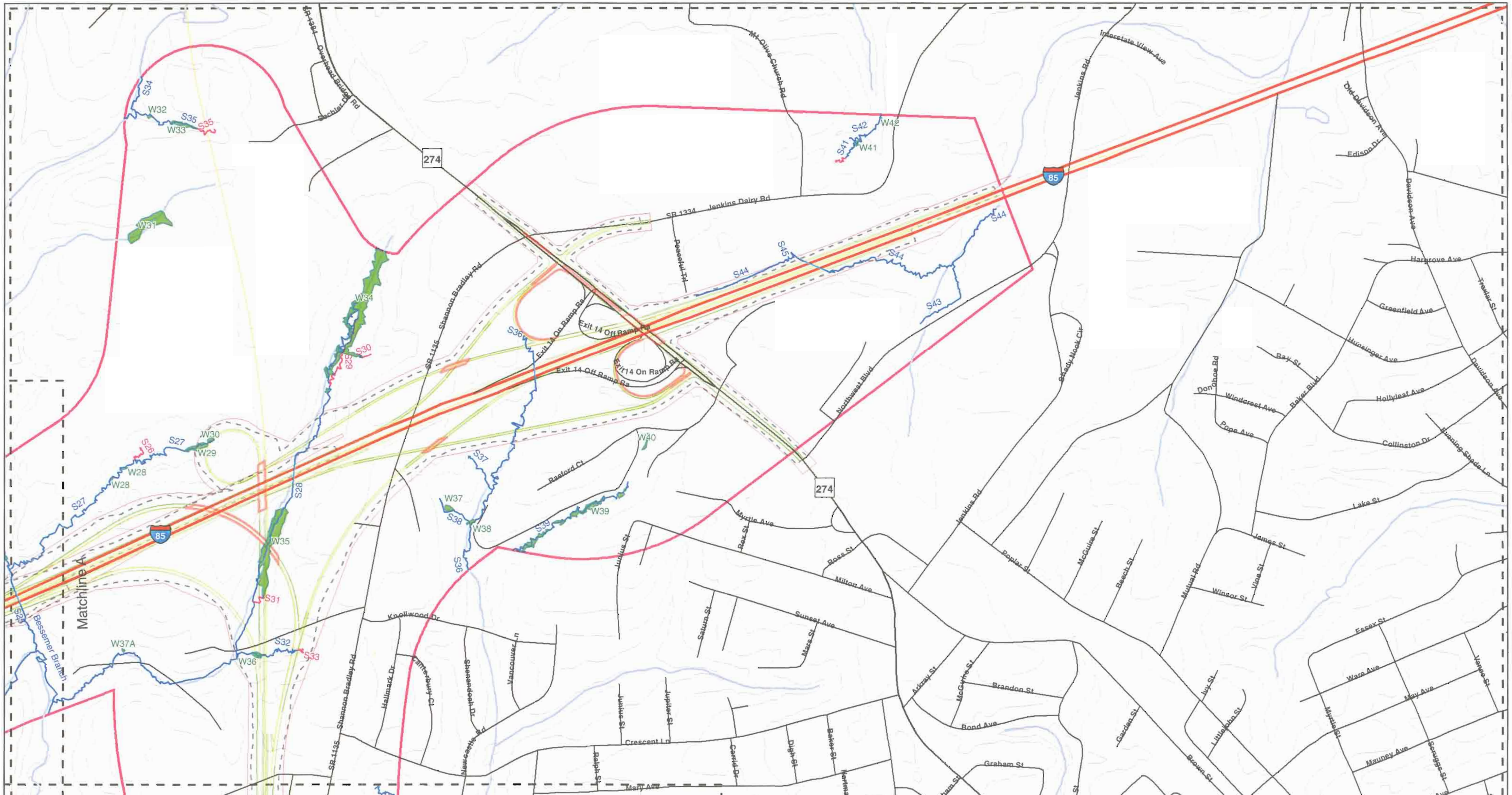
Figure 3A



Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

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NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3B

Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

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NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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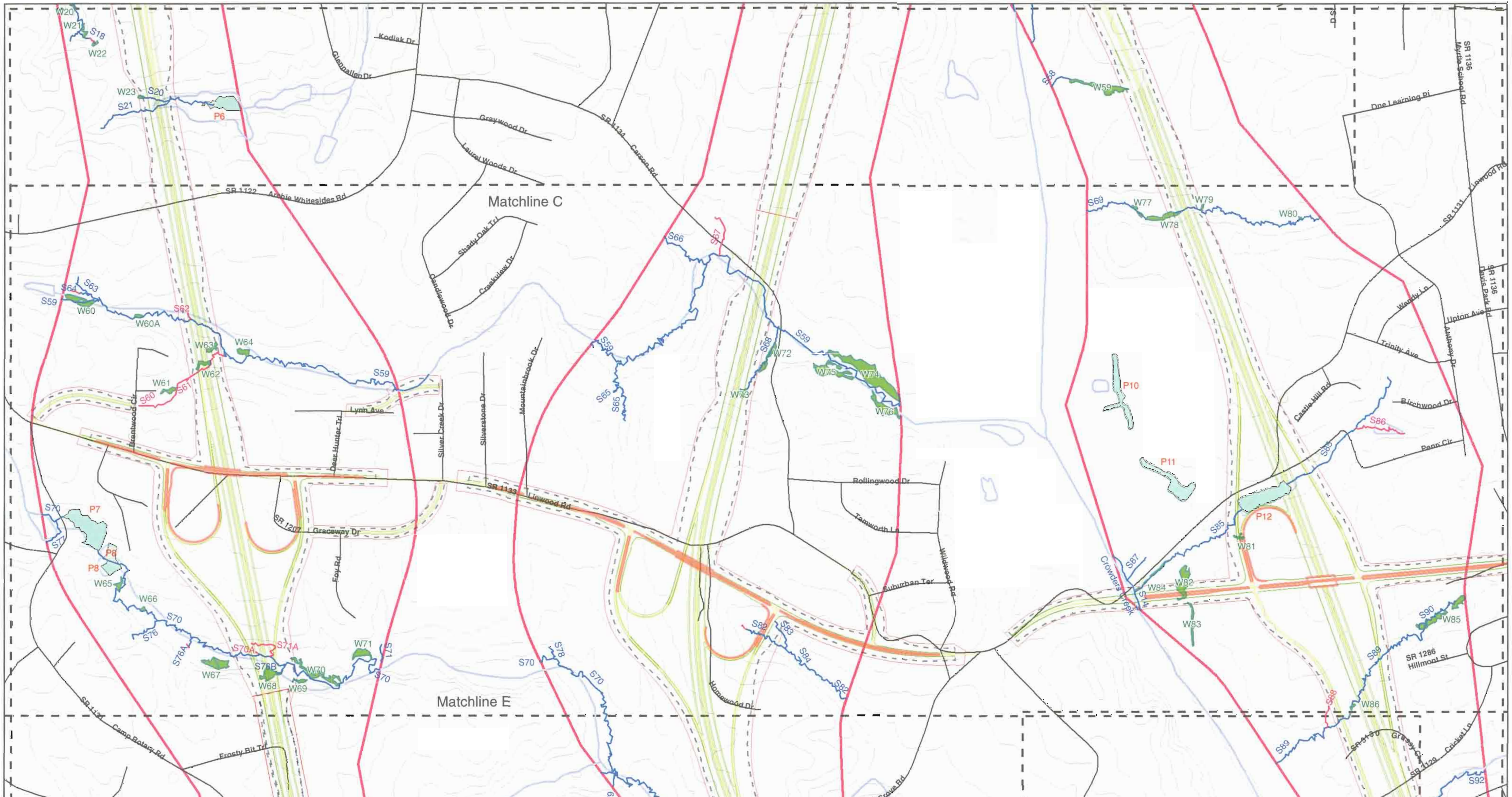
Figure 3C



NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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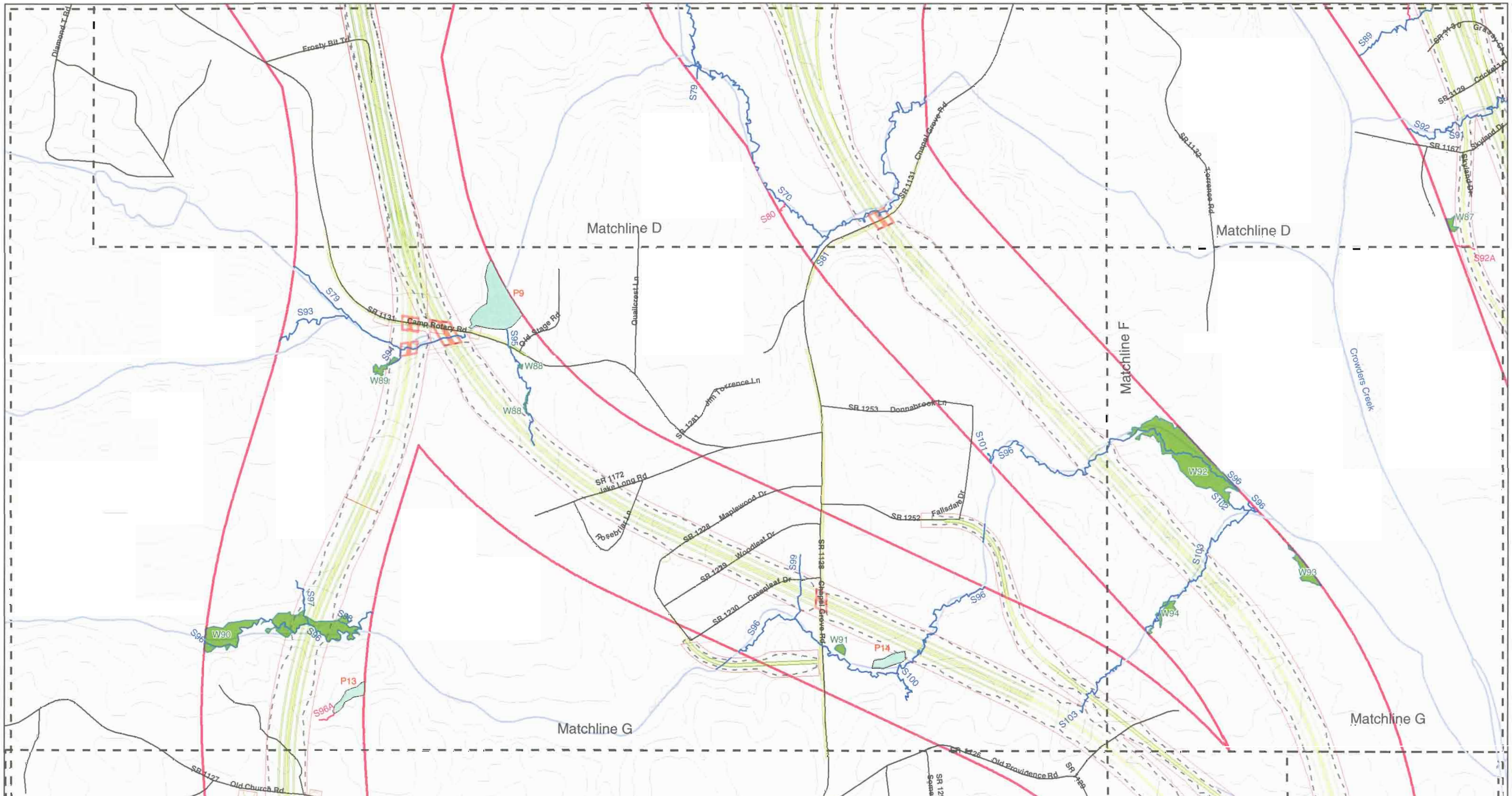
Figure 3D



NORTH CAROLINA
Turnpike Authority

Legend

Interstate	Catawba Basin Streams (GIS)	Matchlines
NC Route	Ponds	Study Area
State Road	20-Foot Contour	
US Route	Right of Way (ROW)	
Perennial Stream	Construction Limits (SS)	
Intermittent Stream	Centerline	
Wetlands	Pavement	
Lake Wylie OHW	Bridge/Structure	

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Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3E

Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

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NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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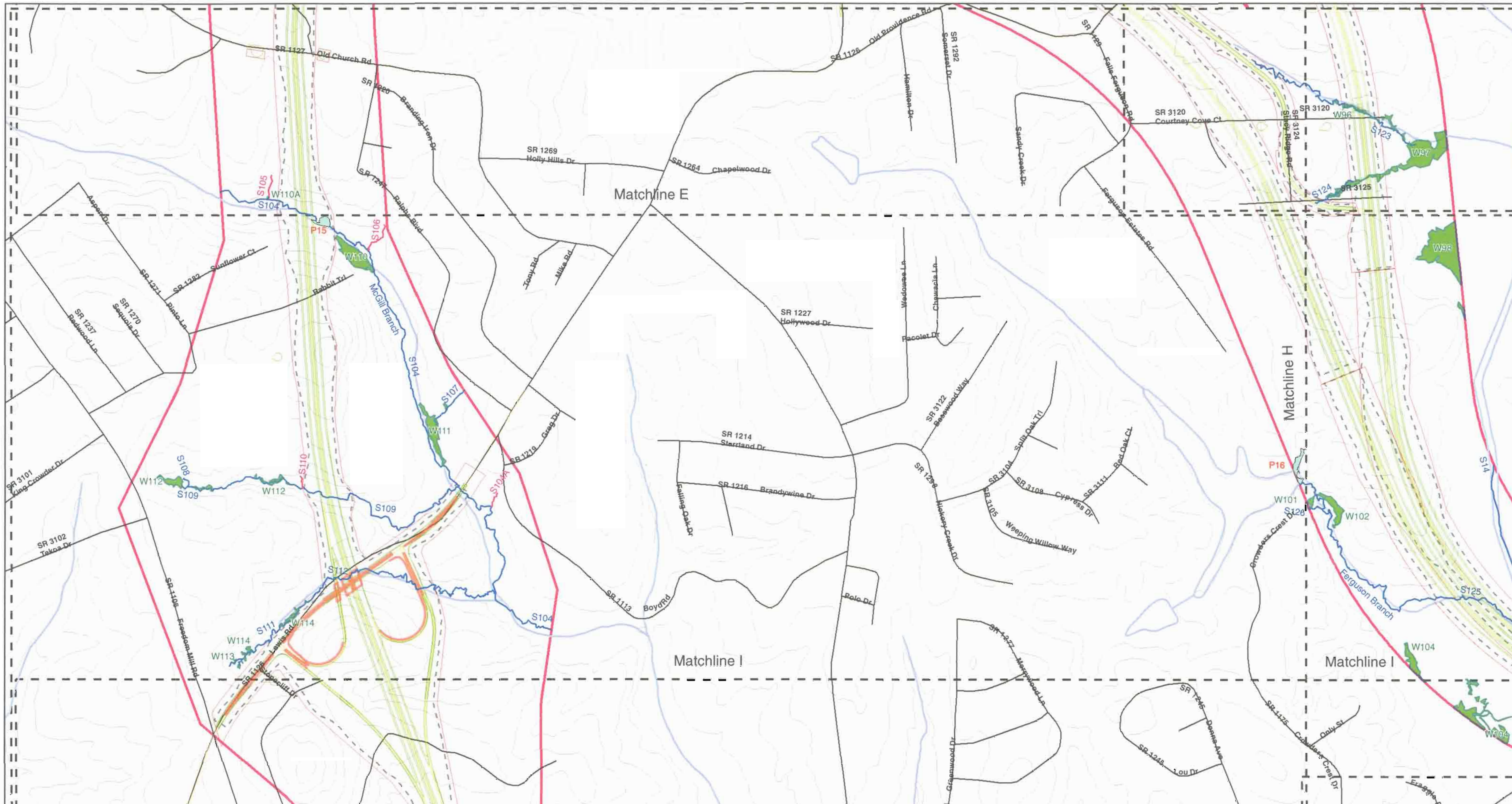
Figure 3F



Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

NORTH CAROLINA
Turnpike Authority

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Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3G

Legend

Interstate	Catawba Basin Streams (GIS)
NC Route	Ponds
State Road	20-Foot Contour
US Route	Right of Way (ROW)
Perennial Stream	Construction Limits (SS)
Intermittent Stream	Centerline
Wetlands	Pavement
Lake Wylie OHW	Bridge/Structure
Matchlines	Study Area

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NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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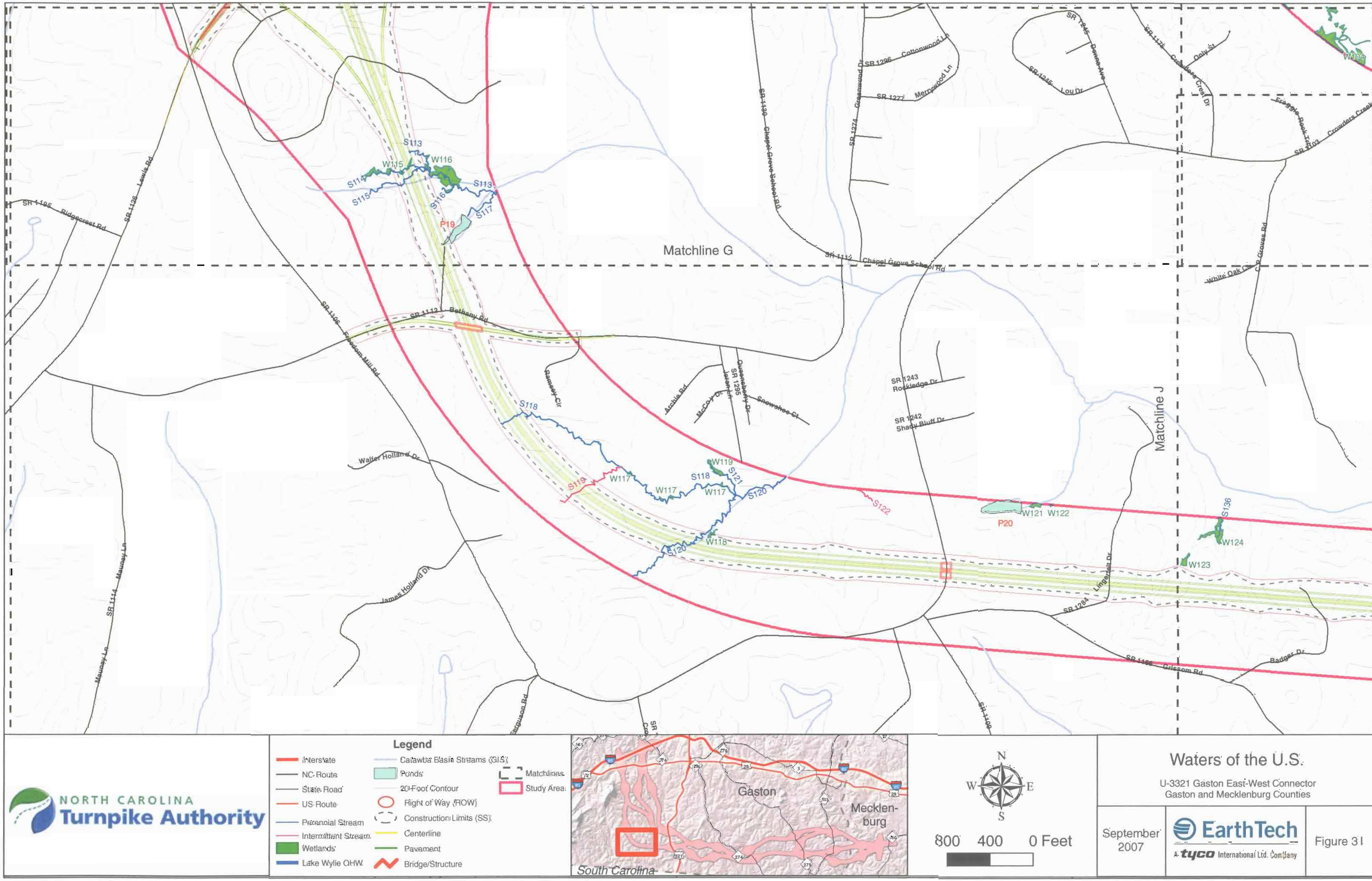
Figure 3H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Matchline J
SR 1195 Ridgecrest Rd
SR 1126 Lewis Rd
SR 1112 Bethany Rd
SR 1106 Freedom Mill Rd
Ramsey Cir
Archie Rd
McCoy Dr
SR 1295 Jason Ln
Queensberry Dr
Snowshoe Ct
SR 1243 Rockledge Dr
SR 1242 Shady Bluff Dr
Walter Holland Dr
James Holland Dr
SR 1114 Mauney Ln
Mauney Ln
Ferguson Rd
SR 1109
SR 1284
Lingerfelt Dr
SR 1108 Grissom Rd
Badger Dr
SR 1130 Chapel Grove School Rd
SR 1117 Chapel Grove School Rd
SR 1274 Greenwood Dr
SR 1296 Cottonwood Ln
SR 1277 Merrywood Ln
SR 1245 Lou Dr
SR 1245 Donna Ave
SR 1175 Crowders Crest Dr
Dolly St
White Oak Cir
SR 1103 Crowders Creek Rd
Fraggle Rock Trl
Chapel Grove Rd
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Legend
Interstate
NC Route
State Road
US Route
Perennial Stream
Intermittent Stream
Wetlands
Lake Wylie OHW
Catawba Basin Streams (GIS)
Ponds
20-Foot Contour
Right of Way (ROW)
Construction Limits (SS)
Centerline
Pavement
Bridge/Structure
Matchlines
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South Carolina
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NORTH CAROLINA
Turnpike Authority
Waters of the U.S.
U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties
September 2007
EarthTech
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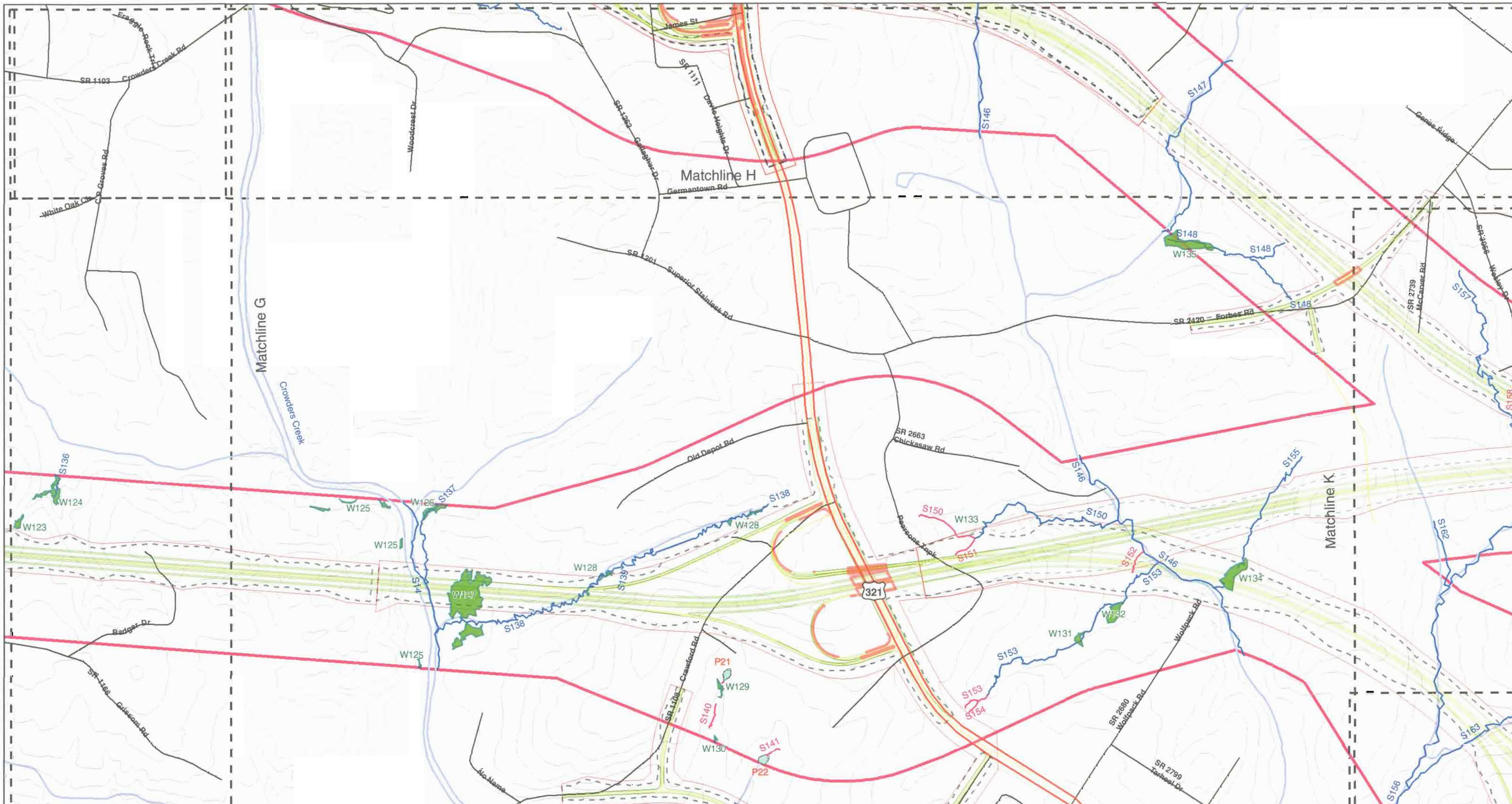
Figure 31



NORTH CAROLINA Turnpike Authority

Legend

- Interstate
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- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

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Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3J

Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

Gaston
Mecklen-burg
South Carolina

N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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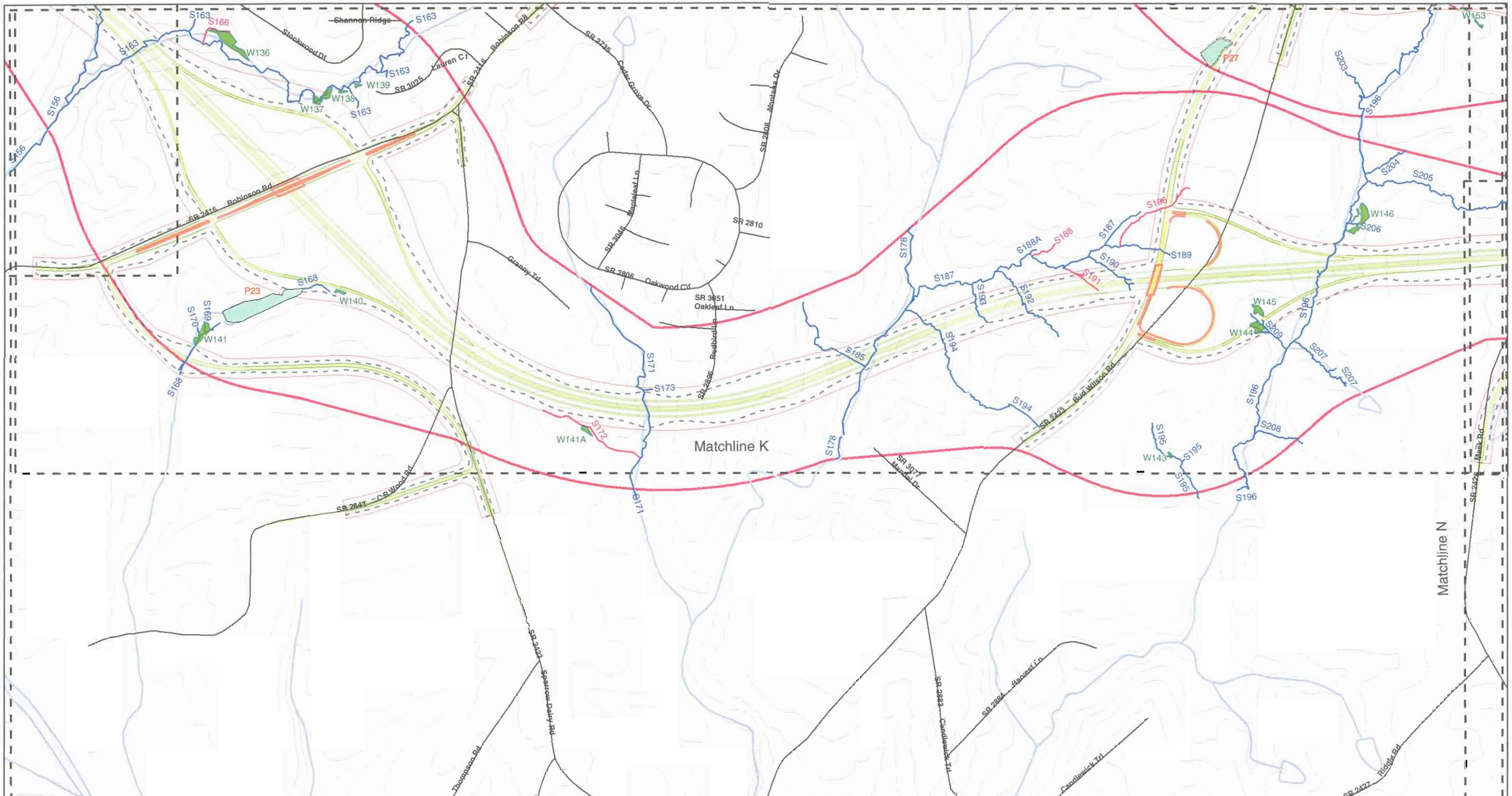
Figure 3K



Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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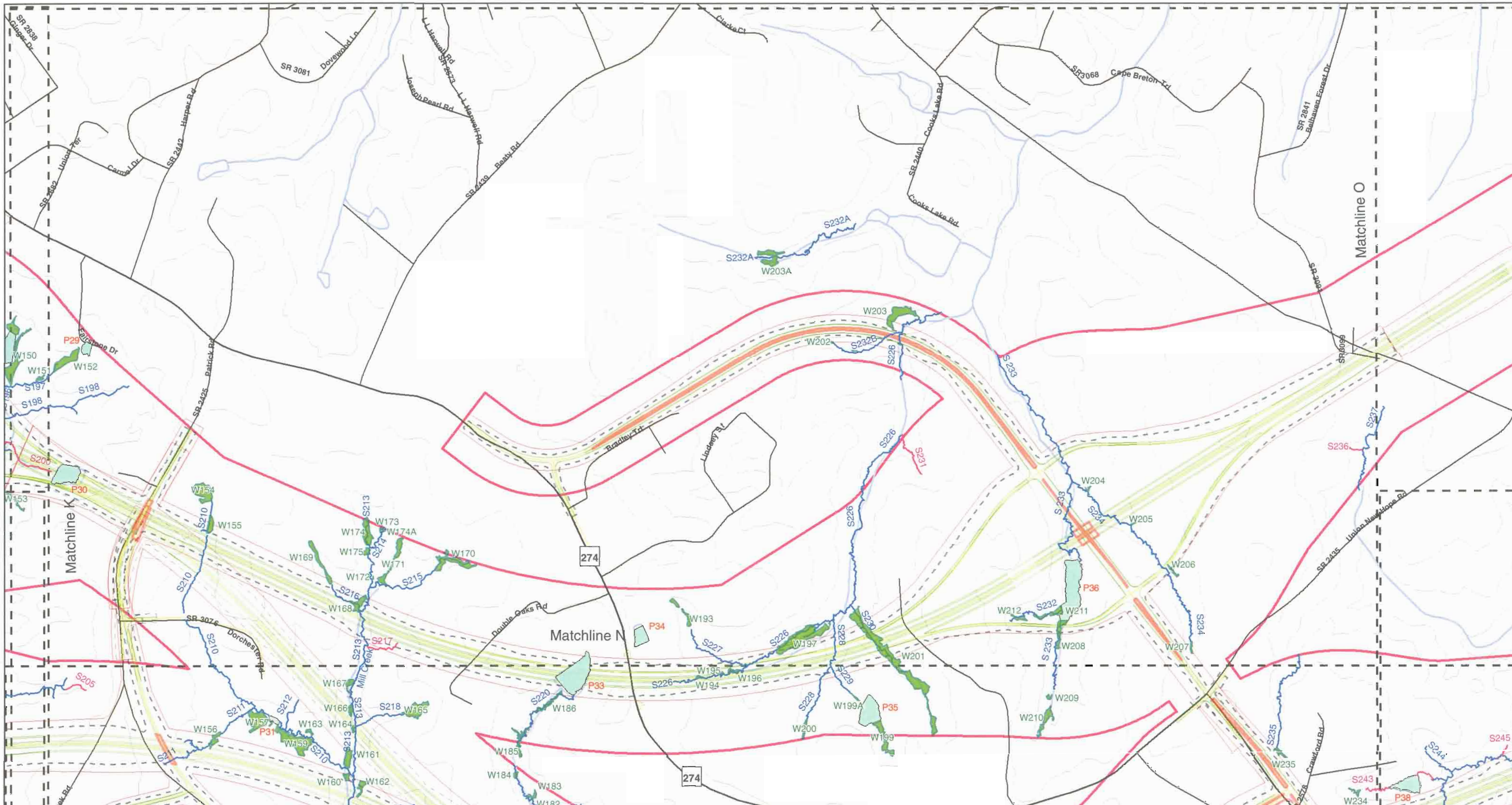
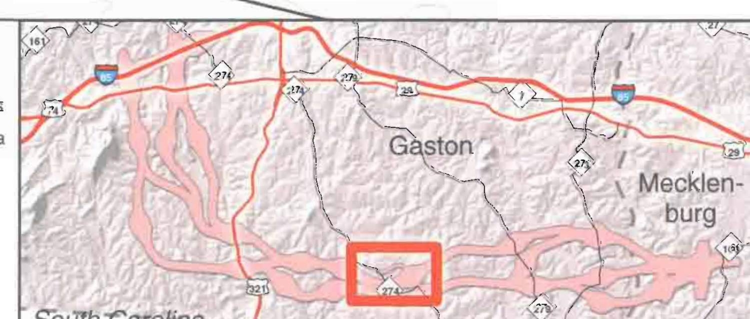
Figure 3L



Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area



N
W E
S

800 400 0 Feet

NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3M

Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

N
W E
S

800 400 0 Feet

NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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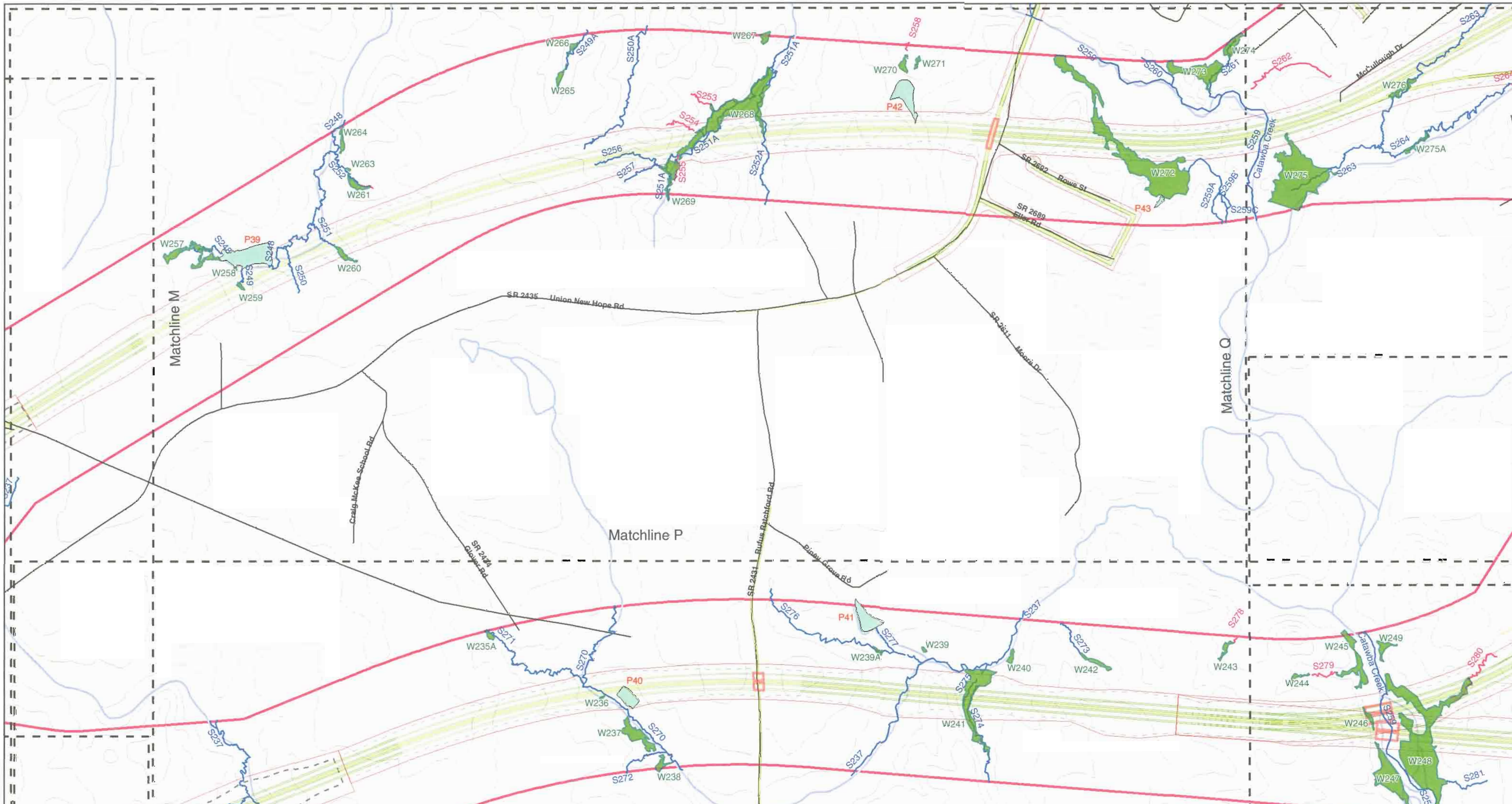
Figure 3N



Legend

Interstate	Catawba Basin Streams (GIS)	Matchlines
NC Route	Ponds	Study Area
State Road	20-Foot Contour	
US Route	Right of Way (ROW)	
Perennial Stream	Construction Limits (SS)	
Intermittent Stream	Centerline	
Wetlands	Pavement	
Lake Wylie OHW	Bridge/Structure	

NORTH CAROLINA
Turnpike Authority

N W E S

800 400 0 Feet

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 30

Legend

Interstate	Catawba Basin Streams (GIS)	Matchlines
NC Route	Ponds	Study Area
State Road	20-Foot Contour	
US Route	Right of Way (ROW)	
Perennial Stream	Construction Limits (SS)	
Intermittent Stream	Centerline	
Wetlands	Pavement	
Lake Wylie OHW	Bridge/Structure	

N
W E
S

800 400 0 Feet

NORTH CAROLINA
Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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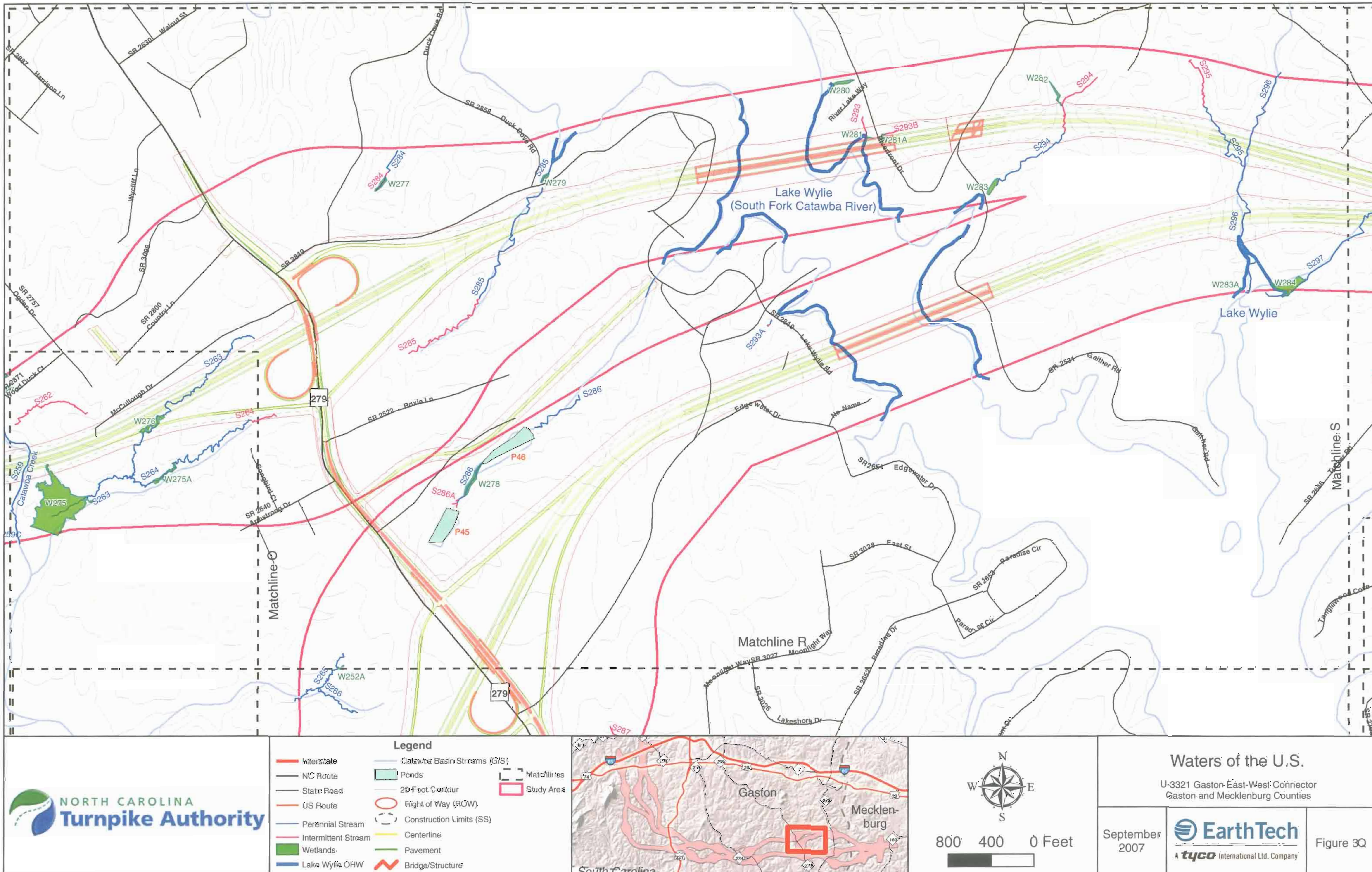
Figure 3P



NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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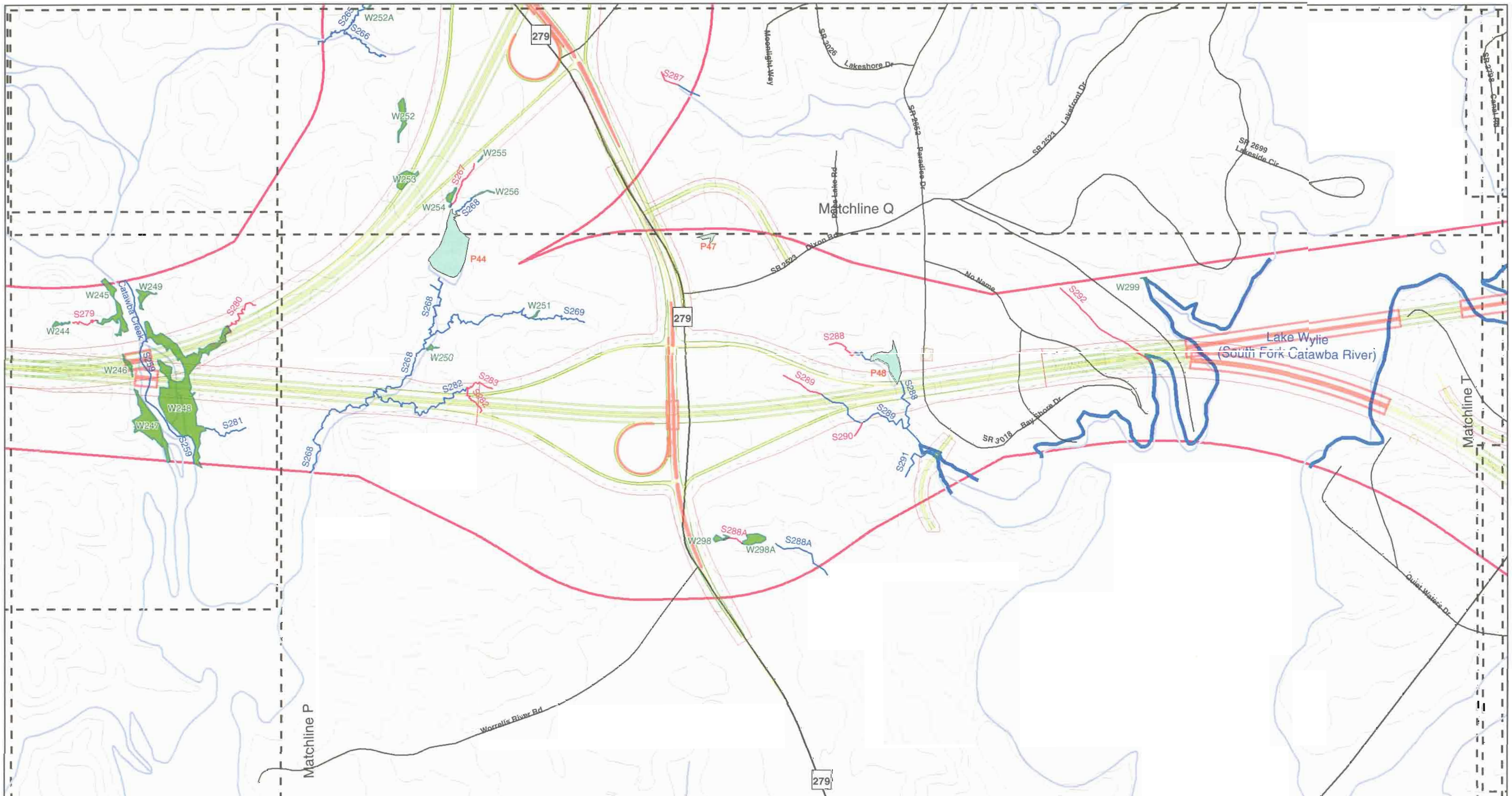
Figure 3Q



Legend

- Interstate
- NC Route
- State Road
- US Route
- Perennial Stream
- Intermittent Stream
- Wetlands
- Lake Wylie OHW
- Catawba Basin Streams (GIS)
- Ponds
- 20-Foot Contour
- Right of Way (ROW)
- Construction Limits (SS)
- Centerline
- Pavement
- Bridge/Structure
- Matchlines
- Study Area

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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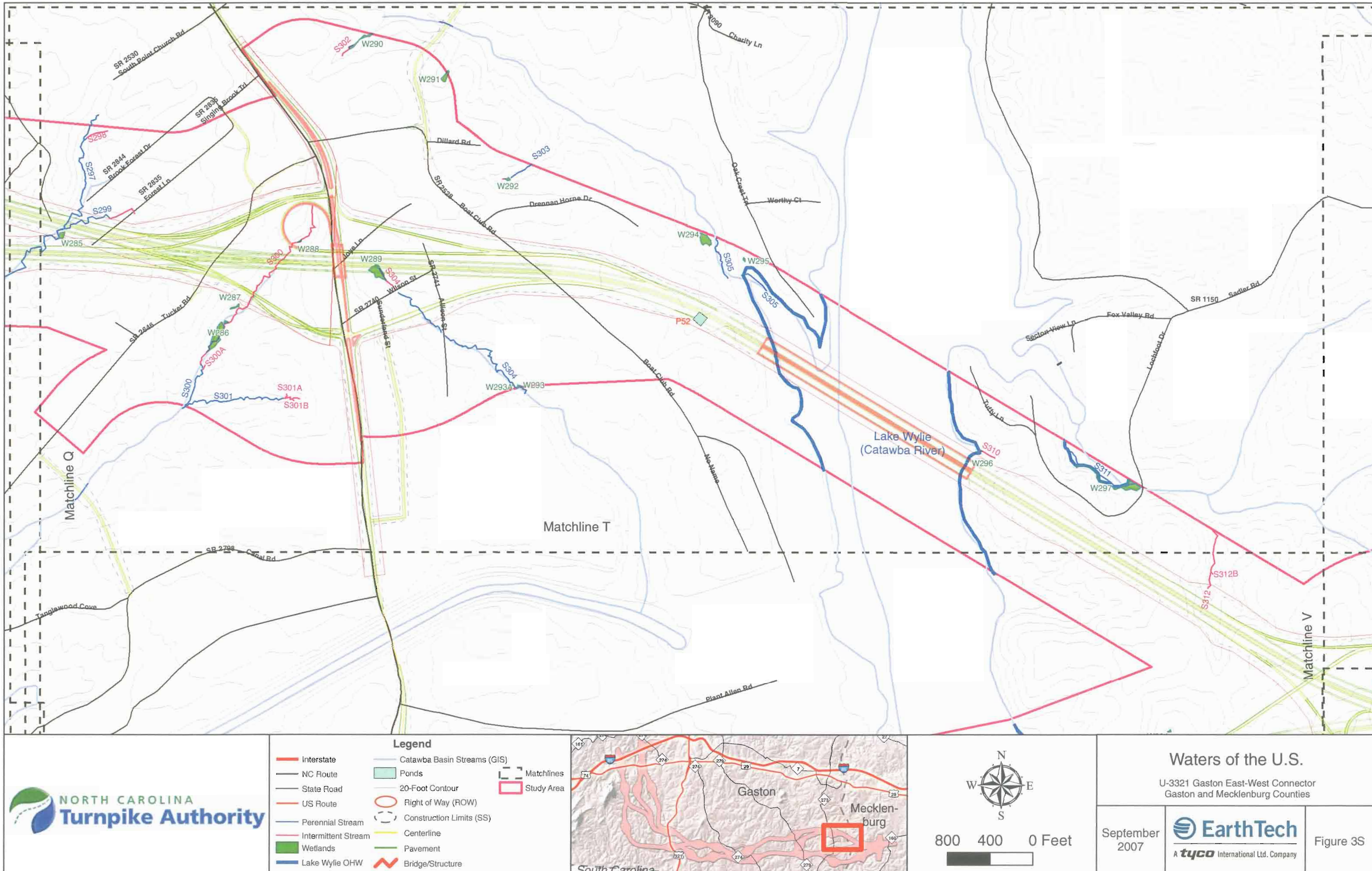
Figure 3R



NORTH CAROLINA **Turnpike Authority**

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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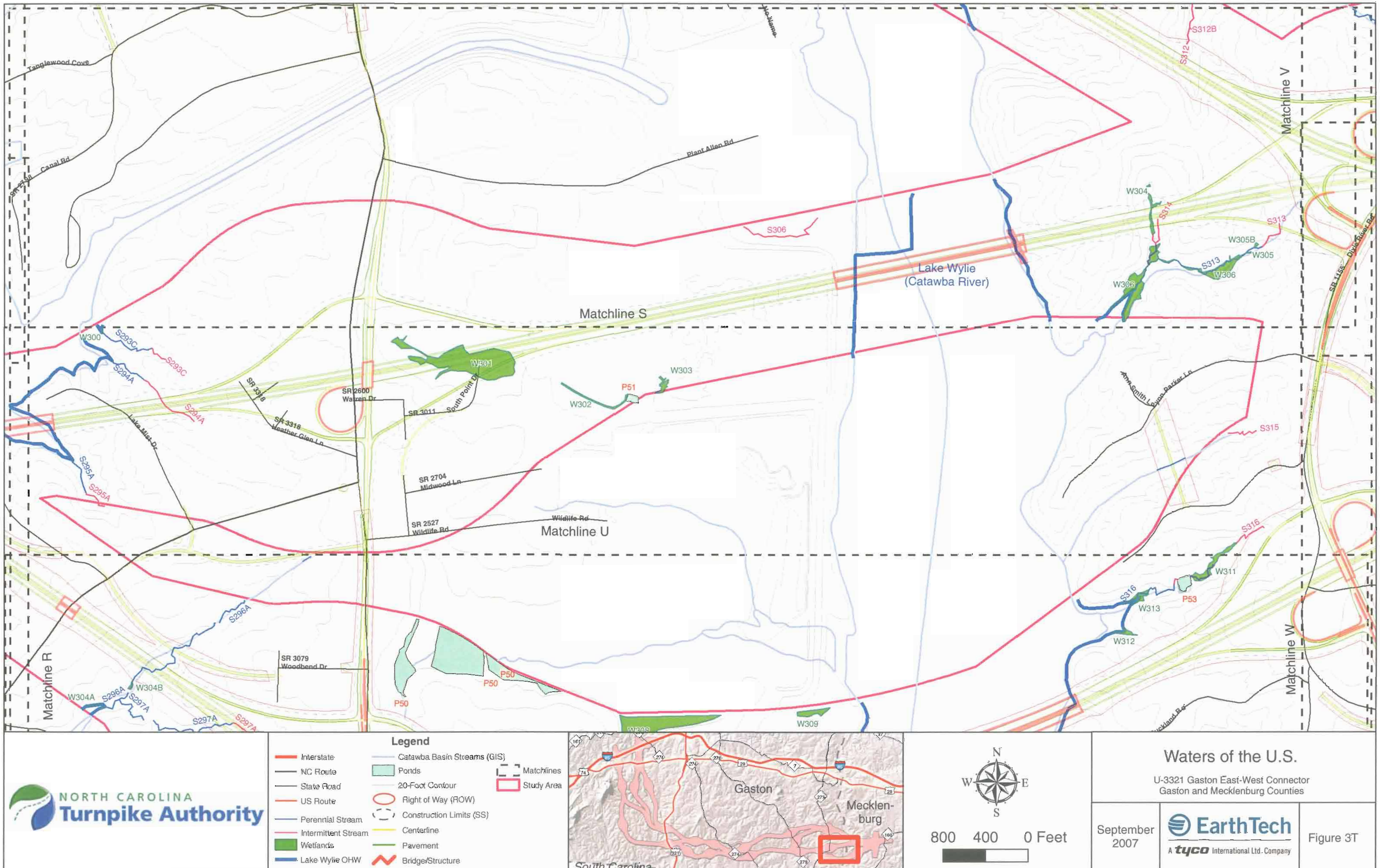
Figure 3S

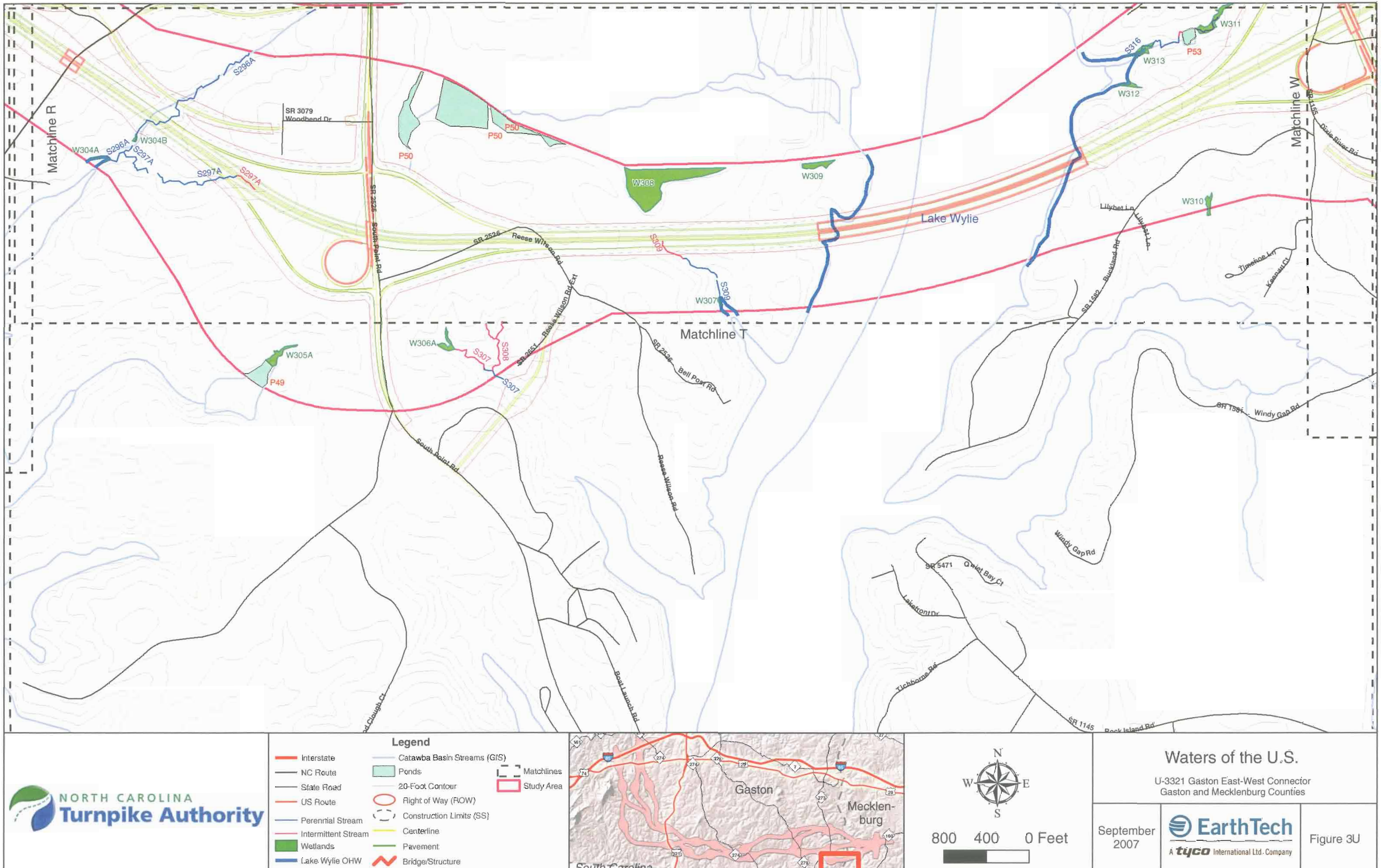


Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

Figure 3T



NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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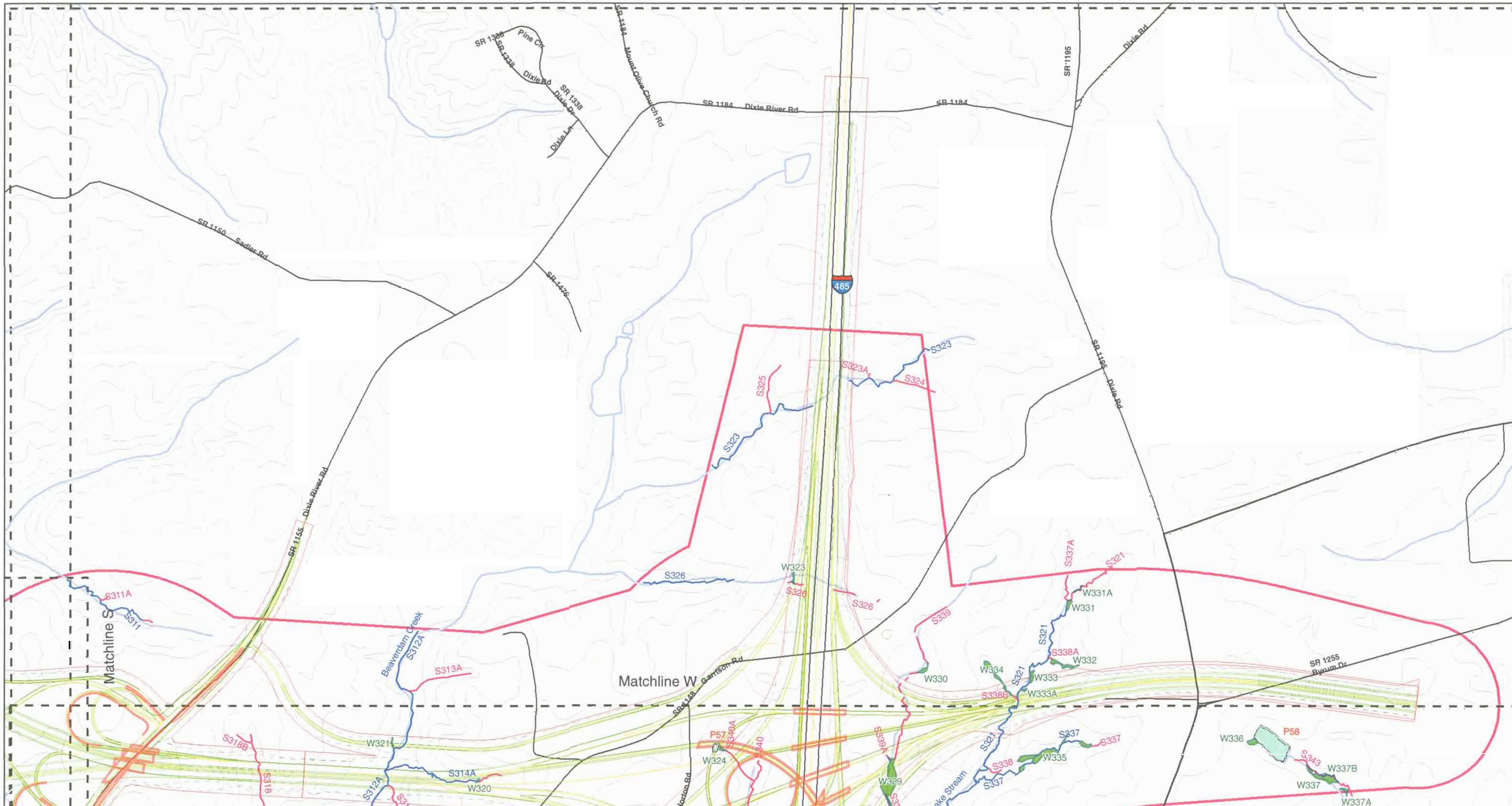
Figure 3U



Legend

Interstate	Catawba Basin Streams (GIS)
NC Route	Ponds
State Road	20-Foot Contour
US Route	Right of Way (ROW)
Perennial Stream	Construction Limits (SS)
Intermittent Stream	Centerline
Wetlands	Pavement
Lake Wylie OHW	Bridge/Structure
Matchlines	Study Area

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Waters of the U.S.

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 3V

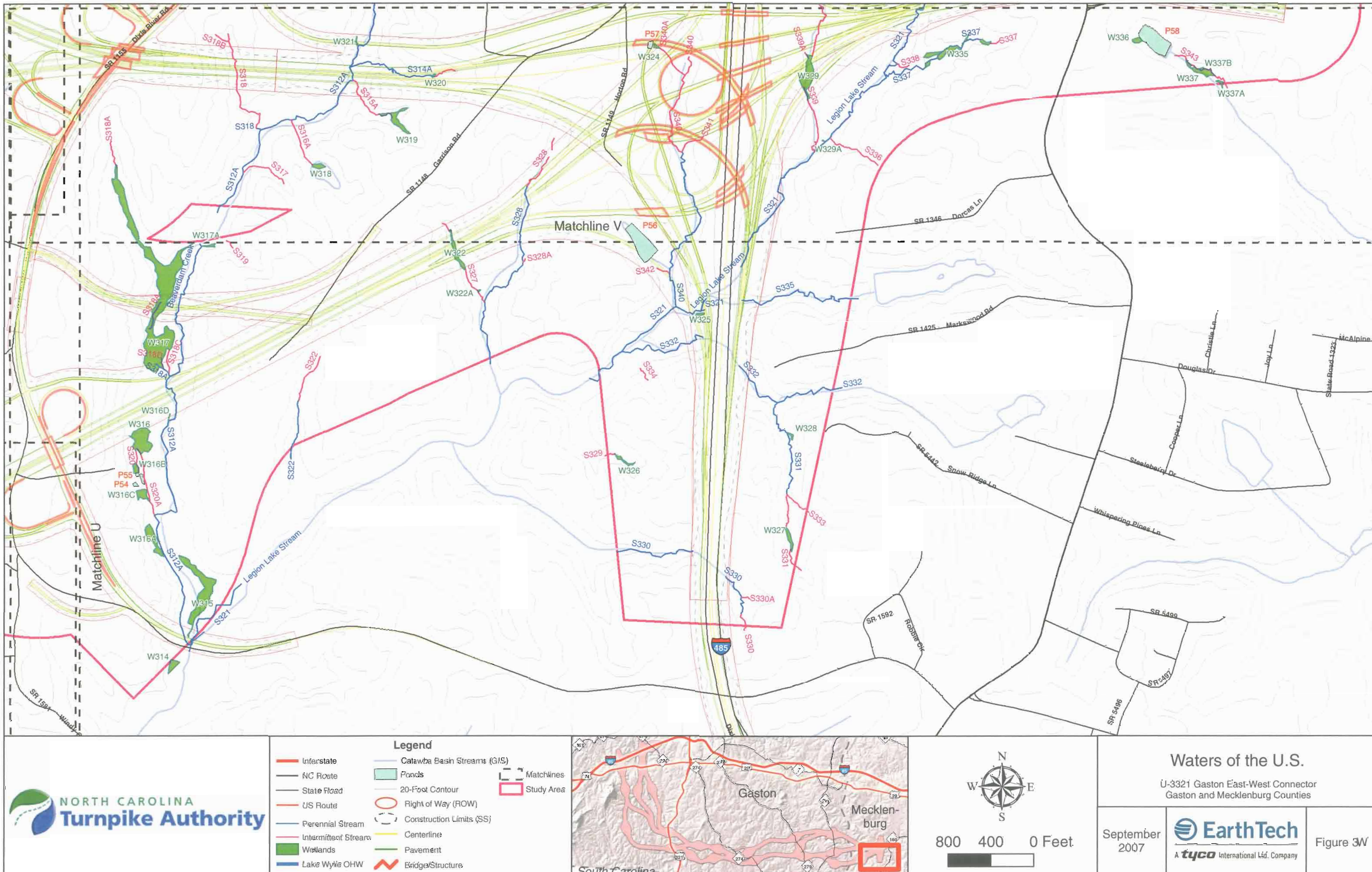
Matchline V
Matchline U
Legion Lake Stream
Beaverdam Creek
SR 1155 Dixie River Rd
SR 1148 Garrison Rd
SR 1149 Horton Rd
SR 1346 Dorcas Ln
SR 1425 Markswood Rd
SR 5442 Snow Ridge Ln
Whispering Pines Ln
Steeleberry Dr
Douglas Dr
Christie Ln
Joy Ln
McAlpine Dr
State Road 1323
Cooper Ln
SR 1592
Robbie Cir
SR 5499
SR 5497
SR 5496
SR 1591
485
Legend
Interstate
NC Route
State Road
US Route
Perennial Stream
Intermittent Stream
Wetlands
Lake Wylie OHW
Catawba Basin Streams (GIS)
Ponds
20-Foot Contour
Right of Way (ROW)
Construction Limits (SS)
Centerline
Pavement
Bridge/Structure
Matchlines
Study Area
Gaston
Mecklen-burg
South Carolina
800 400 0 Feet
NORTH CAROLINA
Turnpike Authority
Waters of the U.S.
U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties
September 2007
EarthTech
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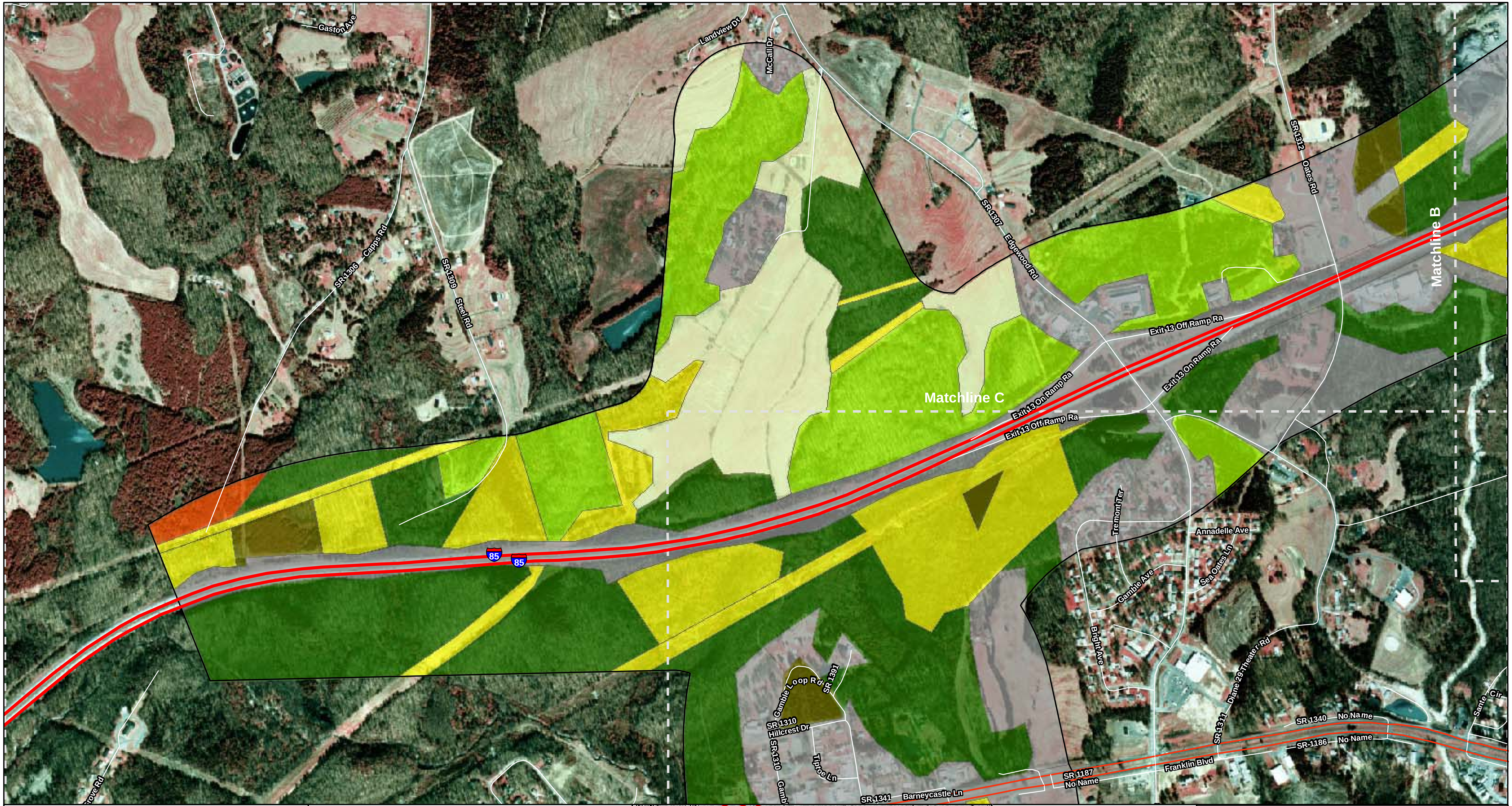
Figure 3W



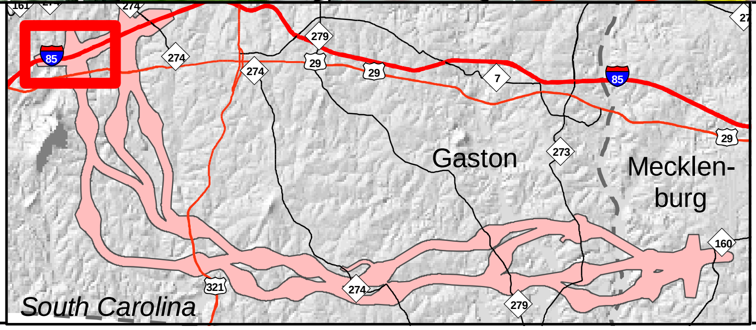
NORTH CAROLINA Turnpike Authority

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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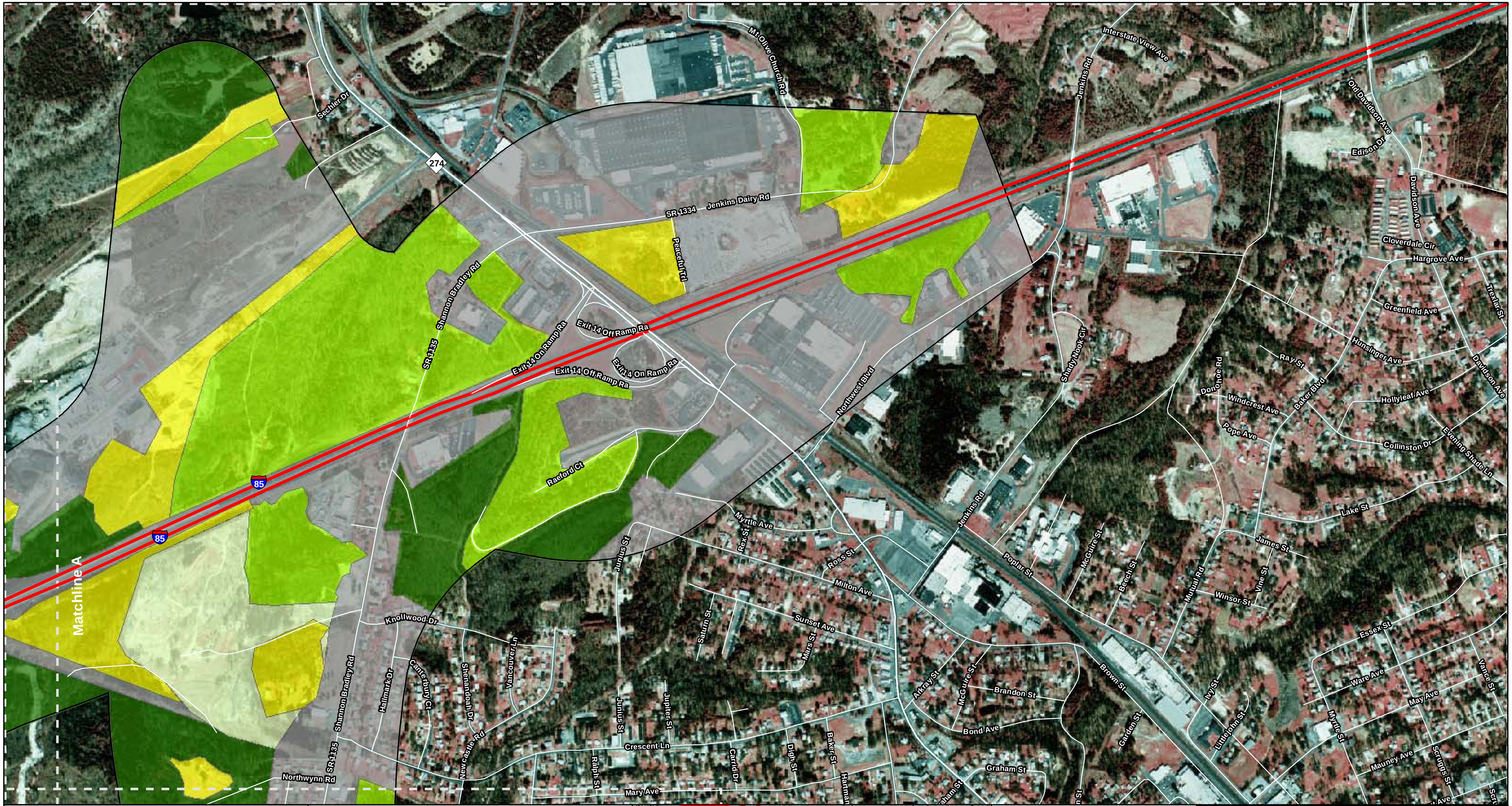
Figure 4A

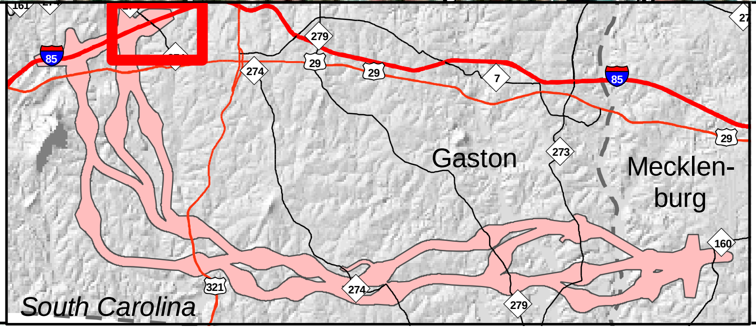


Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N S E W

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

NORTH CAROLINA Turnpike Authority

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Figure 4B

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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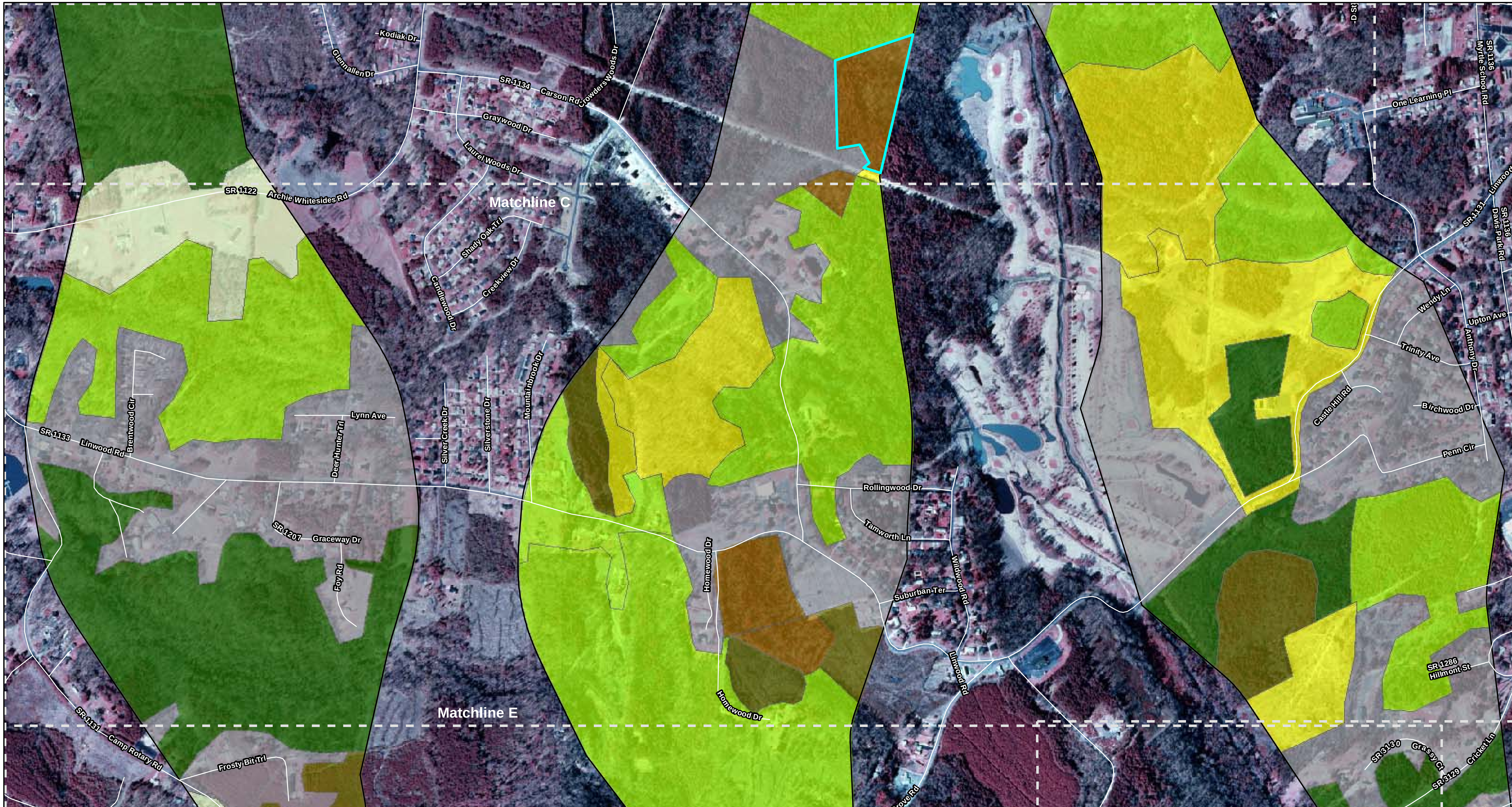
Figure 4C



NORTH CAROLINA
Turnpike Authority

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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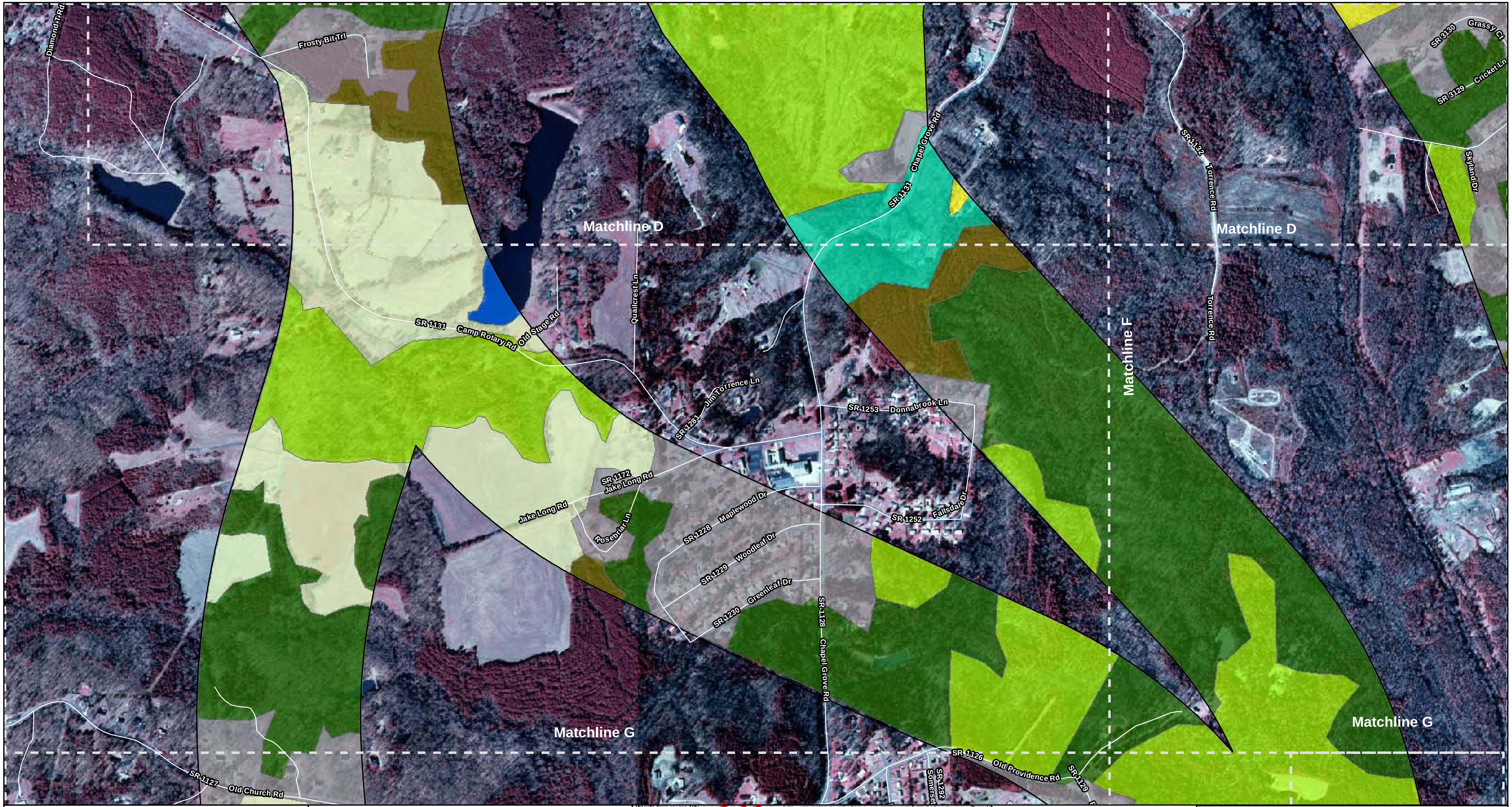
Figure 4D



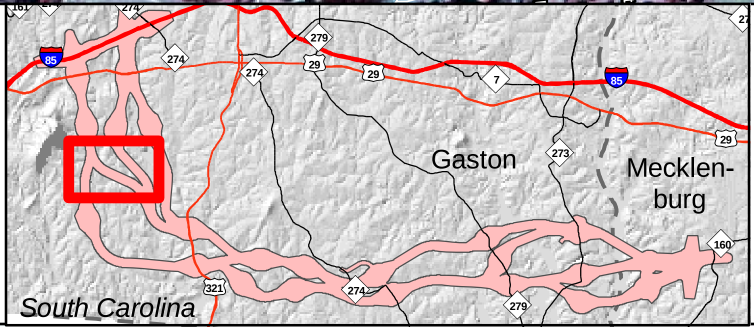
Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

NORTH CAROLINA Turnpike Authority



N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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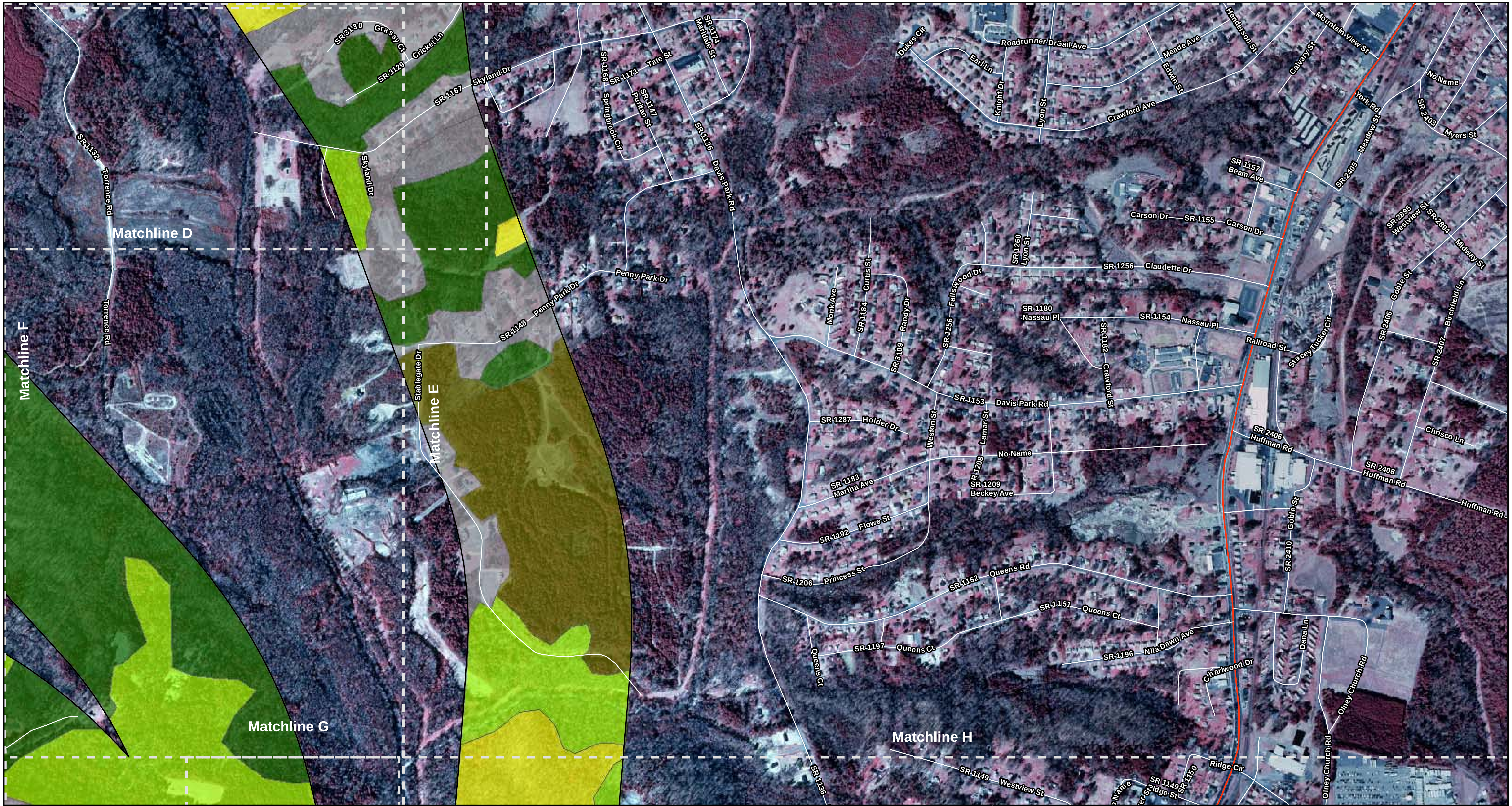
Figure 4E

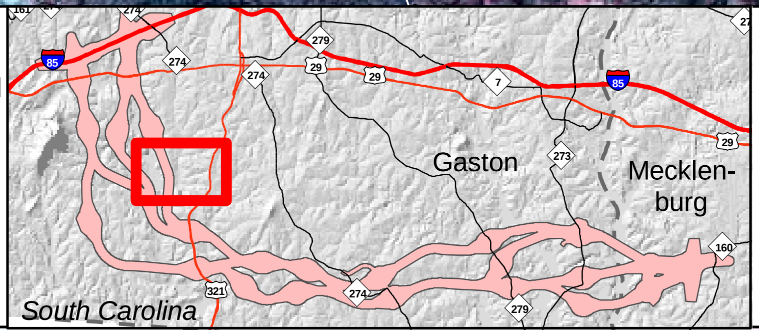


Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 4F

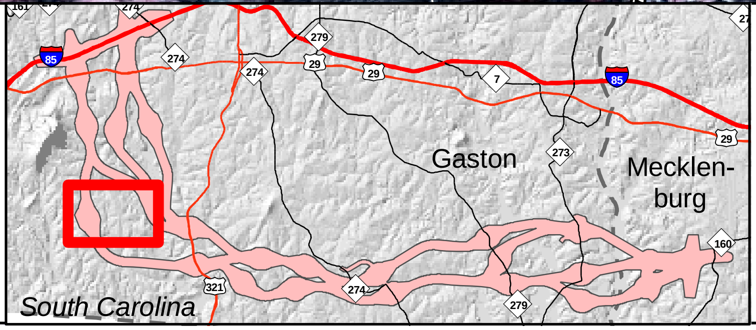
North Carolina Turnpike Authority

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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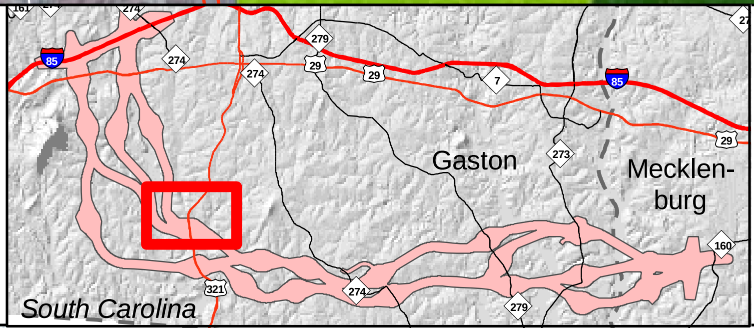
Figure 4G

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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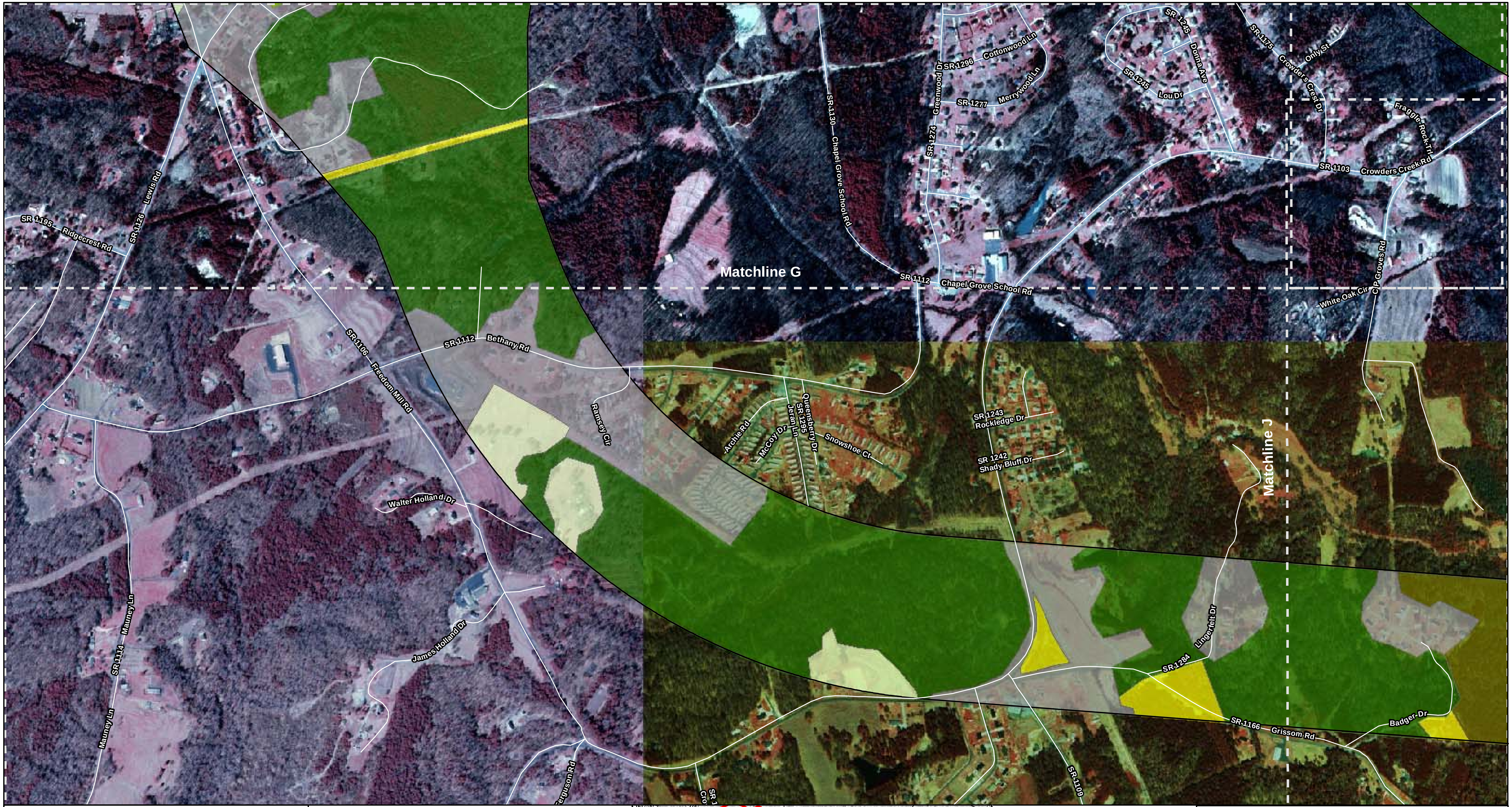
Figure 4H

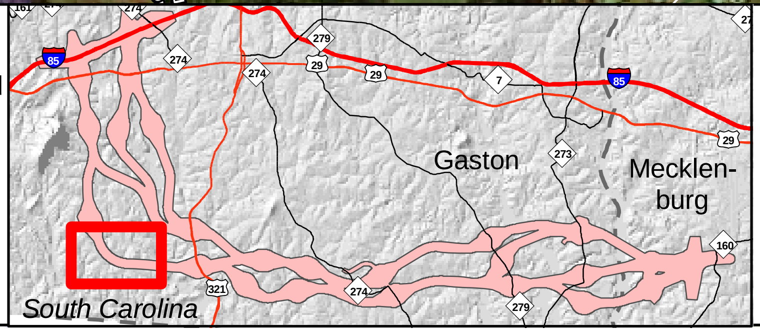


Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 4 I

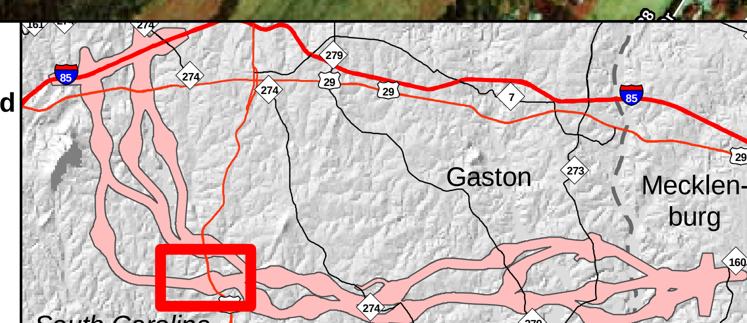
North Carolina Turnpike Authority

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N W E S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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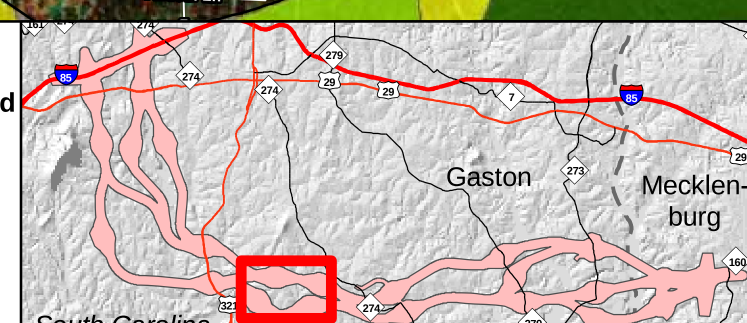
Figure 4J

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

NORTH CAROLINA
Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 4K

NORTH CAROLINA Turnpike Authority

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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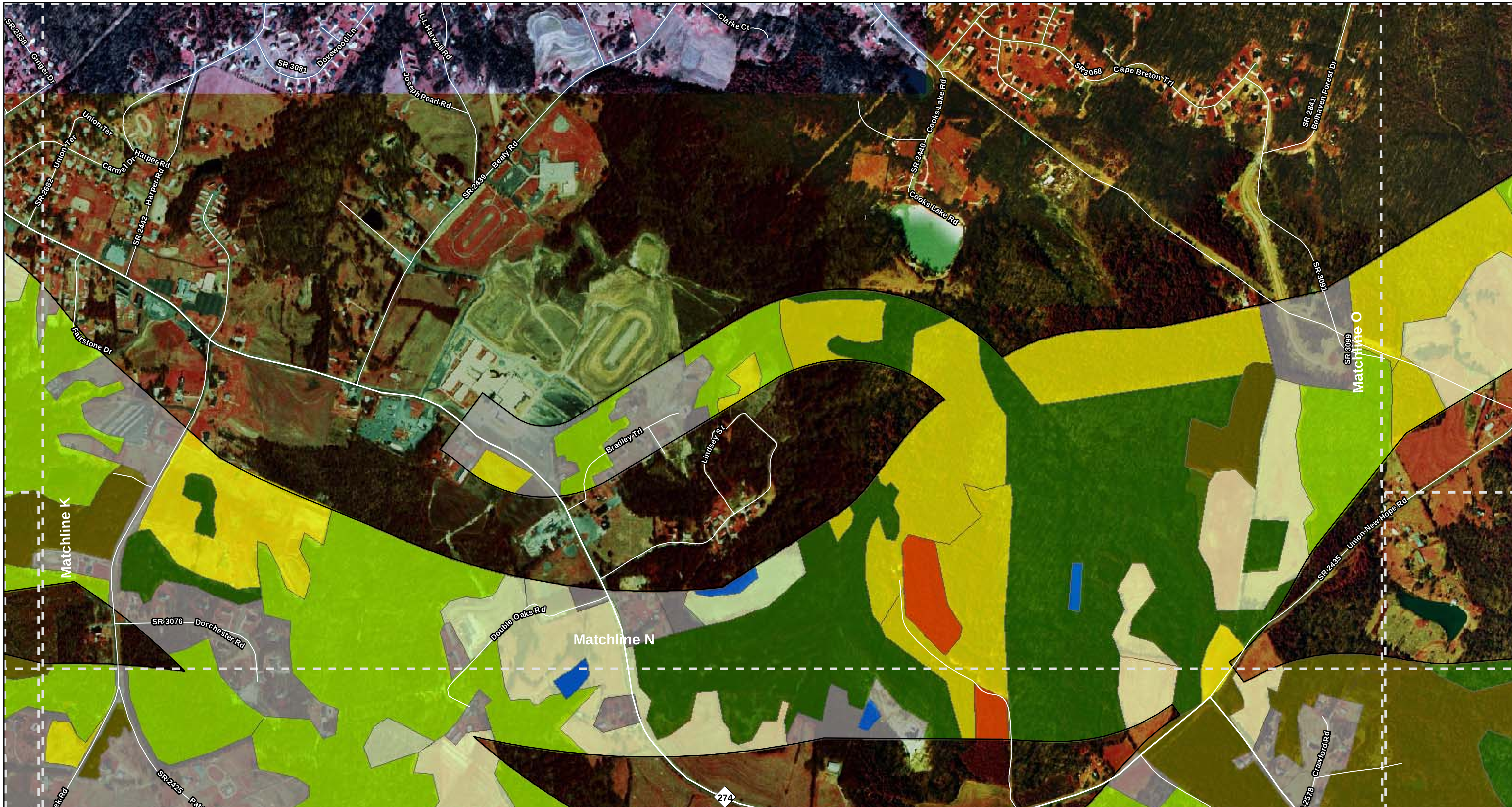
Figure 4L



Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N S E W

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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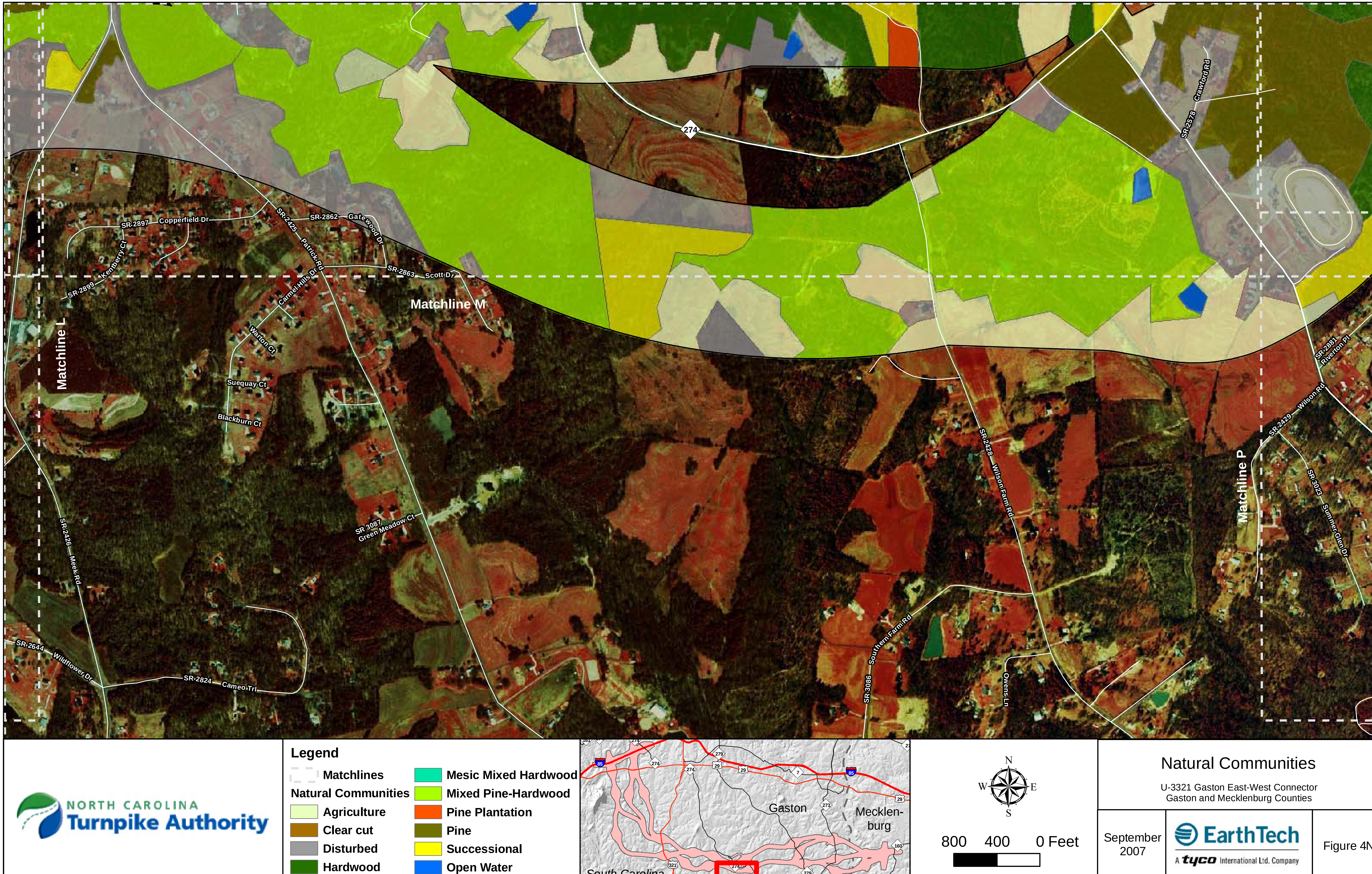
Figure 4M



NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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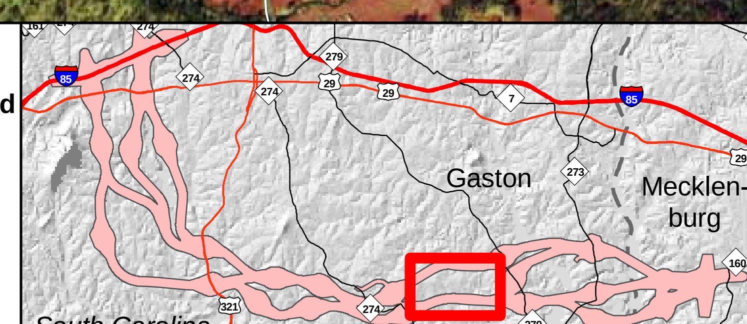
Figure 4N

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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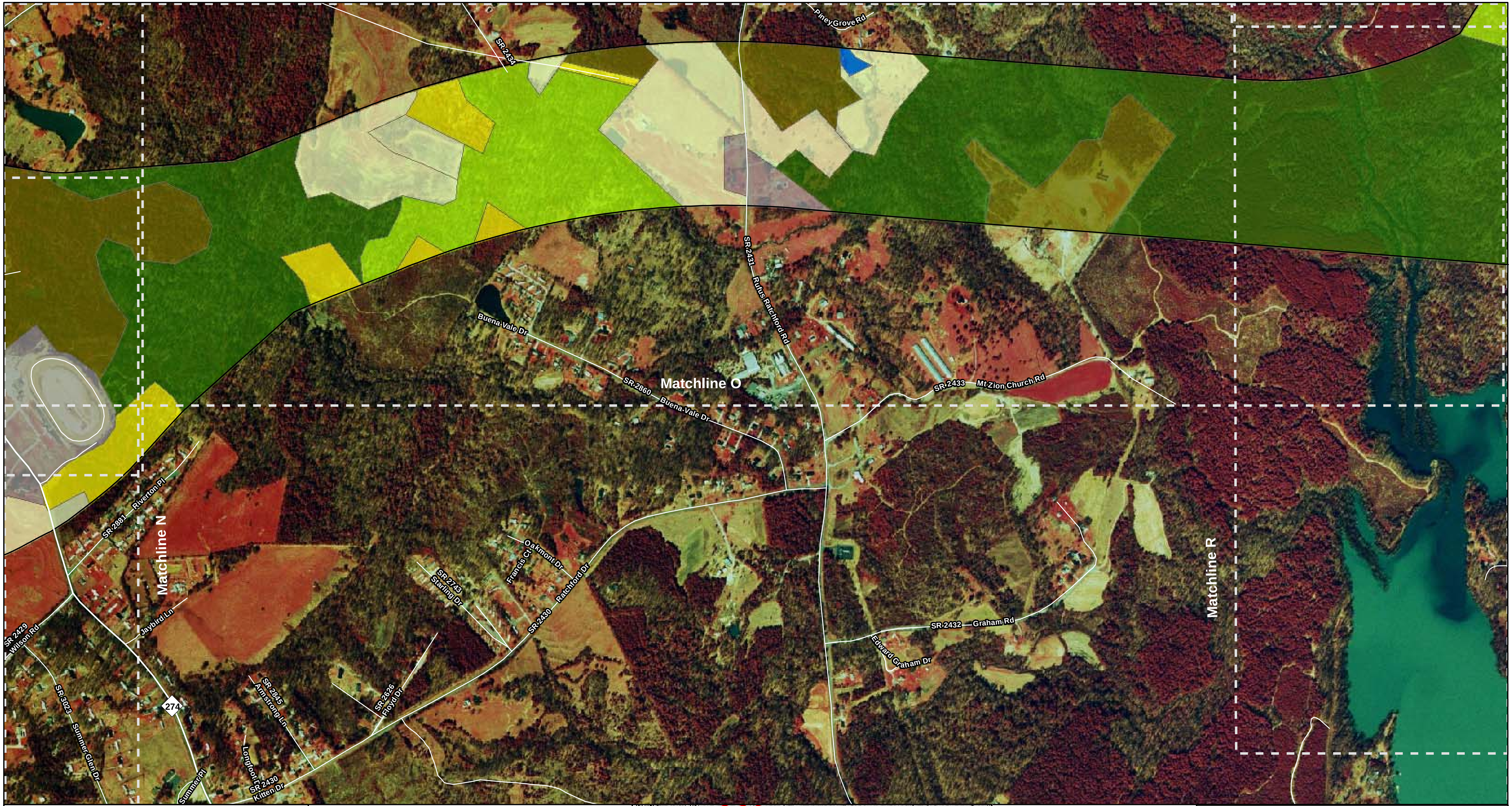
Figure 4O

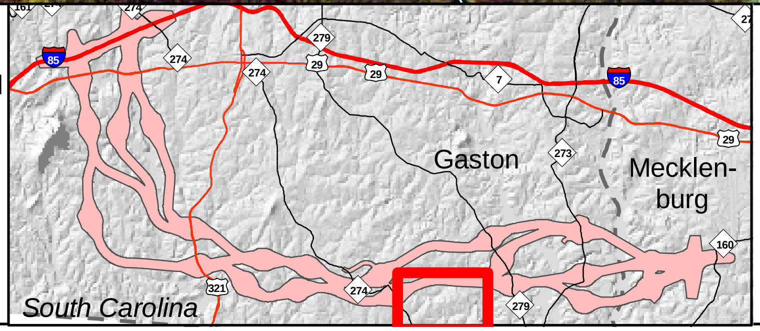


Legend

Matchlines

Natural Communities

Agriculture	Mesic Mixed Hardwood
Clear cut	Mixed Pine-Hardwood
Disturbed	Pine Plantation
Hardwood	Pine
	Successional
	Open Water



N W E S

800 400 0 Feet

NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

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Figure 4P

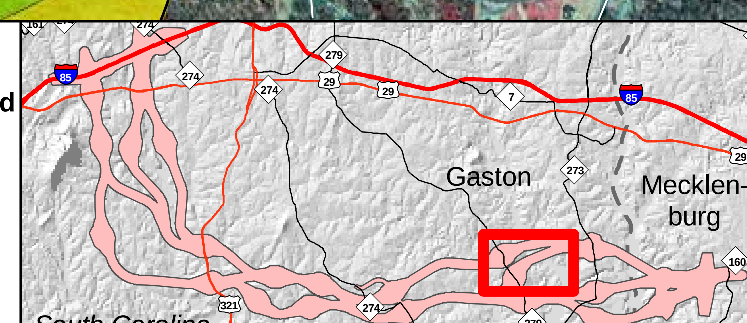
North Carolina Turnpike Authority

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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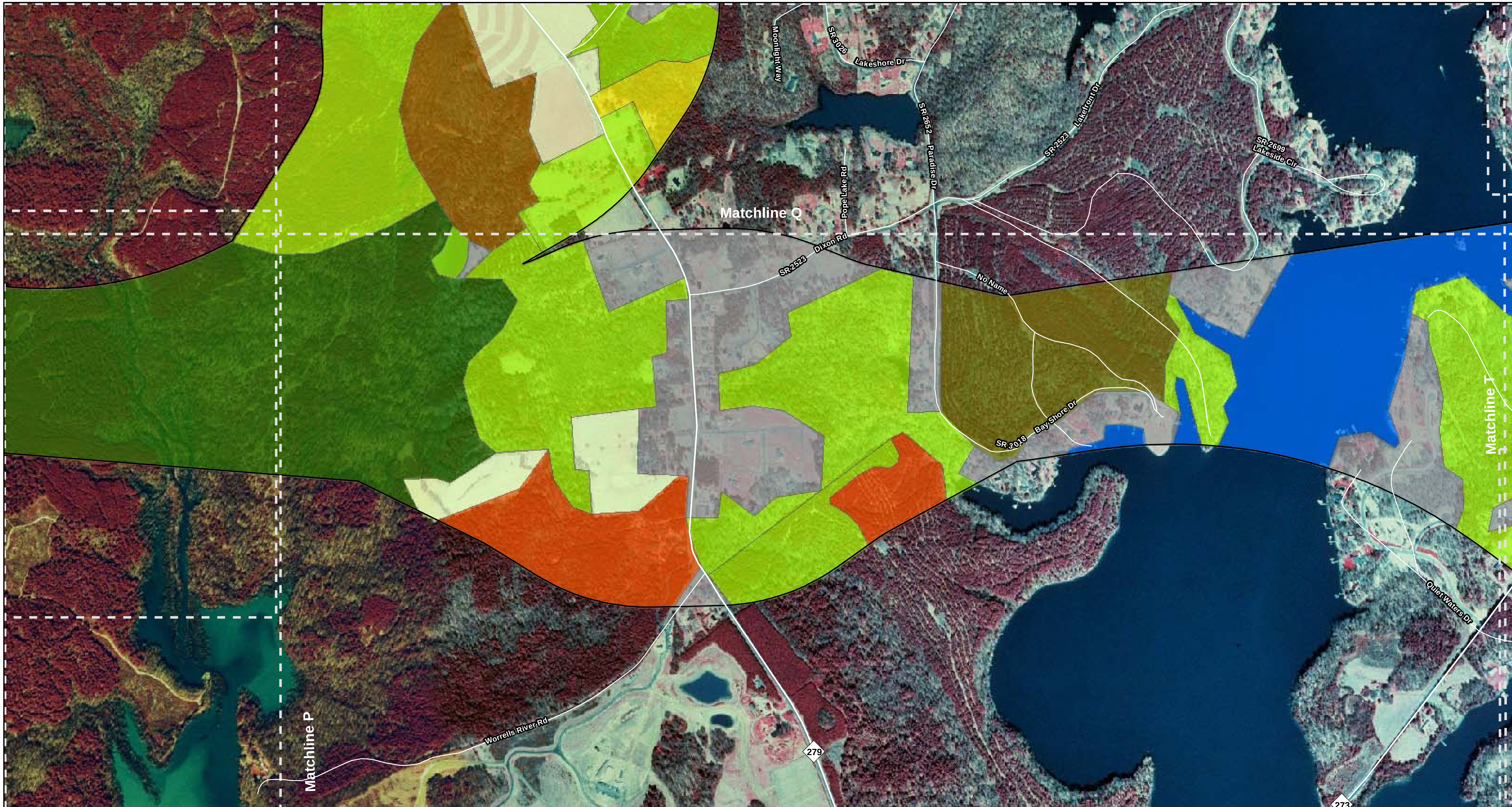
Figure 4Q

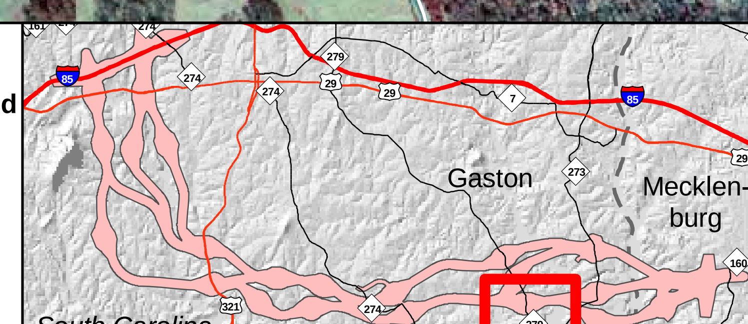


Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



N
W E
S

800 400 0 Feet

NORTH CAROLINA
Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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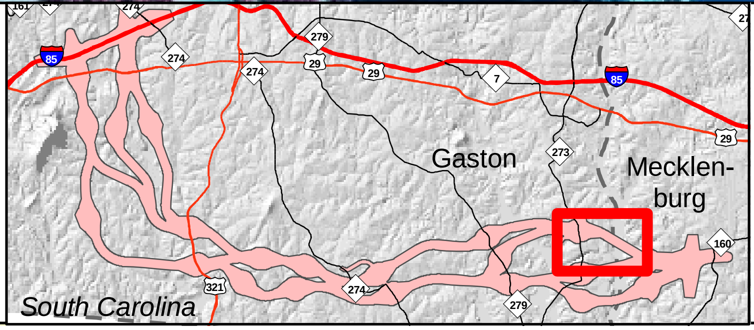
Figure 4R

NORTH CAROLINA Turnpike Authority

Legend

Matchlines	Mesic Mixed Hardwood
Natural Communities	Mixed Pine-Hardwood
Agriculture	Pine Plantation
Clear cut	Pine
Disturbed	Successional
Hardwood	Open Water



N W E S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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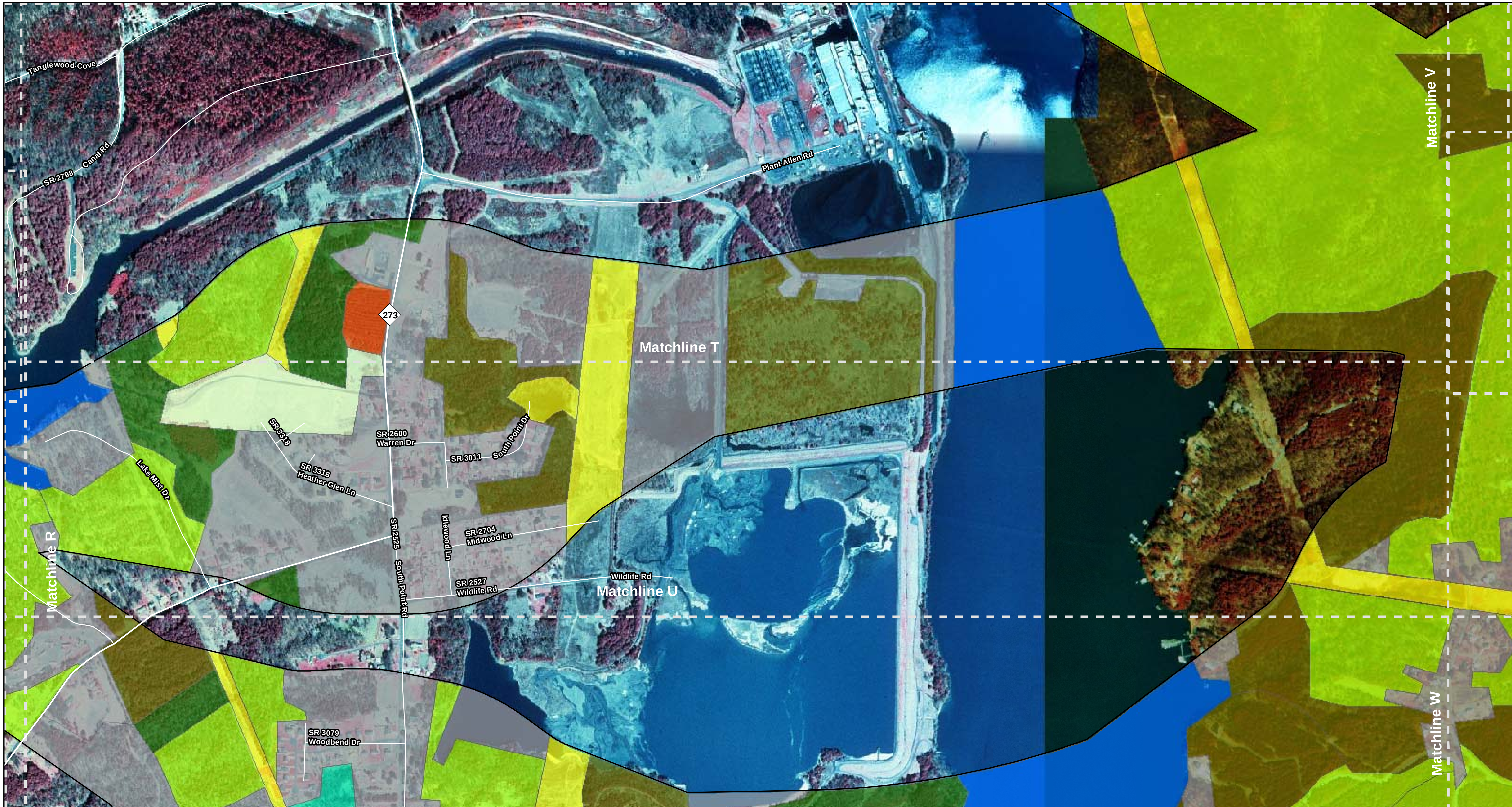
Figure 4S



NORTH CAROLINA
Turnpike Authority

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
A tyco International Ltd. Company

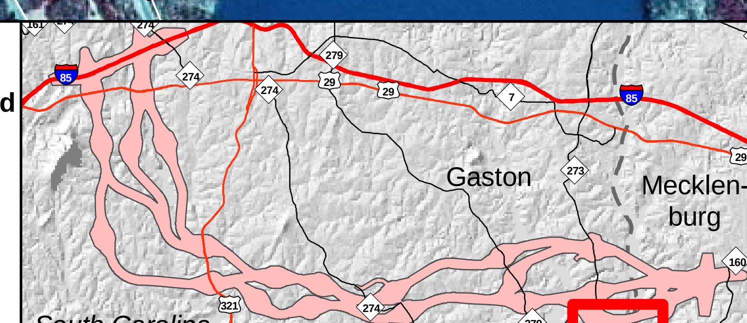
Figure 4T

Legend

- Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water



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NORTH CAROLINA Turnpike Authority

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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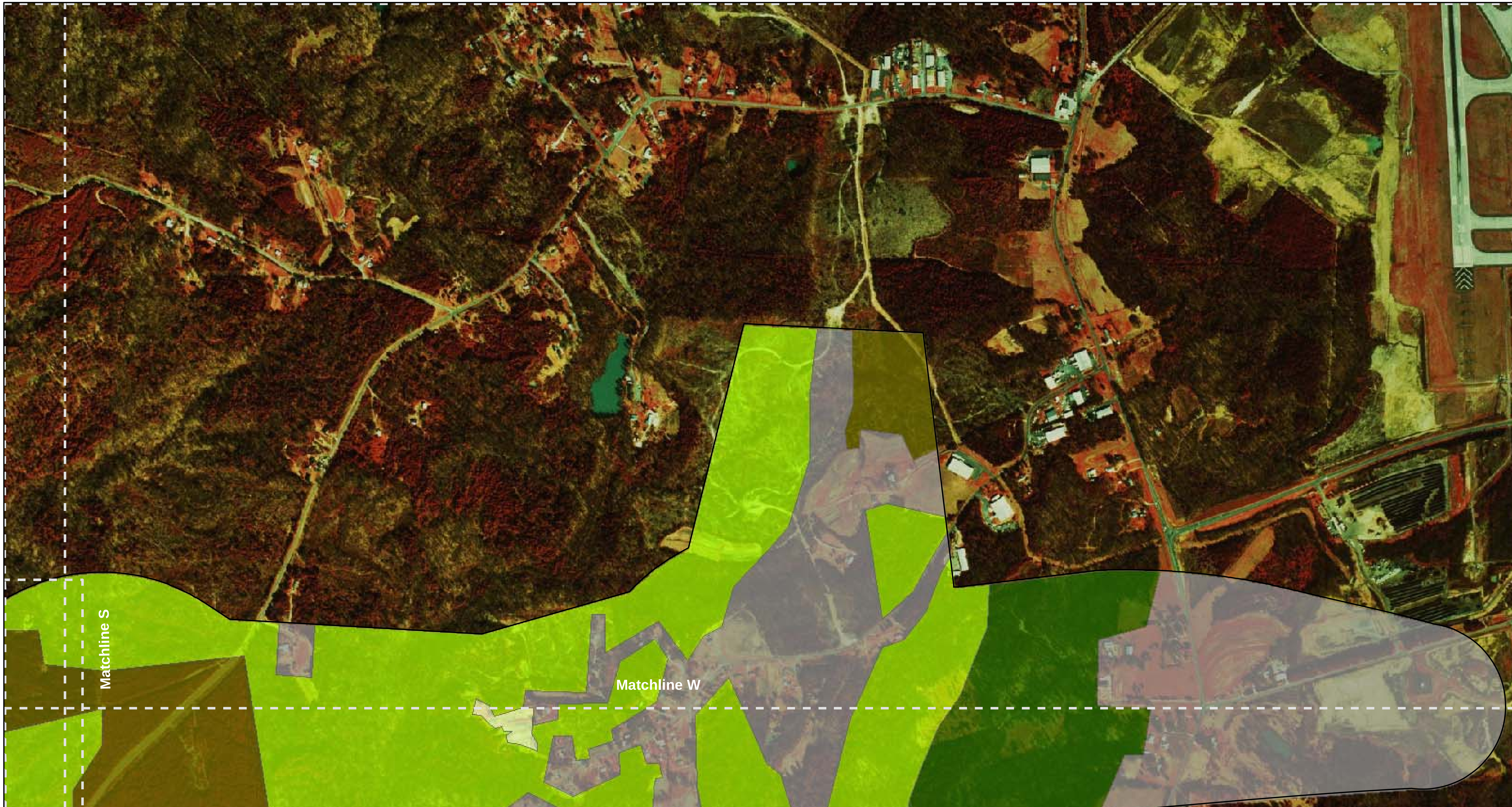
Figure 4U



NORTH CAROLINA
Turnpike Authority

Legend

Matchlines

Natural Communities

- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N W E S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September 2007

EarthTech
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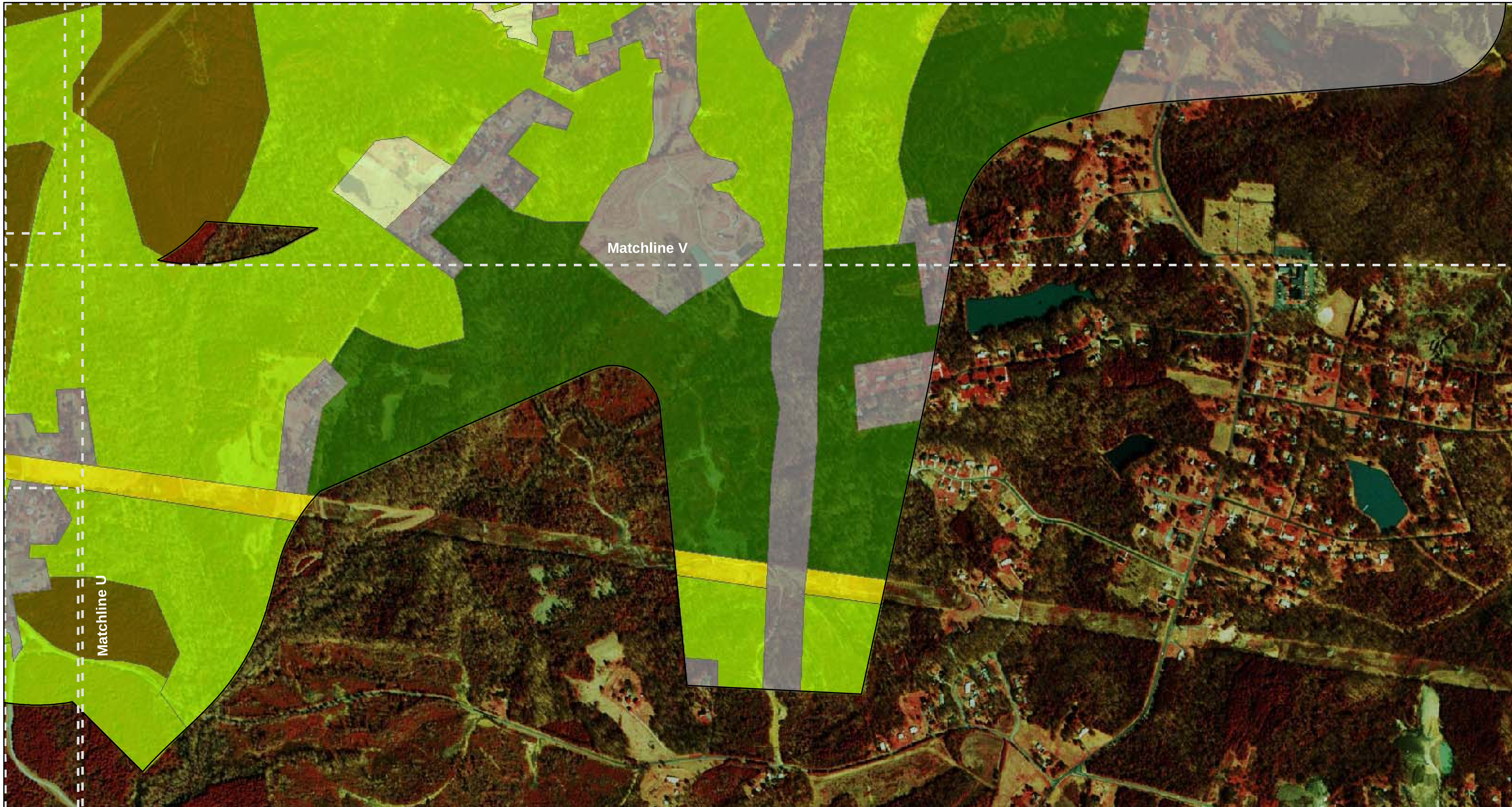
Figure 4V



NORTH CAROLINA
Turnpike Authority

Legend

- Matchlines
- Natural Communities
- Agriculture
- Clear cut
- Disturbed
- Hardwood
- Mesic Mixed Hardwood
- Mixed Pine-Hardwood
- Pine Plantation
- Pine
- Successional
- Open Water

N
W E
S

800 400 0 Feet

Natural Communities

U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

September
2007

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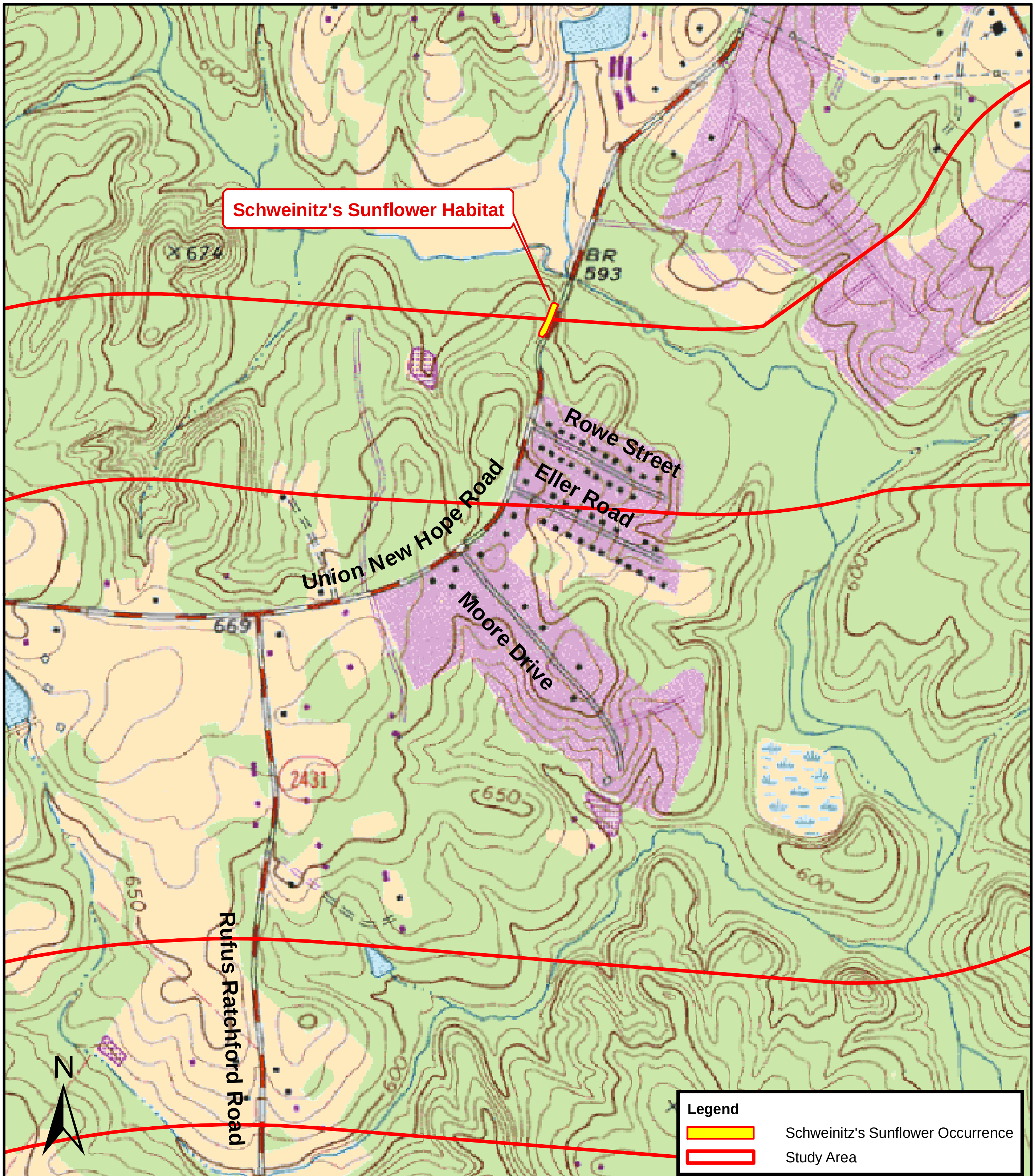
Figure 4W



NORTH CAROLINA Turnpike Authority

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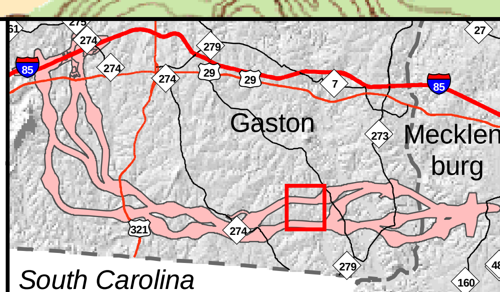

Schweinitz's Sunflower Location
U-3321 Gaston East-West Connector
Gaston and Mecklenburg Counties

Sept. 2007

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Figure 5

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APPENDIX A

Protected Species Survey Reports

EarthTech
A Tyco International Ltd. Company

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Raleigh, NC 27607

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F 919.854.6259
earthtech.com

MEMORANDUM

DATE: March 1, 2007

TO: Louis Raymond, PBS & J

FROM: Kevin Lapp, Biologist, Earth Tech

SUBJECT: Bald Eagle Survey Report

The North Carolina Turnpike Authority is currently investigating alternatives associated with development of a toll road facility on new location in Gaston and Mecklenburg Counties, NC. The proposed Gaston County East-West Connector (U-3321) around the city of Gastonia includes 16 alternatives (endpoint to endpoint) which extend from south of the Charlotte Douglas International Airport in western Mecklenburg County, south of Gastonia, to a link with Interstate 85 (I-85) just west of Gastonia in Gaston County for a total of approximately 72 corridor miles. Corridor width for each alternative averages 1400 feet (Figure 1).

The following memorandum addresses surveys for the Bald Eagle (*Haliaeetus leucocephalus*), a federally protected species listed by the U.S. Fish and Wildlife Service for Gaston and Mecklenburg Counties performed as part of the environmental requirements associated with the Gaston East-West Connector project. The bald eagle is primarily associated with coasts, rivers, and lakes and usually nests near large bodies of water where it feeds. Large nests up to 6 feet (2 m) across and weighing hundreds of pounds are constructed from large sticks, weeds, cornstalks, grasses, and sod. Preferred nesting sites are usually within one-half mile of water, have an open view of the surrounding area, and are in the largest living tree, usually a pine or cypress. In the southeast, the nesting and breeding season runs from September to December.

Bald eagles are known from Lake Wylie and the NC Wildlife Resources Commission (NCWRC) and NC Natural Heritage Program (NCNHP) each had data on separate bald eagle nest locations. An aerial survey of the Lake Wylie area within the project area and extending outward one mile was performed by helicopter on December 19, 2006. Areas along the shoreline and adjacent to the shoreline were surveyed for the presence of large nests and areas with historical nest data were surveyed thoroughly in an attempt to relocate the nest. Three unoccupied large nests (Figure 2) were observed during this survey outside of the project study area, one of which was near the NCNHP tracked nest location. These nests were ground truthed by Earth Tech biologists using a spotting scope and binoculars on February 8, 2007 to determine the species using the nests during the nesting season for the bald eagle. Two of the nests were found to be occupied by great blue herons. The third nest, located in an electrical transmission tower, did not appear to be sufficiently large for bald eagles and is thought to be an osprey nest.

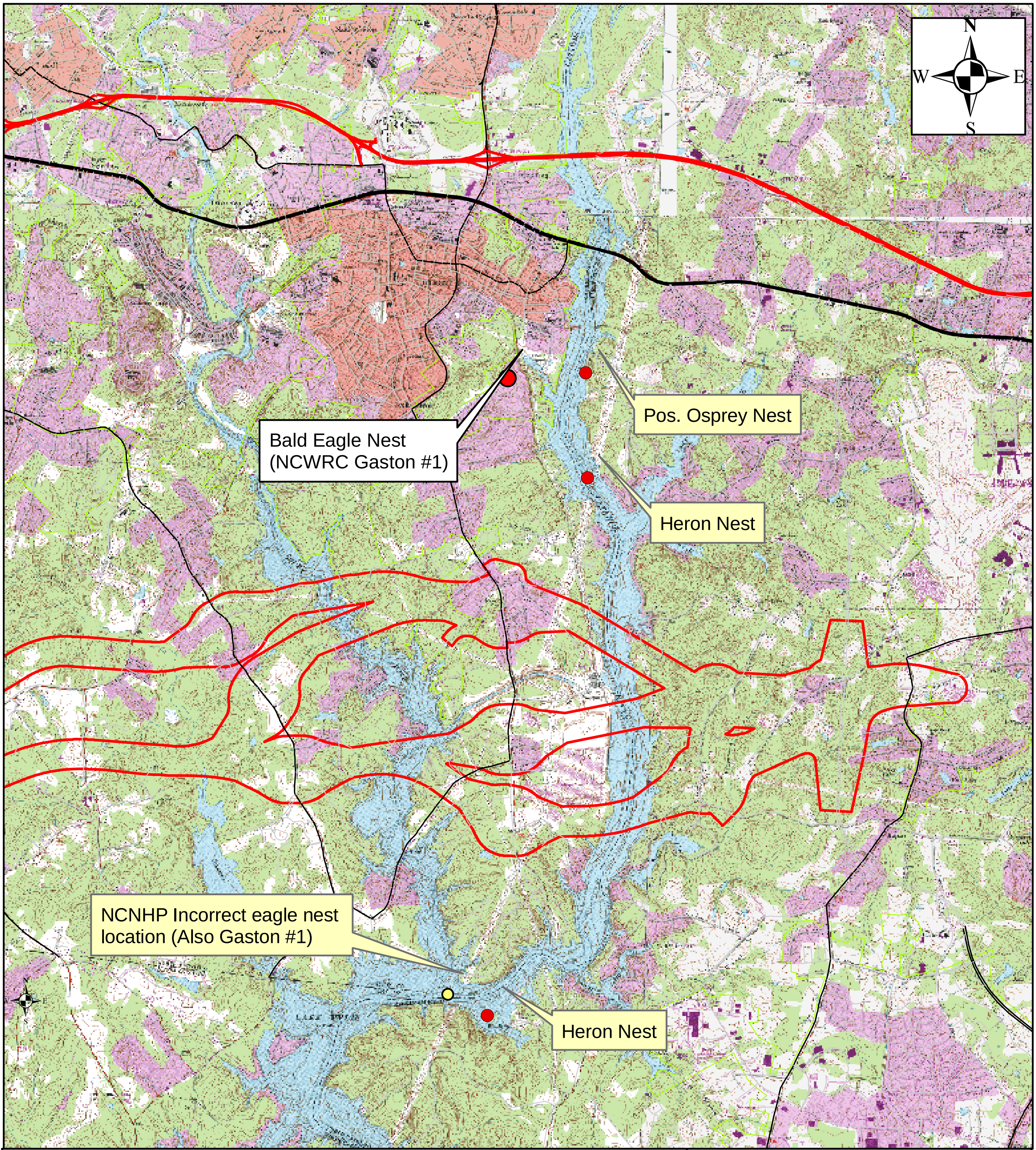
One confirmed eagle nest was observed in a location that has been tracked by the NC Wildlife Resources Commission (NCWRC). The NCWRC provided location data for this occurrence (Gaston #1) and has tracked fledgling survival during previous years. The nest was observed in a relatively new subdivision southeast of Belmont and is surrounded by homes at the end of Deas Drive (approximately 1.6 miles north of the study corridor). Deas Drive is located off of

Amanda Lane in Gaston County. Two adult eagles were observed in the general area and one of these eagles was observed on the nest on February 8, 2007. This was the only documented eagle nest observed during the survey. The nest location is depicted in Figure 3. An additional nest location that was provided by the NC Natural Heritage Program is actually an incorrectly plotted reference to Gaston #1 that we observed and is described above. This location does not have a current or historic eagle nest location associated with it.

Due to the small possibility of impacting foraging habitat with the potential construction of a bridge over Lake Wylie, a biological conclusion of May Affect, Not Likely to Adversely Affect was reached.

Bald eagle (*Haliaeetus leucocephalus*) May Affect, Not Likely to Adversely Affect

The following biological conclusion was reached after surveys and research associated with this project. Surveys for federally protected species are valid for two years from the survey date. If the project is not constructed within those two years then the area may need to be resurveyed prior to the let date.



2 1 0 2 Miles

SOURCE: USGS Quadrangles Charlotte West and Belomont "Maptech® USGS Topographic Series™, ©Maptech®, Inc. 978-933-3000, www.maptech.com/topo" Copyright 2001 Maptech

Figure 2
Observed Nest Locations

Gaston East-West Connector
U-3321
Gaston and Mecklenburg Counties, NC

March 1, 2007

Protected Plant Species Surveys

Gaston County East-West Connector Study

Gaston and Mecklenburg Counties, North Carolina

TIP Project No. U-3321

Prepared for:

NORTH CAROLINA
Turnpike Authority

By:

PBS&J

and

Earth Tech
Environmental Services, Inc.
HW Lochner, Inc.
Kimley-Horn and Associates

March 2006

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TABLES

FIGURES (Figures follow text)

1.0 Introduction

1.1 Project Description

The North Carolina Turnpike Authority is studying alternatives associated with the development of a candidate toll road facility on new location in Gaston and Mecklenburg Counties, North Carolina. The proposed Gaston County East-West Connector Study (TIP Project No. U-3321) includes sixteen Detailed Study Alternatives (endpoint to endpoint) which extend from Interstate 85 (I-85) west of Gastonia in Gaston County to I-485/NC 160 west of the Charlotte Douglas International Airport in western Mecklenburg County. There are approximately 72 miles of corridor. The corridor width averages 1,400 feet, with wider areas around potential interchange locations.

1.2 Purpose of this Report

This report is a summary of the surveys for protected plant species conducted along the Detailed Study Corridors in September through October 2005. The corridors comprising the Detailed Study Alternatives were partitioned into four survey segments for purposes of surveying for federally-protected plant species, as shown in **Figures 1a and 1b**.

A consultant group was selected for each of the four survey segments, and they were responsible for surveying for protected plant species listed as Threatened or Endangered by the US Fish and Wildlife Service (USFWS) that have ranges which extend into Gaston or Mecklenburg Counties. The four consultant groups and the survey segments are described below. Each consultant prepared a survey report for their respective segment, as listed in the References Section of this document.

Survey Segment 1

Kimley-Horn and Associates (KHA) surveyed Segment 1, which includes all Detailed Study Alternative corridors from I-485 west to the Gaston/Mecklenburg County line at the Catawba River. The Segment 1 corridor study area contains approximately 1,800 acres.

Survey Segment 2

Environmental Services, Inc. (ESI) surveyed Segment 2, which begins at the Gaston/ Mecklenburg County line at the Catawba River and includes all Detailed Study Alternative corridors west to NC 274, a distance of approximately 7 miles. The Segment 2 corridor study area contains approximately 4,205 acres.

Survey Segment 3

HW Lochner (Lochner) surveyed Segment 3, which includes all Detailed Study Alternative corridors between NC 274 and Lewis Road (SR 1128)/Chapel Grove Road (SR 1131)/Linwood Road. The Segment 3 corridor study area contains approximately 4,758 acres.

Survey Segment 4

Earth Tech surveyed Segment 4, which includes all Detailed Study Alternative corridors from Lewis Road (SR 1128)/Chapel Grove Road (SR 1131)/Linwood Road north to I-85 in Gaston County. The Segment 4 corridor study area contains approximately 3,700 acres.

2.0 Plant Species Profiles

Federal law under the provisions of Section 7 of the Endangered Species Act (ESA) of 1973, as amended, requires that any action likely to adversely affect a federally-protected species be subject to review by the USFWS. Other species may warrant protection under separate state laws. Plants and animals with federal classifications of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under provisions of Section 7 and Section 9 of the ESA.

2.1 Plants Listed for Mecklenburg County

As of November 10, 2005, the USFWS internet listing for Mecklenburg County identifies three plant species listed as endangered: Michaux's sumac (*Rhus michauxii*), smooth coneflower (*Echinacea laevigata*), and Schweinitz's sunflower (*Helianthus schweinitzii*). An endangered species is one in danger of extinction throughout all or a significant portion of its range. The survey window (as designated by USFWS) for all three species varies; however, the survey window for all three plants overlaps from mid-August to the end of October.

"Critical habitat," as defined in the ESA, is a term for habitat given special protection for the benefit of a listed species. Critical habitat, as defined by the USFWS, is not designated for any species listed in Mecklenburg County, North Carolina. In addition, according to the NC Natural Heritage Program (NCNHP) database (October 19, 2005), no federally threatened, endangered, or species of concern listed by the USFWS have been documented within a 1-mile radius of the Detailed Study Corridor areas in Mecklenburg County.

Survey Segment 1 is the portion of the project's Detailed Study Alternatives that is within Mecklenburg County. The three listed plant species for Mecklenburg County are described below.

Species: Michaux's sumac (*Rhus michauxii*)
Plant Family: *Anacardiaceae*
Status: Endangered
Date Listed: September 28, 1989
Critical Habitat: None identified in Mecklenburg County, NC

Michaux's sumac is a rhizomatous, densely hairy shrub. There are nine to thirteen sessile leaflets that are oblong to oblong-lanceolate. The leaflet margins are simple to double serrated with a rounded base. 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 2005).

Michaux's sumac typically grows in sandy or rocky open wooded areas in association with basic soils. In order to maintain the preferred open wooded areas, Michaux's sumac is commonly found in areas of maintained disturbances. The maintained disturbed areas such as power line easements, railroad rights-of-way, and road rights-of-way replicate the open quality of habitat typically supplied by naturally occurring periodic fires (USFWS 1993).

Species: Smooth coneflower
Plant Family: *Asteraceae*
Status: Endangered
Date Listed: October 8, 1992
Critical Habitat: None identified in Mecklenburg County, NC

Smooth coneflower is a tall rhizomatous perennial herb that grows up to five feet in height. The stems are smooth with leaves that are lance-ovate to elliptic. The smooth to slightly pubescent leaves are acuminate with often course serrations. The ray flowers (two to three inches long) are light pink to purple, usually drooping. Flower heads are usually solitary with flowering occurring from May through July (USFWS 2005).

Smooth coneflower typically inhabits open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way. The smooth coneflower is associated with the gabbro and diabase parent material soil types, which are usually rich in magnesium and calcium (USFWS 1995).

Species: Schweinitz's sunflower (*Helianthus schweinitzii*)
Plant Family: *Asteraceae*
Status: Endangered
Date Listed: May 7, 1991
Critical Habitat: None identified in Mecklenburg County, NC

Schweinitz's sunflower is a rhizomatous perennial herb that grows from 3 to 6 ft (1 to 2 m) tall from a cluster of carrot-like tuberous roots. Stems are usually solitary, branching only at or above mid-stem. The stem is usually pubescent but can be nearly glabrous; it is often purple. The lanceolate leaves are opposite on the lower stem, changing to alternate above. They are variable in size, being generally larger on the lower stem and gradually reduced upwards. The pubescence of the underside of the leaves is distinctive and is one of the best characters to distinguish Schweinitz's sunflower from its relatives. The upper surface of the leaves is rough, with the broad-based spinose hairs directed toward the tip of the leaf. From September to frost, Schweinitz's sunflower blooms with comparatively small heads of yellow flowers.

According to the US Fish and Wildlife Service, the current range of this species is within 60 miles of Charlotte, North Carolina. It occurs on upland interstream flats or gentle slopes, in soils that are thin or clayey in texture. Schweinitz's sunflower is typically found on the following soil types: Iredell, Enon, Badin, Cecil, Misenheimer, Gaston, and Zion soils. It may also occur in Tatum, Cid, Secrest, Georgeville, Mecklenburg, and Uwahrrie soil types. This species needs open areas protected from shade or excessive competition, reminiscent of Piedmont prairies. Disturbances such as fire maintenance or regular mowing help sustain preferred habitat.

The typical suitable habitat for this sunflower includes upland clearings, forest edges, roadsides, utility corridors, pastures, thickets, and woodland openings. Schweinitz's sunflower is usually found on well-drained, shallow, poor, clayey, or rocky soils. Threats to this species include; fire suppression, urbanization, conversion of habitat to pine plantations, right-of-way maintenance, and small population size.

2.2 Plants Listed for Gaston County

As of September 30, 2005, Schweinitz's sunflower (*Helianthus schweinitzii)* is the only plant species listed by the US Fish and Wildlife Service (USFWS) as Threatened or Endangered that has a range extending into Gaston County, NC. The survey window (as designated by USFWS) for this species extends from late August through the end of October.

Survey Segments 2, 3, and 4 are entirely within Gaston County. Please refer to the description of Schweinitz's sunflower included in **Section 2.1**. No critical habitat for this sunflower has been designated by the US Fish and Wildlife Service in Gaston County.

3.0 Survey Methodologies

3.1 Survey Segment 1 - Mecklenburg County

The initial analysis (search) for the protected species began with a review of available mapping. Qualified biologists from KHA reviewed available aerial photography, soils mapping, and corridor mapping to determine potential habitat areas deemed suitable for survey for the three plant species in Mecklenburg County (called "priority habitat areas" in KHA's report). Areas that were likely to have suitable habitat were identified and delineated on the aerial photography. A brief drive-by window survey of the project area was conducted to confirm location and the extent of suitable habitat.

Michaux's sumac, smooth coneflower, and Schweinitz's sunflower typically require open habitat conditions along with basic soils. Habitat conditions within the project study area that provide potential suitable habitat include utility rights-of-way, road shoulders, and other areas that are maintained in an open condition. Eight areas were identified as potential suitable habitat based on soils mapping in conjunction with aerial photography. These potential suitable habitat areas ("priority habitat areas") are shown on **Figure 2a**.

Following the identification and mapping of potential suitable habitats ("priority habitat areas"), qualified biologists from KHA conducted field surveys for the federally listed endangered plant species during the weeks of October 17 and 24, 2005. Biologists methodically walked transects to ensure total coverage of the potentially suitable habitat areas. Spacing between transects was maintained at approximately 25 to 50 feet, depending on vegetative cover. Forested edges surrounding potentially suitable habitat areas were surveyed independently to ensure these areas were covered sufficiently.

3.2 Survey Segment 2 – Gaston County

Prior to the initiation of the field investigation and as part of the scoping process, ESI identified potential suitable habitat (called "high probability areas" in ESI's report) for Schweinitz's sunflower using aerial photography. Potential suitable habitat included roadsides, powerline rights-of-way, field edges, trails, and other open, disturbed areas that were mapped on one of the above mentioned soil types where Schweinitz's sunflower is typically found (**Figure 3b**). Maintained residential yards and fenced/maintained pastures with livestock were not considered to be potential suitable habitat areas, and therefore were not surveyed for the presence/absence of Schweinitz's sunflower.

Prior to conducting the survey, ESI biologists conducted a review of NC Natural Heritage Program (NHP) records (October 6, 2005) to determine if Schweinitz's sunflower has been documented in the study corridor. No known occurrences of Schweinitz's sunflower have been documented within Survey Segment 2. The nearest documented occurrence of Schweinitz's sunflower is located approximately 4,000 feet south of the southern corridor, west of Catawba Creek and north of SR 2650.

ESI biologists also reviewed the Latta Plantation (Mecklenburg County) reference population of Schweinitz's sunflower on October 10 and 17, 2005 to confirm the flowering status. ESI biologists noted that the reference population was past its peak flowering period and only a few flowers remained. The surveys were conducted based on the presence of seed heads and vegetative characteristics.

Surveys in Segment 2 were conducted by ESI biologists on October 10-12, 17-20, and 25, 2005. ESI biologists visually surveyed field edges and roadsides. Powerline rights-of-way and other large areas were surveyed by walking transects through potentially suitable habitat.

3.3 Survey Segment 3 – Gaston County

Aerial photographs and soils mapping were used to aid in identification of potential suitable habitat areas (called high priority areas and medium priority areas in HW Lochner's report) such as clearings and edges of upland woods (**Figure 3c**). Cleared areas with Cecil, Gaston, Tatum, and Uwharrie soil types were considered potential suitable habitat. A brief drive through of the project area confirmed the location and extent of potential suitable habitat areas. All areas to be surveyed were noted on base mapping. Potential suitable habitat areas were systematically surveyed by walking overlapping transects.

Prior to conducting habitat assessments for Schweinitz's sunflower within the project study area, a known population of the species in bloom was visited along an abandoned railroad track in Charlotte, NC on October 10, 2005. This provided an opportunity to see the sunflower's flowering status prior to conducting formal surveys within the region.

Surveys were conducted by Lochner biologists trained in identification of this species between October 10 and 18, 2005.

3.4 Survey Segment 4 – Gaston County

Aerial photos provided by NCDOT, USGS 7.5 minute quadrangles, and soil mapping were used to identify potential suitable habitat (called potential suitable habitat in Earth Tech's report) within the study corridor to search for Schweinitz's sunflower. Field maps were produced on 11 x 17 sheets at 1:12,000 scale. Areas containing power line, telephone, and gas line rights-of-way; road sides; and fields that were visible on mapping, were identified as potential habitat.

Additional habitat not readily visible from the existing mapping was identified by driving the search area. All potential areas having suitable habitat were walked and/or visually surveyed for Schweinitz's sunflower. Additionally, many areas initially identified as potential habitat were walked and a determination made that they were not actually suitable. For purposes of Segment 4, the following definitions are used:

Potential Habitat – An area from review of photos and mapping that appears to contain sunflower habitat.

Potential Suitable Habitat (called Priority Sunflower Habitat in Earth Tech's report) – Potential habitat, that upon field evaluation, appear to be suitable for the sunflower. Many areas initially identified as potential habitat are not suitable habitat due to disturbance, landscape position, or other factors (**Figure 3d**).

On October 13, 2005, prior to the field search, the Natural Heritage Program Plants Database was searched for the occurrence of known populations and previous sightings around and within the search area. A known population of the sunflower was observed on October 17 in preparation to identify the species. This population is located in a power line right-of-way corridor in Asheboro, North Carolina along NC 42 about one-half mile south of US 64.

Field surveys for this species were conducted by Earth Tech biologists October 18 - 20, 2005. A targeted survey approach was used, searching only for Schweinitz's sunflower. Within each community surveyed, a random meander technique was used to visually search for sunflower plants. Search intensity varied within each community, depending upon topography, bordering communities, observed land use patterns (both past and current), and plant species observed within the community.

4.0 Statement of Qualifications of Investigators

4.1 Survey Segment 1 – Mecklenburg County – KHA

Investigator:	Norton Webster, Environmental Scientist
Education:	BS, Business, Wake Forest University
	MS, Forestry, North Carolina State University
Experience:	Kimley-Horn and Associates, Inc., December 2000 to present
	Environmental Scientist, ARCADIS, Inc., July 1998 to December 2000
Expertise:	Wetland/Stream Delineation, Permitting, Threatened and Endangered Species Surveys

Investigator:	Tommy Cousins, Environmental Scientist
Education:	BS, Environmental Science, North Carolina State University
Experience:	Kimley-Horn and Associates, Inc., January 2003 to present
Expertise:	Threatened and Endangered Species Surveys, GPS/Geographic Information Systems, Wetland/Stream Delineation

Investigator:	Tyler McEwen, Environmental Scientist
Education:	BS, Environmental Science, North Carolina State University
Experience:	Kimley-Horn and Associates, Inc., March 2005 to present Environmental Scientist, Environmental Services, Inc., January 2003 to March 2005
Expertise:	Threatened and Endangered Species Surveys, GPS, Wetland/Stream Delineation, Geographic Information Systems

4.2 Survey Segment 2 – Gaston County – ESI

Investigator:	Gail Tyner
Education	BS North Carolina State University
Experience	8+ years of Professional Experience
Expertise	Natural resource investigations, wetlands delineation, wetland mitigation monitoring, threatened and endangered species surveys including red-cockaded woodpecker, rough-leaved loosestrife, and Schweinitz's sunflower. Ms. Tyner has performed numerous surveys for Schweinitz's sunflower including the US 601 Widening and Dickerson Boulevard Extension in Union County and the Mallard Creek Road Improvements in Mecklenburg County.

Investigator:	Jeff Benton
Education	BA University of North Carolina – Wilmington
Experience	3+ years of Professional Experience
Expertise	Natural resource investigations, wetlands delineation, wetland mitigation monitoring, threatened and endangered species surveys including red-cockaded woodpecker, rough-leaved loosestrife, and Schweinitz's sunflower, and dwarf flowered heartleaf. Mr. Benton has performed numerous surveys for Schweinitz's sunflower on various projects throughout its preferred range in North and South Carolina.

Investigator:	Matt Simon
Education	BS University of North Carolina at Chapel Hill
Experience	3+ years of Professional Experience

Expertise Threatened and endangered species surveys including spring-flowering goldenrod, Schweinitz’s sunflower, and dwarf-flowered Heartleaf, wetland mitigation monitoring, and GIS (suitability analysis, digitizing, editing and manipulating spatial features, basin-area calculations, overlay analysis, GIS database management, georeferencing, and serving maps online). Mr. Simon has performed previous sunflower surveys including the Dickerson Boulevard Extension in Union County.

Investigator: Katie Tomany
Education AS Landscape Architecture
Experience 2+ years of Professional Experience
Expertise Threatened and endangered species surveys including spring-flowering goldenrod, Schweinitz’s sunflower, dwarf-flowered Heartleaf, and the Appalachian Elktoe freshwater mussel, natural resource investigations, and GPS data collection and processing.

4.3 Survey Segment 3 – Gaston County – Lochner

Investigator: Heather Renninger
Education BS, Ecology, Appalachian State University
Experience 6 years
Expertise Natural resources surveys, endangered species surveys, wildlife biology, wetlands delineations.

Investigator: Brian Dustin
Education BS, Forest Management, North Carolina State University
Experience 2 years
Expertise Natural resources surveys, wetlands delineations, dendrology, endangered species surveys, GPS.

Investigator: Susan Smith
Education MS, Louisiana State University
Experience 10 years
Expertise Natural resources surveys, endangered species surveys, wildlife biology, wetlands delineations, forestry.

Investigator: Eric Galamb, PWS
Education BS Environmental Management and Biogeography, University of Toronto
Experience 16 years
Expertise Natural resources surveys, regulatory agency coordination, wetland and stream permitting, wetland and stream mitigation, wetland and stream mitigation monitoring, wetland determinations and delineations utilizing US Army Corps

of Engineer (USACE) methodology, stream assessments utilizing USACE and NC Division of Water Quality (DWQ) methodologies, linear corridor studies, environmental constraints mapping, NEPA/SEPA environmental assessments, wildlife surveys, and protected species surveys.

4.4 Survey Segment 4 – Gaston County – Earth Tech

Investigator:	Jane Almon
Education	MS, Forestry, North Carolina State University
Experience	Staff Biologist, Earth Tech 6 years
Expertise	Natural resources surveys, Wetland restoration, Watershed studies

Investigator:	Ron Johnson
Education:	MS, Biological Sciences, Illinois State University
Experience:	Biologist, Earth Tech 18 years
Expertise:	Natural resources surveys, Wetland and stream mitigation

Investigator:	George Lankford, PSS
Education:	MS, Botany, North Carolina State University
Experience:	North Carolina Licensed Soil Scientist, Biologist, Earth Tech 5 years
Expertise:	Botany, Soils, Wetland delineation, Natural resources surveys

Investigator:	Kevin Lapp
Education:	MS, Biological Sciences, North Carolina State University
Experience:	Biologist, Earth Tech, <1 year
Expertise:	Conservation and Natural Resources Management

5.0 Results

5.1 Survey Segment 1 – Mecklenburg County

The majority of Survey Segment 1 consists of rural residential development and large forested areas. The Survey Segment 1 area also includes limited small agricultural areas, a tree farm, and industrial areas, as well as the I-485 corridor. The project study area is bound on the western side by the Catawba River (Lake Wylie). I-485 transects the eastern side of the project study area, running north to south. A transmission line corridor crosses the Catawba River and traverses the western and southern portions of Survey Segment 1 (see **Figure 2a**).

The potential suitable habitat areas ("priority habitat areas") were intensively surveyed. None of the three protected species were found during the field surveys.

5.2 Survey Segment 2 – Gaston County

The potential suitable habitat areas within Survey Segment 2 were surveyed for the presence/absence of Schweinitz's sunflower. (**Figure 2b**) One population of *Helianthus schweinitzii* was observed within the project study area, and is shown on **Figure 3**. This population is located on the northern edge of the northern Detailed Study Corridor, south of Catawba Creek, along the western side of SR 2435 (Union-New Hope Road). On October 25, 2005, the Schweinitz's sunflower population was verified by Senior Project Manager Kevin Markham. Other sunflowers commonly observed within the project study area included small-headed sunflower (*Helianthus microcephalus)*, hairy sunflower *(Helianthus hirsutus)*, and spreading sunflower (*Helianthus divaricatus*). According to the *Flora of the Carolinas and Virginia*, both the small-headed sunflower and the spreading sunflower are common throughout the Piedmont region of North Carolina. The hairy sunflower is uncommon in North Carolina and is on the Virginia Watch List.

5.3 Survey Segment 3 – Gaston County

No Schweinitz's sunflowers were found in Survey Segment 3. Another *Helianthus* species that had already bloomed was observed. The species was determined to most likely be roughleaf sunflower (*Helianthus strumosus*). Other common plant species include fescue (*Festuca* sp.), daisy fleabane (*Erigeron annuus*), white wood aster (*Aster divaricatus*), stiff aster (*Aster linariifolius*), blackberry (*Rubus* sp.), dog fennel (*Eupatorium capillifolium*), and several types of goldenrods (*Solidago* spp.).

5.4 Survey Segment 4 – Gaston County

All potential suitable habitat areas were investigated for Schweinitz's sunflower and none were found. The late survey date resulted in many of the local fall blooming perennial and annual plants, including Schweinitz's sunflower, being past peak flowering. Typically, only the distinctive seed head remained. Vegetative growth on the plants within the reference population observed was still green, but they had lost vigor, with lower leaves withered or dead. Identification of the sunflower relied upon the visibility of seed heads, growth pattern of the plant, and identification of other vegetative characteristics that make it distinctive.

Most of the area within the search limits is urbanized with only a few limited areas containing relatively natural communities. These areas are typically forested and often surrounded by urban communities. The general community types searched includes utility rights-of-way, fields, and road sides. Many of these communities are located in unsuitable landscape positions along lower slopes, toe slopes, and floodplains and do not provide suitable habitat.

The utility rights-of-way identified from mapping are mostly power lines. One gas utility crosses the project area, and sewer lines are located along stream floodplains. The gas utility is closely mowed within Survey Segment 4. Most sewer lines were not searched because of their low topographic position along streams. The typical community within the power line rights-of-way is early successional and consists of mostly annual and perennial herbaceous species with limited woody species. The woody species present are often root sprouts, with a larger main stem or stems nearby that are dead. Along the edges of many of the power line rights-of-way was a band where all woody vegetation and most of the herbaceous vegetation was recently sprayed. The herbaceous vegetation included Canada goldenrod (*Solidago canadensis*), beggar lice (*Bidens* sp.), hairy white oldfield aster (*Symphyotrichum pilosum*), dog fennel (*Eupatorium capillifolium*), broomsedge bluestem (*Andropogon virginicus*), blackberry (*Rubus* sp.), and wingstem (*Verbesina alternifolia*). No Schweinitz's sunflower plants were found within the utility rights-of-way.

The existing community composition along the road sides is variable, depending on the level of maintenance. The extent of maintenance appeared to differ depending on the width of the road cut/fill, surrounding land use, and designated traffic level. All roadsides have been mowed to some extent. Power lines often parallel the roads. Much of the vegetative community along the roads is similar to the utility rights-of-way, although exotic invasive species are more dominant. Areas having herbicide application were also observed along the roads. In general, roadsides communities appear well maintained. No Schweinitz's sunflower plants were found within the road side community.

The fields identified consisted of either actively cultivated fields, active pasture, or old abandoned fields in various stages of successional growth. For the most part, actively managed field edges appear to be either clear of all weedy vegetation or fighting encroachment of Japanese honeysuckle (*Lonicera japonica*) or kudzu (*Pueraria montana*). Old field edges are typically heavily overgrown and the edges obscured with woody vegetation. Many fields were adjacent to forested communities or urban development. Relatively few field edges investigated contained suitable habitat for Schweinitz's sunflower. No Schweinitz's sunflower plants were found within the field edges.

The remaining areas identified were associated with urban development. The developed urban areas are typically maintained landscapes lacking resemblance to natural communities. These areas are small home gardens, mowed lawns, landscaped borders, and waste areas. None of these areas contained suitable habitat for Schweinitz's sunflower. No Schweinitz's sunflower plants were found within the urban communities.

6.0 Biological Conclusions

Table 1 summarizes the biological conclusions for each plant species by Survey Segment. The conclusions are described in the following sections.

Table 1. Biological Conclusions Summary

Survey Segment*	Michaux's Sumac	Smooth Coneflower	Schweinitz Sunflower
1	No Effect	No Effect	No Effect
2	Not Applicable	Not Applicable	May Affect/Not Likely to Adversely Affect
3	Not Applicable	Not Applicable	No Effect
4	Not Applicable	Not Applicable	No Effect

* The survey segments include all Detailed Study Alternative corridors between the stated limits:
Survey Segment 1 – I-485 to Gaston/Mecklenburg County line
Survey Segment 2 – Gaston/Mecklenburg County line to NC 274
Survey Segment 3 – NC 274 to Lewis Road (SR 1128)/Chapel Grove Road (SR 1131)/Linwood Road
Survey Segment 4 - Lewis Road (SR 1128)/Chapel Grove Road (SR 1131)/Linwood Road to I-85

6.1 Survey Segment 1 – Mecklenburg County

No Michaux's sumac, Schweinitz's sunflower, or smooth coneflower were found within Survey Segment 1. NCNHP records also did not indicate any species located within a mile of the study area. Based on the results of this survey and supporting documentation, the proposed Detailed Study Alternatives in Survey Segment 1 will not affect Michaux's sumac, Schweinitz's sunflower, or the smooth coneflower species.

Michaux's Sumac
BIOLOGICAL CONCLUSION NO EFFECT

All potential suitable habitats for Michaux's sumac within Survey Segment 1 were surveyed. No populations of Michaux's sumac were found during this search. The NCNHP record for Michaux's sumac is historic and nearly all of the area has been developed, farmed, and otherwise negatively impacted for suitable habitat. NCNHP records failed to document the location of any known populations of the sumac in or immediately adjacent to the study corridor. Based on the results of this survey, the project will not impact the Michaux's sumac within the area surveyed. Based on the results of this survey, the project will have no affect on the Michaux's sumac within the area surveyed.

Schweinitz's Sunflower
BIOLOGICAL CONCLUSION NO EFFECT

All potential suitable habitats for Schweinitz's sunflower, within the study corridor were surveyed. No populations of Schweinitz's sunflower were found during this search. The search area is farther west than other known locations and nearly all of the area has been developed, farmed, and otherwise negatively impacted for suitable habitat. NCNHP records failed to document the location of any known populations of the sunflower in or immediately adjacent to the study corridor. Based on the results of this survey, the project will not impact the Schweinitz's sunflower within the area surveyed. Based on the results of this survey, the project will have no affect on the Schweinitz's sunflower within the area surveyed.

Smooth Coneflower
BIOLOGICAL CONCLUSION NO EFFECT

All potential suitable habitats for smooth coneflower, within the study corridor were surveyed. No populations of smooth coneflower were found during this search. The search area is not within a mile of other known locations and nearly all of the area has been developed, farmed, and otherwise negatively impacted for suitable habitat. NCNHP records failed to document the location of any known populations of the sunflower in or immediately adjacent to the study corridor. Based on the results of this survey, the project will not impact the smooth coneflower within the area surveyed. Based on the results of this survey, the project will have no affect on the smooth coneflower within the area surveyed.

6.2 Survey Segment 2 – Gaston County

Schweinitz's Sunflower
BIOLOGICAL CONCLUSION May Affect/Not Likely to Adversely Affect

The powerlines, roadsides and open areas within the project study area are high probability areas for potentially suitable Schweinitz's sunflower habitat. These high probability areas were surveyed for the presence/absence of Schweinitz's sunflower. One population of *Helianthus schweinitzii* was observed within the project study area. This population is located on the northern edge of the northernmost Detailed Study Corridor, south of Catawba Creek along the western side of SR 2435 (Union-New Hope Road). Due to its location in relation to the Detailed Study Corridors, it is likely possible to avoid all impacts to the observed Schweinitz's sunflower population.

6.3 Survey Segment 3 – Gaston County

Schweinitz's Sunflower
BIOLOGICAL CONCLUSION NO EFFECT

Although potential suitable habitat areas are present within the project study area in the form of regularly maintained roadside shoulders, field or pasture edges, and utility easements, no individuals of the *Helianthus schweinitzii* species were observed during the October 2005 surveys.

A North Carolina Natural Heritage Program element occurrence records search on October 14, 2005 revealed no element occurrences of this species within 1 mile of Survey Segment 3; however several current records of the species are located within a few miles southeast of Survey Segment 3. Therefore, it can be concluded that Survey Segment 3 of the proposed project will have a Biological Conclusion of No Effect for Schweinitz’s sunflower.

6.4 Survey Segment 4 – Gaston County

Schweinitz’s Sunflower
BIOLOGICAL CONCLUSION NO EFFECT

All potential suitable habitat areas for Schweinitz's sunflower, within Survey Segment 4 were surveyed. No populations of Schweinitz's sunflower were found during this search. The search area is farther west than other known locations, and nearly all of the area has been developed, farmed, and otherwise negatively impacted for suitable habitat. Based on the results of this survey, the project will not impact the Schweinitz's sunflower within Survey Segment 4. Based on the results of this survey the project will have No Effect on the Schweinitz’s sunflower within the area surveyed.

7.0 State-Listed Species

Survey Segments 1-3

Surveys for state-listed species were not requested as part of the protected species scope. A review of NHP files indicated that no state-listed species have been documented within or adjacent to Survey Segments 1-3 of the Detailed Study Alternatives. No directed surveys were conducted for any species other than those listed by the USFWS as Endangered for Mecklenburg or Gaston Counties.

Survey Segment 4

During the survey, an unrecorded population of Georgia aster (*Symphyotrichum georgianum* or *Aster georgianus*) was discovered in a power line right of way. The Georgia aster is State listed as Threatened. It is listed as C1 by the US Fish and Wildlife Service, which does not provide it any special protection but indicates that it is under consideration for official listing and there is sufficient information to support listing. Therefore, this species may be listed for federal protection in the future.

8.0 Conclusions

Protected plant species surveys were conducted along the Gaston County East-West Connector Detailed Study Corridors in September through October 2005. The surveys were for protected plant species listed as Threatened or Endangered by the US Fish and Wildlife Service (USFWS) that have ranges which extend into Gaston or Mecklenburg Counties.

For Mecklenburg County, there are three plant species listed as endangered: Michaux’s sumac (*Rhus michauxii*), smooth coneflower (*Echinacea laevigata*), and Schweinitz’s sunflower (*Helianthus schweinitzii*). None of the three protected plant species were found within the Detailed Study Corridors (Segment 1) during the field surveys. Therefore, the biological conclusion for each of the three species is ‘no effect’.

For Gaston County, there is one plant species listed as endangered, Schweinitz’s sunflower (*Helianthus schweinitzii*). One population of this protected plant species was found in the Detailed Study Corridor area along Union New Hope Road between NC 279 and NC 274. This population was located on the northern edge of the northernmost corridor. Due to its location in relation to the Detailed Study Corridors, it is likely possible to avoid all impacts to the observed Schweinitz’s sunflower population. The biological conclusion for the Schweinitz sunflower is “may affect/not likely to adversely effect” for the Detailed Study Corridor area in Gaston County along Union New Hope Road. For other Detailed Study Corridor areas in Gaston County, the biological conclusion is “no effect.”

Any activity permitted, funded or conducted by a federal agency that may affect a listed species or designated critical habitat requires a consultation with the USFWS. The result of the consultation is a written biological opinion of whether the proposed action is likely to result in jeopardy to a listed species or adverse modification of designated critical habitat.

9.0 References

Individual Survey Segment Reports

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United States Fish and Wildlife Service. 1994. Schweinitz's Sunflower Recovery Plan. Atlanta, Georgia.

United States Fish and Wildlife Service. 1995. Smooth Coneflower Recovery Plan. Atlanta, Georgia.

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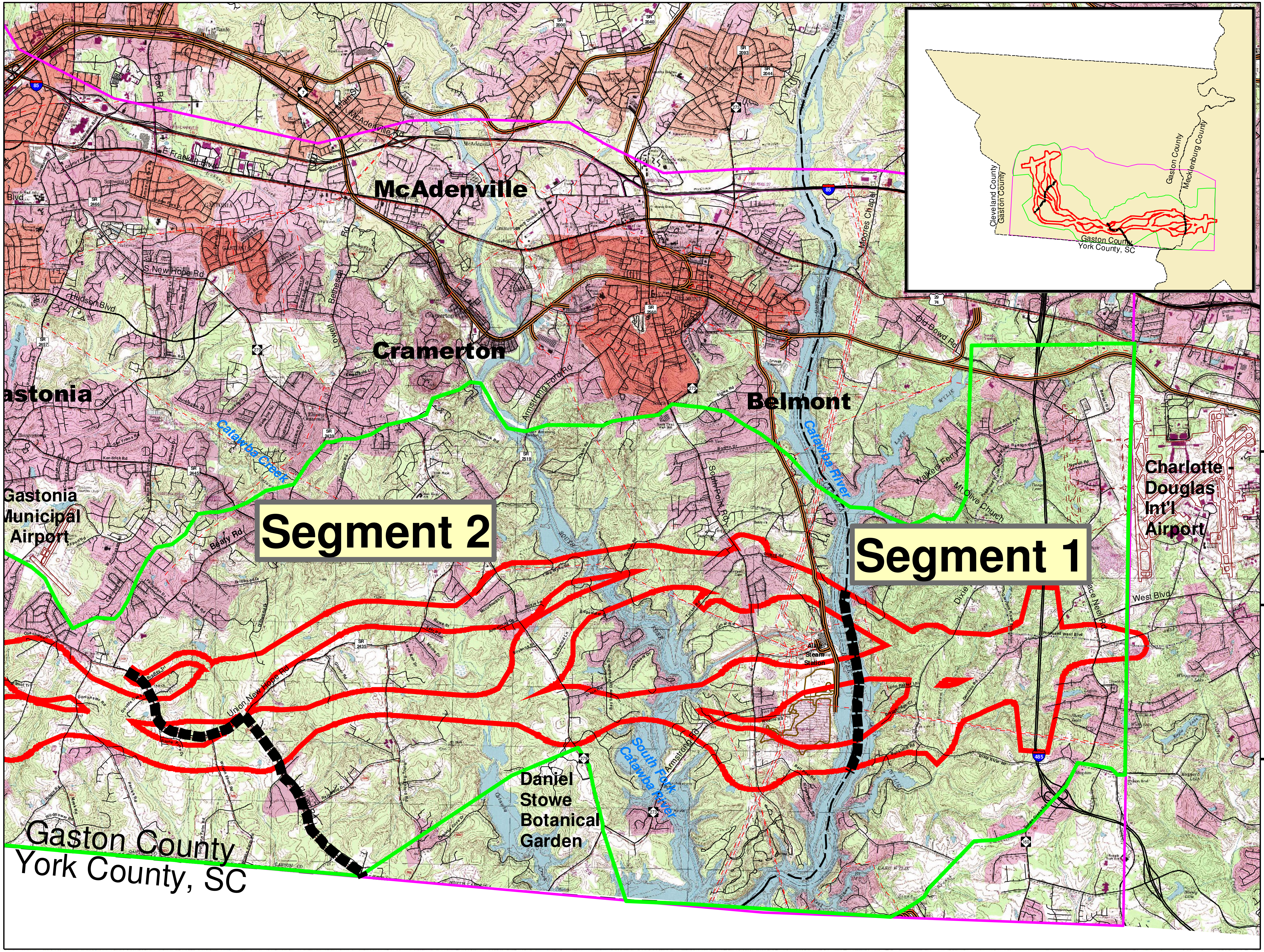


Legend

- Refined Study Area Boundary for New Location Alternatives
- Project U - 3321 Study Area Boundary
- County Line
- Transmission Lines
- Streets
- Airport
- Railroads
- Interstates
- Thoroughfares
- Segment Break Lines
- New Location Corridors

NORTH CAROLINA Turnpike Authority

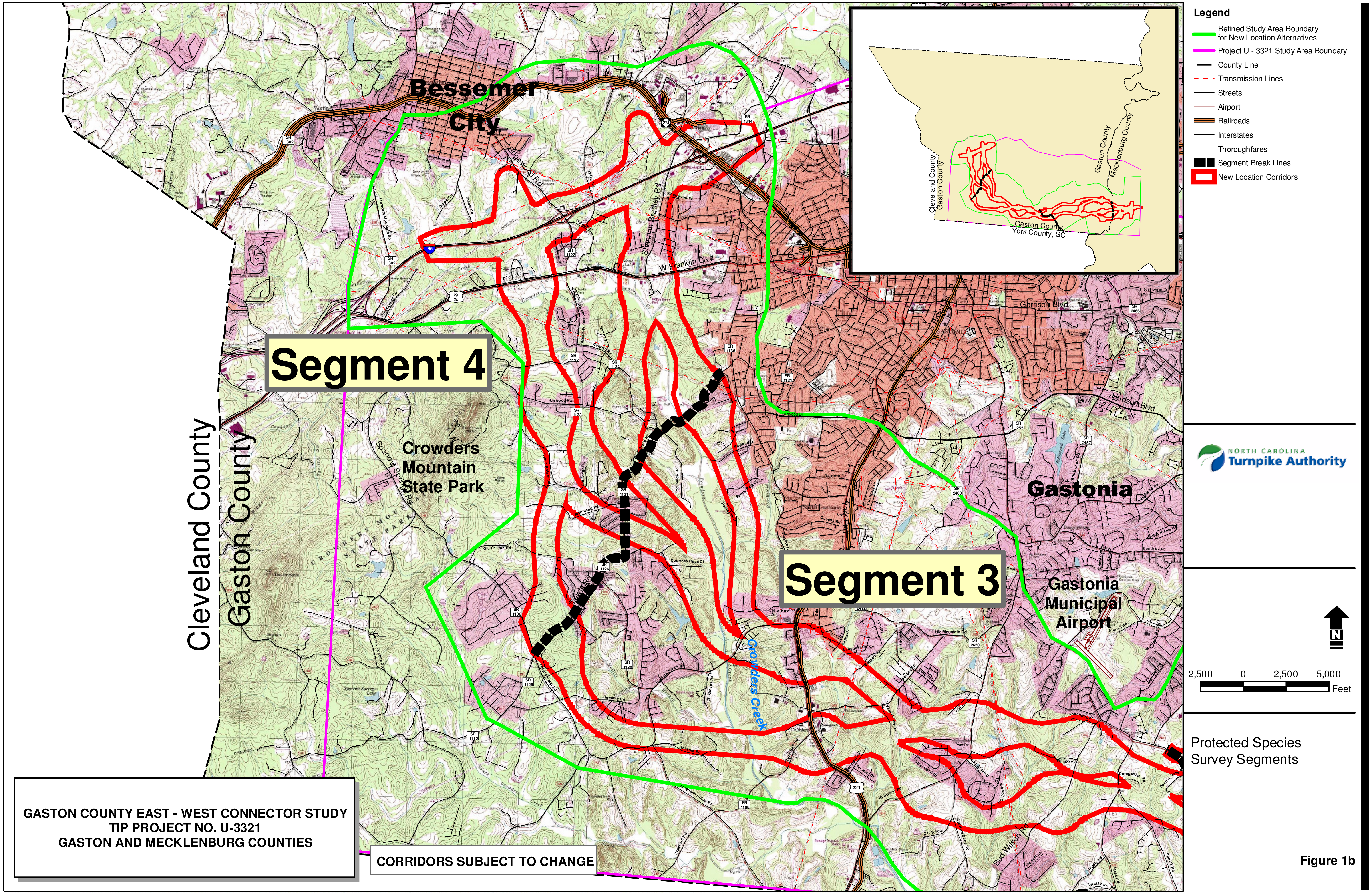
N

2,500 0 2,500 5,000 Feet

Protected Species Survey Segments

Figure 1a

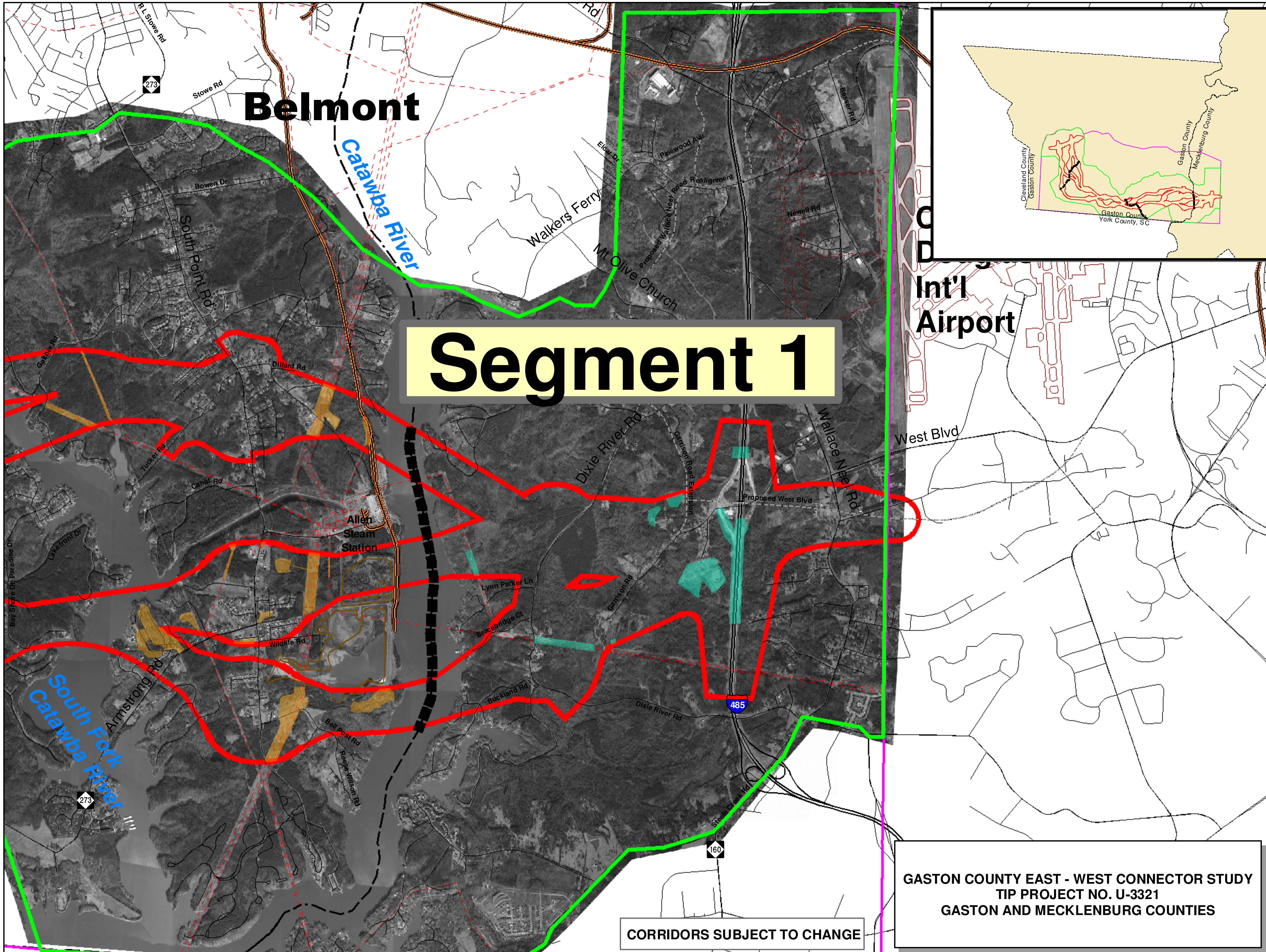
NR_Base_usgs.mxd 1/18/06



GASTON COUNTY EAST - WEST CONNECTOR STUDY
TIP PROJECT NO. U-3321
GASTON AND MECKLENBURG COUNTIES

Figure 1b

NR_Base_usgs.mxd 1/18/06



GASTON COUNTY EAST - WEST CONNECTOR STUDY
TIP PROJECT NO. U-3321
GASTON AND MECKLENBURG COUNTIES

Potential Suitable Habitat Areas

Figure 2a

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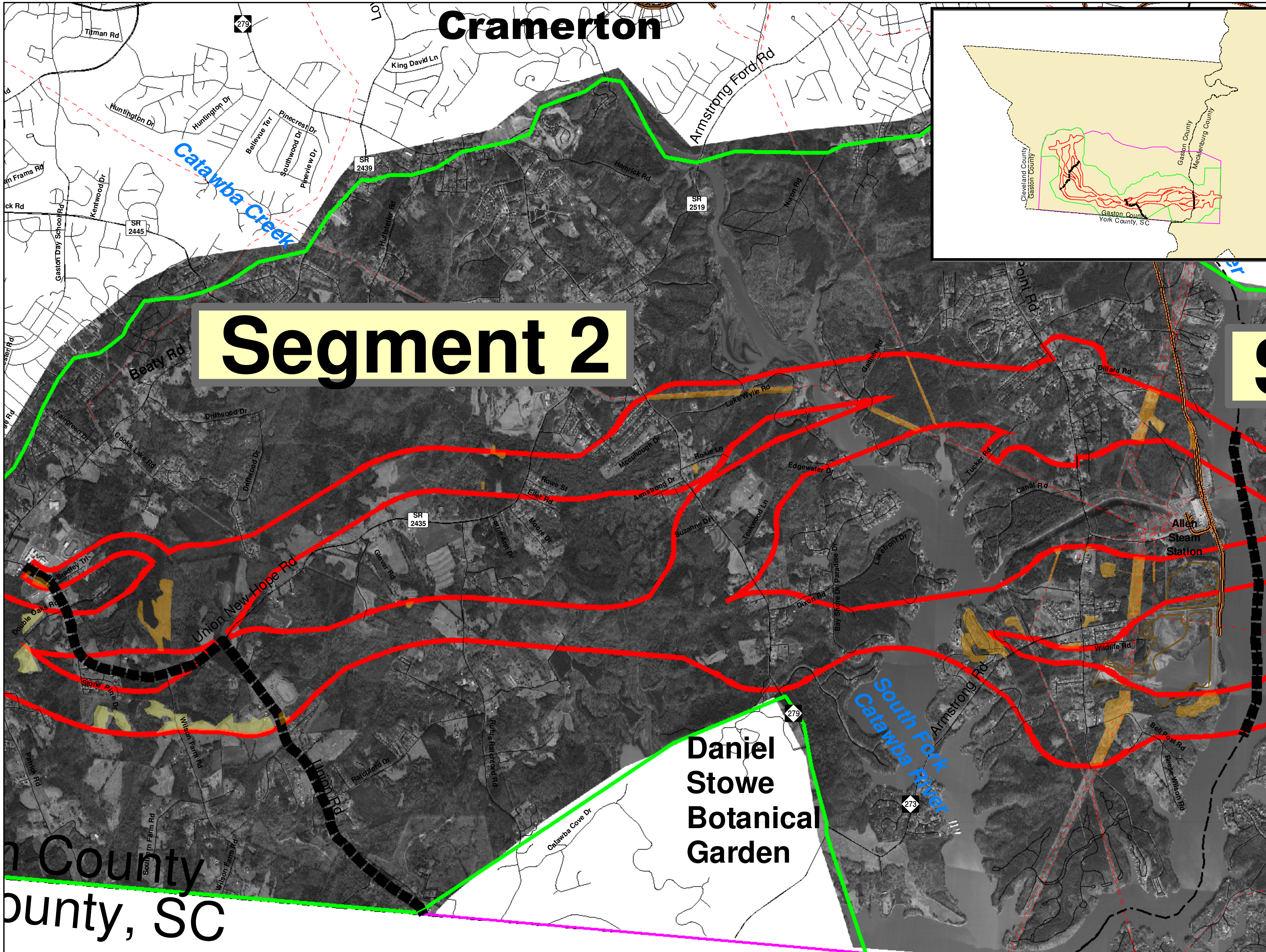


Legend

- Refined Study Area Boundary for New Location Alternatives
- Project U - 3321 Study Area Boundary
- County Line
- Transmission Lines
- Streets
- Airport
- Railroads
- Interstates
- Thoroughfares
- Segment Break Lines

Segment 2

- Potential Suitable Habitat

Segment 3

- Potential Suitable Habitat
- New Location Corridors

NORTH CAROLINA Turnpike Authority

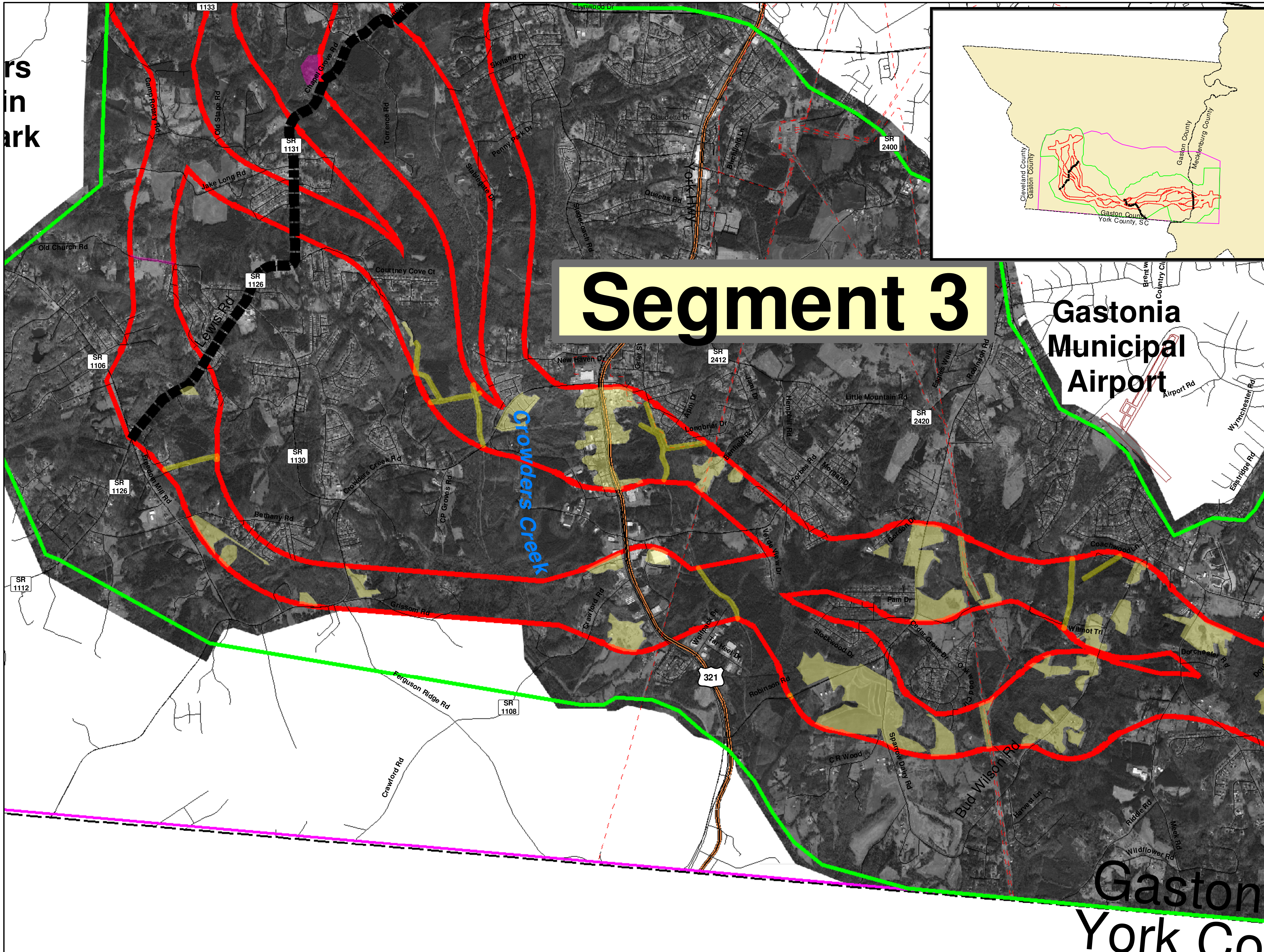
N

1,500 0 1,500 3,000 Feet

Potential Suitable Habitat Areas

Figure 2b

NR_Base_aerial_priorityareas.mxd 2/9/06



Legend

- Refined Study Area Boundary for New Location Alternatives
- Project U - 3321 Study Area Boundary
- County Line
- Transmission Lines
- Streets
- Airport
- Railroads
- Interstates
- Thoroughfares
- Segment Break Lines

Segment 3

- Potential Suitable Habitat

Segment 4

- Potential Suitable Habitat
- New Location Corridors

NORTH CAROLINA Turnpike Authority

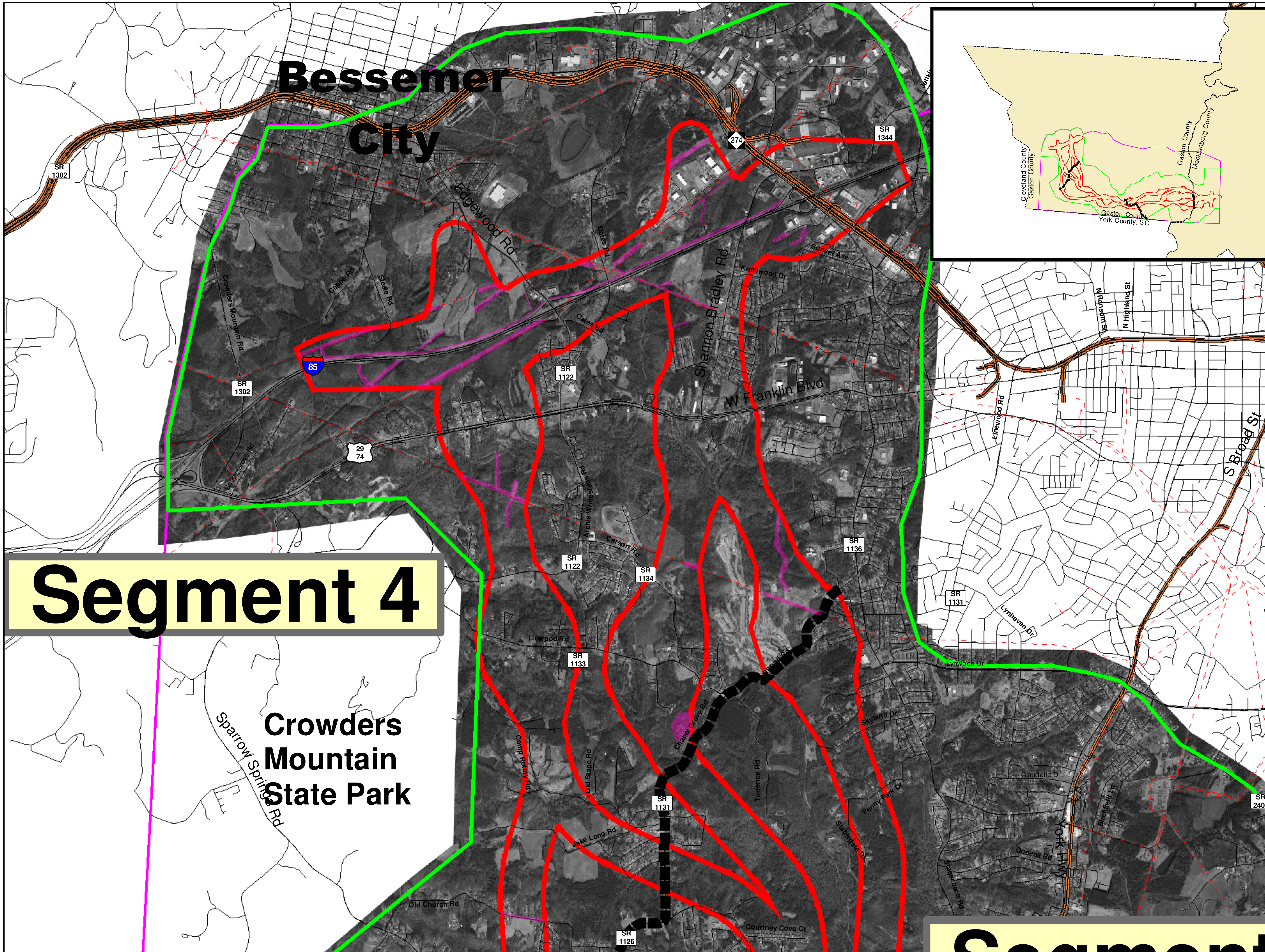
N

1,500 0 1,500 3,000 Feet

Potential Suitable Habitat Areas

Figure 2c

NR_Base_aerial_priorityareas.mxd 2/9/06



NORTH CAROLINA Turnpike Authority

Potential Suitable Habitat Areas

Figure 2d

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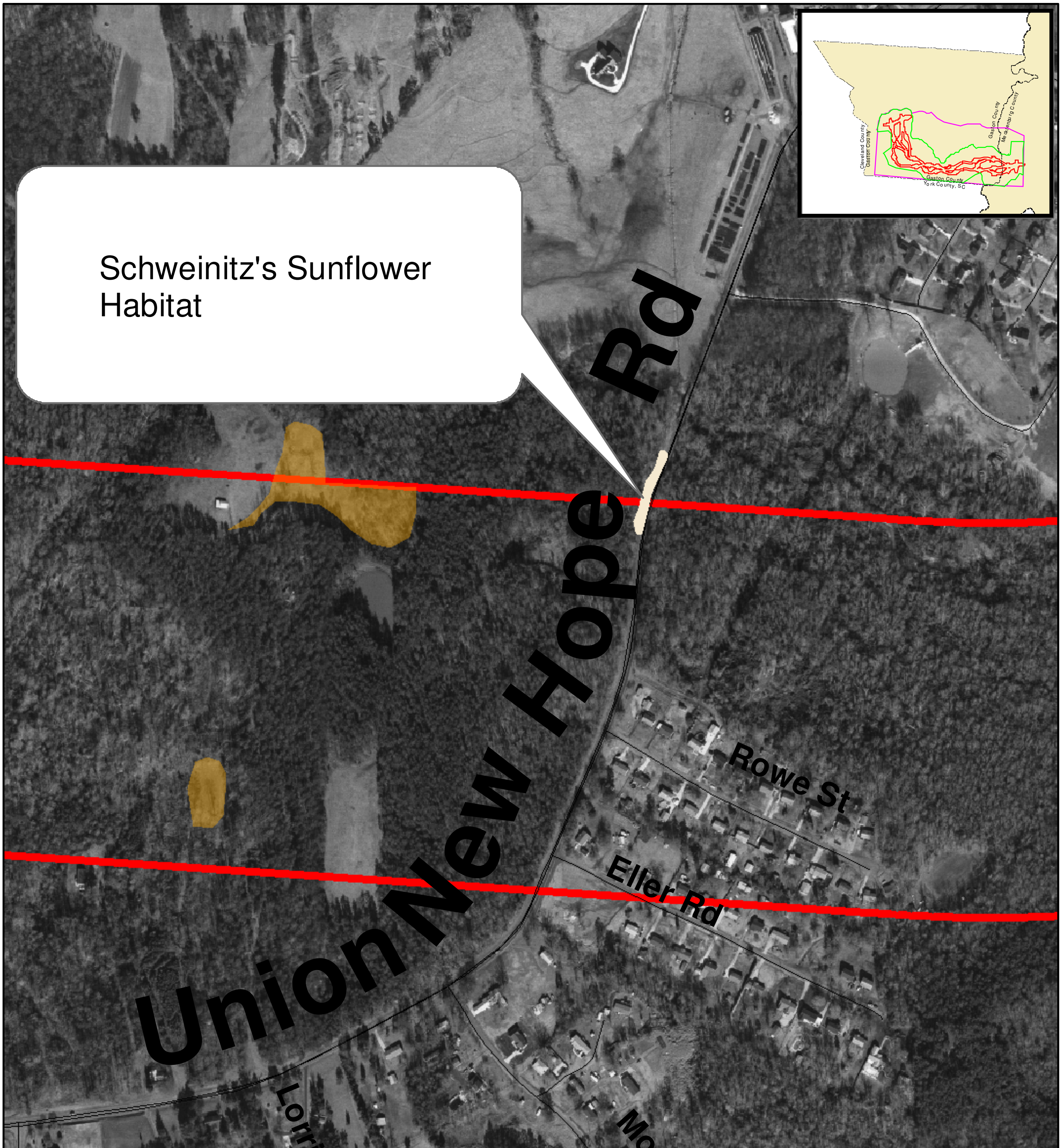

GASTON COUNTY EAST - WEST CONNECTOR STUDY
TIP PROJECT NO. U-3321
GASTON AND MECKLENBURG COUNTIES

CORRIDORS SUBJECT TO CHANGE

Legend

- Streets

Segment 2

- High Probability Areas
- New Location Corridors
- Schweinitz's Sunflower Population

NORTH CAROLINA Turnpike Authority

N

Schweinitz's Sunflower Detail

Figure 3

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 24, 2005

MEMORANDUM TO: Derrick Weaver, P.E., Group Head
Consulting Engineering Group

FROM: Jared Gray, Environmental Biologist
Office of the Natural Environment

SUBJECT: Protected species survey report for the Carolina Heelsplitter (*Lasmigona decorata*) for the proposed Gaston County East-West Connector in Gaston and Mecklenburg Counties: Federal Aid Project No. STP-1213 (6); WBS Element 34922.1.1; TIP Project No. U-3321.

The following memorandum addresses the Carolina Heelsplitter (*Lasmigona decorata*), a federally protected species listed by the U.S. Fish and Wildlife Service for Cabarrus County. The habitat requirements for the Carolina Heelsplitter are shaded areas either in ponded portions of streams or in runs along steep banks with moderate current (Bogan, 2002). The more recent habitat where the Carolina Heelsplitter has been found is sections of streams with bedrock with perpendicular crevices, with sand and gravel in between the crevices, and with large buffers associated with the stream. This project was pre-screened by Alderman Environmental Services, Wildlife Resources Commission and U. S. Fish and Wildlife Service, and this area was considered to have a low probability of containing mussels.

Surveys, Habitat and Methods

A mussel screening was conducted on September 15-16, 2005 by NCDOT biologists, Jason Mays, Kathy Herring, Mike Sanderson and Jared Gray. NCDOT biologist, Neil Medlin, Matt Haney and Jared Gray finished the screening on September 21, 2005. NCDOT biologist looked at twenty-eight streams that could be potentially crossed by the proposed Gaston East-West Connector. The results of the habitat assessments are in Table 1 of this report. NCDOT went to these thirty sites and based on what was observed conducted a typical mussel screening, (100 meters upstream and 400 meters downstream) or a habitat assessment. Some streams did not have water in them so a data sheet was completed with any pertinent information. The following paragraphs will cover the eight named streams that potentially could be crossed by the proposed project and the results of those surveys. All eight of these streams were surveyed using the typical mussel screening protocols.

The Oates Creek crossing at Oates Road (SR 1312) contains runs, riffles and pool areas with normal substrate compactness. The substrate at the crossing consists of silt, sand, cobble and gravel with medium current. Sand was the most dominant substrate in Oates Creek. The portion of the creek that was surveyed had a moderate stream buffer. The stream banks had some erosion and undercutting of its banks. The land use was sub-urban. Oates Creek is shallow with 100 percent of the stream less than 2 feet deep. Oates Creek was 2.0 meter wide and the bank heights were 1.5 meters. No freshwater mussels were found in 1.0 man-hours of survey time.

The second stream that was surveyed was Bessemer Branch. The Bessemer Branch crossing below I-85 contains runs, riffles, pools and slack areas with normal substrate compactness. The substrate above and below the pipe consists of sand, cobble and gravel with slow to medium current. Sand and gravel bars were present in Bessemer Branch. Sand and gravel were the dominant substrate in Bessemer Branch. The portion of Bessemer Branch that was surveyed had a moderate stream buffer. The stream banks had some erosion and undercutting present. The land use was natural. Bessemer Branch is shallow with 99 percent of the stream less than 2 feet deep. Bessemer Branch was 2 meters wide and bank heights were 1.5 meters. No freshwater mussels were found in 0.5 man-hours of survey time.

The next stream that was surveyed was Myrtle Creek. The Myrtle Creek crossing at NC 29/NC74 contains runs, riffles, and pool areas with normal/unconsolidated substrate compactness. The substrate above and below the culvert crossing consists of silt, sand and gravel with slow current. Silt and Sand were the dominant substrate in Myrtle Creek. The portion of Myrtle Branch that was surveyed had a narrow buffer by the road and moderate buffer downstream. There were junkyards adjacent to the road and the stream at this site and the stream banks closest to the junkyard were highly erosive and unstable. The land use was urban. Myrtle Creek is very shallow with 100 percent of the stream less than 2 feet deep. Myrtle Creek was 1.75 meters wide and bank heights were 2.5 meters. No freshwater mussels were found in 0.5 man-hours of survey time.

Crowders Creek was the next stream that was surveyed. The Crowders Creek crossing at Archie Whitesides Road (SR 1122) contains riffles, slack and pool areas with unconsolidated substrate compactness. The substrate above and below the bridge crossing consists of silt, sand pebble and gravel with slow /moderate current. Silt and sand were the dominant substrate in Crowders Creek. The portion of Crowders creek that was surveyed had a narrow buffer. According to a landowner that has lived adjacent to Crowders Creek, it ran blue when the dye plant was open. He also said when his cattle would get in the water to cool off, their hair would fall out and they would not drink the water. The land use in the area was rural. The stream banks were unstable. Crowders Creek is shallow with 95 percent of the stream less than 2 feet deep. Crowders Creek was 5 meters wide and bank heights were 2.0 meters. No freshwater mussels were found in 3.5 man-hours of survey time. Asiatic clams were found to be abundant at the second crossing of Crowders Creek on Crowders Creek Road (SR 1103).

McGill Branch is the fifth stream that was surveyed. The McGill Branch crossing at Carson Road (SR 1134) contains runs and riffles with normal substrate compactness. The substrate above and below the culvert consists of silt, sand, cobble pebble and gravel with slow current. Sand and Gravel were the dominant substrate in McGill Branch. The portion of McGill Branch that was surveyed had a maintained yard for a portion of the stream and a moderate buffer outside of the lawn. The stream banks had some erosion and undercutting present. The land use was rural. McGill Branch was very shallow with aquatic vegetation across the streambed on the upstream side of the crossing and overall was 100 percent less than 2 feet deep. McGill Branch was 0.5 meters wide and bank heights were 1.0 meter. No freshwater mussels were found in 0.5 man-hours of survey time.

Mill Creek is the sixth name stream that was surveyed. The Mill Creek crossing contains runs, riffles, slack and pool areas with normal substrate compactness. The substrate above and below the crossing consists of sand, cobble, pebble and gravel with moderate current. The stream banks were stable. The land use was rural/active pasture. Mill Creek was very shallow with 100 percent less than 2 feet deep. Mill Creek was 2 meters wide and bank heights were 1.0 meter.

Surveys were conducted, by using batiscopes, from approximately 400 meters downstream to 100 meters upstream of the project crossing. No freshwater mussels were found in 0.5 man-hours of survey time.

The next named stream that was surveyed was Catawba Creek. The Catawba Creek crossing at Union New Hope Road (SR 2435) contains runs, riffles and pool areas with normal and unconsolidated areas of compactness. The substrate above and below the bridge consists of silt, sand, and gravel with moderate current. Sand was the dominant substrate in Catawba Creek. The stream banks were unstable. The land use was natural/active pasture. Catawba Creek was shallow with 95 percent of the stream being less than 2 feet deep. Catawba Creek was 4 meters wide and bank heights were 2 meters. No freshwater mussels were found in 2.25 man-hours of survey time. Asiatic clam was found to be abundant in Catawba Creek.

The last named stream that was surveyed was Beaverdam Creek. The Beaverdam Creek crossing contains runs, riffles and pool areas with normal substrate compactness. The substrate above and below the crossing consists of silt, sand, clay, cobble and gravel with moderate current. Sand and silt were the dominant substrate in Beaverdam Creek. The stream banks had some erosion and undercutting. The land use was rural/active pasture. Beaverdam Creek was shallow with 95 percent of the stream less than 2 feet deep. Beaverdam Creek was 2 meters wide and bank heights were 1.5 meters. No freshwater mussels were found in 1.0 man-hours of survey time. Asiatic clam was found to be abundant in Beaverdam Creek.

Table 1.

Stream Name	Site No.	Flow	Substrate	Buffers	Stream width/ height	Bank Stability	Relative depth	Total Time
UT Abernathy Creek	1	Run, riffle, pool	s,sa,c,p,g	Wide	3 /.75	Some erosion	Very shallow	0.5
Oates Creek	2	Run, riffle, pool	S,sa,co,g	Moderate	2.0/1.5	Some erosion	Shallow	1.0
Bessemer Branch	3	Run, riffle, slack, pool	Sa,co,g	Moderate	2.0/1.5	Some erosion	Shallow	0.5
UT Bessemer Branch	4	Run, riffle	S,sa,g	Moderate	0.5/1.0	Some erosion	Very shallow	0.5
UT Crowders Creek	5	Run, riffle, pool	S,sa,g	Narrow/ moderate	1.75/2.5	Unstable	Very shallow	0.5
Myrtle Creek	6	Run, riffle, slack, pool	S,sa,g	Moderate	1.0/1.75	Unstable	Very shallow	0.5
Crowders Creek	7	Run, riffle, slack, pool	S,sa,p,g	Narrow	5.0/2.0	Unstable	Shallow	3.5
UT Crowders Creek	8	Run, riffle	S,sa,co,p, g	None/mo derate	0.5/1.0	Some erosion	Very shallow	0.5
UT Crowders Creek	9	Run, riffle, pool	S,sa,g	Wide	1.0/2.0	Some erosion	Shallow	1.0
UT Crowders Creek	10	Run, riffle, pool	S,sa,co,g	Moderate	0.5/2.0	Some erosion	Very shallow	0.5
McGill Creek	11	Run, riffle, slack	S,sa,co,b o,p,g	None/ moderate	2.0/1.75	Unstable	Shallow	0.75
Crowders Creek	12	Run, riffle	S,sa	Moderate / wide	7.0/2.5	Unstable	Very shallow	2.0
UT Crowders Creek	13	Run, riffle	S,sa	Moderate	2.5/2.0	Some erosion	Very shallow	0.75
UT Crowders Creek	14	Run, riffle, slack	S,sa,	Narrow/ moderate	2.5/2.5	Unstable	Shallow	0.5

UT Crowders Creek	15	Run, riffle, slack	S,sa,co,g	Moderate	1.5/1.0	Unstable	Very shallow	0.5
UT Crowders Creek	16	Run, riffle, slack	M	Narrow	1.0/2.0	Unstable	Stagnant pools	
UT Crowders Creek	17	Run, riffle, slack	S,sa,	Narrow	1.5/4.0	Unstable	Very shallow	0.5
UT Crowders Creek	18	Slack	S,sa,p,g	Moderate	3.0/1.5	stable	stagnant pools	0.5
UT Crowders	19	Run, riffle	S,sa,g	Moderate	1.0/1.5	Some erosion	No water	
Mill Creek	20	Run, riffle, pool, slack	Sa,co,p	Narrow	2.0/1.0	Very stable	Very shallow	2.0
UT Catawba Creek	21	Run, riffle, pool	S,sa,co,b, bo,g	Narrow up/wide down	2.5/2.0	Some erosion	Shallow	1.5
UT Catawba Creek	22	Run, riffle	S,sa,co	Moderate	1.0/1.0	Some erosion	No water	
UT Catawba Creek	23	Run, riffle	S,sa,co,g	Wide	2.0/1.0	Some erosion	Very shallow	1.5
UT Catawba Creek	24	Run, riffle, pool	S,sa,c,co, g	Narrow/ moderate	2.0/1.5	Some erosion	Very shallow	1.0
UT Catawba Creek	25	Run, riffle, pool	S,sa,g	Moderate	4.0/2.0	Unstable	Shallow	2.25
UT South Fork Catawba River	26	Run, riffle	S,sa,g	Moderate	0.75/1.0	Some erosion	No water	
UT South Fork Catawba River	27	Run, riffle	S,sa,co,g	Wide	0.75/0.5	Very stable	Very shallow	0.5
UT Catawba River	28	Slack	Sa,s,g	Moderate	1.0/0.5	Very stable	No water	
UT Catawba River	29	Run, riffle	S,sa,	Wide	0.75/0.5	Some erosion	Very shallow	0.5
Beaverdam Creek	30	Run, riffle	S,sa,co,g	Moderate	1.0/0.5	Some erosion	Very shallow	.75

Qualifications of Investigators

Investigator: Jared Gray
Education: B.S. Environmental Science, Morehead State University
Experience: Environmental Biologist, Enviro-Pro, October 1994 – May 1997
Environmental Technician, Appian Consulting Engineers, P.A., October 1997 – May 1998
Environmental Specialist/Supervisor, NCDOT, October 1998-present
Expertise: Endangered species (terrestrial/aquatic) surveys; benthic macroinvertebrate collection, wetland delineation; soils, water quality analysis, and 404/401 permitting.

Investigator: Neil Medlin, Environmental Supervisor
Education: M.A. Biology, Appalachian State University
B.S. Biology, Appalachian State University
Experience: Environmental Supervisor, NCDOT, January 2002 - present
Environmental Biologist, NC Division of Water Quality
June 1990 - January 2002

Environmental Biologist, FL Department of Environmental Protection (formerly Department of Environmental Regulation), August 1986 – June 1990

Expertise: Freshwater fish and benthic macroinvertebrate collection and identification; aquatic habitat evaluations and function; biocriteria and biotic indices evaluations; Endangered species (terrestrial/aquatic) surveys.

Investigator: Jason Mays, Environmental Specialist, NCDOT, March 2004-present.
Education: B.S. Biological Sciences, minor Chemistry, UNC Chapel Hill 2002.
Experience: NCWRC Field Biologist, May 2002-October 2003
Expertise: Section 7 field investigations, protected species (terrestrial/aquatic) surveys.

Investigator: Michael Sanderson, Environmental Specialist, NCDOT April 2004- present
Education: BS Fisheries and Wildlife Science, North Carolina State University
Experience: Wildlife Research Biologist, Down to Earth Environmental, February – June 2003
Wildlife Research Technician, NC Cooperative Fish and Wildlife Research unit, October, 1991-March 1999
Biological Science Technician (Wildlife), US Fish and Wildlife Service, April 1995-April 1997
Expertise: Bird surveys, behavioral analysis, habitat use/evaluation, Section 7 field investigations, protected species (terrestrial/aquatic) surveys, Wetland delineation/determination

Investigator: Kathy Herring, Environmental Supervisor
Education: B.S. Biology, University of South Carolina
Experience: Environmental Specialist/Supervisor, NCDOT, August 2004 - present
Environmental Biologist, NC Division of Water Quality, Biological Assessment Unit, December 1992 – July 2004
Environmental Biologist Supervisor, Normandeau Associates, Aiken, SC April 1988 to November 1992 and February 1982 to August 1985
Aquatic Biologist Chadwick and Associates, Inc. Denver, CO, November 1986 to March 1988
Project Manager - The Potential Effects of Flow Fluctuations on Establishing a Balanced Biological Community in Discharge Streams at the Savannah River Plant, Aiken, SC. Academy of Natural Sciences of Philadelphia**,** September 1985 to September 1986
Expertise: Freshwater fish and benthic macroinvertebrate collection and identification; aquatic habitat evaluations and function; biocriteria and biotic indices evaluations; Endangered species (terrestrial/aquatic) surveys; data analysis/report writing. Scuba diving certified.

Investigator: Matt Haney, Environmental Specialist
Education: B.S. Natural Resources, North Carolina State University
Experience: Environmental Specialist, NCDOT, October 1999-present
N.C. Forest Service, May 1998-August 1998
U.S. Forest Service, Center for Forested Wetlands Research, May 1997-August 1997

Expertise: 404/401 permitting, wetland delineations, Endangered species (terrestrial/aquatic) surveys, benthic macroinvertebrate collection.

BIOLOGICAL CONCLUSION: No Effect

Given the survey results, that no freshwater mussels were found in the Tributary Abernathy Creek, Oates Creek, Bessemer Branch, Tributaries Crowders Creek, Crowders Creek, McGill Branch, Mill Creek, Tributaries Catawba Creek, Catawba Creek, Tributaries South Fork Catawba River, Tributaries Catawba River and Beaverdam Creek, it is apparent that the Carolina Heelsplitter does not occur in the project vicinity. The North Carolina Natural Heritage Program (NCNHP) does not list a known population up or downstream in any of the above-mentioned streams, which all flow into the Catawba River. There are no known occurrences in the Catawba River up or downstream of the confluence's of these streams. The proposed Gaston East-West Connector project will have no effect on the Carolina Heelsplitter.

cc: Chris Manley, Project Manager
File: U-3321

Bogan, Art, 2002. Workbook and Key to the Freshwater Bivalves of North Carolina.

APPENDIX B

Qualifications of Principle Investigators

Plant Survey Segment 1 – Mecklenburg County – Kimley Horn and Associates

Investigator: Norton Webster, Environmental Scientist
Education: BS, Business, Wake Forest University
MS, Forestry, North Carolina State University
Experience: Kimley-Horn and Associates, Inc., December 2000 to present
Environmental Scientist, ARCADIS, Inc., July 1998 to December 2000
Expertise: Wetland/Stream Delineation, Permitting, Threatened and Endangered Species Surveys

Investigator: Tommy Cousins, Environmental Scientist
Education: BS, Environmental Science, North Carolina State University
Experience: Kimley-Horn and Associates, Inc., January 2003 to present
Expertise: Threatened and Endangered Species Surveys, GPS/Geographic Information Systems, Wetland/Stream Delineation

Investigator: Tyler McEwen, Environmental Scientist
Education: BS, Environmental Science, North Carolina State University
Experience: Kimley-Horn and Associates, Inc., March 2005 to present
Environmental Scientist, Environmental Services, Inc., January 2003 to March 2005
Expertise: Threatened and Endangered Species Surveys, GPS, Wetland/Stream Delineation, Geographic Information Systems

Plant Survey Segment 2 – Gaston County – Environmental Services, Inc.

Investigator: Gail Tyner
Education: BS North Carolina State University
Experience: 8+ years of Professional Experience
Expertise: Natural resource investigations, wetlands delineation, wetland mitigation monitoring, threatened and endangered species surveys including red-cockaded woodpecker, rough-leaved loosestrife, and Schweinitz's sunflower. Ms. Tyner has performed numerous surveys for Schweinitz's sunflower including the US 601 Widening and Dickerson Boulevard Extension in Union County and the Mallard Creek Road Improvements in Mecklenburg County.

Investigator: Jeff Benton
Education: BA University of North Carolina – Wilmington
Experience: 3+ years of Professional Experience
Expertise: Natural resource investigations, wetlands delineation, wetland mitigation monitoring, threatened and endangered species surveys including red-cockaded woodpecker, rough-leaved loosestrife, and Schweinitz's sunflower, and dwarf flowered heartleaf. Mr. Benton has performed numerous surveys for Schweinitz's sunflower on various projects throughout its preferred range in North and South Carolina.

Investigator: Matt Simon
Education: BS University of North Carolina at Chapel Hill
Experience: 3+ years of Professional Experience
Expertise: Threatened and endangered species surveys including spring-flowering goldenrod, Schweinitz's sunflower, and dwarf-flowered Heartleaf, wetland mitigation monitoring, and GIS (suitability analysis, digitizing, editing and manipulating spatial features, basin-area calculations, overlay analysis, GIS database management, georeferencing, and serving maps online). Mr. Simon has performed previous sunflower surveys including the Dickerson Boulevard Extension in Union County.

Investigator: Katie Tomany
Education: AS Landscape Architecture
Experience: 2+ years of Professional Experience
Expertise: Threatened and endangered species surveys including spring-flowering goldenrod, Schweinitz's sunflower, dwarf-flowered Heartleaf, and the Appalachian Elktoe freshwater mussel, natural resource investigations, and GPS data collection and processing.

Plant Survey Segment 3 – Gaston County – HW Lochner, Inc.

Investigator: Heather Renninger
Education: BS, Ecology, Appalachian State University
Experience: 6 years
Expertise: Natural resources surveys, endangered species surveys, wildlife biology, wetlands delineations.

Investigator: Brian Dustin
Education: BS, Forest Management, North Carolina State University
Experience: 2 years
Expertise: Natural resources surveys, wetlands delineations, dendrology, endangered species surveys, GPS.

Investigator: Susan Smith
Education: MS, Louisiana State University
Experience: 10 years
Expertise: Natural resources surveys, endangered species surveys, wildlife biology, wetlands delineations, forestry.

Investigator: Eric Galamb, PWS
Education: BS Environmental Management and Biogeography, University of Toronto
Experience: 16 years
Expertise: Natural resources surveys, regulatory agency coordination, wetland and stream permitting, wetland and stream mitigation, wetland and stream mitigation monitoring, wetland determinations and delineations utilizing US Army Corps of Engineer (USACE) methodology, stream assessments utilizing USACE and NC Division of Water Quality (DWQ) methodologies, linear corridor studies, environmental constraints mapping, NEPA/SEPA environmental assessments, wildlife surveys, and protected species surveys.

Plant Survey Segment 4 – Gaston County – Earth Tech of North Carolina, Inc.

Investigator: Jane Almon
Education: MS, Forestry, North Carolina State University
Experience: Staff Biologist, Earth Tech 6 years
Expertise: Natural resources surveys, Wetland restoration, Watershed studies

Investigator: Ron Johnson
Education: MS, Biological Sciences, Illinois State University
Experience: Biologist, Earth Tech 20 years
Expertise: Natural resources surveys, Wetland and stream mitigation

Investigator: George Lankford, PSS
Education: MS, Botany, North Carolina State University
Experience: North Carolina Licensed Soil Scientist, Biologist, Earth Tech 5 years
Expertise: Botany, Soils, Wetland delineation, Natural resources surveys

Investigator: Kevin Lapp
Education: MS, Biological Sciences, North Carolina State University
Experience: Biologist, Earth Tech, 2 year
Expertise: Conservation and Natural Resources Management

Bald Eagle Surveys – Earth Tech of North Carolina, Inc.

Investigator: Ron Johnson
Education: M.S., Biological Sciences, Illinois State University
Experience: Biologist, Earth Tech 20 years
Expertise: Natural resources surveys, wetland and stream mitigation

Investigator: Kevin Lapp
Education: M.S., Biology, Appalachian State University
Experience: Biologist, Earth Tech 2 years
Expertise: Conservation and Natural Resources Management

Mussel Surveys – NCDOT Office of Natural Environment

Investigator: Jared Gray
Education: B.S. Environmental Science, Morehead State University
Experience: Environmental Biologist, Enviro-Pro, October 1994 – May 1997
Environmental Technician, Appian Consulting Engineers, P.A., October 1997 – May 1998
Environmental Specialist/Supervisor, NCDOT, October 1998-present

Expertise: Endangered species (terrestrial/aquatic) surveys; benthic macroinvertebrate collection, wetland delineation; soils, water quality analysis, and 404/401 permitting.

Investigator: Neil Medlin, Environmental Supervisor
Education: M.A. Biology, Appalachian State University
B.S. Biology, Appalachian State University
Experience: Environmental Supervisor, NCDOT, January 2002 - present
Environmental Biologist, NC Division of Water Quality
June 1990 - January 2002
Environmental Biologist, FL Department of Environmental Protection (formerly Department of Environmental Regulation), August 1986 – June 1990
Expertise: Freshwater fish and benthic macroinvertebrate collection and identification; aquatic habitat evaluations and function; biocriteria and biotic indices evaluations; Endangered species (terrestrial/aquatic) surveys.

Investigator: Jason Mays, Environmental Specialist, NCDOT,
March 2004-present.
Education: B.S. Biological Sciences, minor Chemistry, UNC Chapel Hill 2002.
Experience: NCWRC Field Biologist, May 2002-October 2003
Expertise: Section 7 field investigations, protected species (terrestrial/aquatic) surveys.

Investigator: Michael Sanderson, Environmental Specialist, NCDOT April 2004- present
Education: BS Fisheries and Wildlife Science, North Carolina State University
Experience: Wildlife Research Biologist, Down to Earth Environmental, February – June 2003
Wildlife Research Technician, NC Cooperative Fish and Wildlife Research unit, October, 1991-March 1999
Biological Science Technician (Wildlife), US Fish and Wildlife Service, April 1995-April 1997
Expertise: Bird surveys, behavioral analysis, habitat use/evaluation, Section 7 field investigations, protected species (terrestrial/aquatic) surveys, Wetland delineation/determination

Investigator: Kathy Herring, Environmental Supervisor
Education: B.S. Biology, University of South Carolina
Experience: Environmental Specialist/Supervisor, NCDOT, August 2004 - present
Environmental Biologist, NC Division of Water Quality, Biological Assessment Unit, December 1992 – July 2004
Environmental Biologist Supervisor, Normandeau Associates, Aiken, SC
April 1988 to November 1992 and February 1982 to August 1985
Aquatic Biologist Chadwick and Associates, Inc. Denver, CO, November 1986 to March 1988
Project Manager - The Potential Effects of Flow Fluctuations on Establishing a Balanced Biological Community in Discharge Streams at the Savannah River Plant, Aiken, SC. Academy of Natural Sciences of Philadelphia**,** September 1985 to September 1986
Expertise: Freshwater fish and benthic macroinvertebrate collection and identification; aquatic habitat evaluations and function; biocriteria and biotic indices

evaluations; Endangered species (terrestrial/aquatic) surveys; data analysis/report writing. Scuba diving certified.

Investigator: Matt Haney, Environmental Specialist
Education: B.S. Natural Resources, North Carolina State University
Experience: Environmental Specialist, NCDOT, October 1999-present
N.C. Forest Service, May 1998-August 1998
U.S. Forest Service, Center for Forested Wetlands Research, May 1997-August 1997
Expertise: 404/401 permitting, wetland delineations, Endangered species (terrestrial/aquatic) surveys, benthic macroinvertebrate collection.

Wetland and Stream Delineations – Segment 1 – S&ME, Inc.

Investigator: Ms. Lisa Beckstrom, C.E., C.W.B.
Education:
Experience: Natural Resources Department Manager with 13 years experience
Expertise: Her experience includes project management; peer review/senior review of natural resources documents; environmental assessments; linear corridor studies; environmental constraints mapping; wetland determinations and delineations utilizing USACE methodology, and stream assessments utilizing USACE and DWQ methodology; wetland and stream permitting; wetland and stream mitigation; agency coordination; coordination with acquiring conservation easements; biological assessments and protected species assessments.

Investigator: Ms. Suzanne L. Knudsen
Education:
Experience: 4 years experience
Expertise: Her experience includes mitigation monitoring, macrobenthic monitoring, observation of sediment and erosion control measures, wildlife management, wetlands ecology, waterfowl surveys, avian identification, environmental assessment/Natural Resources Technical Memorandum/Natural Systems Study preparation, Environmental Report preparation for Rural Development and U.S. Housing of Urban Development; wetland determinations and delineations utilizing USACE methodology; stream assessments utilizing USACE and DWQ methodology; biological assessments, and Section 404/401 permitting.

Investigator: Mr. Joey Lawler, P.W.S.
Education:
Experience: Natural Resources Project Manager with 12 years experience
Expertise: His experience includes wetland determinations and delineations utilizing USACE and DWQ methodology; stream assessments utilizing USACE and DWQ methodologies; coastal wetland delineation; Coastal Area Management Act (CAMA) permitting; Section 404.401 permitting; enforcement resolution; protected species assessments; stream geomorphological assessment and monitoring in accordance with Rosgen methodology; macrobenthos monitoring in accordance with DWQ and Environmental Protection Agency protocols.

Investigator: Ms. Catherine McRae, C.E.
Education:
Experience: 8 years experience
Expertise: Her experience includes plant community identification and assessment; plant keying and the use of technical plant identification manuals; protected species assessments; Section 7 consultation with the USFWS; environmental assessments; habitat management; prairie, stream, and wetland mitigation and monitoring; stream restoration projects; mitigation for stream and wetland impacts permitted through the USACE; planting design for extended wetland detention systems; wetland determinations and delineations utilizing USACE and DWQ methodologies; and stream assessments utilizing USACE and DWQ methodologies.

Investigator: Ms. Patricia Kelly
Education:
Experience: 3 years experience
Expertise: Her experience includes wetland determinations and delineations utilizing USACE methodology; stream assessments utilizing USACE and DWQ methodology; protected species assessments; Section 404/401 permitting; biological assessment in accordance with Endangered Species Act (Section 7); ecological site assessment and ecological sampling; ArcView and GPS mapping; avian identification; invasive plant management; and sediment and erosion control inspection.

Investigator: Mr. David Homans
Education:
Experience: 2 years experience
Expertise: His experience includes stream assessments utilizing USACE and DWQ methodology; benthic macroinvertebrate monitoring and identification; freshwater fish monitoring and identification; aquatic community classification; GIS mapping; MS Access database management and development; natural resources data management; multivariate and information-theoretic statistical methods; wetlands ecology; fluvial geomorphology; and GPS plotting.

Investigator: Ms. Crystal Fox
Education:
Experience: 1 year experience
Expertise: Her experience includes conservation easement monitoring and stewardship; habitat restoration for the bog turtle (*Clemmys muhlenbergii*); wetland determinations and delineations utilizing USACE methodology; stream assessments utilizing USACE and DWQ methodology; ArcView and GPS mapping; wetland ecology, amphibian and reptile identification; and amphibian population monitoring.

Investigator: Ms. Melanie McKinney, L.S.S.
Education:
Experience: Ms. McKinney has 5 years experience and provided field support for the project.

Expertise: Her experience includes wetland determinations and delineations utilizing USACE methodology; stream assessments utilizing USACE and DWQ methodology; Section 404/401 permitting; soil classification; soil and site evaluations; and Technical Management of Land Application Programs for industrial and municipal biosolids and water treatment plant residual solids.

Wetland and Stream Delineations – Segment 2 – J.A. Carter and Associates, Inc.

Investigator: Tracy E. Rush
Education: M.S. Forest Resources, The Pennsylvania State University, 1992.
B.S. Biology (Botany Option), The Pennsylvania State University, 1988.
Experience: Senior Biologist/ Botanist, JCA, Jul. 2000 – present.
Botanist, Washington State Natural Heritage Program, Apr. 1997 – June 2000.
Biologist/Botanist, JCA, Jan. 1993 – Jan. 1996.
Expertise: Protected species surveys for flora and fauna, native plant identification, biotic community identification, preparation of Biological and Environmental Assessments, wetland delineation, restoration, monitoring and permitting, forest management, vegetation monitoring and GPS/GIS.

Investigator: William B. Mullin
Education: B.T. Wildlife Management, SUNY Cobleskill, 1998.
A.T. Fisheries and Wildlife Technologies, SUNY Cobleskill, 1996.
Experience: Wetlands Biologist, JCA, August 2004 – present.
Environmental Scientist, The Chazen Companies, May 2001 – Aug. 2004, New York.
Environmental Analyst, The Louis Berger Group, April 1999 – May 2001, New Jersey.
Wildlife Technician, NY State Department of Environmental Conservation, Jan. 1998 – Dec. 1998.
Expertise: Wetland delineation and restoration, hydric soils, wetland hydrology, vegetation and groundwater monitoring, protected species surveys for flora and fauna, flora and fauna sampling and population dynamics, aerial photograph interpretation, GPS survey, and proficiency with a wide variety of computer systems and software.

Investigator: Jennifer M. Freeman
Education: B.S. Fisheries and Wildlife Sciences, Minor in Environmental Science, NC State University, 2004.
A.S. Biological Sciences, Grand Rapids Community College, Grand Rapids, Michigan, 2002.
Experience: Biologist, JCA, Mar. 2005 – present.
Forestry Technician, NC State University, Aug. 2004 – Mar. 2005.
Research Technician, NC State University, May 2003 – Aug. 2003
Expertise: Stream identification, wetland delineation and restoration, protected species surveys for flora and fauna, vegetation monitoring, preparation of Biological Assessments, monitoring and management of red-cockaded woodpeckers, including banding and demographic monitoring of color-banded birds, forest inventory, prescribed burning and GPS/GIS.

Wetland and Stream Delineations – Segment 3 – Catena Group

Investigator: Mike Callahan
Education: MS, Soil Science, Pennsylvania State University
BS, Soil Science, Pennsylvania State University
Experience: 6 years experience in the delineation of soil boundaries for various purposes
Expertise: He has worked in both the private sector as well as for the USDA-Agricultural Research Service. His expertise lies in soil morphology and classification as well as nutrient management and soil chemistry.

Investigator: Tom Dickinson
Education: BS, Forestry/Natural Resources, University of the South
Experience:
Expertise: Through his employment with the NCDOT and The Catena Group, Mr. Dickinson has gained varied experience fulfilling compliance with NEPA, ESA, CWA, and other state and federal mandates as they apply to avoiding and minimizing impacts to the natural environment for both public and private entities. He has expertise in scientific survey techniques for T/ E species and their identification, particularly freshwater mussels, as well as the environmental permitting process. He is also experienced in wetland and stream delineation and natural resource investigation.

Investigator: Shay Garriock
Education: BS, Wildlife Resources, Virginia Tech
Experience: seven years
Expertise: Mr. Garriock has managed or assisted on projects involving natural systems investigations, protected species surveys, environmental permitting, water quality monitoring, nutrient loading analysis, mitigation site searches, and mitigation site monitoring. He is permitted to survey for rare and protected butterflies on the state and federal levels, and he is also experienced in performing small mammal, avian, herpetological, and terrestrial and aquatic invertebrate surveys. His other skills are varied and include wetland and stream delineation, plant community and habitat mapping.

Investigator: Jonathan Hartsell
Education: MS, Marine Biology, University of North Carolina at Wilmington
Experience: nine years of experience
Expertise: Mr. Hartsell has received training in the identification of intermittent and perennial streams under the direction of North Carolina State University. Other professional expertise includes jurisdictional area delineations, stream and riparian buffer determinations, protected species surveys, and environmental document preparation.

Investigator: John Lancaster
Education: BS, Economics, University of North Carolina at Chapel Hill
Experience:
Expertise: He has been a Head Field Instructor for troubled teens in various therapeutic wilderness programs and has enlightened the students through the teaching of the

flora and fauna of the regions throughout the country (Oregon, Idaho, Florida, and western North and South Carolina.) Throughout this project he has gained experience in jurisdictional wetland and stream delineations, stream identification, GPS field surveys, protected species surveys, plant and wildlife identification, plant community mapping, GIS mapping and analysis, as well as environmental document preparation.

Investigator: Jennifer Logan
Education: BS, Environmental Resource Management, Pennsylvania State University MS, Environmental Pollution Control, Pennsylvania State University
Experience: five years experience
Expertise: She is qualified to perform Phase I and II Environmental Site Assessments and permitting various projects. Ms. Logan is experienced with natural resource investigations, jurisdictional wetland and stream delineations, protected species surveys, stream classifications and GPS surveys. Other professional expertise includes NEPA/SEPA (Environmental Assessments and Environmental Impact Statements) documentation.

Investigator: Kate Montieth
Education: MS, Environmental Sciences, University of Rhode Island
BS, Biology, Reed College
Experience: 6 years experience in the environmental field
Expertise: Ms. Montieth has conducted field research and species inventories for reptiles and amphibians. Ms. Montieth has received training in the identification of intermittent and perennial streams under the direction North Carolina State University. Other professional expertise includes jurisdictional area delineations, stream and riparian buffer determinations, protected species surveys, permit preparation, and environmental document preparation.

Investigator: Chris Sheats
Education: BS, Botany, North Carolina State University
Experience: 4 years of experience with natural resource investigations
Expertise: His experience includes wetland and stream mitigation, jurisdictional wetland and stream delineations, environmental permitting, threatened and endangered species surveys, natural systems assessments, stream classifications, and graphics mapping. He has had training in applied fluvial geomorphology, stream classification, basic processes of hydric soils, evaluations of advanced problems in hydric soils, benthic macroinvertebrate sampling, and the identification of intermittent and perennial streams.

APPENDIX C

Waters of the U.S Tables

U-3321 Gaston East-West Connector
Pond Impacts by Alternative (Acres)

Earth Tech Pond ID	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
1																
2									0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
3									0.06	0.06	0.06	0.06	0.06	0.54	0.06	0.06
4																
5																
6																
7																
8																
9																
10																
11																
12	1.23	1.23	1.23	1.23												
13																
14													0.11	0.54	0.11	0.11
15									0.18	0.18	0.18	0.18				
16																
17																
18	0.03	0.03	0.03	0.03	0.06	0.06	0.06	0.06					0.07	0.07	0.07	0.07
19									0.05	0.05	0.05	0.05				
20																
21																
22																
23										0.12	0.12	0.12				
24	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15				1.15	1.43	1.15	1.15
25																
26																
27										0.52	0.52	0.52				
28																
29																
30	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68				0.68	0.68	0.68	0.68
31																
32																
33	1.10				1.10				1.10				1.10			
34																
35																
36	1.50				1.50				1.50				1.50			
37		0.34	0.34	0.34		0.34	0.34	0.34		0.34	0.34	0.34		0.47	0.34	0.34
38																
39	0.32				0.32				0.32				0.32			
40		0.41	0.41	0.41		0.41	0.41	0.41		0.41	0.41	0.41		0.41	0.41	0.41
41																
42	0.05				0.05				0.05				0.05			
43																
44																
45																
46																
47																
48		0.17	0.17			0.17	0.17			0.17	0.17			0.76	0.17	
49																
50																
51																
52	0.20			0.20	0.20			0.20	0.20			0.20	0.20			0.20
53																
54																
55																
56		1.06				1.06				1.06				1.06		
57	0.06		0.06	0.06	0.06		0.06	0.06	0.06		0.06	0.06	0.06		0.06	0.06
58																
Total	**6.3**	**5.1**	**4.1**	**4.1**	**5.1**	**3.9**	**2.9**	**2.9**	**5.5**	**3.1**	**2.1**	**2.1**	**5.5**	**6.1**	**3.2**	**3.3**

U-3321 Gaston East-West Connector
Wetland Impacts by Alternative (Acres)

Wetland Number	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
1																
2																
3									0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
4									0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
5									0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
6									0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
7																
8									0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
9																
10																
11									0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
12									4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20
13																
14																
15																
16																
17									0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
18									0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
19																
20																
21																
22																
23									0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
24																
25																
26																
27																
28																
29	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10								
30	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03								
31																
32																
33																
34																
35	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17								
36	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06								
37																
37A																
38																
39																
40																
41																
42																
43	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01								
44	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05								
45																
46																
47																
48																
49																
50																
51	1.35	1.35	1.35	1.35	2.07	2.07	2.07	2.07								
52																
53																
54					0.48	0.48	0.48	0.48								
55					0.07	0.07	0.07	0.07								
56					0.26	0.26	0.26	0.26								
57					0.10	0.10	0.10	0.10								
58	0.01	0.01	0.01	0.01												
59	0.01	0.01	0.01	0.01												
60																
60A																
61																
62									0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
63									0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
64																
65																
66																
67																
68									0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
69									< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
70									0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
71																
72																
73					0.08	0.08	0.08	0.08								
74																
75																
76																
77																

U-3321 Gaston East-West Connector
Wetland Impacts by Alternative (Acres)

Wetland Number	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
78	0.04	0.04	0.04	0.04												
79	< 0.01	< 0.01	< 0.01	< 0.01												
80																
81	0.03	0.03	0.03	0.03												
82	0.21	0.21	0.21	0.21												
83	0.01	0.01	0.01	0.01												
84	0.01	0.01	0.01	0.01												
85																
86	0.03	0.03	0.03	0.03												
87	< 0.01	< 0.01	< 0.01	< 0.01												
88													< 0.01	< 0.01	< 0.01	< 0.01
89									0.05	0.05	0.05	0.05				
90									0.91	0.91	0.91	0.91				
91																
92																
93																
94																
95																
96					0.08	0.08	0.08	0.08								
97					0.11	0.11	0.11	0.11								
98																
99	0.46	0.46	0.46	0.46												
100	0.04	0.04	0.04	0.04												
101																
102																
103					1.73	1.73	1.73	1.73					1.92	1.92	1.92	1.92
104																
105																
106	< 0.01	< 0.01	< 0.01	< 0.01	0.37	0.37	0.37	0.37					0.41	0.41	0.41	0.41
107	0.01	0.01	0.01	0.01												
108	0.04	0.04	0.04	0.04												
109	0.03	0.03	0.03	0.03												
110									< 0.01	< 0.01	< 0.01	< 0.01				
110A																
111																
112																
113																
114									0.06	0.06	0.06	0.06				
115									0.05	0.05	0.05	0.05				
116																
117																
118									0.03	0.03	0.03	0.03				
119																
120																
121																
122																
123																
124																
125																
126																
127									1.66	1.66	1.66	1.66				
128									0.07	0.07	0.07	0.07				
129																
130																
131																
132																
133																
134										0.52	0.52	0.52				
135																
136																
137																
138																
139																
140										0.04	0.04	0.04				
141										< 0.01	< 0.01	< 0.01				
141A																
142																
143																
144										0.18	0.18	0.18				
145										0.12	0.12	0.12				
146																
147																
148																
149																
150																
151																
152																
153																
154																

U-3321 Gaston East-West Connector
Wetland Impacts by Alternative (Acres)

Wetland Number	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
155	0.03				0.03				0.03				0.03			
156										0.04	0.04	0.04				
157																
158																
159																
160										0.02	0.02	0.02				
161		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01						< 0.01	< 0.01	< 0.01
162										0.07	0.07	0.07				
163																
164		0.02	0.02	0.02		0.02	0.02	0.02						0.02	0.02	0.02
165																
166		0.05	0.05	0.05		0.05	0.05	0.05						0.05	0.05	0.05
167																
168	0.15				0.15				0.15				0.15			
169																
170																
171																
172																
173																
174																
174A																
175																
176																
177																
178																
179																
180																
181																
182																
183																
184																
185																
186																
187																
188		0.17	0.17	0.17		0.17	0.17	0.17		0.17	0.17	0.17		0.17	0.17	0.17
189		0.36	0.36	0.36		0.36	0.36	0.36		0.36	0.36	0.36		0.36	0.36	0.36
190																
191																
192																
193																
194	0.02				0.02				0.02				0.02			
195	0.01				0.01				0.01				0.01			
196	0.04				0.04				0.04				0.04			
197	0.18				0.18				0.18				0.18			
198																
199																
199A																
200																
201	0.05				0.05				0.05				0.05			
202																
202A																
203	0.01				0.01				0.01				0.01			
203A																
204	0.02				0.02				0.02				0.02			
205	0.01				0.01				0.01				0.01			
206	0.01				0.01				0.01				0.01			
207																
208	0.12				0.12				0.12				0.12			
209																
210																
211	0.10				0.10				0.10				0.10			
212	0.05				0.05				0.05				0.05			
213	0.05				0.05				0.05				0.05			
214																
214																
215																
216																
217		0.02	0.02	0.02		0.02	0.02	0.02		0.02	0.02	0.02		0.02	0.02	0.02
218		0.05	0.05	0.05		0.05	0.05	0.05		0.05	0.05	0.05		0.05	0.05	0.05
219		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01
220																
221																
222																
223																
224																
225																
226																
227																
228																

U-3321 Gaston East-West Connector
Wetland Impacts by Alternative (Acres)

Wetland Number	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
229																
230																
231																
232																
233																
234																
235		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
235A																
236		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01
237																
238																
239																
239A																
240																
241		0.89	0.89	0.89		0.89	0.89	0.89		0.89	0.89	0.89		0.89	0.89	0.89
242																
243																
244																
245																
246		0.07	0.07	0.03		0.07	0.07	0.03		0.07	0.07	0.03		0.07	0.07	0.03
247		0.01	0.01			0.01	0.01			0.01	0.01			0.01	0.01	
248		1.25	1.25	1.50		1.25	1.25	1.50		1.25	1.25	1.50		1.25	1.25	1.50
249																
250																
251																
252																
252A																
253				0.35				0.35				0.35				0.35
254				0.01				0.01				0.01				0.01
255				0.01				0.01				0.01				0.01
256																
257																
258	< 0.01				< 0.01				< 0.01				< 0.01			
259	0.03				0.03				0.03				0.03			
260	0.06				0.06				0.06				0.06			
261																
262																
263																
264																
265																
266																
267																
268	0.57				0.57				0.57				0.57			
269	0.01				0.01				0.01				0.01			
270																
271																
272	0.74				0.74				0.74				0.74			
273																
274																
275	0.05				0.05				0.05				0.05			
275A																
276	0.18				0.18				0.18				0.18			
277																
278																
279																
280																
281																
281A																
282	0.01				0.01				0.01				0.01			
283																
283A																
284																
285	0.05			0.04	0.05			0.04	0.05			0.04	0.05			0.04
286																
287																
288	< 0.01			< 0.01	< 0.01			< 0.01	< 0.01			< 0.01	< 0.01			< 0.01
289	0.23			0.23	0.23			0.23	0.23			0.23	0.23			0.23
290																
291																
292																
293																
293A																
294																
295																
296																
297																
298																
298A																
299																

U-3321 Gaston East-West Connector
Wetland Impacts by Alternative (Acres)

Wetland Number	Alt 4	Alt 5	Alt 6	Alt 9	Alt 22	Alt 23	Alt 24	Alt 27	Alt 58	Alt 64	Alt 65	Alt 68	Alt 76	Alt 77	Alt 78	Alt 81
300																
301			3.98				3.98				3.98				3.98	
302																
303																
304			0.18				0.18				0.18				0.18	
304A																
304B																
305																
305A																
305B																
306																
306A																
307																
308																
309																
310																
311																
312																
313																
314																
315		0.01				0.01				0.01				0.01		
316		0.13				0.13				0.13				0.13		
316A																
316B																
316C																
316D		< 0.01				< 0.01				< 0.01				< 0.01		
317	0.37	0.51	0.37	0.37	0.37	0.51	0.37	0.37	0.37	0.51	0.37	0.37	0.37	0.51	0.37	0.37
317A																
318																
319																
320	0.01		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01	0.01		0.01	0.01
321	0.02		0.02	0.02	0.02		0.02	0.02	0.02		0.02	0.02	0.02		0.02	0.02
322		0.21				0.21				0.21				0.21		
332A																
323	0.02	< 0.01	0.02	0.02	0.02	< 0.01	0.02	0.02	0.02	< 0.01	0.02	0.02	0.02	< 0.01	0.02	0.02
324	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02
325	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
326																
327																
328																
329	0.42	0.56	0.42	0.42	0.42	0.56	0.42	0.42	0.42	0.56	0.42	0.42	0.42	0.56	0.42	0.42
329A																
330																
331																
331A																
332																
333	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
333A	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
334	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
335																
336																
337																
337A																
337B																
TOTAL	**7.4**	**8.1**	**11.7**	**8.4**	**10.5**	**11.2**	**14.8**	**11.5**	**12.1**	**13.7**	**17.3**	**14.0**	**11.6**	**12.3**	**15.9**	**12.6**

U-3321 Gaston East-West Connector
Ponds

Earth Tech Pond ID	Consultant Pond ID	Consultant	Acres within Corridor	Cowardin Classification
1	W2	S&ME	0.58	PUB3Hh
2	W3	S&ME	0.44	PUBHh
3	W4	S&ME	0.54	PUBHh
4	W64	S&ME	1.31	PEM1/PUBHh
5	W68	S&ME	1.56	PUBHh/PEM1Fh
6	W26	S&ME	0.57	PUBHh
7	W34	S&ME	1.35	PUBHh/PSS1Fh
8	W35	S&ME	0.54	PUBHh/PEM1Fh
9	W101	S&ME	2.93	PUB3Hh
10	W94	S&ME	0.82	PUB3Hhx
11	W93	S&ME	0.93	PUB3Hhx
12	W121	S&ME	1.23	PUB3Hh
13	W109	S&ME	0.52	PUB3Hh
14	W99	S&ME	0.54	PUB3Hh
15	W112	S&ME	0.18	PUB3Hh
16	W116	S&ME	0.24	PUB3Hh
17	W143	S&ME	0.26	PUB3H
18	W141	S&ME	0.07	PUB3Hh
19	W128	S&ME	0.46	PUB3Hh
20	W132	S&ME	0.81	PUB3Hh
21	W146	S&ME	0.11	PUB3Hh
22	W149	S&ME	0.12	PUB3Hh
23	D13 Pond	JCA	1.71	PUBHh
24	D24 Pond	JCA	1.43	PUBHh
25	D16 Pond	JCA	1.93	PUBHh
26	N/A	JCA	0.27	PUBHh
27	D28 Pond	JCA	0.72	PUBHh
28	D21 Pond	JCA	0.90	PUBHh
29	D25 Pond	JCA	0.17	PUBHh
30	D23 Pond	JCA	0.68	PUBHh
31	W2-027	JCA	0.08	PUBHh
32	D26 Pond	JCA	0.30	PUBHh
33	D31 Pond	JCA	1.26	PUBHh
34	D35 Pond	JCA	0.34	PUBHh
35	D42 Pond	JCA	0.77	PUBHh
36	D47 Pond	JCA	1.50	PUBHh
37	D53 Pond	JCA	0.47	PUBHh
38	D64 Pond	JCA	0.54	PUBHh
39	D70 Pond	JCA	1.38	PUBHh
40	D77 Pond	JCA	0.41	PUBHh
41	D96 Pond	JCA	0.65	PUBHh
42	D90 Pond	JCA	0.79	PUBHh
43	D112 Pond	JCA	0.06	PUBHh
44	D105 Pond	JCA	2.42	PUBHh
45	Pond 1	Catena	1.00	PUBHh
46	Pond 2	Catena	1.04	PUBHh
47	Pond 3	Catena	0.11	PUBHh

U-3321 Gaston East-West Connector
Ponds

Earth Tech Pond ID	Consultant Pond ID	Consultant	Acres within Corridor	Cowardin Classification
48	Pond 4	Catena	0.76	PUBHh
49	Pond 5	Catena	0.73	PUBHh
50	Pond 6, 7, 8	Catena	6.19	PUBHh
51	Pond 10	Catena	0.16	PUBHh
52	Pond 9	Catena	0.20	PUBHh
53	Pond 11	Catena	0.32	PUBHh
54	Pond 12	Catena	0.03	PUBHh
55	Pond 13	Catena	0.08	PUBHh
56	Pond 14	Catena	1.06	PUBHh
57	Pond 15	Catena	0.06	PUBHh
58	Pond 16	Catena	1.063	PUBHh

U-3321 Gaston East-West Connector
Streams

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
1	Abernethy Creek	Perennial	491	4 - 5	30 - 40	2 - 36	Cobble	C	42
2	UT to Crowders Creek	Perennial	2422	4 - 5	5 - 15	2 - 24	Cobble, sand	C	45.5
3	UT to Crowders Creek	Perennial	123	1	3	1	Silt	C	26
4	UT to Crowders Creek	Perennial	2439	4 - 6	15	2 - 42	Cobble, bedrock	C	42.5
5	UT to Crowders Creek	Perennial	362	1 - 3	3	1	Cobble, gravel	C	31
6	UT to Crowders Creek	Intermittent	187	1 - 3	3	0 - 4	Cobble, sand	C	22.5
7	UT to Crowders Creek	Intermittent	80	1	1	<1	sand	C	22
8	UT to Crowders Creek	Perennial	1608	1 - 4	3	4	Cobble, gravel	C	39
9	UT to Crowders Creek	Intermittent	138	1 -2	2	1 - 2	Cobble, gravel	C	40.5
9	UT to Crowders Creek	Perennial	6801	2-4	3-8	2 - 12	Bedrock, cobble	C	40.5
9A	UT to Crowders Creek	Intermittent	29	4	2	<1	Sand, gravel	C	20
10	UT to Crowders Creek	Perennial	171	3	3	2	Cobble, gravel	C	24.5
10A	UT to Crowders Creek	Perennial	83	1	1	1	gravel	C	22
11	UT to Crowders Creek	Intermittent	57	4	2	<1	Sand, gravel	C	19
12	UT to Crowders Creek	Intermittent	113	<1	2	0 - 2	Silt	C	20.5
13	UT to Crowders Creek	Perennial	534	2 - 4	2.5	2 - 4	Cobble, gravel	C	35.5
14	Crowders Creek	Perennial	12684	10 - 15	40 - 55	12	Sand, cobble, bedrock	C	34.5 - 52.5
15	UT to Crowders Creek	Perennial	716	3	3	1	Silt, sand	C	27.5
16	UT to Crowders Creek	Perennial	120	2	2	1	Silt. sand	C	27.5
17	UT to Crowders Creek	Perennial	5480	2 - 5	4	4	Cobble, gravel, silt	C	44
18	UT to Crowders Creek	Intermittent	66	2	3	1	Cobble, silt	C	30.5
18	UT to Crowders Creek	Perennial	140	2	3	1	Cobble, silt	C	30.5
19	UT to Crowders Creek	Perennial	49	8	4	1	Gravel	C	30.5
20	UT to Crowders Creek	Perennial	270	<1	2	1	Cobble, sand	C	32
21	UT to Crowders Creek	Perennial	1177	4 - 7	4	2	Cobble, gravel, silt	C	36.5
22	UT to Oates Branch	Intermittent	177	10 - 25	4-8	4	Cobble, gravel, bedrock	C	38
22	UT to Oates Branch	Perennial	2305	10 - 25	4-8	4	Cobble, gravel, bedrock	C	38
22A	UT to Oates Branch	Perennial	62	3	4	2	Gravel	C	NA
23	UT to Oates Branch	Intermittent	57	5	4	<1	Silt	C	24
24	Oates Branch	Perennial	3196	4	8	6	Cobble	C	44
25	Bessemer Branch	Perennial	3604	2 - 4	5 - 14	2 - 6	Silt, sand, cobble, bedrock	C	27, 47
26	UT to Bessemer Branch	Intermittent	241	5 - 15	4	1 - 3	Sand, gravel, cobble	C	27.5
27	UT to Bessemer Branch	Perennial	3300	5	8	2	Gravel, cobble	C	43.5
28	UT to Bessemer Branch	Perennial	6510	<1 - 2	4 - 8	4	Silt	C	48
29	UT to Bessemer Branch	Intermittent	884	<1	2 - 4	6	Silt	C	25.5
30	UT to Bessemer Branch	Intermittent	117	1 - 4	3	2	Silt	C	24.5
31	UT to Bessemer Branch	Intermittent	183	5	3	1	Sand, silt	C	22
32	UT to Bessemer Branch	Perennial	813	2	4	2	Gravel, sand	C	32
33	UT to Bessemer Branch	Intermittent	97	15	8	<1	Sand	C	19.5
34	UT to Bessemer Branch	Perennial	595	3	4 - 6	6	Silt, sand	C	37.5
35	UT to Bessemer Branch	Intermittent	255	2	3	1	Sand	C	38.5
35	UT to Bessemer Branch	Perennial	674	2	3	1	Sand	C	38.5
36	UT to Crowders Creek	Perennial	3073	2	8	2	Sand, gravel	C	37
37	UT to Crowders Creek	Perennial	435	4	6	<1	Sand, gravel	C	30
38	UT to Crowders Creek	Perennial	422	1	4	<1	Sand	C	34.5
39	UT to Crowders Creek	Perennial	1785	2	4	4	Sand	C	41
40	UT to Crowders Creek	Perennial	356	10	4	1	Gravel, cobble	C	29.5
41	UT to Long Creek	Intermittent	165	15	4	2	Silt	C	31.5
41	UT to Long Creek	Perennial	334	15	4	2	Silt	C	31.5
42	UT to Long Creek	Perennial	547	5 - 20	8 - 12	2	Sand, cobble	C	36.5
43	UT to Kaglor Branch	Perennial	792	4 - 15	12	4	Sand, boulders	C	33.5

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Streams

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
44	UT to Kaglor Branch	Perennial	3699	5 - 15	8 - 12	6	Sand, gravel, cobble	C	36
45	UT to Kaglor Branch	Perennial	14	3	3	3	Cobble, gravel	C	26
46	UT to Crowders Creek	Perennial	3891	1	4 - 8	3	Silt, sand	C	32.5
46A	UT to Crowders Creek	Intermittent	28	2	3	1	Silt	C	20.5
47	UT to Crowders Creek	Intermittent	116	5	4	<1	Gravel	C	28
48	UT to Crowders Creek	Intermittent	95	<1	4	1	Silt	C	23.5
49	UT to Crowders Creek	Perennial	803	1	6	3	Silt	C	16
50	UT to Crowders Creek	Intermittent	117	1	6	4	Silt	C	16
51	UT to Crowders Creek	Perennial	694	2	5	1	Sand	C	24
52	UT to Crowders Creek	Perennial	3712	8	16	3	Gravel	C	48.5
53	UT to Crowders Creek	Perennial	82	4	6	2	Gravel	C	30
54	UT to Crowders Creek	Perennial	1377	3	6	4	Sand, gravel	C	37
55	UT to Crowders Creek	Perennial	765	1 - 2	3	1	Silt	C	26
56	UT to Crowders Creek	Intermittent	79	2	5	4	Sand	C	37
56	UT to Crowders Creek	Perennial	592	2	5	4	Sand	C	37
57	UT to Crowders Creek	Perennial	1488	1 - 6	4 - 8	1	Gravel, sand	C	38.3
58	UT to Crowders Creek	Perennial	202	3	3	1	Sand	C	26.5
59	UT to Crowders Creek	Perennial	9399	4	4 - 16	6	Cobble, gravel, bedrock	C	44.5, 45
60	UT to Crowders Creek	Intermittent	1047	3	3	<1	Sand	C	22
61	UT to Crowders Creek	Intermittent	37	4	2	0	Sand	C	19
62	UT to Crowders Creek	Intermittent	67	4	2	0	Silt	C	18.5
63	UT to Crowders Creek	Perennial	340	3	3	2	Cobble, silt	C	34.5
64	UT to Crowders Creek	Intermittent	76	3 / 3	3 / 3	<1/2	Cobble, silt	C	33
64	UT to Crowders Creek	Perennial	116	3	3	<1/2	Cobble, silt	C	33
65	UT to Crowders Creek	Perennial	1016	1	2	2	Gravel	C	35
66	UT to Crowders Creek	Perennial	639	5	4 - 8	4	Sand, cobble, bedrock	C	39
67	UT to Crowders Creek	Intermittent	402	2 - 5	5 - 10	2	Cobble	C	19.5
68	UT to Crowders Creek	Perennial	728	1 - 4	1 - 4	4	Sand, gravel	C	35
69	UT to Crowders Creek	Perennial	2493	2 - 7	4 - 8	2 - 4	Bedrock, gravel	C	41
70	UT to Crowders Creek	Perennial	12186	4 - 8	6 - 24	3 - 5	Cobble, gravel	C	42, 45.5
70A	UT to Crowders Creek	Intermittent	34	3	4	<1	Sand, cobble	C	24
71	UT to Crowders Creek	Perennial	163	4	4	2	Sand, cobble	C	32
71A	UT to Crowders Creek	Intermittent	368	2	4	<1	Sand, cobble	C	16
72-75	Not Used								
76	UT to Crowders Creek	Perennial	376	15	4	1	Sand, gravel	C	29
76A	UT to Crowders Creek	Intermittent	117	10	4	2	Sand	C	35.5
76A	UT to Crowders Creek	Perennial	41	10	4	2	Sand	C	35.5
76B	UT to Crowders Creek	Perennial	111	1	3	2	Silt	C	35.5
77	UT to Crowders Creek	Perennial	285	1	3	2	Silt	C	30
78	UT to Crowders Creek	Perennial	158	<1	1	<1	Sand	C	18
79	UT to Crowders Creek	Perennial	2083	1 - 4	8 - 10	2 - 5	Gravel, cobble	C	40.5, 50
80	UT to Crowders Creek	Intermittent	124	5	2	2	Sand, gravel	C	24.5
81	UT to Crowders Creek	Perennial	245	2	2	2	Sand	C	23
82	UT to Crowders Creek	Intermittent	61	4-10	4-8	4	Sand, bedrock	C	NA
82	UT to Crowders Creek	Perennial	1402	4-10	4-8	4	Sand, bedrock	C	40
83	UT to Crowders Creek	Perennial	314	15	2 - 6	4	Silt, gravel	C	28
84	UT to Crowders Creek	Perennial	44	3	2	2	Silt	C	24.5
85	UT to Crowders Creek	Perennial	2917	4	4 - 8	3	Gravel, cobble	C	43.5
86	UT to Crowders Creek	Intermittent	533	2	1 - 6	6	Silt	C	25
87	UT to Crowders Creek	Perennial	260	3	2	3	Sand	C	23
88	UT to Crowders Creek	Intermittent	202	8	4 - 5	1	Silt	C	25.5
89	UT to Crowders Creek	Perennial	3259	1 - 15	1 - 5	4	Sand, gravel, bedrock	C	31.5

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
90	UT to Crowders Creek	Perennial	78	3	1 - 4	1	gravel	C	27.5
91	UT to Crowders Creek	Perennial	76	4	3 - 4	1	Silt	C	19.5
92	UT to Crowders Creek	Perennial	2360	3	8	3	Gravel, silt	C	44.5
92A	UT to Crowders Creek	Intermittent	179	5	8 - 14	3	Silt	C	22.5
93	UT to Crowders Creek	Perennial	921	1	7	2 - 4	Gravel, cobble	C	45.5
94	UT to Crowders Creek	Perennial	203	<1	6	1	Silt	C	27.8
95	UT to Crowders Creek	Perennial	1311	<1	5	1 - 2	Sand, silt	C	36.5
96	UT to Crowders Creek	Perennial	9813	1 - 6	4 - 20	3 - 4	Sand, gravel, cobble, bedrock	C	38 - 53
96A	UT to Crowders Creek	Intermittent	167	3	3	<1	Silt	C	20
97	UT to Crowders Creek	Perennial	479	1	4	3	Gravel, cobble	C	49
98	UT to Crowders Creek	Perennial	256	6	1	1	Silt, gravel	C	34.5
99	UT to Crowders Creek	Perennial	593	<1	5	2	Sand, cobble	C	21
100	UT to Crowders Creek	Perennial	464	5	2	1	Silt	C	19
101	UT to Crowders Creek	Perennial	123	1	10	2 - 4	Sand, gravel	C	34.5
102	UT to Crowders Creek	Perennial	256	<1	5	1	Silt	C	35
103	UT to Crowders Creek	Perennial	2801	<1	2 - 5	1 - 4	Silt, sand, gravel	C	26, 27
104	McGill Branch	Perennial	5831	4	6	2 - 5	Cobble, sand	C	38
104A	UT to McGill Branch	Intermittent	146	7	2	1	Sand	C	21.5
105	UT to McGill Branch	Intermittent	226	3	2	1 - 3	Sand, gravel	C	18.5
106	UT to McGill Branch	Intermittent	324	4	3	<1	Gravel	C	28
107	UT to McGill Branch	Perennial	418	8	4 - 6	1	Sand, cobble	C	20
108	UT to McGill Branch	Perennial	109	7	3	1 - 3	Cobble, sand	C	26.5
109	UT to McGill Branch	Perennial	3118	3	4	2	Sand, gravel	C	42.5
110	UT to McGill Branch	Intermittent	112	5	3	<1	Sand	C	19.5
111	UT to McGill Branch	Perennial	165	4	2	<1 - 2	Silt, cobble	C	34.5
112	UT to McGill Branch	Perennial	3660	2	3	1 - 3	Gravel, cobble	C	39.5
113	UT to McGill Branch	Perennial	1454	2	3	2	Cobble, gravel	C	36.5
114	UT to McGill Branch	Perennial	804	1	5	1	Cobble, gravel	C	42.8
115	UT to McGill Branch	Perennial	809	2	6	1	Cobble	C	49.5
116	UT to McGill Branch	Perennial	198	2	4	2	Cobble	C	45.5
117	UT to McGill Branch	Perennial	502	3	5	1	Sand, gravel	C	25
118	UT to McGill Branch	Perennial	3387	1	5	1 3	Sand, then cobble, boulder	C	35
119	UT to McGill Branch	Intermittent	862	4	4	3	Sand, cobble	C	27.5
120	UT to McGill Branch	Perennial	2677	1	5	3	Cobble, boulder	C	38.5
121	UT to McGill Branch	Perennial	529	1	4	2 - 3	Cobble, silt, gravel	C	30
122	UT to McGill Branch	Intermittent	235	4	4	3	Sand	C	17.5
123	UT to Crowders Creek	Perennial	2177	<1	4	1 - 3	Sand	C	36.3
124	UT to Crowders Creek	Perennial	473	<1	6	2 - 4	Silt	C	43.8
125	Ferguson Branch	Perennial	3385	4 - 8	4 - 12	4	Cobble, boulder, bedrock	C	53
126	UT to Ferguson Branch	Perennial	126	4	4	3	Silt, cobble	C	27.5
127	UT to Crowders Creek	Perennial	216	3 - 4	1 - 4	3	Sand	C	23
128	UT to Crowders Creek	Intermittent	249	1	4	1 - 4	Sand	C	27
129	UT to Crowders Creek	Perennial	587	<1	6	4	Sand	C	23
130	UT to Crowders Creek	Perennial	881	8 - 10	4 - 6	1	Sand	C	29.5
131	UT to Crowders Creek	Perennial	4918	3 - 5	2	1	Gravel	C	26
132	UT to Crowders Creek	Intermittent	50	2 - 4	4 - 12	6	Bedrock, boulder, sand	C	44
133	UT to Crowders Creek	Perennial	3121	<1 - 2	2 - 4	2	Sand, gravel	C	39
134	UT to Blackwood Creek	Perennial	1206	4	4 - 8	6	Silt	C	26
135	Blackwood Creek	Perennial	1646	8	24 - 32	6	Sand, gravel	C	40
136	UT to McGill Branch	Perennial	226	<1	2	2	Silt	C	40
137	UT to Crowders Creek	Perennial	856	<1 - 4	6	2	Sand, gravel	C	37
138	UT to Crowders Creek	Perennial	4556	1	4	4	Bedrock, boulder, gravel	C	52

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
139	UT to Crowders Creek	Perennial	37	1	3	1	Cobble	C	36
140	UT to Crowders Creek	Intermittent	270	<1	2	<1	Silt	C	20
141	UT to Crowders Creek	Intermittent	122	4	4	1	Silt	C	16
142	UT to Crowders Creek	Intermittent	466	< 1	2	4 - 5	fine/course sand	C	25, 26
142	UT to Crowders Creek	Perennial	1891	2-5	5	5	sand, gravel, cobble, rock	C	46
143	UT to Crowders Creek	Intermittent	284	2	2-3	2	fine/course sand	C	25
144	UT to Crowders Creek	Perennial	133	2-6	2-3	1	sand, gravel	C	31.25
145	UT to Crowders Creek	Intermittent	1284	3- 7	4 - 5	0 - 1	sand, gravel	C	21, 28
146	UT to Crowders Creek	Perennial	4831	7 - 12	12 - 30	8 - 10	sand, gravel, cobble, rock	C	53
147	UT to Crowders Creek	Perennial	2061	4-6	10	8	sand, gravel, rock	C	46
148	UT to Crowders Creek	Perennial	1780	<1	2-3	4	fine/course sand	C	39.25
149	Not Used								
150	UT to Crowders Creek	Intermittent	570	3-6	4	1	sand, gravel, cobble, rock	C	29.5
150	UT to Crowders Creek	Perennial	1698	varies	3.5	6	sand, gravel	C	41
151	UT to Crowders Creek	Intermittent	231	2	2	1	sand, gravel	C	29.25
152	UT to Crowders Creek	Intermittent	228	7	4	0	fine/course sand	C	17.5
153	UT to Crowders Creek	Intermittent	246	NA	NA	NA	NA	C	NA
153	UT to Crowders Creek	Perennial	2382	1 - 10	3 - 6	0 - 6	sand, gravel	C	22 - 40
154	UT to Crowders Creek	Intermittent	124	2-4	4-5	2	fine/course sand	C	26
155	UT to Crowders Creek	Perennial	1484	0.5-1.5	3-4	4	sand, gravel	C	43.5
156	UT to Crowders Creek	Perennial	6167	3 - 8	10 - 12	12	sand, gravel, cobble, boulder	C	50.25
157	UT to Crowders Creek	Perennial	2883	2-4	3-4	4	sand, gravel, cobble, rock	C	45
158	UT to Crowders Creek	Intermittent	221	5-8	3	0	fine/course sand	C	11.5
159	UT to Crowders Creek	Intermittent	1238	1-2.5	4	0	fine/course sand	C	20.75
160	Not Used								
161	UT to Crowders Creek	Intermittent	471	1-2	2	1	sand, gravel	C	49
161	UT to Crowders Creek	Perennial	2567	3-7	4-8	4	sand, gravel, cobble, rock	C	48.75
162	UT to Crowders Creek	Perennial	624	1-2	3	3	sand, gravel	C	33
163	UT to Crowders Creek	Perennial	5309	2.5-5	6-8	5	sand, gravel, cobble, rock	C	51.75
164	Not Used								
165	Not Used								
166	UT to Crowders Creek	Intermittent	332	<1	1.5	2	fine, homogeneous	C	23
167	Not Used								
168	UT to Crowders Creek	Perennial	848	3.5-3	3	6	sand, gravel, rock	C	43
169	UT to Crowders Creek	Perennial	99	NA	NA	NA	NA	NA	NA
170	UT to Crowders Creek	Perennial	79	NA	NA	NA	NA	NA	NA
171	UT to Crowders Creek	Perennial	2272	≤ 1	2	5	fine/course sand	C	26
172	UT to Crowders Creek	Intermittent	992	<1-2	1-2	2	fine sand/clay	C	24.5
173	UT to Crowders Creek	Perennial	83	NA	NA	NA	NA	C	NA
174	UT to Crowders Creek	Perennial	1189	1-2	2	2	sand, gravel	C	34.5
175	UT to Crowders Creek	Perennial	461	5	3	3	sand, gravel, rock	C	35.5
176	UT to Crowders Creek	Intermittent	405	5	2	1	sand, gravel	C	22.5
177	UT to Crowders Creek	Perennial	2543	2-6	4-8	7	sand, gravel, rock, boulder	C	51
178	UT to Crowders Creek	Perennial	4780	4-7	6 - 15	6 - 12	sand, gravel, rock, boulder	C	44.5, 50
179	UT to Crowders Creek	Intermittent	460	3-4	3	1	fine/course sand	C	24.5
180	UT to Crowders Creek	Intermittent	256	2-3	2	1	fine sand/clay	C	24.5
181	UT to Crowders Creek	Perennial	2966	4-7	12	10	sand, gravel, rock, boulder	C	55
182	UT to Crowders Creek	Intermittent	183	1.5	2	0	fine sand/clay	C	17.5
182	UT to Crowders Creek	Perennial	1866	1.5	3.5	1	sand, gravel, cobble	C	30.5
183	UT to Crowders Creek	Perennial	1474	3-7	4	5	sand, gravel, cobble, rock	C	48.5
184	UT to Crowders Creek	Perennial	121	NA	NA	NA	NA	C	NA
185	UT to Crowders Creek	Perennial	992	2-4	3-4	2	sand, gravel, cobble	C	39

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
186	UT to Crowders Creek	Intermittent	864	3	3	0	fine/course sand	C	23.5
187	UT to Crowders Creek	Perennial	2715	3-5	4	2	fine/course sand	C	30.5
188	UT to Crowders Creek	Intermittent	253	6	3.5	1	sand, gravel	C	27
188A	UT to Crowders Creek	Perennial	73	NA	NA	NA	NA	C	NA
189	UT to Crowders Creek	Perennial	616	NA	NA	NA	NA	C	NA
190	UT to Crowders Creek	Perennial	638	1.5	2	3	sand, gravel, cobble	C	38.5
191	UT to Crowders Creek	Intermittent	431	0.5-2	1.5-2	1	fine/course sand	C	21
192	UT to Crowders Creek	Perennial	940	2-3.5	2-4	3	sand, gravel, cobble	C	40.5
193	UT to Crowders Creek	Perennial	409	3-6	2	3	sand, gravel	C	32.5
194	UT to Crowders Creek	Perennial	1894	3-6	3-4	5	sand, gravel, cobble	C	38
195	UT to Crowders Creek	Perennial	911	2-3	2-3.5	4	sand, gravel, rock	C	39.5
196	UT to Crowders Creek	Perennial	7189	4-6	12	12	sand, gravel, rock, boulder	C	51
197	UT to Crowders Creek	Perennial	619	0.5-2	3	4	sand, gravel	C	40.5
198	UT to Crowders Creek	Perennial	1368	0.5-3	2-3	4	sand, gravel	C	45
199	UT to Crowders Creek	Intermittent	311	0.5-2	2	2	sand, gravel	C	28.5
200	UT to Crowders Creek	Intermittent	562	<1-2	2	1	fine/course sand	C	24.5
201	UT to Crowders Creek	Intermittent	236	1	2	0	fine sand, rock	C	15
202	UT to Crowders Creek	Perennial	487	3-4	2.5-3	5	sand, gravel	C	33
203	UT to Crowders Creek	Perennial	326	3-4	3	3	sand, gravel, cobble	C	38
204	UT to Crowders Creek	Perennial	439	3	3	3	sand, gravel, cobble	C	37.5
205	UT to Crowders Creek	Intermittent	213	1-2	1-2	1	fine sand/clay	C	19.5
205	UT to Crowders Creek	Perennial	1917	1-2	2-3.5	4	sand, gravel, cobble	C	40
206	UT to Crowders Creek	Perennial	105	NA	NA	NA	NA	C	NA
207	UT to Crowders Creek	Perennial	833	3-4	3-4	4	sand, gravel, cobble	C	39.5
208	UT to Crowders Creek	Perennial	470	1.5-3	2-3	3	sand, gravel, cobble, rock	C	38.5
209	UT to Crowders Creek	Perennial	746	4	2.5	2	sand, gravel, cobble	C	38.5
210	UT to Mill Creek	Perennial	3615	0.5-3.5	2 - 7	5 - 6	sand, gravel, cobble, boulder	C	38.5, 44.5
211	UT to Mill Creek	Perennial	1223	3.5-5	3	3	fine/course sand, gravel	C	30, 37, 39.5
212	UT to Mill Creek	Perennial	317	1.5-2	2-3	3	fine/course sand, gravel	C	35
213	Mill Creek	Perennial	4663	1 - 4	2 - 10	2 - 8	sand, gravel, rock, boulder	C	34.5, 39.5
214	UT to Mill Creek	Perennial	329	1-2	2-3	3	fine/course sand	C	40
215	UT to Mill Creek	Perennial	1188	1-2	2-3	3	fine/course sand	C	42.5
216	UT to Mill Creek	Perennial	387	1	3	3	sand, gravel	C	39.5
217	UT to Mill Creek	Intermittent	322	1-2	2	2	fine/course sand	C	27
218	UT to Mill Creek	Perennial	468	1	3	4	sand, gravel	C	31.5
219	UT to Mill Creek	Perennial	601	< 1	2-2.5	4	sand, gravel	C	34.25
220	UT to Mill Creek	Perennial	3881	1-4	4-6	4 - 5	sand, gravel, cobble, bedrock	C	42, 43.5
221	UT to Mill Creek	Perennial	731	< 1	3.5	3	sand, gravel	C	35
222	UT to Mill Creek	Intermittent	1442	< 1	2	2	fine sand/clay	C	28.5
222	UT to Mill Creek	Perennial	778	< 1	3.5	4	sand, gravel, cobble	C	41.25
223	UT to Mill Creek	Perennial	238	1-1.5	3.5-4.5	7	fine/course sand	C	34.25
224	UT to Mill Creek	Perennial	148	2	2	2	fine/course sand	C	33
225	UT to Mill Creek	Perennial	621	< 1-2	1-3	2	fine/course sand	C	34.25
226	UT to Catawba Creek	Perennial	5607	< 1 - 4	2 - 10	2 - 8	sand, gravel, cobble, bedrock	C	33.5 - 48.5
227	UT to Catawba Creek	Perennial	767	3.5	3	4	sand, gravel, cobble	C	38.25
228	UT to Catawba Creek	Perennial	1110	2-6	3-6	3	sand, gravel, rock	C	31, 34
229	UT to Catawba Creek	Perennial	299	NA	NA	NA	NA	C	NA
230	UT to Catawba Creek	Perennial	853	< 1-4	1-3	4	fine/course sand	C	34.25
231	UT to Catawba Creek	Intermittent	474	4	1	1	fine sand/clay	C	24.75
232	UT to Catawba Creek	Perennial	641	< 1	3	3	sand, gravel	C	35.75
232A	UT to Catawba Creek	Perennial	1322	1-2.5	10	6	sand, gravel, cobble, bedrock	C	45.5
232B	UT to Catawba Creek	Perennial	735	2	2.5-3.5	4	sand, gravel, cobble, bedrock	C	28

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
233	UT to Catawba Creek	Perennial	3614	3 - 4	3.5 - 10	3 - 7	sand,gravel, cobble, boulder	C	36.5, 42
234	UT to Catawba Creek	Perennial	2496	1-6	4	5	sand, gravel, cobble, rock	C	46.5
235	UT to Catawba Creek	Perennial	1089	2-5	3-6	4	fine/course sand	C	36
236	UT to Catawba Creek	Intermittent	118	< 1	1	2	fine/course sand	C	23
237	UT to Catawba Creek	Perennial	5954	2 - 6	2 - 20	3 - 8	sand, gravel, cobble, bedrock	C	45.5 - 55
238	UT to Mill Creek	Intermittent	168	1	1	2	fine sand/clay	C	19.5
238	UT to Mill Creek	Perennial	3108	1-3	2-3	4 - 6	sand, gravel, cobble	C	34.5, 35.75
239	UT to Mill Creek	Intermittent	249	< 1	1	2	sand, gravel	C	20.5
240	UT to Mill Creek	Intermittent	178	1	2-3	2	fine sand/clay	C	29.5
241	UT to Mill Creek	Intermittent	381	< 1	2.5	3	sand, gravel	C	22.5
242	UT to Catawba Creek	Perennial	3115	1-4	3-5	3 - 4	silt, sand, gravel, rock	C	34, 47
243	UT to Catawba Creek	Intermittent	516	< 1	1 - 2	2 - 3	sand, gravel, rock	C	25.5, 26
243	UT to Catawba Creek	Perennial	154	< 1	1-3	3	sand, gravel, cobble	C	34.5
244	UT to Catawba Creek	Perennial	403	< 1	2-3	3	sand, gravel	C	33
245	UT to Catawba Creek	Intermittent	98	<1-5	3-4	1	sand, gravel, cobble	C	19.5
246	UT to Catawba Creek	Intermittent	114	1-2	2-3	1	sand, gravel	C	29.5
247	UT to Catawba Creek	Intermittent	125	< 1	< 1.5	2	fine sand/clay	C	27.25
247	UT to Catawba Creek	Perennial	3158	1-4	4-12	4	sand, gravel, cobble, bedrock	C	44
248	UT to Catawba Creek	Perennial	2921	,1 - 3	1 - 4	3 - 5	sand, gravel, cobble, rock	C	32.5 48
249	UT to Catawba Creek	Perennial	171	< 1	1-2	3	sand, gravel	C	32.25
249A	UT to Catawba Creek	Perennial	487	< 1	3-4	4	sand, gravel, cobble	C	34.5
250	UT to Catawba Creek	Perennial	489	3-4.5	2.5-4	4	sand, gravel	C	41.5
250A	UT to Catawba Creek	Perennial	1637	2-4	3.5-5	4	sand, gravel, rock	C	45.5
251	UT to Catawba Creek	Perennial	363	< 1	2-4	4	sand, gravel, cobble	C	44.5
251A	UT to Catawba Creek	Perennial	3052	<1-4	4-5	6	sand, gravel, rock	C	49.5
252	UT to Catawba Creek	Intermittent	126	< 1	1	3	fine/course sand	C	28.25
252	UT to Catawba Creek	Perennial	482	2	2-3	4	sand, gravel, cobble	C	42
252A	UT to Catawba Creek	Perennial	1565	1-2.5	4	5	sand, gravel, cobble	C	46
253	UT to Catawba Creek	Intermittent	233	1-2	2-4	1	sand, gravel	C	21.5
254	UT to Catawba Creek	Intermittent	356	< 1	1-2	2	sand, gravel	C	27
255	UT to Catawba Creek	Intermittent	246	< 1	3-4	2	fine/course sand	C	26.5
256	UT to Catawba Creek	Perennial	846	1-2	2	3	sand, gravel, cobble	C	42.5
257	UT to Catawba Creek	Perennial	385	1-2	1-3	2	sand, gravel	C	39.5
258	UT to Catawba Creek	Intermittent	114	1	2	2	sand, gravel	C	27
259	Catawba Creek	Perennial	4867	3-6	25 - 50	14 - 15	sand, gravel, cobble	C	51, 57.5
259A	UT to Catawba Creek	Perennial	892	3	7	12	sediment, sand	C	33
259B	UT to Catawba Creek	Perennial	187	3	15	12	sediment, sand	C	34.5
259C	UT to Catawba Creek	Perennial	288	3	15	12	sediment, sand	C	34.5
260	UT to Catawba Creek	Perennial	409	2-3	3.5-5	5	fine/course sand	C	35.5
261	UT to Catawba Creek	Perennial	894	< 1	2.5-3	2	sand, gravel	C	31
262	UT to Catawba Creek	Intermittent	944	1.5-3	2-3	3	sand, gravel	C	20
263	UT to Catawba Creek	Perennial	3499	<1-2.5	2-4	5	sand, gravel, rock	C	40.5
264	UT to Catawba Creek	Intermittent	278	2	2-3	1	sand, gravel	C	19
264	UT to Catawba Creek	Perennial	2145	1 - 6	3 - 16	4 - 10	sand, gravel, rock, boulder	C	41.5, 55.5
265	UT to Catawba Creek	Perennial	540	1-2.5	3-4	2	sand, gravel, rock	C	34.5
266	UT to Catawba Creek	Perennial	938	1-2	3-4	5	sand, gravel, rock	C	47
267	UT to Catawba Creek	Intermittent	441	2-3	3-4	2	sediment, sand, gravel	C	23.5
268	UT to Catawba Creek	Perennial	3245	2 - 4	2 - 10	2 - 5	sand, gravel, cobble, rock	C	35.25, 52
269	UT to Catawba Creek	Perennial	1975	<1-3	3-4	4	sand, gravel, cobble, rock	C	50.5
270	UT to Catawba Creek	Perennial	2345	4-8	6-9	8	sand, gravel, cobble, rock	C	50
271	UT to Catawba Creek	Perennial	1565	4-8	3-6	4	sand, gravel, cobble, rock	C	46.5
272	UT to Catawba Creek	Perennial	474	<1-2	2-5	1	sand, gravel, cobble	C	35.75

U-3321 Gaston East-West Connector
Streams

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
273	UT to Catawba Creek	Perennial	371	1	2	2	sand, gravel, cobble	C	35.5
274	UT to Catawba Creek	Perennial	1272	<1-3	1.5-3.5	4	sand, gravel, cobble	C	38.5
275	UT to Catawba Creek	Perennial	345	< 1	1.5-3	2	fine/course sand	C	35
276	UT to Catawba Creek	Perennial	1892	2-3	3-7	4	sand, gravel, cobble	C	42
277	UT to Catawba Creek	Perennial	242	1-2	2	3	sand, gravel	C	40.75
278	UT to Catawba Creek	Intermittent	78	1	2.5	2	sand, gravel	C	22.5
279	UT to Catawba Creek	Intermittent	321	1	1-2	3	fine/course sand	C	28.5
280	UT to Catawba Creek	Intermittent	843	1	1.5	1	sand, gravel	C	22.5
281	UT to Catawba Creek	Perennial	428	1-2	2	3	sand, gravel, rock	C	30
282	UT to Catawba Creek	Intermittent	306	<1-2	3-4	<1	sand, gravel	C	43.5
282	UT to Catawba Creek	Perennial	1330	2-4	3	4	sand, gravel, cobble	C	43.5
283	UT to Catawba Creek	Intermittent	283	2-5	3-4	2	sand, gravel	C	29.5
284	UT to S. F. Catawba River	Intermittent	208	1	2	3	Silt, sand	WS-V	26
284	UT to S. F. Catawba River	Perennial	254	2-3	4-5	3-6	Sand, gravel, cobble, boulder	WS-V	NA
285	UT to S. F. Catawba River	Intermittent	1123	1-2	2-4	3	Sand, gravel	WS-V	24.5
285	UT to S. F. Catawba River	Perennial	1817	1-3	2-5	6	Sand, gravel, cobble, boulder	WS-V	NA
286	UT to S. F. Catawba River	Intermittent	84	<1	1-2	1	Silt, sand, gravel	WS-V	21, 27.5
286	UT to S. F. Catawba River	Perennial	1110	1-4	2-7	4-6	Silt, sand, gravel, cobble	WS-V	31
286A	UT to S. F. Catawba River	Intermittent	30	1	1-2	1	Silt, sand	WS-V	NA
287	UT to S. F. Catawba River	Intermittent	193	1	2-3	4	Silt, sand	WS-V	23
287	UT to S. F. Catawba River	Perennial	213	>6	4-6	4	Sand, gravel	WS-V	NA
288	UT to S. F. Catawba River	Intermittent	286	1	1-3	2-4	Silt, sand, gravel, cobble	WS-V	25.5
288	UT to S. F. Catawba River	Perennial	1339	1	1-3	4	Silt, sand, gravel, cobble	WS-V	NA
288A	UT to S. F. Catawba River	Intermittent	190	<1	2	1	Silt, sand, gravel	WS-V	21.5
288A	UT to S. F. Catawba River	Perennial	582	2-4	4-7	2-6	Silt to cobble, boulder	WS-V	28
289	UT to S. F. Catawba River	Intermittent	373	1-2	1-2	1	Silt, sand, gravel	WS-V	22.5
289	UT to S. F. Catawba River	Perennial	1036	2-3	2-6	2 - 6	Silt, sand,gravel,cobble, boulder	WS-V	31, 34.5
290	UT to S. F. Catawba River	Intermittent	125	1	1-2	1	Silt, sand, gravel	WS-V	21.25
291	UT to S. F. Catawba River	Perennial	372	1-3	3-4	2-5	Silt, sand, gravel, cobble	WS-V	28.5
292	UT to S. F. Catawba River	Intermittent	1027	1	2	2	Silt, sand	WS-V	21.5
293	UT to S. F. Catawba River	Intermittent	229	1-2	2	2	Silt, Sand, gravel	WS-V	21
293A	UT to S. F. Catawba River	Intermittent	22	1	1-2	1	Silt, sand	WS-V	22.75
293A	UT to S. F. Catawba River	Perennial	65	<1	2-3	3-4	Silt, Sand, gravel	WS-V	NA
293B	UT to S. F. Catawba River	Intermittent	120	1-2	2-3	2-5	Silt, sand	WS-V	23
293C	UT to S. F. Catawba River	Perennial	660	2-4	3-5	2-6	Silt to cobble, boulder	WS-V	33.75
293C	UT to S. F. Catawba River	Intermittent	185	1-2	2-3	2-5	Silt, sand	WS-V	25.25
294	UT to S. F. Catawba River	Intermittent	747	3-4	3-6	2	Silt to cobble, boulder	WS-V	21
294	UT to S. F. Catawba River	Perennial	951	1-3	4-7	1-3	Silt to cobble, boulder	WS-V	34.5
294A	UT to S. F. Catawba River	Intermittent	635	1	2	1-3	Silt, sand, gravel, cobble	WS-V	25
294A	UT to S. F. Catawba River	Perennial	404	NA	NA	NA	NA	NA	NA
295	UT to S. F. Catawba River	Intermittent	563	1-3	3	1-2	Silt, Sand, gravel	WS-V	20.5
295	UT to S. F. Catawba River	Perennial	901	2-4	3-5	1-4	Silt, sand, gravel, cobble	WS-V	32, 32.25
295A	UT to S. F. Catawba River	Intermittent	242	1-2	2-4	1-2	Silt, sand, gravel, boulder	WS-V	23
295A	UT to S. F. Catawba River	Perennial	436	1-2	2-4	1-3	Silt to cobble, boulder	WS-V	30
296	UT to S. F. Catawba River	Perennial	2543	4	6	2-4	Silt, Sand, gravel	WS-V	34
296A	UT to S. F. Catawba River	Perennial	1973	1-5	2-6	2-6	Silt, sand, gravel, cobble	WS-V	32.5
297	UT to S. F. Catawba River	Perennial	3485	1-4	3-6	1-4	Silt to cobble, boulder	WS-V	31.5
297A	UT to S. F. Catawba River	Intermittent	217	4-6	3-5	2-4	Silt, Sand, gravel	WS-V	25.5
297A	UT to S. F. Catawba River	Perennial	1335	3-4	3-4	2-6	Silt to cobble, boulder	WS-V	35
298	UT to S. F. Catawba River	Intermittent	202	1-2	3	1	Silt, sand gravel	WS-V	19
298	UT to S. F. Catawba River	Perennial	45	NA	NA	NA	NA	NA	NA
299	UT to S. F. Catawba River	Intermittent	279	1-2	3	1-2	Silt, Sand, gravel	WS-V	26.5

U-3321 Gaston East-West Connector
Streams

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
299	UT to S. F. Catawba River	Perennial	572	2-3	3-4	1-4	Silt, Sand, gravel	WS-V	NA
300	UT to S. F. Catawba River	Intermittent	2176	3	3	1-3	Silt, sand, gravel, cobble	WS-V	23.5
300	UT to S. F. Catawba River	Perennial	526	3	3-5	1-3	Silt, sand, gravel, cobble	WS-V	33
300A	UT to S. F. Catawba River	Intermittent	42	6	3	1-3	Silt, Sand, gravel	WS-V	21
301	UT to S. F. Catawba River	Intermittent	167	4	3-6	1-2	Silt, Sand, gravel	WS-V	23
301	UT to S. F. Catawba River	Perennial	1065	3-4	4-7	1-6	Silt, sand, gravel, cobble	WS-V	28.5
301A	UT to S. F. Catawba River	Intermittent	49	5	3	1-3	Sand, gravel	WS-V	19.5
301B	UT to S. F. Catawba River	Intermittent	22	5	3	1-3	Silt, Sand, gravel	WS-V	19.5
302	UT to Catawba River	Intermittent	161	2-4	3	1-2	Silt, sand	WS-V, B	19.5
303	UT to Catawba River	Intermittent	31	1	2	1	Sand, gravel	WS-V, B	23
303	UT to Catawba River	Perennial	236	2-3	2-4	1-3	Silt, sand, gravel, cobble	WS-V, B	31
304	UT to Catawba River	Intermittent	260	1	3	1-2	Silt, sand	WS-V	22
304	UT to Catawba River	Perennial	1889	3	3-5	1-4	Silt, sand, gravel, cobble	WS-V	31
305	UT to Catawba River	Perennial	748	3-4	4-6	3-10	Silt, sand, gravel, cobble	WS-V, B	31.5
306	UT to Catawba River	Intermittent	888	<1	1-2	1	Sand, gravel, coal	WS-V, B	19
307	UT to Catawba River	Intermittent	418	3-5	4-5	4-6	Silt, sand, gravel	C	NA
307	UT to Catawba River	Perennial	244	1-2	4-6	2-6	Silt to cobble, boulder	WS-V, B	31.5
308	UT to Catawba River	Intermittent	763	1-2	2-3	1-3	Silt, sand, gravel	WS-V, B	20
309	UT to Catawba River	Intermittent	297	1-3	2-4	2-4	Silt, sand, gravel	WS-V, B	22.5
309	UT to Catawba River	Perennial	640	2-7	3-6	1-6	Silt to cobble, boulder	WS-V, B	35.5
310	UT to Catawba River	Intermittent	167	1-2	1-3	1-2	Silt, sand, gravel	WS-V, B	NA
311	UT to Catawba River	Intermittent	81	1	1-2	1	Silt, sand, gravel	WS-V, B	19
311	UT to Catawba River	Perennial	1525	1 - 4	3 - 10	2 - 12	Sand, gravel, cobble, boulder	WS-V, B	35, 39
311A	UT to Catawba River	Intermittent	60	<1	1-2	1-2	Silt, sand	WS-V, B	23.5
312	UT to Catawba River	Intermittent	596	1	2-3	1	Silt, sand	WS-V, B	23.5
312A	Beaverdam Creek	Perennial	8227	3-5	8-10	2-12	Silt to cobble, boulder	C	50
312B	UT to Catawba River	Intermittent	25	1	2	2	Silt, sand	C	19
313	UT to Catawba River	Intermittent	324	1-3	3	1-3	Silt, sand, gravel	WS-V, B	22
313	UT to Catawba River	Perennial	1644	4	2-8	2-6	Silt, sand, gravel	WS-V, B	34
313A	UT to Beaverdam Creek	Intermittent	571	1-3	3-5	2	Silt, Sand, gravel	C	19
314	UT to Catawba River	Intermittent	591	1-3	3	2-4	Silt, sand, gravel	WS-V, B	21.5
314A	UT to Beaverdam Creek	Intermittent	226	1-3	4-5	1-3	Silt, sand, gravel, cobble	C	21.75
314A	UT to Beaverdam Creek	Perennial	969	1-2	2-4	1-2	Silt, sand, gravel, cobble	C	33
315	UT to Catawba River	Intermittent	331	1	1-2	1-3	Silt, sand, gravel, cobble	WS-V, B	27
315A	UT to Beaverdam Creek	Intermittent	630	1-2	2-4	1-2	Silt, sand, gravel, cobble	C	NA
316	UT to Catawba River	Intermittent	777	1	1-2	1-3	Silt, sand	WS-V, B	25
316	UT to Catawba River	Perennial	668	4-6	4-6	2-6	Silt to cobble, boulder	WS-V, B	32.5
316A	UT to Beaverdam Creek	Intermittent	487	1-2	3	1-2	Silt, sand, gravel	C	23.5
317	UT to Beaverdam Creek	Intermittent	485	1	2-3	1-2	Silt, sand, gravel	C	22.5
318	UT to Beaverdam Creek	Intermittent	1099	1-3	2-5	1-3	Silt to cobble, boulder	C	25
318	UT to Beaverdam Creek	Perennial	49	NA	NA	NA	NA	C	NA
318A	UT to Beaverdam Creek	Intermittent	573	2-4	3-5	2-6	Silt, Sand, gravel	C	25.75
318B	UT to Beaverdam Creek	Intermittent	150	1-3	1-2	1	Silt, Sand, gravel	C	21.5
318C	UT to Beaverdam Creek	Intermittent	229	1-3	3-5	3	Silt, Sand, gravel	C	21.5
318D	UT to Beaverdam Creek	Intermittent	102	2-4	2	3	Silt, sand	C	25
319	UT to Beaverdam Creek	Intermittent	96	1-2	1-2	2	Silt, sand, gravel	C	19
320	UT to Beaverdam Creek	Intermittent	217	1	3	2-5	Silt, sand	C	19
320A	UT to Beaverdam Creek	Intermittent	667	1	4	2-4	Silt, sand	C	22
321	Legion Lake Stream	Intermittent	598	1-3	3-6	1-6	Silt, sand, gravel	C	24
321	Legion Lake Stream	Perennial	7302	2-4	5-8	1-12	Silt to cobble, boulder	C	33
322	UT to Legion Lake Stream	Intermittent	488	1-3	3	1-4	Silt, sand, gravel	C	24.5
322	UT to Legion Lake Stream	Perennial	664	NA	NA	NA	NA	NA	NA

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Streams

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Linear feet in Project Study Area	Bank Height (ft)	Average Width (ft)	Depth (in)	Substrate	Water Quality Classification	NCDWQ Score
323	UT to Beaverdam Creek	Perennial	2234	3-5	3-6	2-4	Silt, sand, gravel, cobble	C	38
323A	UT to Beaverdam Creek	Intermittent	40	1	1-2	1	Silt, sand	C	19.5
324	UT to Beaverdam Creek	Intermittent	378	1-2	5	2	Silt, sand, gravel, cobble	C	25.5
325	UT to Beaverdam Creek	Intermittent	456	1	1-2	1-3	Silt, sand	C	23
326	UT to Beaverdam Creek	Intermittent	352	1-2	1-4	1-5	Silt, sand, gravel, cobble	C	21.25
326	UT to Beaverdam Creek	Perennial	829	4	3-4	1-4	Silt, sand, gravel, cobble	C	30.75
327	UT to Legion Lake Stream	Intermittent	535	1-4	3	2-4	Silt, sand, gravel	C	30.5
328	UT to Legion Lake Stream	Intermittent	496	1	1-3	1	Silt, sand, gravel	C	23.5
328	UT to Legion Lake Stream	Perennial	1994	3-4	4	1-4	Silt, sand, gravel, cobble	C	33.5
328A	UT to Legion Lake Stream	Intermittent	43	NA	NA	NA	NA	C	NA
329	UT to Legion Lake Stream	Intermittent	104	1	2-3	1-2	Silt, sand, gravel	C	24
330	UT to Legion Lake Stream	Intermittent	175	3-4	3-5	1-3	Silt to cobble, boulder	C	26
330	UT to Legion Lake Stream	Perennial	1258	3-4	3-5	1-3	Silt to cobble, boulder	C	NA
330A	UT to Legion Lake Stream	Intermittent	80	3-4	2	1-2	Silt, sand, gravel	C	20.5
331	UT to Legion Lake Stream	Intermittent	580	1-3	2-3	1-2	Silt, sand, gravel	C	27
331	UT to Legion Lake Stream	Perennial	1067	2-4	3-5	2-3	Silt, sand, gravel, cobble	C	34
332	UT to Legion Lake Stream	Perennial	2210	3-6	2-6	1-4	Silt, sand, gravel, cobble	C	41
333	UT to Legion Lake Stream	Intermittent	283	2-4	2-3	1-3	Silt, sand, gravel	C	24.5
334	UT to Legion Lake Stream	Intermittent	153	1-2	1-2	1-2	Silt, sand, gravel	C	21
335	UT to Legion Lake Stream	Perennial	1385	2-4	3-5	2-5	Sand, gravel, boulder, bedrock	C	34
336	UT to Legion Lake Stream	Intermittent	546	2-3	2-3	2-4	Silt, sand gravel	C	20.5
337	UT to Legion Lake Stream	Intermittent	94	1-2	1-3	1-3	Silt, sand, gravel	C	23.5
337	UT to Legion Lake Stream	Perennial	1197	1-4	2-4	1-4	Silt, sand, gravel	C	26
337A	UT to Legion Lake Stream	Intermittent	264	2-3	3	1-2	Silt, sand, gravel	C	23.5
338	UT to Legion Lake Stream	Intermittent	136	1-4	2-4	1-4	Silt, sand, gravel	C	24.5
338A	UT to Legion Lake Stream	Intermittent	34	1	2	1-2	Silt, sand	C	19
338B	UT to Legion Lake Stream	Intermittent	68	1	2	1-2	Silt, sand	C	20.5
339	UT to Legion Lake Stream	Intermittent	2178	1-2	2-3	4	Silt, sand, gravel	C	23.5
339A	UT to Legion Lake Stream	Intermittent	63	1	2	1-2	Silt, sand	C	19
340	UT to Legion Lake Stream	Intermittent	1082	2-4	3-5	2-6	Silt, sand, gravel, cobble	C	28.5
340	UT to Legion Lake Stream	Perennial	1825	2-4	4-6	2-6	Silt, sand, gravel, cobble	C	34
340A	UT to Legion Lake Stream	Intermittent	359	1-2	3	1-3	Silt, Sand, gravel	C	25
341	UT to Legion Lake Stream	Intermittent	282	1-2	2	2	Silt, sand, gravel, cobble	C	21
342	UT to Legion Lake Stream	Intermittent	137	1-2	2	1-3	Silt, sand, gravel	C	19.5
343	UT to Coffey Creek	Intermittent	731	1-2	2	1-2	Silt, sand, gravel	C	20.5
344	UT to Beaverdam Creek	Perennial		Stream outside study cooridor added from USGS mapping				C	NA
345	UT to Catawba Creek	Perennial		Stream outside study cooridor added from USGS mapping				C	NA

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Stream Impacts by Alternative (Feet)

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
1	Abernethy Creek	Perennial																
2	UT to Crowders Creek	Perennial																
3	UT to Crowders Creek	Perennial									45	45	45	45	45	45	45	45
4	UT to Crowders Creek	Perennial									324	324	324	324	324	324	324	324
5	UT to Crowders Creek	Perennial																
6	UT to Crowders Creek	Intermittent																
7	UT to Crowders Creek	Intermittent									80	80	80	80	80		80	80
8	UT to Crowders Creek	Perennial									970	970	970	970	970	970	970	970
9	UT to Crowders Creek	Intermittent																
9	UT to Crowders Creek	Perennial									1332	1332	1332	1332	1332	1332	1332	1332
9A	UT to Crowders Creek	Intermittent																
10	UT to Crowders Creek	Perennial									171	171	171	171	171	171	171	171
10A	UT to Crowders Creek	Perennial																
11	UT to Crowders Creek	Intermittent																
12	UT to Crowders Creek	Intermittent																
13	UT to Crowders Creek	Perennial									131	131	131	131	131	131	131	131
14	Crowders Creek	Perennial	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged
15	UT to Crowders Creek	Perennial																
16	UT to Crowders Creek	Perennial																
17	UT to Crowders Creek	Perennial									817	817	817	817	817	817	817	817
18	UT to Crowders Creek	Intermittent																
18	UT to Crowders Creek	Perennial																
19	UT to Crowders Creek	Perennial																
20	UT to Crowders Creek	Perennial									270	270	270	270	270	270	270	270
21	UT to Crowders Creek	Perennial									331	331	331	331	331	331	331	331
22	UT to Oates Branch	Intermittent																
22	UT to Oates Branch	Perennial																
22A	UT to Oates Branch	Perennial									62	62	62	62	62	62	62	62
23	UT to Oates Branch	Intermittent																
24	Oates Branch	Perennial	116	116	116	116	116	116	116	116	425	425	425	425	425	425	425	425
25	Bessemer Branch	Perennial	606	606	606	606	606	606	606	606	111	111	111	111	111	111	111	111
26	UT to Bessemer Branch	Intermittent																
27	UT to Bessemer Branch	Perennial	506	506	506	506	506	506	506	506								
28	UT to Bessemer Branch	Perennial	2231	2231	2231	2231	2231	2231	2231	2231	32	32	32	32	32	32	32	32
29	UT to Bessemer Branch	Intermittent																
30	UT to Bessemer Branch	Intermittent																
31	UT to Bessemer Branch	Intermittent	183	183	183	183	183	183	183	183								
32	UT to Bessemer Branch	Perennial	813	813	813	813	813	813	813	813								
33	UT to Bessemer Branch	Intermittent	97	97	97	97	97	97	97	97								
34	UT to Bessemer Branch	Perennial																
35	UT to Bessemer Branch	Intermittent																
35	UT to Bessemer Branch	Perennial																
36	UT to Crowders Creek	Perennial	1092	1092	1092	1092	1092	1092	1092	1092								
37	UT to Crowders Creek	Perennial																
38	UT to Crowders Creek	Perennial																
39	UT to Crowders Creek	Perennial																

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
40	UT to Crowders Creek	Perennial																
41	UT to Long Creek	Intermittent																
41	UT to Long Creek	Perennial																
42	UT to Long Creek	Perennial																
43	UT to Kaglor Branch	Perennial																
44	UT to Kaglor Branch	Perennial	1461	1461	1461	1461	1461	1461	1461	1461								
45	UT to Kaglor Branch	Perennial																
46	UT to Crowders Creek	Perennial	923	923	923	923	1773	1773	1773	1773								
46A	UT to Crowders Creek	Intermittent	28	28	28	28	28	28	28	28								
47	UT to Crowders Creek	Intermittent	116	116	116	116	116	116	116	116								
48	UT to Crowders Creek	Intermittent																
49	UT to Crowders Creek	Perennial					574	574	574	574								
50	UT to Crowders Creek	Intermittent					28	28	28	28								
51	UT to Crowders Creek	Perennial					561	561	561	561								
52	UT to Crowders Creek	Perennial	726	726	726	726	152	152	152	152								
53	UT to Crowders Creek	Perennial																
54	UT to Crowders Creek	Perennial	188	188	188	188												
55	UT to Crowders Creek	Perennial																
56	UT to Crowders Creek	Intermittent					25	25		25								
56	UT to Crowders Creek	Perennial					592	592	617	592								
57	UT to Crowders Creek	Perennial	453	453	453	453												
58	UT to Crowders Creek	Perennial																
59	UT to Crowders Creek	Perennial	68				539	539	539	539	725	725	725	725	725	725	725	725
60	UT to Crowders Creek	Intermittent									437	437	437	437	437	437	437	437
61	UT to Crowders Creek	Intermittent																
62	UT to Crowders Creek	Intermittent									67	67	67	67	67	67	67	67
63	UT to Crowders Creek	Perennial																
64	UT to Crowders Creek	Intermittent																
64	UT to Crowders Creek	Perennial																
65	UT to Crowders Creek	Perennial																
66	UT to Crowders Creek	Perennial																
67	UT to Crowders Creek	Intermittent																
68	UT to Crowders Creek	Perennial					255	255	255	255								
69	UT to Crowders Creek	Perennial	244	244	244	244												
70	UT to Crowders Creek	Perennial					374	374	374	374	803	803	803	803	803	803	803	803
70A	UT to Crowders Creek	Intermittent									34	34	34	34	34	34	34	34
71	UT to Crowders Creek	Perennial																
71A	UT to Crowders Creek	Intermittent									368	368	368	368	368	368	368	368
72-75	Not Used																	
76	UT to Crowders Creek	Perennial																
76A	UT to Crowders Creek	Intermittent																
76A	UT to Crowders Creek	Perennial																
76B	UT to Crowders Creek	Perennial									111	111	111	111	111	111	111	111
77	UT to Crowders Creek	Perennial																
78	UT to Crowders Creek	Perennial																
79	UT to Crowders Creek	Perennial									418	418	418	418	350	350	350	350

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
80	UT to Crowders Creek	Intermittent														80		
81	UT to Crowders Creek	Perennial																
82	UT to Crowders Creek	Intermittent					61	61	61	61								
82	UT to Crowders Creek	Perennial					425	425	425	425								
83	UT to Crowders Creek	Perennial					144	144	144	144								
84	UT to Crowders Creek	Perennial																
85	UT to Crowders Creek	Perennial	742	742	742	742												
86	UT to Crowders Creek	Intermittent																
87	UT to Crowders Creek	Perennial																
88	UT to Crowders Creek	Intermittent																
89	UT to Crowders Creek	Perennial	1010	1010	1010	1010												
90	UT to Crowders Creek	Perennial																
91	UT to Crowders Creek	Perennial																
92	UT to Crowders Creek	Perennial	827	827	827	827												
92A	UT to Crowders Creek	Intermittent	133	133	133	133												
93	UT to Crowders Creek	Perennial																
94	UT to Crowders Creek	Perennial									203	203	203	203				
95	UT to Crowders Creek	Perennial									523				271	271	271	271
96	UT to Crowders Creek	Perennial					585	585	585	585		523	523	523	876	876	876	876
96A	UT to Crowders Creek	Intermittent																
97	UT to Crowders Creek	Perennial									326	326	326	326				
98	UT to Crowders Creek	Perennial																
99	UT to Crowders Creek	Perennial													376	376	376	376
100	UT to Crowders Creek	Perennial																
101	UT to Crowders Creek	Perennial																
102	UT to Crowders Creek	Perennial																
103	UT to Crowders Creek	Perennial					440	440	440	440					355	355	355	355
104	McGill Branch	Perennial									760	760	760	760				
104A	UT to McGill Branch	Intermittent																
105	UT to McGill Branch	Intermittent																
106	UT to McGill Branch	Intermittent																
107	UT to McGill Branch	Perennial																
108	UT to McGill Branch	Perennial																
109	UT to McGill Branch	Perennial									677	677	677	677				
110	UT to McGill Branch	Intermittent									52	52	52	52				
111	UT to McGill Branch	Perennial																
112	UT to McGill Branch	Perennial									1879	1879	1879	1879				
113	UT to McGill Branch	Perennial									110	110	110	110				
114	UT to McGill Branch	Perennial									409	409	409	409				
115	UT to McGill Branch	Perennial									437	437	437	437				
116	UT to McGill Branch	Perennial																
117	UT to McGill Branch	Perennial																
118	UT to McGill Branch	Perennial									363	363	363	363				
119	UT to McGill Branch	Intermittent									388	388	388	388				
120	UT to McGill Branch	Perennial									904	904	904	904				
121	UT to McGill Branch	Perennial																

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
122	UT to McGill Branch	Intermittent																
123	UT to Crowders Creek	Perennial					389	389	389	389					296	296	296	296
124	UT to Crowders Creek	Perennial					3	3	3	3					119	119	119	119
125	Ferguson Branch	Perennial					788	788	788	788					453	453	453	453
126	UT to Ferguson Branch	Perennial																
127	UT to Crowders Creek	Perennial																
128	UT to Crowders Creek	Intermittent																
129	UT to Crowders Creek	Perennial																
130	UT to Crowders Creek	Perennial	207	207	207	207												
131	UT to Crowders Creek	Perennial	2054	2054	2054	2054	1590	1590	1590	1590					1578	1578	1578	1578
132	UT to Crowders Creek	Intermittent	25	25	25	25												
133	UT to Crowders Creek	Perennial					732	732	732	732					923	923	923	923
134	UT to Blackwood Creek	Perennial	296	296	296	296												
135	Blackwood Creek	Perennial	305	305	305	305												
136	UT to McGill Branch	Perennial																
137	UT to Crowders Creek	Perennial																
138	UT to Crowders Creek	Perennial									1569	1569	1569	1569				
139	UT to Crowders Creek	Perennial																
140	UT to Crowders Creek	Intermittent																
141	UT to Crowders Creek	Intermittent																
141	UT to Crowders Creek	Perennial									150	150	150	150				
142	UT to Crowders Creek	Intermittent																
142	UT to Crowders Creek	Perennial																
143	UT to Crowders Creek	Intermittent																
144	UT to Crowders Creek	Perennial																
145	UT to Crowders Creek	Intermittent	820	820	820	820	769	769	769	769					732	732	732	732
146	UT to Crowders Creek	Perennial	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged	Bridged					Bridged	Bridged	Bridged	Bridged
147	UT to Crowders Creek	Perennial	382	382	382	382	382	382	382	382					382	382	382	382
148	UT to Crowders Creek	Perennial	71	71	71	71	71	71	71	71					71	71	71	71
150	UT to Crowders Creek	Intermittent									207	188	188	188				
150	UT to Crowders Creek	Perennial									1110	354	354	354				
151	UT to Crowders Creek	Intermittent									231	231	231	231				
152	UT to Crowders Creek	Intermittent									173	228	228	228				
153	UT to Crowders Creek	Intermittent																
153	UT to Crowders Creek	Perennial										489	489	489				
154	UT to Crowders Creek	Intermittent																
155	UT to Crowders Creek	Perennial									513	252	252	252				
156	UT to Crowders Creek	Perennial	603	603	603	603	603	603	603	603	659	445	445	445	603	603	603	603
157	UT to Crowders Creek	Perennial	1033	1033	1033	1033	1033	1033	1033	1033	463				1033	1033	1033	1033
158	UT to Crowders Creek	Intermittent	178	178	178	178	178	178	178	178					178	178	178	178
159	UT to Crowders Creek	Intermittent																
160	Not Used																	
161	UT to Crowders Creek	Intermittent																
161	UT to Crowders Creek	Perennial	70	70	70	70	70	70	70	70	267				70	70	70	70
162	UT to Crowders Creek	Perennial									300							
163	UT to Crowders Creek	Perennial										561	561	561				

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
164	Not Used																	
165	Not Used																	
166	UT to Crowders Creek	Intermittent																
167	Not Used																	
168	UT to Crowders Creek	Perennial										643	643	643				
169	UT to Crowders Creek	Perennial																
170	UT to Crowders Creek	Perennial																
171	UT to Crowders Creek	Perennial										388	388	388				
172	UT to Crowders Creek	Intermittent																
173	UT to Crowders Creek	Perennial										55	55	55				
174	UT to Crowders Creek	Perennial	908	908	908	908	908	908	908	908	908				908	908	908	908
175	UT to Crowders Creek	Perennial																
176	UT to Crowders Creek	Intermittent																
177	UT to Crowders Creek	Perennial	956	956	956	956	956	956	956	956	956				956	956	956	956
178	UT to Crowders Creek	Perennial	391	391	391	391	391	391	391	391	391	479	479	479	391	391	391	391
179	UT to Crowders Creek	Intermittent																
180	UT to Crowders Creek	Intermittent																
181	UT to Crowders Creek	Perennial	567	567	567	567	567	567	567	567	567				567	567	567	567
182	UT to Crowders Creek	Intermittent	183	183	183	183	183	183	183	183	183				183	183	183	183
182	UT to Crowders Creek	Perennial	1866	1866	1866	1866	1866	1866	1866	1866	1866				1866	1866	1866	1866
183	UT to Crowders Creek	Perennial	1474	1474	1474	1474	1474	1474	1474	1474	1474				1474	1474	1474	1474
184	UT to Crowders Creek	Perennial	121	121	121	121	121	121	121	121	121				121	121	121	121
185	UT to Crowders Creek	Perennial										261	261	261				
186	UT to Crowders Creek	Intermittent										252	252	252				
187	UT to Crowders Creek	Perennial																
188	UT to Crowders Creek	Intermittent																
188A	UT to Crowders Creek	Perennial																
189	UT to Crowders Creek	Perennial										180	180	180				
190	UT to Crowders Creek	Perennial										421	421	421				
191	UT to Crowders Creek	Intermittent										348	348	348				
192	UT to Crowders Creek	Perennial										340	340	340				
193	UT to Crowders Creek	Perennial										266	266	266				
194	UT to Crowders Creek	Perennial										387	387	387				
195	UT to Crowders Creek	Perennial																
196	UT to Crowders Creek	Perennial	1175	1175	1175	1175	1175	1175	1175	1175	1175	772	772	772	1175	1175	1175	1175
197	UT to Crowders Creek	Perennial																
198	UT to Crowders Creek	Perennial	159	159	159	159	159	159	159	159	159				159	159	159	159
199	UT to Crowders Creek	Intermittent	311	311	311	311	311	311	311	311	311				311	311	311	311
200	UT to Crowders Creek	Intermittent	562	562	562	562	562	562	562	562	562				562	562	562	562
201	UT to Crowders Creek	Intermittent	152	152	152	152	152	152	152	152	152				152	152	152	152
202	UT to Crowders Creek	Perennial	487	487	487	487	487	487	487	487	487				487	487	487	487
203	UT to Crowders Creek	Perennial																
204	UT to Crowders Creek	Perennial																
205	UT to Crowders Creek	Intermittent																
205	UT to Crowders Creek	Perennial																
206	UT to Crowders Creek	Perennial																

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
207	UT to Crowders Creek	Perennial																
208	UT to Crowders Creek	Perennial																
209	UT to Crowders Creek	Perennial										545	545	545				
210	UT to Mill Creek	Perennial	326	288	288	288	326	288	288	288	326				326	288	288	288
211	UT to Mill Creek	Perennial										808	808	808				
212	UT to Mill Creek	Perennial																
213	Mill Creek	Perennial	527	530	530	530	527	530	530	530	527	719	719	719	527	530	530	530
214	UT to Mill Creek	Perennial																
215	UT to Mill Creek	Perennial																
216	UT to Mill Creek	Perennial	384				384				384				384			
217	UT to Mill Creek	Intermittent	83				83				83				83			
218	UT to Mill Creek	Perennial		138	138	138		138	138	138						138	138	138
219	UT to Mill Creek	Perennial		43	43	43		43	43	43		323	323	323		43	43	43
220	UT to Mill Creek	Perennial		474	474	474		474	474	474		498	498	498		474	474	474
221	UT to Mill Creek	Perennial																
222	UT to Mill Creek	Intermittent		413	413	413		413	413	413		413	413	413		413	413	413
222	UT to Mill Creek	Perennial																
223	UT to Mill Creek	Perennial																
224	UT to Mill Creek	Perennial																
225	UT to Mill Creek	Perennial																
226	UT to Catawba Creek	Perennial	1617				1617				1617				1617			
227	UT to Catawba Creek	Perennial	311				311				311				311			
228	UT to Catawba Creek	Perennial	516				516				516				516			
229	UT to Catawba Creek	Perennial	83				83				83				83			
230	UT to Catawba Creek	Perennial	432				432				432				432			
231	UT to Catawba Creek	Intermittent																
232	UT to Catawba Creek	Perennial	641				641				641				641			
232A	UT to Catawba Creek	Perennial																
232B	UT to Catawba Creek	Perennial	228				228				228				228			
233	UT to Catawba Creek	Perennial	1862				1862				1862				1862			
234	UT to Catawba Creek	Perennial	1634				1634				1634				1634			
235	UT to Catawba Creek	Perennial																
236	UT to Catawba Creek	Intermittent																
237	UT to Catawba Creek	Perennial		1257	1257	1257		1257	1257	1257		1257	1257	1257		1257	1257	1257
238	UT to Mill Creek	Intermittent		38	38	38		38	38	38		38	38	38		38	38	38
238	UT to Mill Creek	Perennial		75	75	75		75	75	75		75	75	75		75	75	75
239	UT to Mill Creek	Intermittent		249	249	249		249	249	249		249	249	249		249	249	249
240	UT to Mill Creek	Intermittent																
241	UT to Mill Creek	Intermittent																
242	UT to Catawba Creek	Perennial		2178	2178	2178		2178	2178	2178		2178	2178	2178		2178	2178	2178
243	UT to Catawba Creek	Perennial																
243	UT to Catawba Creek	Intermittent																
244	UT to Catawba Creek	Perennial																
245	UT to Catawba Creek	Intermittent																
246	UT to Catawba Creek	Intermittent		114	114	114		114	114	114		114	114	114		114	114	114
247	UT to Catawba Creek	Intermittent																

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
247	UT to Catawba Creek	Perennial		437	437	437		437	437	437		437	437	437		437	437	437
248	UT to Catawba Creek	Perennial	779				779				779				779			
249	UT to Catawba Creek	Perennial	171				171				171				171			
249A	UT to Catawba Creek	Perennial																
250	UT to Catawba Creek	Perennial	327				327				327				327			
250A	UT to Catawba Creek	Perennial	249				249				249				249			
251	UT to Catawba Creek	Perennial	267				267				267				267			
251A	UT to Catawba Creek	Perennial	988				988				988				988			
252	UT to Catawba Creek	Intermittent																
252	UT to Catawba Creek	Perennial																
252A	UT to Catawba Creek	Perennial	332				332				332				332			
253	UT to Catawba Creek	Intermittent																
254	UT to Catawba Creek	Intermittent	70				70				70				70			
255	UT to Catawba Creek	Intermittent	39				39				39				39			
256	UT to Catawba Creek	Perennial	679				679				679				679			
257	UT to Catawba Creek	Perennial																
258	UT to Catawba Creek	Intermittent																
259	Catawba Creek	Perennial	Bridged				Bridged				Bridged				Bridged			
259A	UT to Catawba Creek	Perennial	Bridged				Bridged				Bridged				Bridged			
259B	UT to Catawba Creek	Perennial																
259C	UT to Catawba Creek	Perennial																
260	UT to Catawba Creek	Perennial																
261	UT to Catawba Creek	Perennial																
262	UT to Catawba Creek	Intermittent																
263	UT to Catawba Creek	Perennial	1483				1483				1483				1483			
264	UT to Catawba Creek	Intermittent	131				131				131				131			
264	UT to Catawba Creek	Perennial																
265	UT to Catawba Creek	Perennial																
266	UT to Catawba Creek	Perennial																
267	UT to Catawba Creek	Intermittent				120				120				120				120
268	UT to Catawba Creek	Perennial		1021	1021			1021	1021			1021	1021			1021	1021	
269	UT to Catawba Creek	Perennial																
270	UT to Catawba Creek	Perennial		610	610	610		610	610	610		610	610	610		610	610	610
271	UT to Catawba Creek	Perennial		133	133	133		133	133	133		133	133	133		133	133	133
272	UT to Catawba Creek	Perennial																
273	UT to Catawba Creek	Perennial																
274	UT to Catawba Creek	Perennial		363	363	363		363	363	363		363	363	363		363	363	363
275	UT to Catawba Creek	Perennial		302	302	302		302	302	302		302	302	302		302	302	302
276	UT to Catawba Creek	Perennial																
277	UT to Catawba Creek	Perennial																
278	UT to Catawba Creek	Intermittent																
279	UT to Catawba Creek	Intermittent																
280	UT to Catawba Creek	Intermittent				843				843				843				843
281	UT to Catawba Creek	Perennial																
282	UT to Catawba Creek	Intermittent		306	306			306	306			306	306			306	306	
282	UT to Catawba Creek	Perennial		1330	1330			1330	1330			1330	1330			1330	1330	

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Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
283	UT to Catawba Creek	Intermittent		172	172			172	172			172	172			172	172	
284	UT to S. F. Catawba River	Intermittent																
284	UT to S. F. Catawba River	Perennial																
285	UT to S. F. Catawba River	Intermittent																
285	UT to S. F. Catawba River	Perennial	1004				1004				1004				1004			
286	UT to S. F. Catawba River	Intermittent																
286	UT to S. F. Catawba River	Perennial	210				210				210				210			
286A	UT to S. F. Catawba River	Intermittent																
287	UT to S. F. Catawba River	Intermittent																
287	UT to S. F. Catawba River	Perennial																
288	UT to S. F. Catawba River	Intermittent																
288	UT to S. F. Catawba River	Perennial		667	667			667	667			667	667			667	667	
288A	UT to S. F. Catawba River	Intermittent																
288A	UT to S. F. Catawba River	Perennial																
289	UT to S. F. Catawba River	Perennial		568	568			568	568			568	568			568	568	
289	UT to S. F. Catawba River	Intermittent		373	373			373	373			373	373			373	373	
290	UT to S. F. Catawba River	Intermittent																
291	UT to S. F. Catawba River	Perennial		81	81			81	81			81	81			81	81	
292	UT to S. F. Catawba River	Intermittent		315	356			315	356			315	356			315	356	
293	UT to S. F. Catawba River	Intermittent																
293A	UT to S. F. Catawba River	Intermittent			536				536				536					
293A	UT to S. F. Catawba River	Perennial																
293B	UT to S. F. Catawba River	Intermittent	71				71				71				71			
293C	UT to S. F. Catawba River	Perennial																
293C	UT to S. F. Catawba River	Intermittent																
294	UT to S. F. Catawba River	Intermittent	364				364				364				364			
294	UT to S. F. Catawba River	Perennial	172				172				172				172			
294A	UT to S. F. Catawba River	Intermittent															536	
294A	UT to S. F. Catawba River	Perennial																
295	UT to S. F. Catawba River	Intermittent																
295	UT to S. F. Catawba River	Perennial	713				713				713				713			
295A	UT to S. F. Catawba River	Intermittent																
295A	UT to S. F. Catawba River	Perennial																
296	UT to S. F. Catawba River	Perennial	361			578	361			578	361			578	361			578
296A	UT to S. F. Catawba River	Perennial		829	83			829	83			829	83			829	83	
297	UT to S. F. Catawba River	Perennial	649			917	649			917	649			917	649			917
297A	UT to S. F. Catawba River	Intermittent		217				217				217				217		
297A	UT to S. F. Catawba River	Perennial		290				290				290				290		
298	UT to S. F. Catawba River	Intermittent																
298	UT to S. F. Catawba River	Perennial																
299	UT to S. F. Catawba River	Intermittent																
299	UT to S. F. Catawba River	Perennial	479				479				479				479			
300	UT to S. F. Catawba River	Intermittent	1365			1399	1365			1399	1365			1399	1365			1399
300	UT to S. F. Catawba River	Perennial	193			193	193			193	193			193	193			193
300A	UT to S. F. Catawba River	Intermittent																
301	UT to S. F. Catawba River	Intermittent																

U-3321 Gaston East-West Connector
Stream Impacts by Alternative (Feet)

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
301	UT to S. F. Catawba River	Perennial																
301A	UT to S. F. Catawba River	Intermittent																
301B	UT to S. F. Catawba River	Intermittent																
302	UT to Catawba River	Intermittent																
303	UT to Catawba River	Intermittent																
303	UT to Catawba River	Perennial																
304	UT to Catawba River	Intermittent	260			260	260			260	260			260	260			260
304	UT to Catawba River	Perennial	484			484	484			484	484			484	484			484
305	UT to Catawba River	Perennial	135			135	135			135	135			135	135			135
306	UT to Catawba River	Intermittent																
307	UT to Catawba River	Intermittent																
307	UT to Catawba River	Perennial																
308	UT to Catawba River	Intermittent																
309	UT to Catawba River	Intermittent		190				190				190				190		
309	UT to Catawba River	Perennial																
310	UT to Catawba River	Intermittent																
311	UT to Catawba River	Intermittent																
311	UT to Catawba River	Perennial																
311A	UT to Catawba River	Intermittent																
312	UT to Catawba River	Intermittent	52			52	52			52	52			52	52			52
312A	Beaverdam Creek	Perennial	973	1283	973	973	973	1283	973	973	973	1283	973	973	973	1283	973	973
312B	UT to Catawba River	Intermittent																
313	UT to Catawba River	Intermittent			251				251				251				251	
313	UT to Catawba River	Perennial																
313A	UT to Beaverdam Creek	Intermittent																
314	UT to Catawba River	Intermittent			285				285				285				285	
314A	UT to Beaverdam Creek	Intermittent	226		226	226	226		226	226	226		226	226	226		226	226
314A	UT to Beaverdam Creek	Perennial	969		969	969	969		969	969	969		969	969	969		969	969
315	UT to Catawba River	Intermittent		290				290				290				290		
315A	UT to Beaverdam Creek	Intermittent	176		172	176	176		172	176	176		172	176	176		172	176
316	UT to Catawba River	Intermittent		152				152				152				152		
316	UT to Catawba River	Perennial																
316A	UT to Beaverdam Creek	Intermittent																
317	UT to Beaverdam Creek	Intermittent																
318	UT to Beaverdam Creek	Intermittent	464		381	464	464		381	464	464		381	464	464		381	464
318	UT to Beaverdam Creek	Perennial																
318A	UT to Beaverdam Creek	Perennial		158				158				158				158		
318A	UT to Beaverdam Creek	Intermittent	131	197	131	131	131	197	131	131	131	197	131	131	131	197	131	131
318B	UT to Beaverdam Creek	Intermittent																
318C	UT to Beaverdam Creek	Intermittent		97				97				97				97		
318D	UT to Beaverdam Creek	Intermittent		40				40				40				40		
319	UT to Beaverdam Creek	Intermittent																
320	UT to Beaverdam Creek	Intermittent																
320A	UT to Beaverdam Creek	Intermittent																
321	Legion Lake Stream	Intermittent										151						
321	Legion Lake Stream	Perennial	1610	2303	1610	1610	1610	2303	1610	1610	1610	2152	1610	1610	1610	2303	1610	1610

U-3321 Gaston East-West Connector
Stream Impacts by Alternative (Feet)

Earth Tech Stream ID	Stream Name	Intermittent / Perennial	Alternative 4	Alternative 5	Alternative 6	Alternative 9	Alternative 22	Alternative 23	Alternative 24	Alternative 27	Alternative 58	Alternative 64	Alternative 65	Alternative 68	Alternative 76	Alternative 77	Alternative 78	Alternative 81
322	UT to Legion Lake Stream	Intermittent																
322	UT to Legion Lake Stream	Perennial																
323	UT to Beaverdam Creek	Perennial	99	59	99	99	99	59	99	99	99	59	99	99	99	59	99	99
323A	UT to Beaverdam Creek	Intermittent																
324	UT to Beaverdam Creek	Intermittent																
325	UT to Beaverdam Creek	Intermittent																
326	UT to Beaverdam Creek	Intermittent	239	181	239	239	239	181	239	239	239	181	239	239	239	181	239	239
326	UT to Beaverdam Creek	Perennial																
327	UT to Legion Lake Stream	Intermittent		80				80				80				80		
328	UT to Legion Lake Stream	Intermittent		424				424				424				424		
328	UT to Legion Lake Stream	Perennial		587				587				587				587		
328A	UT to Legion Lake Stream	Intermittent																
329	UT to Legion Lake Stream	Intermittent																
330	UT to Legion Lake Stream	Intermittent																
330	UT to Legion Lake Stream	Perennial	74	72	74	74	74	72	74	74	74	72	74	74	74	72	74	74
330A	UT to Legion Lake Stream	Intermittent																
331	UT to Legion Lake Stream	Intermittent																
331	UT to Legion Lake Stream	Perennial																
332	UT to Legion Lake Stream	Perennial	317	366	317	317	317	366	317	317	317	366	317	317	317	366	317	317
333	UT to Legion Lake Stream	Intermittent																
334	UT to Legion Lake Stream	Intermittent																
335	UT to Legion Lake Stream	Perennial	180	177	180	180	180	177	180	180	180	177	180	180	180	177	180	180
336	UT to Legion Lake Stream	Intermittent																
337	UT to Legion Lake Stream	Intermittent																
337	UT to Legion Lake Stream	Perennial																
337A	UT to Legion Lake Stream	Intermittent																
338	UT to Legion Lake Stream	Intermittent																
338A	UT to Legion Lake Stream	Intermittent																
338B	UT to Legion Lake Stream	Intermittent	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68
339	UT to Legion Lake Stream	Intermittent	735	874	735	735	735	874	735	735	735	874	735	735	735	735	735	735
339A	UT to Legion Lake Stream	Intermittent	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
340	UT to Legion Lake Stream	Intermittent	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082	1082
340	UT to Legion Lake Stream	Perennial	1244	1825	1244	1244	1244	1825	1244	1244	1244	1825	1244	1244	1244	1244	1244	1244
340A	UT to Legion Lake Stream	Intermittent	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359	359
341	UT to Legion Lake Stream	Intermittent	282	282	282	282	282	282	282	282	282	282	282	282	282	282	282	282
342	UT to Legion Lake Stream	Intermittent		137				137				137				137		
343	UT to Coffey Creek	Intermittent																
344	UT to Beaverdam Creek	Perennial																
345	UT to Catawba Creek	Perennial	233				233				233				233			
Total Stream Impacts			**58114**	**53008**	**50726**	**49765**	**59892**	**54854**	**52572**	**51611**	**60244**	**50931**	**48649**	**47688**	**55819**	**50061**	**48499**	**47538**

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
1	W1-R	S&ME	0.01	PEM1J	44	Low
2	W5-R	S&ME	0.29	PFO1C	37	Low
3	W6-R	S&ME	0.05	PEM1C	41	Low
4	W8-R	S&ME	0.04	PFO1B	31	Low
5	W7-R	S&ME	0.06	PFO1B	38	Low
6	W9-R	S&ME	0.21	PFO1B	33	Low
7	W10-R	S&ME	0.22	PFO1C	39	Low
8	W11-R	S&ME	0.28	PFO1/EM1B	26	Low
9	W15-R	S&ME	0.25	PFO1J	41	Low
10	W14-R	S&ME	0.12	PFO1J	35	Low
11	W13-R	S&ME	0.18	PSS1C	21	Low
12	W12-R	S&ME	4.20	PFO1/EM1G	73	High
13	W19-R	S&ME	0.09	PUBHd	53	Medium
14	W21-R	S&ME	0.02	PFO1Ad	40	Low
15	W20-R	S&ME	0.36	PFO1C	51	Medium
16	W18-R	S&ME	0.02	PFO/SS1B	23	Low
17	W17-R	S&ME	0.72	PUBHd	63	High
18	W16-R	S&ME	0.04	PFO/SS1J	35	Low
19	W22-R	S&ME	0.05	PEM1G	37	Low
20	W27-R	S&ME	0.01	PFO1B	40	Low
21	W23-R	S&ME	0.05	PFO1A	27	Low
22	W24-R	S&ME	0.02	PFO1B	23	Low
23	W25-R	S&ME	0.02	PFO1B	23	Low
24	W43-R	S&ME	0.00	PFO1C	31	Low
25	W44-R	S&ME	0.03	PEM1B	37	Low
26	W45-R	S&ME	0.01	PEM1F	20	Low
27	W46-R	S&ME	0.01	PSS3C	31	Low
28	W47-R	S&ME	0.01	PEM1B	27	Low
29	W48-R	S&ME	0.14	PSS1C	40	Low
30	W49-R	S&ME	0.03	PSS1/3C	44	Low
31	W50-N	S&ME	0.70	PEM1Fh	39	Low
32	W51-R	S&ME	0.02	PSS1B	31	Low
33	W52-R	S&ME	0.10	PFO1C	47	Medium
34	W56-R	S&ME	1.89	PFO1C	73	High
35	W60-R	S&ME	1.17	PEM1/SS1C	78	High
36	W61-R	S&ME	0.06	PFO1B	40	Low
37	W59-R	S&ME	0.06	PFO1B	21	Low
37A	W62-R	S&ME	0.01	PFO1B	23	Low
38	W58-R	S&ME	0.04	PEM1B	21	Low
39	W55-R	S&ME	0.38	PFO1C	47	Medium
40	W57-R	S&ME	0.05	PFO1A	26	Low
41	W54-R	S&ME	0.02	PFO1B	31	Low
42	W53-R	S&ME	0.002	PFO1B	32	Low
43	NL	S&ME	0.01	NA	NA	NA
44	W63-R	S&ME	0.37	PFO1G	42	Low
45	W69-R**	S&ME	0.04	PFO1Ah	19	Low
46	W71-R	S&ME	0.57	PSS1Bds	69	High
47	W75-R	S&ME	0.11	PFO1Cs	16	Low
48	W74-R	S&ME	0.09	PFO1C	59	Medium
49	W65-R	S&ME	0.16	PFO1C	34	Low
50	W66-R	S&ME	0.14	PFO1C	28	Low
51	W77-R	S&ME	2.07	PFO1C	70	High
52	W76-R	S&ME	0.23	PFO1Cd	55	Medium
53	W67-R	S&ME	0.20	PFO1C	22	Low
54	W70-R	S&ME	0.48	PFO1C	22	Low

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
55	W73-R	S&ME	0.07	PFO1C	32	Low
56	W90-R	S&ME	0.27	PFO1C	48	Medium
57	W78-R	S&ME	0.76	PFO1Ed	54	Medium
58	W72-R	S&ME	0.06	PEM1C	36	Low
59	W88-R	S&ME	0.38	PSS1Fh	46	Medium
60	W30-R	S&ME	0.23	PFO1B	51	Medium
60A	W29-R	S&ME	0.04	PFO1B	44	Low
61	W33-R	S&ME	0.07	PFO1A	35	Low
62	W32-R	S&ME	0.08	PFO1B	27	Low
63	W31-R	S&ME	0.06	PFO1B	20	Low
64	W28-R	S&ME	0.10	PFO1/EM1B	27	Low
65	W36-R	S&ME	0.07	PFO/SS1C	46	Medium
66	W37-R	S&ME	0.02	PFO1B	39	Low
67	W42-R	S&ME	0.28	PFO1C	37	Low
68	W38-R	S&ME	0.21	PFO1A	54	Medium
69	W41-R	S&ME	0.04	PFO1C	23	Low
70	W39-R	S&ME	0.31	PFO1C	52	Medium
71	W40-R	S&ME	0.17	PFO/SS1C	34	Low
72	W80-R	S&ME	0.14	PFO1C	36	Low
73	W79-R	S&ME	0.08	PFO1/EM1C	48	Medium
74	W81-R	S&ME	1.21	PFO1C	41	Low
75	W83-R	S&ME	0.42	PFO1C	28	Low
76	W82-R	S&ME	0.32	PFO1C	36	Low
77	W95-R	S&ME	0.02	PFO1C	39	Low
78	W96-R	S&ME	0.22	PEM1/SS1F	36	Low
79	W97-R	S&ME	0.02	PEM1/SS1Fd	39	Low
80	W98-R	S&ME	0.01	PFO1G	36	Low
81	W120-R	S&ME	0.03	PFO1B	20	Low
82	W105-R	S&ME	0.38	PFO1Cd	20	Low
83	W104-R	S&ME	0.10	PFO1Cd	20	Low
84	W102-R	S&ME	0.06	PSS1B	32	Low
85	W89-R	S&ME	0.35	PFO1C	63	High
86	W108-R	S&ME	0.03	PEM1B	27	Low
87	W111-N**	S&ME	0.14	PFO1B	19	Low
88	W103-R	S&ME	0.07	PFO1B	63	High
89	W106-R	S&ME	0.19	PFO1C	34	Low
90	W107-R	S&ME	3.55	PFO1C	52	Medium
91	W92-R	S&ME	0.12	PEM1F	40	Low
92	W84-R	S&ME	4.40	PFO1B	58	Medium
93	W86-R	S&ME	0.44	PFO1A	94	High
94	W85-R	S&ME	0.30	PFO1B	45	Medium
95	W114-N	S&ME	0.02	PFO1/4C	23	Low
96	W91-R	S&ME	0.20	PFO1C	65	High
97	W87-R	S&ME	1.81	PFO1C	57	Medium
98	W87-R	S&ME	2.16	PFO1C	57	Medium
99	W143-R/P	S&ME	2.19	PFO1C/PUBH	34	Low
100	W142-N	S&ME	0.26	PFO1/EM1C	24	Low
101	W118-R	S&ME	0.07	PFO1B	35	Low
102	W119-R	S&ME	0.36	PFO1C	36	Low
103	W123-R	S&ME	6.70	PFO1C	83	High
104	W135-R	S&ME	1.15	PFO1C/Fd	37	Low
105	W125-R	S&ME	0.09	PEM1C	14	Low
106	W126-R	S&ME	0.47	PFO1C/B	39	Low
107	W140-R	S&ME	0.44	PFO/SS1Fh	48	Medium
108	W139-R	S&ME	0.04	PEM1C	16	Low

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
109	W138-R	S&ME	0.03	PFO1/EM1C	28	Low
110	W113-R	S&ME	0.77	PFO1/EM1Cd	59	Medium
110A	W110-R	S&ME	0.01	PEM1C	23	Low
111	W115-R	S&ME	0.60	PFO/SS1C	52	Medium
112	W117-R**	S&ME	0.37	PFO1C	44	Low
113	W124-R	S&ME	0.01	PFO1B	32	Low
114	W122-R	S&ME	0.15	PFO1B	43	Low
115	W100-R	S&ME	0.18	PFO1B	34	Low
116	W127-R	S&ME	0.71	PFO1B	36	Low
117	W130-R	S&ME	0.06	PEM1B	37	Low
118	W129-R	S&ME	0.03	PFO1B	27	Low
119	W141-P	S&ME	0.08	PUBHh	--	--
120	W131-R	S&ME	0.03	PSS1C	39	Low
121	W133-R	S&ME	0.06	PFO1B	42	Low
122	NL	S&ME	0.01	NA	NA	NA
123	W136-N	S&ME	0.08	PFO1A	11	Low
124	W134-R	S&ME	0.29	PFO1/EM1B	32	Low
125	W137-R	S&ME	0.14	PFO1Fd	19	Low
126	W144-R	S&ME	0.16	PFO1B	42	Low
127	W148A-R	S&ME	2.38	PFO1Cd	61	High
128	W145-R	S&ME	0.09	PFO1B	31	Low
129	W147-R	S&ME	0.05	PFO1C	24	Low
130	W150-R	S&ME	0.01	PFO1C	26	Low
131	C2 (NR)	JCA	0.10	PFO1	56	Medium
132	C1 (NR)	JCA	0.31	PFO1	64	Medium
133	C3 (NR)	JCA	0.003	PFO1	0	Low
134	C4 (NR)	JCA	0.54	PFO1	54	Medium
135	C5 (NR)	JCA	0.68	PFO1	70	High
136	C6 (NR)	JCA	0.43	PFO1	28	Low
137	C9 (NR)	JCA	0.20	PSS1	48	Medium
138	C8 (NR)	JCA	0.02	PFO1	26	Low
139	C7 (NR)	JCA	0.03	PFO1	70	High
140	C10 (NR)	JCA	0.04	PFO1	55	Medium
141	C11 (NR)	JCA	0.24	PFO1	68	High
141A	C12 (NR)	JCA	0.07	PEM1	24	Low
142	NL	JCA	1.52	NA	NA	
143	C13 (NR)	JCA	0.02	PFO1	24	Low
144	C14 (NR)	JCA	0.18	PEM1	24	Low
145	C15 (NR)	JCA	0.12	PEM1	24	Low
146	W2-023 (NR)	JCA	0.31	PFO1	41	Medium
147	W2-016 (NR)	JCA	0.02	PFO1	36	Medium
148	W2-019 (NR)	JCA	0.20	PEM1	41	Medium
149	W2-018 (NR)	JCA	0.17	PFO1	33	Low
150	W2-017 (NR)	JCA	0.40	PFO1	39	Medium
151	W2-020 (NR)	JCA	0.03	PFO1	35	Medium
152	W2-021 (NR)	JCA	0.32	PFO1	39	Medium
153	W2-022 (NR)	JCA	0.05	PFO1	37	Medium
154	W2-030 (NR)	JCA	0.42	PFO1F	43	Medium
155	W2-031 (NR)	JCA	0.13	PFO1	9	Low
156	W2-029 (NR)	JCA	0.11	PFO1	51	Medium
157	W2-028 (NR)	JCA	0.39	PFO1	30	Low
158	W2-027 (NR)	JCA	0.01	PFO1	8	Low
159	W2-026 (NR)	JCA	0.63	PEM1	25	Low
160	W2-025 (NR)	JCA	0.05	PFO1	13	Low
161	W2-050 (NR)	JCA	0.17	PFO1	33	Low

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
162	W2-052 (NR)	JCA	0.10	PFO1	21	Low
163	NL	JCA	0.03	NA	NA	
164	W2-033 (NR)	JCA	0.02	PFO1	4	Low
165	W2-051 (NR)	JCA	0.35	PFO1	35	Medium
166	W2-034 (NR)	JCA	0.05	PFO1	7	Low
167	W2-035 (NR)	JCA	0.06	PFO1	19	Low
168	NL	JCA	0.17	NA	NA	
169	W2-032 (NR)	JCA	0.21	PFO1	42	Medium
170	W2-043 (NR)	JCA	0.38	PFO1	47	Medium
171	W2-042 (NR)	JCA	0.24	PFO1	47	Medium
172	W2-041 (NR)	JCA	0.003	PFO1	15	Low
173	W2-039 (NR)	JCA	0.01	PFO1	14	Low
174	W2-038 (NR)	JCA	0.28	PFO1	38	Medium
174A	W2-040 (NR)	JCA	0.01	PFO1	4	Low
175	W2-037 (NR)	JCA	0.05	PFO1	21	Low
176	W2-057	JCA	0.004	PFO1	0	Low
177	W2-045 (NR)	JCA	0.01	PFO1	13	Low
178	W2-044 (NR)	JCA	0.01	PFO1	13	Low
179	W2-055 (NR)	JCA	0.22	PFO1	55	Medium
180	W2-056	JCA	0.03	PFO1	21	Low
181	W2-046 (NR)	JCA	0.004	PFO1	13	Low
182	W2-054 (NR)	JCA	0.01	PFO1	2	Low
183	W2-053 (NR)	JCA	0.05	PFO1	23	Low
184	W2-047 (NR)	JCA	0.03	PFO1	8	Low
185	W2-048 (NR)	JCA	0.12	PFO1Ah	51	Medium
186	W2-049 (NR)	JCA	0.11	PFO1Ah	36	Medium
187	W2-058 (NR)	JCA	0.56	PFO1A	53	Medium
188	W2-059 (NR)	JCA	0.54	PFO1A	43	Medium
189	W2-060 (NR)	JCA	5.51	PSS1	51	Medium
190	W2-086 (NR)	JCA	0.09	PFO1	13	Low
191	W2-085 (NR)	JCA	0.20	PFO1	13	Low
192	W2-087 (NR)	JCA	0.99	PFO1	59	Medium
193	W2-068 (NR)	JCA	0.12	PEM1	18	Low
194	W2-071 (NR)	JCA	0.02	PFO1	37	Medium
195	W2-070 (NR)	JCA	0.01	PFO1	36	Medium
196	W2-069 (NR)	JCA	0.04	PFO1	55	Medium
197	W2-067 (NR)	JCA	0.87	PFO1E	66	High
198	W2-066 (NR)	JCA	0.004	PFO1	0	Low
199	W2-063 (NR)	JCA	0.25	PFO1/PEM1	13	Low
199A	W2-065 (NR)	JCA	0.01	PFO1	26	Low
200	W2-064 (NR)	JCA	0.06	PFO1	33	Low
201	W2-062 (NR)	JCA	1.39	PFO1F	70	High
202	W2-074 (NR)	JCA	0.00	PFO1	28	Low
202A	W2-073 (NR)	JCA	0.00	PFO1	32	Low
203	W2-072 (NR)	JCA	0.40	PFO1	42	Medium
203A	W2-061 (NR)	JCA	0.29	PFO1	15	Low
204	W2-081 (NR)	JCA	0.02	PFO1	34	Medium
205	W2-082 (NR)	JCA	0.01	PFO1	8	Low
206	W2-083 (NR)	JCA	0.03	PFO1	28	Low
207	W2-084 (NR)	JCA	0.02	PFO1	11	Low
208	W2-076 (NR)	JCA	0.17	PFO1A	44	Medium
209	W2-079 (NR)	JCA	0.02	PFO1	24	Low
210	W2-080 (NR)	JCA	0.18	PFO1A	60	Medium
211	W2-075 (NR)	JCA	0.10	PFO1A	42	Medium
212	W2-078 (NR)	JCA	0.05	PFO1	15	Low

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
213	W2-077 (NR)	JCA	0.05	PFO1	10	Low
214	W2-095	JCA	0.15	PFO1	58	Medium
214	W2-096	JCA		PFO1	58	Medium
215	W2-094	JCA	0.02	PFO1	4	Low
216	W2-093	JCA	0.01	PFO1	4	Low
217	W2-097 (NR)	JCA	0.02	PFO1	8	Low
218	W2-092 (NR	JCA	0.05	PEM1	17	Low
219	W2-098 (NR)	JCA	0.01	PEM1	15	Low
220	W2-091	JCA	0.03	PEM1	17	Low
221	W2-099	JCA	0.12	PFO1	18	Low
222	W2-100	JCA	0.02	PFO1	18	Low
223	W2-090	JCA	0.09	PEM1	17	Low
224	W2-089 (NR)	JCA	0.02	PFO1	12	Low
225	W2-101	JCA	0.06	PFO1	18	Low
226	W2-102 (NR)	JCA	0.06	PFO1	23	Low
227	W2-103 (NR)	JCA	0.18	PFO1	23	Low
228	W2-088	JCA	0.12	PEM1	16	Low
229	W2-104 (NR	JCA	0.22	PEM1	16	Low
230	W2-107 (NR)	JCA	0.06	PEM1	28	Low
231	W2-105 (NR)	JCA	0.10	PEM1	23	Low
232	W2-106 (NR)	JCA	1.20	PEM1	21	Low
233	W2-109 (NR)	JCA	0.07	PSS1	0	Low
234	W2-108 (NR)	JCA	0.03	PFO1	11	Low
235	W2-110 (NR)	JCA	0.05	PEM1/PFO1	61	Medium
235A	W2-119 (NR)	JCA	0.07	PFO1	17	Low
236	W2-120 (NR)	JCA	0.01	PFO1	0	Low
237	W2-121 (NR)	JCA	0.56	PFO1	37	Medium
238	W2-122 (NR)	JCA	0.13	PFO1	35	Medium
239	W2-134 (NR)	JCA	0.02	PEM1	18	Low
239A	W2-133 (NR)	JCA	0.05	PEM1	28	Low
240	W2-131 (NR)	JCA	0.09	PFO1	22	Low
241	W2-132 (NR)	JCA	1.34	PFO1	39	Medium
242	W2-130 (NR)	JCA	0.15	PSS1	13	Low
243	W2-138 (NR)	JCA	0.10	PFO1	20	Low
244	W2-139 (NR)	JCA	0.06	PFO1	25	Low
245	W2-137 (NR)	JCA	0.59	PFO1Ah	77	High
246	W2-136	JCA	0.08	PFO1Ah	77	High
247	W2-135	JCA	1.26	PFO1Ah	77	High
248	W2-141 (NR)	JCA	4.76	PFO1Ah	93	High
249	W2-140 (NR)	JCA	0.18	PFO1Ah	61	Medium
250	W2-142 (NR)	JCA	0.04	PFO1	15	Low
251	W2-144 (NR)	JCA	0.02	PFO1	36	Medium
252	W2-148 (NR)	JCA	0.29	PEM1/PSS1/PFO1	9	Low
252A	W2-145 (NR)	JCA	0.01	PFO1	7	Low
253	W2-147 (NR)	JCA	0.35	PEM1	26	Low
254	W2-149 (NR)	JCA	0.11	PEM1	15	Low
255	W2-146	JCA	0.01	PEM1	15	Low
256	W2-143	JCA	0.02	PEM1	15	Low
257	W2-112 (NR)	JCA	0.51	PFO1	43	Medium
258	W2-111 (NR)	JCA	0.01	PFO1	6	Low
259	W2-113 (NR)	JCA	0.03	PFO1	14	Low
260	W2-114 (NR)	JCA	0.13	PFO1	43	Medium
261	W2-118 (NR)	JCA	0.16	PEM1	5	Low
262	W2-117 (NR)	JCA	0.01	PEM1	0	Low
263	W2-116 (NR)	JCA	0.01	PEM1	0	Low

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
264	W2-115 (NR)	JCA	0.11	PEM1	14	Low
265	W2-127	JCA	0.09	PFO1	58	Medium
266	W2-128	JCA	0.07	PFO1	58	Medium
267	W2-126 (NR)	JCA	0.11	PSS1A	15	Low
268	W2-125 (NR)	JCA	2.42	PFO1A	67	High
269	W2-124 (NR)	JCA	0.42	PFO1A	62	Medium
270	W2-123 (NR)	JCA	0.12	PFO1	45	Medium
271	W2-129 (NR)	JCA	0.05	PFO1	20	Low
272	W2-155 (NR)	JCA	4.30	PFO1	64	Medium
273	W2-154 (NR)	JCA	0.99	PFO1	53	Medium
274	W2-153 (NR)	JCA	0.31	PFO1	51	Medium
275	W2-151 (NR)	JCA	3.57	PFO1	53	Medium
275A	W2-152 (NR)	JCA	0.14	PFO1	34	Medium
276	W2-150 (NR)	JCA	0.18	PFO1	32	Low
277	W3C	Catena	0.08	Palustrine	27	Low
278	W3A8	Catena	0.18	Palustrine	23	Low
279	W3B	Catena	0.05	Palustrine	17	Low
280	W3AA	Catena	0.09	Palustrine	52	Medium
281	W3AB	Catena	0.02	Palustrine	47	Medium
281A	W3AC	Catena	0.01	Palustrine	30	Low
282	W3AF	Catena	0.06	Palustrine	18	Low
283	W3AE	Catena	0.12	Palustrine	59	Medium
283A	W3AH	Catena	0.01	Palustrine	70	High
284	W3AH	Catena	0.47	Palustrine	70	High
285	W3AG	Catena	0.05	Palustrine	44	Medium
286	W3AL	Catena	0.33	Palustrine	68	High
287	W3AK	Catena	0.02	Palustrine	42	Medium
288	W3AJ	Catena	0.004	Palustrine	46	Medium
289	W3AL2	Catena	0.23	Palustrine	43	Medium
290	W3AQ	Catena	0.05	Palustrine	64	Medium
291	W3AO	Catena	0.07	Palustrine	9	Low
292	W3AP	Catena	0.01	Palustrine	32	Low
293	W3AM	Catena	0.02	Palustrine	23	Low
293A	W3AN	Catena	0.00	Palustrine	23	Low
294	W3AR	Catena	0.18	Palustrine	38	Medium
295	W3AU	Catena	0.01	Palustrine	22	Low
296	W3B7	Catena	0.01	Palustrine	NA	NA
297	W3Y	Catena	0.30	Palustrine	58	Medium
298	W3C7	Catena	0.08	Palustrine	23	Low
298A	W3E	Catena	0.29	Palustrine	61	Medium
299	W3A7	Catena	0.02	Palustrine	42	Medium
300	W3H	Catena	0.01	Palustrine	28	Low
301	W3J	Catena	4.21	Palustrine	59	Medium
302	(W3H2) W3H4 OLD	Catena	0.21	Palustrine	33	Medium
303	W3K	Catena	0.16	Palustrine	17	Low
304	W3C3	Catena	0.19	Palustrine	38	Medium
304A	W3O	Catena	0.03	Palustrine	54	Medium
304B	W3N	Catena	0.02	Palustrine	23	Low
305	W3A3	Catena	0.01	Palustrine	23	Low
305A	W3P	Catena	0.30	Palustrine	45	Medium
305B	W3Z	Catena	0.02	Palustrine	23	Low
306	W3B3	Catena	2.00	Palustrine	46	Medium
306A	W3Q	Catena	0.22	Palustrine	34	Medium
307	W3T	Catena	0.03	Palustrine	43	Medium
308	W3R	Catena	3.54	Palustrine	35	Medium

Earth Tech Wetland Number	Consultant Wetland Number	Consultant	Wetland Size (acres)	Cowardin Classification	DWQ Rating	Wetland Quality Rating
309	W3S	Catena	0.30	Palustrine	50	Medium
310	W3U	Catena	0.16	Palustrine	13	Low
311	W3V	Catena	0.47	Palustrine	44	Medium
312	W3W	Catena	0.11	Palustrine	51	Medium
313	W3W	Catena	0.19	Palustrine	51	Medium
314	W3O3	Catena	0.14	Palustrine	52	Medium
315	W3N3	Catena	1.28	Palustrine	31	Low
316	W3G3	Catena	0.73	Palustrine	22	Low
316A	W3D3	Catena	0.37	Palustrine	33	Low
316B	W3F3	Catena	0.09	Palustrine	15	Low
316C	W3E3	Catena	0.17	Palustrine	29	Low
316D	W3H3	Catena	0.004	Palustrine	23	Low
317	W3I3	Catena	4.78	Palustrine	62	Medium
317A	W3M3	Catena	0.03	Palustrine	31	Low
318	W3L3	Catena	0.09	Palustrine	24	Low
319	W3K3	Catena	0.30	Palustrine	23	Low
320	W3L3A	Catena	0.01	Palustrine	23	Low
321	W3J3	Catena	0.02	Palustrine	14	Low
322	W3O2	Catena	0.22	Palustrine	57	Medium
332A	W3P2	Catena	0.01	Palustrine	35	Medium
323	W3P3	Catena	0.02	Palustrine	17	Low
324	W3B4	Catena	0.02	Palustrine	22	Low
325	W3L2	Catena	0.03	Palustrine	15	Low
326	W3D4	Catena	0.08	Palustrine	41	Medium
327	W3M2	Catena	0.12	Palustrine	60	Medium
328	W3N2	Catena	0.03	Palustrine	53	Medium
329	W3J2	Catena	0.56	Palustrine	43	Medium
329A	W3I2	Catena	0.00	Palustrine	27	Low
330	W3K2	Catena	0.05	Palustrine	19	Low
331	W3B2	Catena	0.05	Palustrine	17	Low
331A	W3A2	Catena	0.01	Palustrine	38	Medium
332	W3C2	Catena	0.10	Palustrine	38	Medium
333	W3D2	Catena	0.05	Palustrine	17	Low
333A	W3E2	Catena	0.01	Palustrine	16	Low
334	W3F2	Catena	0.14	Palustrine	42	Medium
335	W3H2	Catena	0.43	Palustrine	33	Medium
336	W3AW	Catena	0.07	Palustrine	11	Low
337	W3AX	Catena	0.23	Palustrine	68	High
337A	W3AY	Catena	0.03	Palustrine	27	Low
337B	W3AZ	Catena	0.02	Palustrine	35	Medium

APPENDIX D

Corps of Engineers Wetland Data Forms

APPENDIX E

NCDWQ Wetland Rating Forms

APPENDIX F

NCDWQ Stream Identification Forms

APPENDIX G

Corps of Engineers Stream Quality Assessment Worksheets

APPENDIX H

Corps of Engineers Approved Jurisdictional Determination (Rapanos) Forms