

I-26 CONNECTOR BRIDGE CONSTRUCTION AND DEMOLITION

**I-26 Asheville Connector
Buncombe County, North Carolina**

STIP I-2513



North Carolina Department of Transportation

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1	INTRODUCTION	2
2	STRUCTURES	2
2.1	I-40 over the French Broad River (FBR-1).....	2
2.2	I-40 over Hominy Creek (HC-1, HC-2, HC-5, HC-6)	3
2.3	I-26 over Hominy Creek (HC-3, HC-4, HC-7).....	4
2.4	I-40/I-240 Smith Mill Creek and Emma Branch Bridges.....	5
2.5	I-26/I-240 Bridges over the French Broad River (FBR-2, FBR-3, FBR-4).....	5
3	DEMOLITION AND CONSTRUCTION ACTIVITIES AND METHODS	6
3.1	Causeways	6
3.2	Access Roads	9
3.3	Construction Lighting	9
3.4	Demolition of Existing Structures	11
3.5	Bridge Summary.....	11
3.6	Other Considerations	11
4	HYDRAULICS	11
4.1	Analysis	12
4.2	Stormwater and Erosion Control	12
4.3	Deck Drainage	12
5	AVOIDANCE AND MINIMIZATION	13
6	RIVER USER SAFETY	22

1 INTRODUCTION

As part of the North Carolina Department of Transportation's (NCDOT) State Transportation Improvement Program (STIP) Project No. I-2513, the roadways associated with I-40, I-240, and I-26 will be upgraded to accommodate additional traffic needs. The French Broad River, Hominy Creek, Emma Branch, and Smith Mill Creek are bridged by existing and proposed roadways and lie within an area occupied by two federally protected species: gray bat (*Myotis grisescens*) and Appalachian elktoe (*Alasmidonta raveneliana*). For the purposes of securing compliance with Section 7 of the Endangered Species Act and preparing a Biological Assessment (BA) for review by the US Fish and Wildlife Service (USFWS), the NCDOT evaluated the various constraints associated with construction of new bridges, the replacement of existing bridges, and the expansion of roadways and impervious surfaces within the I-2513 project. NCDOT has coordinated with the US Army Corps of Engineers (USACE), USFWS, the Federal Highway Administration (FHWA), NC Department of Water Resources (NCDWR), and the NC Wildlife Resources Commission (NCWRC) to gain input on the considerations and likely construction methods.

NCDOT has identified that the two existing bridges over the French Broad River carrying I-40 will likely be replaced, as will four bridges carrying I-40 and four bridges carrying I-240 over Hominy Creek. Twelve new bridges carrying I-240, I-240 ramps, and I-26 will be constructed on new location. (Note: these bridges may be identified separately however may be a part of a larger structure crossing multiple water bodies.) Preliminary designs were used to establish potential impacts in a "worst-case scenario" given the current designs at the time. This project has been identified to be let as a design-build project, and as such, the final designs may differ from those presented herein.

This document describes the likely structure type, possible construction and demolition staging, and the additional challenges associated with construction and demolition as currently known. All claims are based on the preliminary designs that were utilized during project development, although designs may change during the final design process.

A map key identifying the bridge crossing ID is included in the Appendix.

2 STRUCTURES

2.1 I-40 OVER THE FRENCH BROAD RIVER (FBR-1)

EXISTING

The existing two bridges carry I-40 utilizing eight spans. The bridges are approximately 575 feet long each and have a clear space between them of approximately 35 feet. Each structure has spread footings. The river is approximately 235 feet wide at this location. It is estimated that five bents are located in the waterway.

PROPOSED

The project is still in the preliminary design phase, therefore detailed bridge drawings are not currently available. The bridge pair is expected to be replaced in place by one bridge using three bents, each within the water. Property to the east is owned by the Biltmore Estate and is not available for use during construction. Each side of the river, beneath the bridge, has a greenway trail. Access to the site can be

made by moving goods within the right-of-way of the existing roadway. Property to the west includes a power line right-of-way that may be utilized also. Access will occur parallel to the existing roadway, within the right-of-way. Areas adjacent to the bridges will be cleared to the right-of-way limits; however this area would need to be cleared as part of typical construction process for this project.

For the purposes of establishing a “worst-case scenario” of impacts at this location, a 25x25-foot spread footing has been used for estimates because it covers more square footage of the river bottom. Using the basic estimate for a “worst case”, spread footings may cover as much as 6,600 square feet in the river. Drilled shafts may also be used, but the construction method will ultimately be decided during final design. An uneven span arrangement will allow for avoidance of existing foundations, thereby limiting the river disturbance.

The current bridge foundations exist within the waterway of the French Broad River. During construction, the existing piers will be either removed or cut below water level. To accomplish this, causeways may need to be constructed that, for short durations, cover more than 50 percent of the river. It is estimated that causeways will be used to demolish the existing bridges and to build the new substructure, totaling up to 36,600 square feet coverage (temporary fill) of the riverbed. Further discussion of causeways can be found in section 3.1.

2.2 I-40 OVER HOMINY CREEK (HC-1, HC-2, HC-5, HC-6)

EXISTING

I-40 crosses Hominy Creek in two locations: over Upper Hominy Creek and over Lower Hominy Creek. The existing pair of bridges carrying I-40 eastbound and I-40 westbound over Lower Hominy Creek (HC-5) includes five spans each and are approximately 357 and 345 feet long, respectively. The existing bridges have two bents adjacent to the water’s edge currently. The structures have spread footings and the creek is approximately 50 feet wide at this location. The I-40 bridges crossing Upper Hominy Creek are adjacent to the I-26/I-40 interchange. The pair have 3 spans each. The I-40 eastbound bridge (HC-1) is 180 feet long while the westbound bridge (HC-2) is approximately 170 feet long. They currently each have three bents each, none of which are in the water, and are expected to be replaced in kind. The creek is approximately 50 feet wide at this location also.

PROPOSED

The project is still in the preliminary design phase, so detailed bridge drawings are not currently available. The existing bridges carrying I-40 across Lower Hominy Creek (HC-5) will be replaced by a single bridge in the same location. It is estimated that the bridge will have a total of five spans and one to two bents will be located at the water’s edge. Causeways for demolition are anticipated, covering 825 square feet of creek bed, but none are anticipated for construction. No more than 50 percent of the width of the river will be blocked by the causeways at any point during demolition or construction.

The I-40 ramp to NC 191 will be constructed on new location (HC-6). No bents are expected to be located in the water at this location; the bridge is expected to span the creek and no causeways will be needed.

Access to the site may be available via the existing right-of-way. Additional access may be necessary via Hominy Creek Road; however this serves as a main access for the Buncombe County Transfer Station and will likely require an agreement with the county so as not to block access. Parallel access roads may need to be constructed adjacent to the roadway on the west bank, however the area where they may be constructed will be cleared during construction.

The pair of Upper Hominy Creek bridges carrying I-40 eastbound (HC-1) and I-40 (HC-2) westbound east of the I-40/I-26/I-240 interchange are also called for replacement. No new bents are expected in the water. No causeways are anticipated for demolition or construction of these bridges. Access to the site is available via the NCDOT right-of-way on both sides of the creek, and phased construction is expected.

2.3 I-26 OVER HOMINY CREEK (HC-3, HC-4, HC-7)

EXISTING

I-26 crosses Upper Hominy Creek just west of Bear Creek Road (HC-3, HC-4), then it crosses Lower Hominy Creek near Brevard Road (HC-7). The existing pair of bridges over Upper Hominy Creek have 3 spans each. The bridge carrying the eastbound lanes is 170 feet long and the bridge carrying the westbound lanes is 200 feet long. The bridge pair over Lower Hominy Creek utilize 3 spans with continuous girders. They are 300 feet (eastbound) and 330 feet long (westbound). The creek is approximately 50 feet wide at both of these locations along Hominy Creek. The bridges spanning Lower Hominy Creek also span another, potentially historic, bridge. The historic bridge currently functions as a footbridge for greenway traffic and is closed to vehicles. This bridge has a single bent in the waterway of Hominy Creek and is in disrepair.

PROPOSED

The bridges over Upper Hominy Creek are expected to be replaced in kind, but widened to accommodate 3 lanes of traffic each. No bents are expected to be placed in the water at this location, and no causeways are anticipated for construction. The bents can currently be reached from land, so causeways needed during demolition would be minimal, if even needed at all. The bridges can be accessed via existing right-of-way in this vicinity.

The bridges over Lower Hominy Creek are expected to be replaced with a single bridge structure that spans the creek and the potentially historic bridge. However, this proposal may be altered by the design-build team. As it is shown in the preliminary plans, an uneven span arrangement would be necessary to avoid placing bents in the water and avoid hitting the lower bridge. It is anticipated that one bent could be expected in Lower Hominy Creek, with up to 3 additional bents located near the water. The bridge bents would be separated and offset such that they do not affect the historic bridge. A worst-case estimate assumes that all 4 bents may be placed in the water, with up to 3,125 square feet of spread footings located on the creek bed, depending on final bent design.

2.4 I-40/I-240 SMITH MILL CREEK AND EMMA BRANCH BRIDGES (SMC-1, SMC-2, SMC-3, SMC-4, SMC-5, SMC-6, SMC-7, SMC-8, SMC-9, EB-1, EB-2, EB-3, EB-4)

EXISTING

No bridges exist in the project construction area along Smith Mill Creek and Emma Branch. One existing culvert, carrying Resort Drive, will be removed as part of the project.

PROPOSED

Three bridges and associated ramps are proposed to cross the French Broad River north of existing I-26 (described below in Section 2.5). In addition to crossing the French Broad River, the proposed structure will cross Smith Mill Creek and Emma Branch at 13 locations. No bridge bents are expected to be constructed within the waterway of Smith Mill Creek or other waterways. No causeways are anticipated for the Smith Mill Creek and Emma Branch bridges.

Access to the bridge construction site will be obtained by purchasing right-of-way. Construction activities associated with the structures is expected to occur wholly within the right-of-way. SR 1338 (Emma Road) crosses the alignment and may be needed for construction traffic. Special considerations may need to be taken to accommodate residences along Emma Road. Additionally, the alignment crosses the Norfolk Southern rail corridor and coordination with the rail will be necessary.

2.5 I-26/I-240 BRIDGES OVER THE FRENCH BROAD RIVER (FBR-2, FBR-3, FBR-4)

EXISTING

There are no existing bridges carrying vehicle traffic over the French Broad River downstream of the Captain Jeff Bowen Bridges within the project study area. The project includes new location bridges to carry I-26 and I-240 over the French Broad River. A railroad bridge crosses the French Broad River upstream of the proposed new bridge crossing.

PROPOSED

Three bridges are proposed to cross the French Broad River north of existing I-26. The Captain Jeff Bowen Bridges that carry existing I-26/I-240/Patton Avenue over the river are to remain in place. The three new bridges include one bridge for carrying I-26 (FBR-3), and two flyover bridges to carry I-240 eastbound (FBR-2) and westbound (FBR-4). The I-26 bridge is expected to be wide enough to carry five lanes of traffic in each direction, though only three through-lanes will be utilized. Additional space is necessary for shoulders and auxiliary lanes. Analyzing a "worst-case scenario", the footing size estimates for these bridges in the French Broad River are 1,875 square feet (FBR-2), 9,375 square feet (FBR-3), and 1,875 square feet (FBR-4), for a total of 13,125 square feet. It is assumed that 100-foot maximum length curved steel spans will likely be used.

The two flyover bridges carrying I-240 eastbound and westbound are expected to have the same 100-foot curved steel girders. These two bridges will each be smaller than the I-26 bridge. They are expected to be approximately two lanes wide each.

These three bridges will require causeways during construction. Access to the crossing site is limited due to the railroad bridge to the west of the river. A temporary rail crossing may be required for

construction. Limited access may be available via Emma Road from the west, and by way of right-of-way from the south. “Top-down” construction will be considered as a viable construction method to reduce the access requirements needed, but the decision on the method used will be made during final design development. Construction activities originating from the east bank of the river will utilize acquired right-of-way for staging and construction. Construction time in the river shall be reduced as much as possible, and causeways will remain in place for as short of a period as practicable. No more than 50 percent of the river width shall be blocked by causeways at any one period. The river width at this location is approximately 350 feet.

Detailed construction methods and timelines/phasing will be developed during the final design process.

3 DEMOLITION AND CONSTRUCTION ACTIVITIES AND METHODS

At the time of this writing, Smith Mill Creek has been proposed to be included on the 2018 303(d) list for North Carolina. Design Standards for Sensitive Waters (DSSW) will be used within one mile of the French Broad River and Environmentally Sensitive Areas will apply within 50 feet of the river to mitigate the amount of sediment and erosion that enters the French Broad River Environmentally Sensitive Areas (ESAs) require a 50-foot buffer between construction and stream. USFWS and USACE will have the opportunity to review the design of the SEC measures prior to construction. The NCDOT Design-Build Team will provide USFWS with the sediment and erosion control plan and allow 15 days for review upon acknowledgement of receipt of notice. A revegetation and monitoring plan shall be developed for the bridge once the project is complete.

3.1 CAUSEWAYS

Due to the length of the bridges and the location of the existing and proposed interior bents, causeways will be required to provide construction access for some of the bridges. For the purposes of this report, causeway sizes are estimated based on the width of the bridge and the location of the bridge bents. The size, width, and length of the causeways will vary depending on the construction activities taking place. Causeways will be removed from the river when possible, and causeways will not block more than half of the river width unless agreed upon by USACE and USFWS.

Causeway sizes and locations will be determined during final design; however the table below summarizes the anticipated sizes of the causeways in the river needed to perform demolition and construction of the bridges.

TABLE 1. BRIDGE CONSTRUCTION CROSSINGS AND CAUSEWAY SIZE ESTIMATES

Crossing ID	Existing/ New Bridge	Road Carried	Waterbody	Causeway 1 Size ^a	Causeway 2 Size ^a	Causeway 3 Size ^a	Demolition Causeway Size ^a	Total Causeway Area (ft ²)
HC-1	Existing	I-40 EB	Hominy Creek	0	0	0	N/A	0
HC-2	Existing	I-40 WB	Hominy Creek	0	0	0	N/A	0
HC-3	Existing	I-26 NB/I-240NB	Hominy Creek	0	0	0	N/A	0
HC-4	Existing	I-26 SB/I-240 SB	Hominy Creek	0	0	0	N/A	0
HC-5	Existing	I-40	Hominy Creek	0	0	0	55X15	825
FBR-1	Existing	I-40	French Broad River	200X90	100X90	0	60X160	36,600
HC-6	New	I-40 RAMP TO 191	Hominy Creek	0	0	0	N/A	0
HC-7	Existing	I-26/I-240 NB AND SB	Hominy Creek	0	0	0	35X35	1,225
NONE	Existing	NC 191	Hominy Creek	0	0	0	N/A	0
SMC-1	New	RESORT DRIVE	Smith Mill Creek	0	0	0	N/A	0
SMC-2	New	I-240 RAMPS	Smith Mill Creek	0	0	0	N/A	0
SMC-3	New	I-26	Smith Mill Creek	0	0	0	N/A	0
SMC-4	New	I-240 RAMPS	Smith Mill Creek	0	0	0	N/A	0
SMC-5	New	I-26	Smith Mill Creek	0	0	0	N/A	0
SMC-6	New	I-240/I-26 RAMPS	Smith Mill Creek	0	0	0	N/A	0
SMC-7	New	I-240 RAMPS	Smith Mill Creek	0	0	0	N/A	0
SMC-8	New	I-240 RAMPS	Smith Mill Creek	0	0	0	N/A	0
SMC-9	New	I-240 RAMPS	Smith Mill Creek	0	0	0	N/A	0
EB-1	New	I-240 RAMPS	Emma Branch	0	0	0	N/A	0
EB-2	New	I-26	Emma Branch	0	0	0	N/A	0
EB-3	New	I-240/I-26 RAMPS	Emma Branch	0	0	0	N/A	0
EB-4	New	I-240 RAMPS	Emma Branch	0	0	0	N/A	0

FBR-2	New	I-240 EB	French Broad River	350X130	260X60	150X80	N/A	73,100
FBR-3	New	I-26 EB/WB	French Broad River	300X90	350X130	0	N/A	72,500
FBR-4	New	I-240 WB	French Broad River	100X80	490X90	0	N/A	52,100
							TOTAL	236,350

^a Causeway size is an estimated length times width in feet based on the 2018 preliminary designs. Estimated sizing was determined per coordination with NCDOT Division 13 on 12/18/2018. . Estimated sizes are for the surface of each causeway, not the base on the riverbed. Actual sizes will be determined during final design.

Demolition of the existing bridges, including superstructure and interior bents, will occur in conjunction with the construction of the new bridges. The phases will be staggered to allow for traffic to be maintained during construction. Due to the design-build nature of this project, the selected contractor will be permitted to establish their preferred construction phasing plan once a design has been finalized. However, it is anticipated that for existing bridges, traffic will be rerouted to accommodate construction. For new bridges, construction will occur without the interference of roadway traffic. Some causeways may need to be extended to cover greater than 50% of the waterway to allow for demolition activities. The length of time these causeways are in place will be minimized as much as possible. Time estimates for this length of time will be available during final design. These additional restrictions will be coordinated with USACE and USFWS prior to permitting.

NCDOT has committed to performing a channel morphology study of the French Broad River to determine the preconstruction channel condition, as well as any effects of the causeways during and after construction.

3.2 ACCESS ROADS

Generally, construction locations will be reached using existing roadways where possible and temporary access roads may be constructed to physically restricted locations. Access roads will be constructed where no existing right-of-way is available for use. The construction of the flyover bridges over the French Broad River will likely require the use of access roads due to vertical height restrictions near the site, and the constricted access due to the railroad line on the west bank of the French Broad River. Additional bridge-specific access road considerations are discussed above.

3.3 CONSTRUCTION LIGHTING

As part of its evaluation, NCDOT also took into consideration the time of day when construction and demolition may take place. It was determined that some work would likely need to be completed at night. These activities may include setting girders, drilling shafts, concrete pours, deck concrete pours, beam setting, construction material(s) stockpiling, and traffic shifts. The amount and type of lighting for all activities will be minimized to the extent possible. All lights will be directed towards the work area and will not shine out over any waterways and no nighttime lighting directed away from the work area will be permitted within 50 ft. of the French Broad River, Hominy Creek, Emma Branch, or Smith Mill Creek between March 15 and November 15. Below is a list of some construction operations that may occur at night, as well as the likelihood and/or circumstances under which the operation may occur. Lighting considerations for each night operation are also included.

- Causeway construction – Will occur – Access road and causeway construction and removal may take place at night throughout the life of the project. This will allow the contractor to utilize the lower traffic volume to access the site. Installing the access roads and causeways at night allows longer-term operations to be constructed during daylight hours. Due to the easier site access the contractor may be able to construct the access roads and causeways more quickly.

- Lighting for this operation will likely consist of one to two light plants that will be used to directly light up the construction area. Care will be taken to not shine light directly out into the river or into the adjacent forest.
- Drilled shafts – Possible – This is dependent upon construction schedule, contract, and availability of the concrete plant.
 - Lighting for this operation will be at water level. Lights on the drill rig will be used, and one light plant may be used if needed. Only the active work area (where the hole is currently being drilled) will be lit. No lights will be shining down from the bridge deck during this operation.
- Concrete pours during hot weather – Will occur – Night pours of concrete are required during hot weather to achieve the proper cure. These pours may include elements such as bent caps, end bents, and barrier rail wall.
 - The use of lights for this operation will be minimal, because these will be small-area and short-duration (six hours or less) pours. Lights will generally be set up on the causeway, shining upward at the bridge member being poured. Small lights, such as headlamps, will be used on the structure. There will be pump truck and concrete trucks with headlights either on the bridge deck or on the causeway.
- Deck concrete pours from May to November (summer) – Will occur – Deck concrete pours are generally larger, more complex, and more time consuming than other types of concrete pours.
 - Of all potential night time operations, this will be the operation with the most lighting. The majority of lighting will be at bridge deck level, with lights shining toward the bridge rather than down toward the river. Any lighting that shines down toward the river or adjacent woods will be indirect and minimal.
 - Headlights on concrete delivery trucks will also be used.
- Beam setting – Will occur – Setting beams at night is required due to the volume of daytime traffic and the need to maintain traffic.
 - Cranes sitting on either of the causeways or on the new or existing bridges will be used to set the beams for the new bridges. There will be a light plant on the structure where the truck with the beams is parked, either on the new or existing structure. These lights will be shining toward the truck. There will also be lights shining toward each structure where the beam ends sit.
 - It is difficult to determine if the lights will be placed on the causeway shining up toward the structure, or on the bridge deck shining down. This decision will need to be made on site at the time of the activity.
- Traffic shifts – Will occur – Traffic shifts will be necessary to construct the new bridges on existing location. These shifts will occur at night and be of short duration, and will likely require minimal lighting on the bridge. All other activities with traffic shifts will occur beyond the end bents of the bridge and will not be part of the work on the bridge or in the area of the river.

There are other operations that may occur at night; however, this would be evaluated after phasing and final design. The previously listed operations are not operations that occur on a regular schedule.

3.4 DEMOLITION OF EXISTING STRUCTURES

During demolition, removal of the bents will be accomplished by tipping them over and removing the entire bent, or by cutting the bent off at stream bed elevation or, if the bent is on land, one foot below ground elevation. Because the base of the remaining bent in the stream is at stream elevation, no material will be put back over the remaining bent. The method of removal will be dependent on the foundation conditions present at the site. No loose portion of the existing bents can remain in the streambed.

Causeways have been identified as the most likely mechanism to be used during bridge demolition and construction. Work bridges are not anticipated to be used. Demolition and construction are expected to take place from temporary causeways placed in waterways where needed, not covering more than 50 percent of the waterway width. Channel restrictions greater than 50 percent may be necessary for short durations, and these additional restrictions will be coordinated with USACE and USFWS prior to permitting. See Table 1 for estimates of the causeway sizes needed for demolition.

Removal of the existing bridges shall be performed in a manner that prevents debris from falling into the water. The Contractor shall remove the bridges and submit plans for demolition in accordance with Article 402-2 of the Standard Specifications. However, if bridge material inadvertently ends up in the river, it will be removed.

USFWS will review the demolition plans, from an environmental permitting perspective prior to the finalization of the plans. USFWS will also be notified prior to the start of bridge demolition, so they may have a representative on-site during that stage of the project.

3.5 BRIDGE SUMMARY

The total area anticipated to be covered by causeways in all Waters of the US for new bridge construction and bridge replacements is 236,350 square feet, of which 234,300 square feet will be in the French Broad River. The total area to be covered by bridge footings is 22,850 square feet. The footing totals for the French Broad River are 19,725 square feet.

3.6 OTHER CONSIDERATIONS

Additional measures to protect the French Broad River, Smith Mill Creek, Hominy Creek, and Emma Branch during construction will be taken and are summarized in the Avoidance and Minimization Measures.

4 HYDRAULICS

A review of flood map data of the study area and bridge vicinities indicates that there are several residential and commercial structures that are currently located in the 100-year floodplain. During the construction of the proposed bridges, should causeways be used, they will create a temporary constriction in the flow of the river that will cause the upstream water surface elevation (WSE) to rise. The extent of the rise will be determined once the causeway phasing and bridge construction phasing is determined during final design. Should the final design minimize the number of bridge bents located in

the waterways, the potential for debris to become lodged and the potential for a WSE rise as a result is lessened. Dangers to river users will also be lessened. Strides shall be made to minimize the number of bents in the river and streams.

4.1 ANALYSIS

Hydraulic analysis of the French Broad River will be performed in conjunction with final design. Impacts will be modeled using the US Army Corps of Engineers (USACE) Hydrologic Engineering Center's River Analysis System (HEC-RAS). Per the USACE website, HEC-RAS "allows the user to perform one-dimensional steady flow, one-dimensional steady flow, and one- and two-dimensional unsteady flow calculations, sediment transport/mobile bed calculations, and water temperature/water quality modeling." For this project, HEC-RAS models are under development to guide final design. The proposed designs and construction phasing will be input into the models and storm return periods will be run that will represent conditions during flood events along the French Broad River. The approximate cross sections of the model are shown in Appendix A. Using the Flood Risk Information System (FRIS) database provided by the North Carolina Emergency Management (NCEM) and the Flood Inundation Mapping Alert Network (FIMAN) data, impacts to properties can be estimated, if present.

The HEC-RAS model is scheduled to be completed in spring/summer 2019.

4.2 STORMWATER AND EROSION CONTROL

Access roads, if needed, will use Design Standards for Sensitive Waters (DSSW) to mitigate the amount of sediment and erosion control material that enters the French Broad River, Smith Mill Creek, or Hominy Creek. The NCDOT Design-Build Team will provide USFWS with the sediment and erosion control plan and allow 15 days for review upon acknowledgement of receipt of notice. Roadway and bridge construction will be in accordance with appropriate permitting and stormwater plans.

Sediment and Erosion control plans are required to be in place prior to any ground disturbance. When needed, combinations of erosion control measures will be used to ensure protective measures are being implemented.

NCDOT is working with the USGS to install/monitor gages along the French Broad River to collect continuous streamflow, precipitation, and water-quality (temperature, conductance, and turbidity) data. The baseline information can be used to compare to water quality in the river during construction.

4.3 DECK DRAINAGE

NCDOT makes every attempt to eliminate direct deck drainage into water bodies whenever federally protected aquatic species or sensitive habitats are present. It is anticipated that direct drainage into the French Broad River can be avoided by conveying runoff via the deck over water. Overland discharge via deck drains will provide treatment through vegetative conveyance or other stormwater BMPs.

5 AVOIDANCE AND MINIMIZATION

The avoidance and minimization measures are summarized below.

Project Design Modification for Avoidance and Minimization

- Eliminated approximately 20,000 ft. of collector-distributor roads and added retaining walls added in Section C, along I-40. This resulted in reduction of impacts to Ragsdale Creek and avoidance of impacts to Upper Hominy Creek.
- Reduced overall permanent impacts to streams by 724 linear ft.
- Reduced overall impacts to wetlands by 0.63 ac.

Measures to Avoid/Minimize Effects to Gray Bat during Culvert Roost Construction

Timing of Construction

- The RCBC portion of the culvert system, as well as the dual CMAP at the culvert outlet will remain in place. Work on this portion of the culvert system will not occur until bat activity ceases for the season (and bats are presumably no longer using the culvert for roosting). This time frame is approximately between November 15 and March 15. NCDOT will monitor the culvert with an acoustic detector and/or emergence counts to determine when bat activity ceases for the season. After bat activity ceases for the season, a federally permitted bat biologist will enter the culvert to confirm no bats are present. This will determine when construction activity may safely begin, and/or when it should end to avoid effects to MYGR that may use the culvert system for roosting.
- NCDOT will conduct sleeving or replacement of the 60" CMP adjacent to Courtland Ave. and the entrance to Dickson Elementary School (that conveys flow under Hill Street to the RCBC) between October 15 and April 1.
- NCDOT will monitor bat activity at the culvert before, during, and after construction. Acoustic monitoring and/or emergence surveys will be conducted between March and November.

Vegetation Removal

- An operational work pad area will be established near the culvert outlets to complete the culvert rehabilitation process, as well as at the inlet near Courtland Avenue where the 60" CMP will be replaced or lined. Vegetation must be cleared to allow room for the work pad. NCDOT will cut plants in the work pad area in a way that will minimize impacts to bats and their activity by implementing the following measures: vegetation will not be removed if the area will be left bare for many months prior to construction; cutting of vegetation will be coordinated with USFWS and will not occur until all bats have left the culvert for the winter. This will be determined through emergence counts and/or acoustic monitoring and a physical check of the culvert for remaining bats; and limiting cutting to only what is necessary to complete the work and no more than 50 feet from culvert inlet/outlets.

Additional Commitments

- An equipment staging area will also need to be established adjacent to the work pads near the culvert outlets and inlet areas near Courtland Avenue to complete the culvert rehabilitation process. NCDOT will attempt to use areas that are already cleared of vegetation whenever possible. This area will only be used for culvert rehabilitation activity staging and will not be used for any other project construction purposes.
- NCDOT will maintain water sources that provide baseflow to the culvert (non-stormwater sources) to provide a naturally occurring, continual water source.

- NCDOT will either replace or install a liner in the 60" CMP located adjacent to Courtland Ave. and the entrance to Isaac Dickson Elementary School that conveys flow under Hill Street to the RCBC. NCDOT will complete this activity between October 15 and April 1.
- NCDOT will install a barrier/baffle in the RCBC between the intersection with the 60" CMP (located adjacent to Courtland Ave. and the entrance to Isaac Dickson Elementary School that conveys flow under Hill Street) and the upstream end of the RCBC to buffer noise and light associated with the CMP replacements further upstream.

Measures to Avoid/Minimize Effects to Gray Bat during Road Construction

Preservation of Riparian Vegetation

- NCDOT will direct the contractor to preserve riparian buffer trees where practicable and feasible.

Roadway Construction Lighting

- Due to MYGR activity on the landscape, NCDOT will limit all construction-related lighting to whatever is necessary to maintain safety in active work areas closest to the French Broad River, Hominy Creek, Emma Branch, and Smith Mill Creek.
- Construction-related lighting will be indirect in nature and will not project into adjacent forested areas or over the water surface of the French Broad River, Hominy Creek, Emma Branch, or Smith Mill Creek, whenever practicable.

Measures to Avoid/Minimize Effects to Gray Bat during Bridge Construction

Access Roads

- NCDOT will revegetate all access roads created for bridge construction and replacement activities where practicable.

Nighttime Construction Activities

- NCDOT will limit the use of night time construction within 50' of the French Broad River, Hominy Creek, Emma Branch, or Smith Mill Creek between April 1 and October 15 to only the following activities: causeway construction, drilled shafts, concrete pours, beam setting, and traffic shifts.
- NCDOT shall commit to restrict the construction contractor to no night work at crossings of the French Broad River, Hominy Creek, Emma Branch, and Smith Mill Creek to minimize potential impacts to lactating females and their pups between June 1 and June 14. Between June 15 through August 1, NCDOT will also commit to restrict the construction contractor to no more than 28 total nights of work, with no more than four consecutive nights. Lighting used for construction will be limited to what is necessary to maintain safety standards and will only be directed toward active work areas.

Pre-Demolition Check for Bats

- If bridge demolition is required between April 1 and October 15, NCDOT will conduct a check of all subject bridges within 30 days of demolition to determine if bats are present. This will also apply to the culvert under Resort Drive that carries Smith Mill Branch.
- If bats are present, one of the following options will be implemented (options listed in order of preference). NCDOT will:
 1. Wait for bats to leave for the season (approximately mid-October to early November) before beginning work; or
 2. A biologist will monitor the bridge and work will begin after bats leave the bridge for the evening, or
 3. A permitted biologist will exclude bats from work area immediately prior to the start of work using acoustic deterrents, or

4. A permitted biologist will hand remove bats from work area immediately prior to the start of work.
5. If pre-demo check determines pups are present, NCDOT will refrain from bridge demolition until it can be determined by a biologist that the pups are volant, and then use the previous options to proceed with demolition.

Red Safety Lighting

- As part of NCDOT's Communication Plan specific to the construction/demolition of the bridges over the French Broad River, NCDOT will place solar-powered, steady-state red lights on the causeways to alert river users to their locations. Generators will not be used to provide power.

Measures to Avoid/Minimize Effects to Gray Bat and Appalachian elktoe during Bridge Construction

Contract language will include the following, or similar language as appropriate for bridges over the French Broad River

- The Contractor will be required to prosecute the work in a continuous and uninterrupted manner from the time work begins until completion of each phase of structure construction, demolition, and completion. The Contractor will not be permitted to suspend operations except for reasons beyond their control or except where the Engineer has authorized a suspension of the Contractor's operations in writing.

Causeways-French Broad River, Hominy Creek, and Smith Mill Creek

- Causeways will not restrict more than 50% of the existing channel width of the French Broad River, Hominy Creek, and Smith Mill Creek. Potential additional restrictions of the channel may be necessary for short durations, and these additional restrictions will be coordinated with USACE and USFWS prior to permitting.
- NCDOT will require the contractor to use clean rock (free of debris and pollutants) for the construction of the causeways to minimize unnecessary sediment input into the river.
- Causeway material will be removed to the extent practicable and either disposed of off-site or used in areas that require permanent stone protection after project completion. NCDOT will also require that concrete barriers (barrier rail) be placed along the downstream edge of each causeway to limit the downstream movement of causeway material during high flow events.
- If the final causeway plan is staged, causeway material will be added/removed as needed for each stage to minimize the causeway footprint over the length of the project.
- To minimize disturbance to the riverbed, all readily detectible causeway material will be removed, to the extent practicable, while removing as little of the original riverbed as possible.
- Construction fabric will not be used under the causeway material, as it tends to tear into tiny pieces and float downstream during removal.
- Any equipment that is placed on the causeways will be removed any time throughout a workday when the water level rises, or is expected to rise overnight, to a point where the equipment could be flooded, or during periods of inactivity (two or more consecutive days). The only exception to this measure is that the drill rig and crane may be left in place for periods of inactivity; however, they must also be removed if the water rises, or is expected to rise, to a point where the drill rig and crane could be flooded.
- NCDOT will require its contractor to have clean, non-leaking equipment, diapers on-site for each causeway, and spill kits located at each causeway.
- Causeways needed for the new bridges over the FBR will be designed so that during a 100-year storm event there will not be a rise in water surface elevation outside the Action Area greater than normal seasonal variation.

Containment

- All construction equipment shall be refueled above the 100-year base flood elevation plus a foot of freeboard and be protected with secondary containment. During crucial periods of construction and demolition, when the drill rig and crane cannot be moved, the drill rig and crane can be refueled while inside the 100-year floodplain provided that spill response materials (such as spill blankets and fueling diapers) are used during the refueling. Hazardous materials, fuel, lubricating oils, or other chemicals will be stored above the 100-year base flood elevation plus a foot of freeboard.
- Areas used for borrow or construction by-products will not be located within wetlands or the 100-year base flood elevation plus a foot of freeboard.
- When constructing drilled piers for the I-240, I-40 and I-26 French Broad River bridges, a containment system will be developed so that material does not enter the river. Material by-product will be pumped out of the shaft to an upland disposal area to the extent practicable and treated through a proper stilling basin or silt bag.
- Construction of all bridges will be accomplished in a manner that prevents uncured concrete from coming into contact with water entering or flowing in the river.
- Removal of existing bridges shall be performed so as not to allow debris to fall into the water. If debris is dropped in a waterway, it will be immediately removed.
- NCDOT will not place bridge bents in Smith Mill Creek or Emma Branch.

Avoidance/Minimization to Gray Bat and Appalachian elktoe during Road Construction and Bridge Replacement

Erosion Control Measures

- The SEC plan will be in place prior to any ground disturbance for all bridge replacements and construction. When needed, combinations of erosion control measures (such as silt bags in conjunction with a stilling basin) will be used to ensure that the most protective measures are being implemented.
- NCDOT standard procedures dictate that when a project has both Environmentally Sensitive Areas and a requirement to follow DSSW, and uses the GP NCG01 permit, NCDOT will default to the most-restrictive SEC measure requirement.

Agency Coordination (Post Biological Opinion Checkpoints)

- NCDOT will arrange, for each shortlisted team, a meeting with representatives of the USFWS and regulatory agencies prior to the due date for the submission of Technical and Price Proposals. The discussions and answers provided at these meetings are not contractually binding but intend to offer the shortlisted teams an opportunity to inquire as to the permitting process as well as specific team concepts.
- NCDOT will arrange a meeting with the selected Design-Build team to provide an opportunity for USFWS to convey their concern about potential effects to protected species.
- NCDOT will revisit CP4A with the Merger Team after the BA is submitted to discuss any new avoidance and minimization efforts for major crossings of the French Broad River and Hominy Creek including those in the Biological Assessment.
- The NCDOT Design-Build Team will adhere to project commitments within the ROD and the Biological Opinion relating to Section 7 of the Endangered Species Act. The NCDOT Design-Build Team will be required to prepare information required for any event in which NCDOT and FHWA reinstate Section 7 consultation with the USFWS. It is possible that consultation be reinstated prior to Concurrence Point 4B and again at Concurrence Point 4C.
- NCDOT will continue to identify avoidance and minimization measures to all Waters of the U.S. and ensure that major hydraulic structures associated with the project are designed and installed to minimize negative impacts to stream stability (and therefore, water quality) to the greatest extent

practicable. As part of this process, NCDOT and the NCDOT Design-Build Team will continue to coordinate with the Merger Team to identify avoidance and minimization measures and ensure that project impacts are minimized to every practicable extent, including impacts to federally protected species.

- The NCDOT Design-Build Team shall meet with NCDOT personnel and USFWS and regulatory agency representatives around the time of the 4C meeting to review the project and project commitments. At this time, the USFWS shall be afforded the opportunity to meet with key NCDOT Design-Build Team members and NCDOT employees to provide education on the effects of artificial lighting, noise, and construction on nearby wildlife habitat and behavior. The NCDOT Design-Build Team shall contact NCDOT Environmental Analysis Unit to schedule these meetings. Every effort shall be made to have this meeting prior to submitting the permit application.
- The NCDOT Design-Build Team will invite USFWS and regulatory agency representatives to the pre-construction meeting for the proposed project, as well as to all subsequent field inspections prior to construction, to ensure compliance with all special project commitments.
- The NCDOT Design-Build Team will provide USFWS with the sediment and erosion control plan and allow 15 days for review upon acknowledgement of receipt of notice.
- The NCDOT Design-Build Team will provide regulatory agency representatives with the demolition plan for all bridges and allow 15 days for review upon acknowledgement of receipt of notice. All agencies will be notified prior to start of demolition so they may have a representative on site.
- The NCDOT Design-Build Team will provide USFWS with the construction phasing plan for each bridge.
- The NCDOT Design-Build Team will provide USFWS with the final roadway lighting plans and allow 15 days for review upon acknowledgement of receipt of notice.
- The NCDOT Design-Build Team will contact USFWS if new information about MYGR is discovered, as it relates to the project.
- The NCDOT Design-Build Team will report any dead bats found on the construction sites to USFWS.
- The NCDOT Design-Build Team will include an Environmental Coordinator who will be invited to attend all design, merger, and preconstruction meetings, and who will consult bat and mussel experts, as needed.
- NCDOT will provide USFWS with the total size of bridge footings in the water as project design progresses and the information becomes available.
- NCDOT will provide USFWS with the results of the hydrology modeling (described below) as it becomes available, including change in French Broad velocity with causeways in place, and change in water surface elevation with causeways in place.

Measures to Avoid/Minimize Effects to Gray Bat and Appalachian Elktoe during Roadway Operation

Stormwater Control Measures

- NCDOT has developed stormwater commitment guidance, which will apply at the crossings of the French Broad River and any tributaries draining to the French Broad River, any portion of the NCDOT stormwater conveyance system draining to an outfall discharging to those waters within the right-of-way.
- NCDOT will prepare a stormwater management plan (SMP) that implements structural and non-structural post-construction stormwater best management practices (BMPs) to the maximum extent practical, which is consistent with the Department's National Pollutant Discharge Elimination System (NPDES) Post-Construction Stormwater Program.
- When preparing the SMP, NCDOT commits to using a hierarchical BMP selection process, which is optimized to treat silt, nutrients, and heavy metals.

- At each discharge location outside of the 100-year floodplain, the hydraulics engineer will evaluate the feasibility of installing either an infiltration basin or a media filter as described in NCDOT's BMP Toolbox. If neither is feasible, the hydraulics engineer will select another BMP that is feasible.
- NCDOT will commit to evaluating the use of emerging BMP technologies that the Department has not yet published in its BMP Toolbox. These emerging BMP technologies are as follows:
 - Bioswales
 - Bioembankments
 - Biofiltration conveyances
 - Soil improvement to maximize infiltration
- The NCDOT hydraulics design engineer will consult with the State Hydraulics Engineer and obtain prior approval before proposing one of these BMP technologies in the SMP.

Permanent Lighting

(Crossing numbers in this section refer to Table 2 in Section 2.1.2 and Figures 4A-4F in Appendix A).

- General CM's for the entire project:
 - NCDOT plans to install 3500K to 4000k LED fixtures wherever new or replacement lighting is required.
 - Using shorter poles which will provide an overall LED light fixture mounting height of 35' above the pavement surface.
 - Using LED light fixtures with a more rectangular light pattern as well as house side shields to minimize lighting outside of the pavement area.
 - Using LED light fixtures with a BUG rating of 1-0-3 or less
 - NCDOT is committed to changing the design standards to meet the AASHTO minimum requirements of 0.6 fc at 4:1 uniformity at all crossing locations identified in the lighting document, from the original design of 0.8 fc at 4:1 uniformity.
 - At all identified crossings, the proposed high mast poles and 45' poles with GE Cobrahead (GE) fixtures (3-0-3 BUG) were redesigned with 35' poles with Cooper Cobrahead (Cooper) fixtures (1-0-3 BUG).
- Hill Street Culvert Outlet – The current NCDOT design near Southern States property results in zero calculated change to the baseline light levels at the culvert opening and ditch leading to the FBR.
- Hill Street Culvert Outlet – NCDOT will meet with landowners adjacent to the roost culvert to discuss replacement or augmentation of existing lighting to reduce existing baseline conditions determined by the NCDOT Roadway Lighting Squad.
- Hill Street Culvert inlet – The original lighting design near the Hill Street culvert inlet had 80' high mast poles installed between the mainline and Hill Street behind the Isaac Dickson Elementary School. NCDOT is revising this design to remove the high mast poles and to replace them with GE light fixtures installed on twin arm poles on the mainline median barrier.
- New French Broad Crossing (NFBC) – Use of single arm light poles mounted on the bridge and flyover barriers in place of the 120' and 100' high mast poles.
- NFBC – 35' single arm poles with a narrow distribution light fixture and a house side shield will be used.
- FBR-1 – The GE fixtures were replaced with the lower BUG rated Cooper fixtures.
- FBR-1 – Fixtures were redesigned to have the outer ring (as shown in the figures within the lighting document) ending roughly 115' from the west bank of the FBR.

- FBR-2, FBR-3, & FBR-4 – All high mast poles within the connector interchange were removed and replaced with Cooper fixtures mounted on the outer and/or center bridge barrier rail.
- FBR-2, FBR-3, & FBR-4 – The Cooper fixtures are located so the crossings are centered between fixtures where the light level is the lowest.
- HC-1 – Replacing the GE fixtures with the Cooper fixtures.
- HC-1 - Replacing the 120' high mast pole with an 80' high mast pole.
- HC-2 & HC-3 – Removal of a 120' high mast pole and replaced with Cooper fixtures.
- HC-2 & HC-3 - The Cooper fixtures are located so the crossings are centered between fixtures where the light level is the lowest.
- HC-4 - The Cooper fixtures are located so the crossings are centered between fixtures where the light level is the lowest.
- HC-5 & HC-6 – Removal of 80' high mast pole and replacing with Cooper fixtures along the mainline and ramp in both directions.
- HC-5, HC-6, HC-7 - The Cooper fixtures are located so the crossings are centered between fixtures where the light level is the lowest.
- All SMC and EBC – Removal of all high mast poles within the connector interchange and replaces them with Cooper fixtures mounted on the outer and/or center bridge barrier.
- All SMC and EBC - The Cooper fixtures are located so the crossings are centered as best as possible between fixtures where the light level is the lowest.
- SMC culvert area – the existing high mast pole located within the interchange ramps will be removed.

Conservation Measures to Benefit Gray Bat

Monitoring for MYGR Return and Activity

- NCDOT will conduct acoustic monitoring (or emergence counts, as appropriate) for MYGR at some locations immediately before, during and up to two years after construction. This monitoring may help determine changes in bat activity due to construction. NCDOT will coordinate the locations and time frame for monitoring with USFWS.
- To determine whether MYGR avoid active construction zones at night, NCDOT will investigate the use of night-vision video recordings, or other methods, in an attempt to monitor bat activity at locations where they may be most susceptible to disturbance.
- NCDOT will conduct additional monitoring/research to potentially include additional telemetry, coordinated monitoring of roosts, monitoring of new panels, basin-wide acoustics to be conducted at key points during and after construction. This additional monitoring will be coordinated with USFWS, NCWRC and NCDOT.

Hill Street Culvert Roost Area

- NCDOT will replace most, if not all the CMP within the culvert system upstream from the RCBC with RCBC and/or concrete pipe, which will effectively create additional bat roosting habitat.
- NCDOT will meet with landowners adjacent to the roost culvert to discuss replacement or augmentation of existing lighting to reduce existing baseline conditions determined during by the NCDOT Roadway Lighting Squad.
- NCDOT will acquire a permanent drainage easement (PDE) or additional right of way at the culvert inlet (near Courtland Ave.) and outlets, where replanting with containerized, native, woody vegetation will occur. In addition, if NCDOT acquires additional right-of-way or conservation

easements along the French Broad River or adjacent to the culvert, NCDOT will replant with native, woody vegetation to provide, in time, a buffer for noise, light, and surface water runoff. NCDOT will coordinate with USFWS and NCWRC to develop a revegetation and invasive species management plan for these areas.

NCDOT-Sponsored MYGR Research Project

- NCDOT, with the cooperation of the USFWS and NCWRC, committed to a three-year study on MYGR within the French Broad River Basin. This study will serve as a conservation measure for NCDOT projects within the Divisions 13 and 14 for a limited time. NCDOT will provide \$900,000 in funding Indiana State University to conduct the research project, which will aid in the recovery and conservation of MYGR. The end goal is to gather the information needed to allow NCDOT and USFWS to enter a programmatic consultation to cover MYGR for NCDOT Divisions 13 and 14, as well as help to develop species-specific avoidance and minimization measures. This agreement was reached, in part, for the I-4400/I-4700 (I-26 widening) project in Buncombe and Henderson Counties, but also benefits this project.

Protection of Culvert Roost Entrance

- NCDOT will coordinate with USFWS to assess the need to deter trespassing/use of the culvert by humans, and install signage or barriers, as needed.

Gray Bat Conservation Funding

- NCDOT will provide \$350,000 in funding to be utilized for measures that are consistent with the recovery objectives outlined in the recovery plan for the MYGR (Brady et al. 1982).

Installation of Temporary Bat Roost Panels on Bridges

- NCDOT will have Modern Bat roost panels or comparable structures temporarily installed on four bridges within the French Broad River basin that are currently or have recently been used by roosting bats. The sites will be selected by a team of USFWS and NCDOT personnel and will be installed as soon as possible. The panels will remain in place until project construction is complete; approximately 2026. The panels will be monitored for bat use while they are in place. The team will determine the appropriate number of panels for each bridge as well as the monitoring protocol.

Conservation Measures to Benefit Appalachian Elktoe

Appalachian Elktoe Conservation Funding

- NCDOT will provide \$500,000 in funding to the North Carolina Nongame Aquatic Projects Fund for the French Broad River Conservation Plan (FBRCP) proposed by USFWS, which will aid in the recovery and conservation of Appalachian elktoe. The funding will be held by the NCWRC. A multi-agency/organization group of mussel species experts, including USFWS, will determine how to expend the funds.
- The French Broad River Conservation Plan proposes to improve aquatic habitat and diversity and to mitigate risks in the French Broad River. It may include the following:
 - Species Reintroduction: Developing a normal cohort of companion species will benefit long-term Appalachian elktoe recruitment and survival; mussel species are healthier in dense multi-species mussel beds (Vaughn et al 2008).
 - Early Warning and Emergency Capacity: A monitoring network and propagation facility devoted to species introduction pairs an early warning system with emergency production capacity to immediately mitigate unforeseen effects to the Appalachian elktoe population should the need arise.

- Genetic Management Program: A study of the genetic health/potential genetic drift of the population will provide feedback to the previous two program aspects and will fine tune management of Appalachian elktoe.
- Miscellaneous: Other projects could include development of technologies such as the use of passive integrated transponder (PIT) tags to passively locate mussels; radio tracking equipment to study movement of mussels during high flow events; development of techniques to artificially stabilize habitat for the placement of propagated mussels; and/or a cost-benefit study of watershed improvement options.

This agreement was reached, in part, for the I-4400/I-4700 (I-26 widening) project in Buncombe and Henderson Counties, but also benefits this project.

French Broad River Geomorphology Monitoring

- NCDOT is working with the US Geological Survey (USGS) to evaluate the impacts of construction and temporary causeways on river habitat. This monitoring project encompasses several Transportation Improvement Projects (I-2513, I-4400 and I-4700). Therefore, the monitoring project will span several years to accommodate the varying construction schedules.
 - Terrestrial Light Detection and Ranging (T-LiDAR) technology will be used annually to produce a laser scan of river banks. Bathymetric surveys will be conducted concurrently one to two times a year. Bathymetric data will be used to generate a gridded surface representation (digital elevation model, or DEM) of the channel bed for each survey. A similar approach will be applied to T-LiDAR data to evaluate stream bank position between successive surveys.
 - Water quality monitoring will include real-time (continuous) data collection of temperature, turbidity, and specific conductance. Discrete water-quality samples will be collected during a variety of flow conditions to measure total suspended sediment (TSS) and suspended sediment concentration (SSC).
 - Continuous streamflow, precipitation, and water-quality (temperature, conductance, and turbidity) data will be available online at <http://waterdata.usgs.gov/nc/nwis/rt/> and via text and email alerts. Yearly summaries for each monitoring site will be available on demand from the USGS National Water Information System web interface (NWISWeb). Real-time alerts will be available to NCDOT via the NWISWeb when temperature or turbidity concentrations spike or exceed a predetermined threshold.
 - If monitoring at the French Broad River reveals excessive bank erosion, bank instability, or sedimentation associated with the bridge replacement, NCDOT will work to identify the cause and will make improvements to address the problems in a timely manner.

Avoidance and Minimization Measures to Benefit Northern long-eared bat

The following avoidance and minimization measures have been proposed to minimize adverse effects of the proposed action on Northern long-eared bat:

- No alterations of a known hibernacula entrance or interior environment if it impairs an essential behavioral pattern, including sheltering northern long-eared bats (January 1 through December 31);
- No tree removal within a 0.25-mile radius of a known hibernacula (January 1 through December 31); and
- No cutting or destroying a known, occupied maternity roost tree, or any other trees within a 150-foot radius from the known, occupied maternity tree during the period from June 1 through and including July 31.

6 RIVER USER SAFETY

Because the French Broad River, Hominy Creek, and Smith Mill Creek are regularly used for recreation, they cannot be closed for the life of construction. NCDOT shall commit to providing a safe passage lane for users of the French Broad River, Hominy Creek, and Smith Mill Creek. To do so, NCDOT shall employ safety measures, including catchment devices on overhead structures to prevent material from falling on river users. In addition, floating navigational aids will be used to guide river users to the safe passage lane and away from the causeways/construction zone. Certain activities, such as setting girders, will require temporary river closure to ensure the safety of river users. Most of these activities are anticipated to occur at night when working with existing bridges. For new bridges, most work is expected to take place during the day. NCDOT will work with river users, businesses, and recreational river and civic groups to insure public notification of the temporary closures.

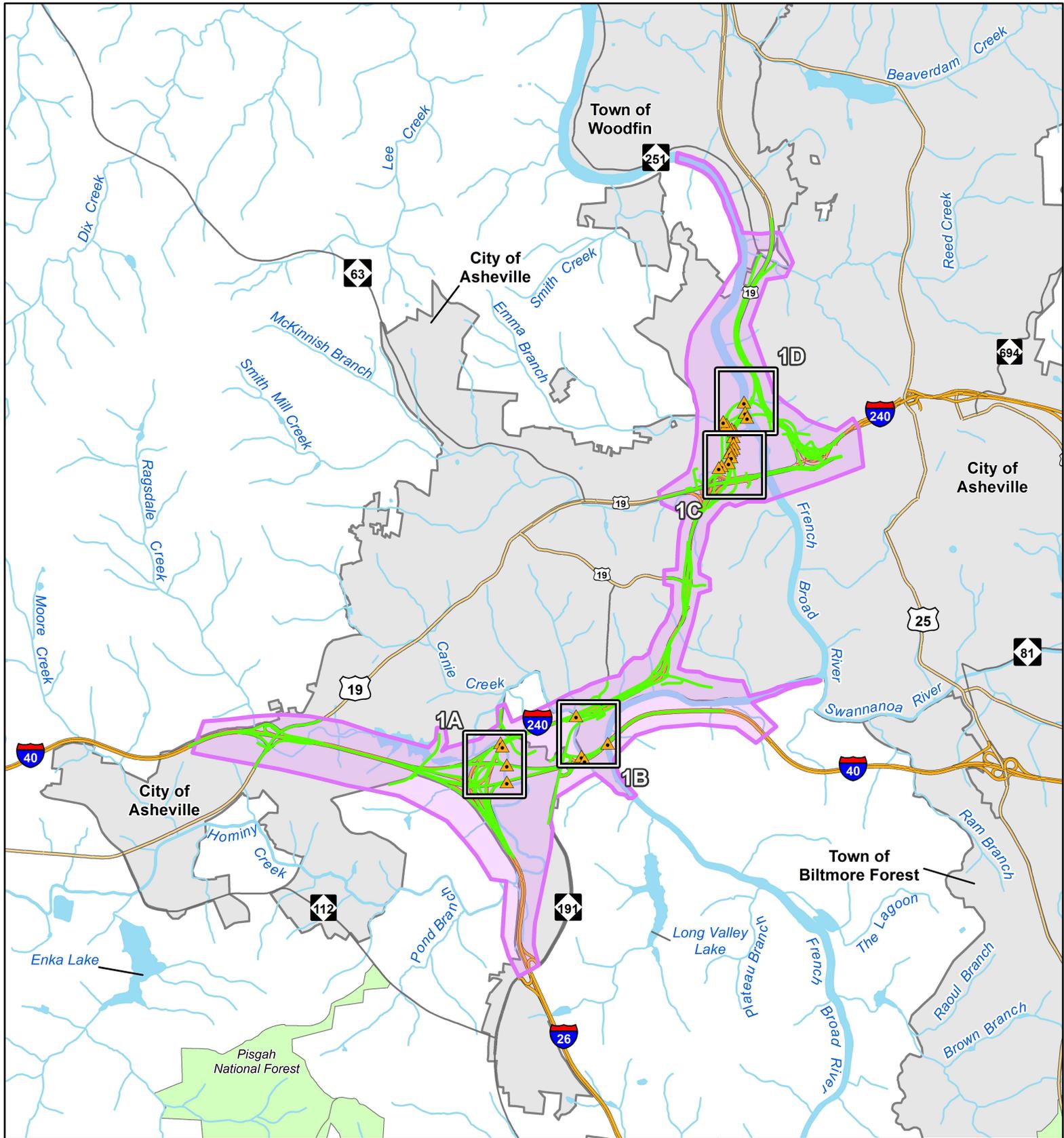
The safe passage lane for river users will be located in a portion of the river away from the causeways for the majority of the life of the project. NCDOT shall use a floating navigational aid to guide river users to the safe passage lane.

NCDOT shall commit to including a rigid, non-drooping, catchment device on the overhead structures to prevent material from falling on river or greenway users, or in the water. NCDOT shall place steady-state red lights that are solar-powered on the causeway to alert river users to its location. Generators will not be used to provide power. These lights will be atop permanent structures, such as a pole, on each causeway for the duration of the project. The contractor will be responsible for maintaining these lights at all times during construction, replacing them as necessary.

It is expected that there will be times when the river, creeks or greenways must be closed for the safety of recreational users due to the type of work being done (e.g. setting girders, removal of bent caps). These closures are not expected to last more than two days and are expected to occur predominantly at night. Care will be taken to not close the waterways or greenways during known peak user times, particularly the Memorial Day, Fourth of July, and Labor Day weekends.

NCDOT will develop a Communication Plan for the Construction of the I-26 Connector Bridges. This plan focuses on specific activities to alert recreational users to the hazards of bridge construction and will be appended to larger communication plan for the entire I-26 project.

Communication plans include holding small group meetings; placing signage upstream of the construction zone at river access points; and alerting greenway and river users through various traditional and social media outlets of construction schedules, including closures and other pertinent information.




**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION**

I-26 Asheville Connector
 TIP Project I-2513
 Buncombe County, NC

Legend

	Crossing Location		Waterbody
	Map Tile		Stream
	Action Area		Interstate
	Detailed Study Alternative		US Route
	Federal Land		NC Route
	Municipal Boundary		Major Road

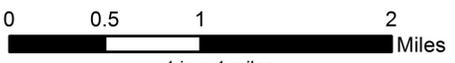
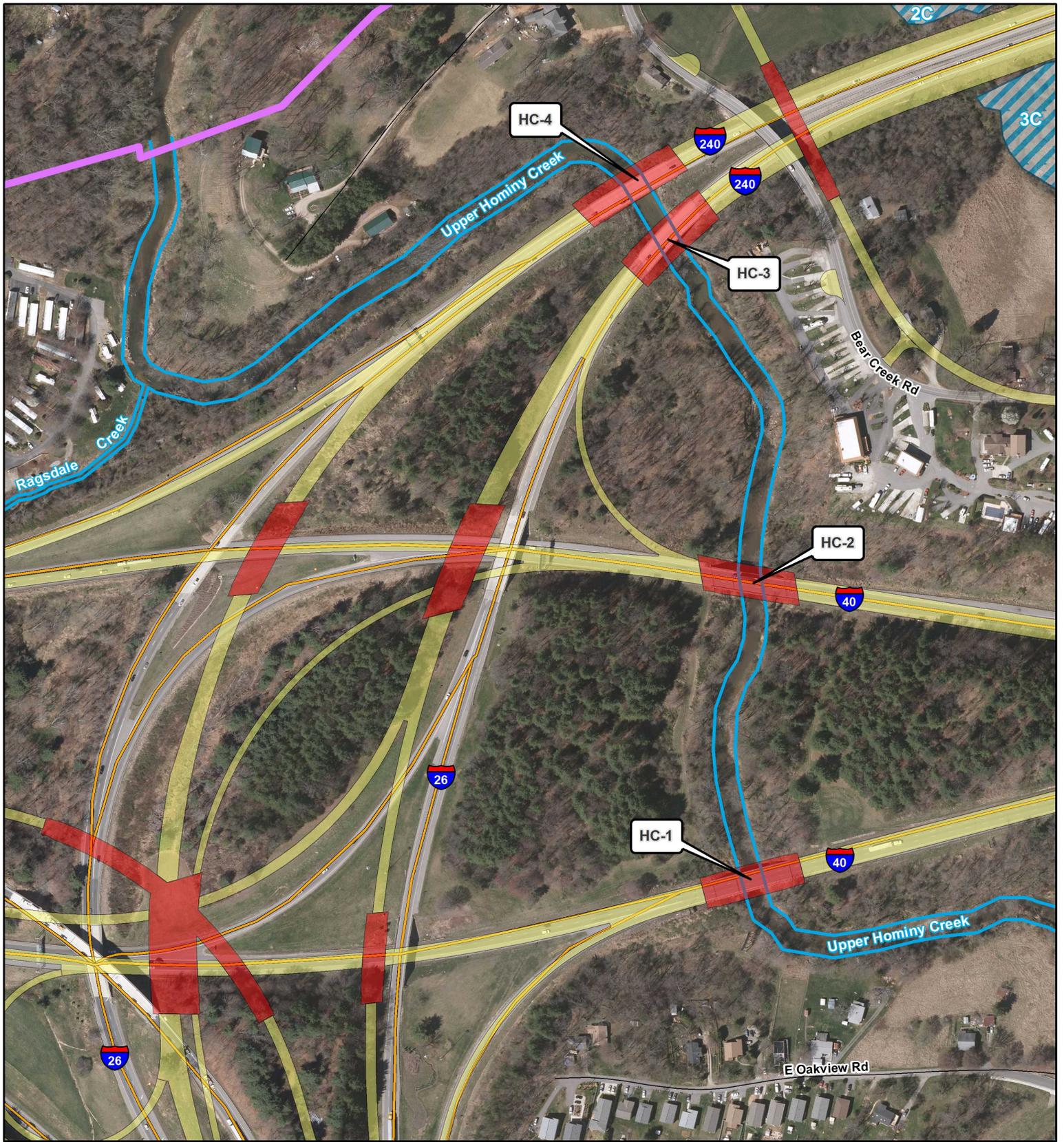


 1 in = 1 miles

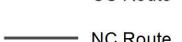
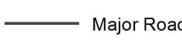
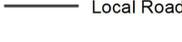
Figure 1
Crossing Locations Overview
Source: NC OneMap, CALYX Engineers and Consultants
 Map Date: 2/20/2019




NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

I-26 Asheville Connector
 TIP Project I-2513
 Buncombe County, NC

Legend

-  Action Area
-  Crossing
-  Proposed Bridge
-  Proposed Roadway
-  Delineated Wetland
-  Delineated Stream
-  Interstate
-  US Route
-  NC Route
-  Major Road
-  Local Road

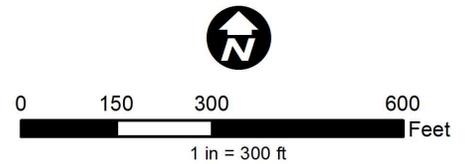
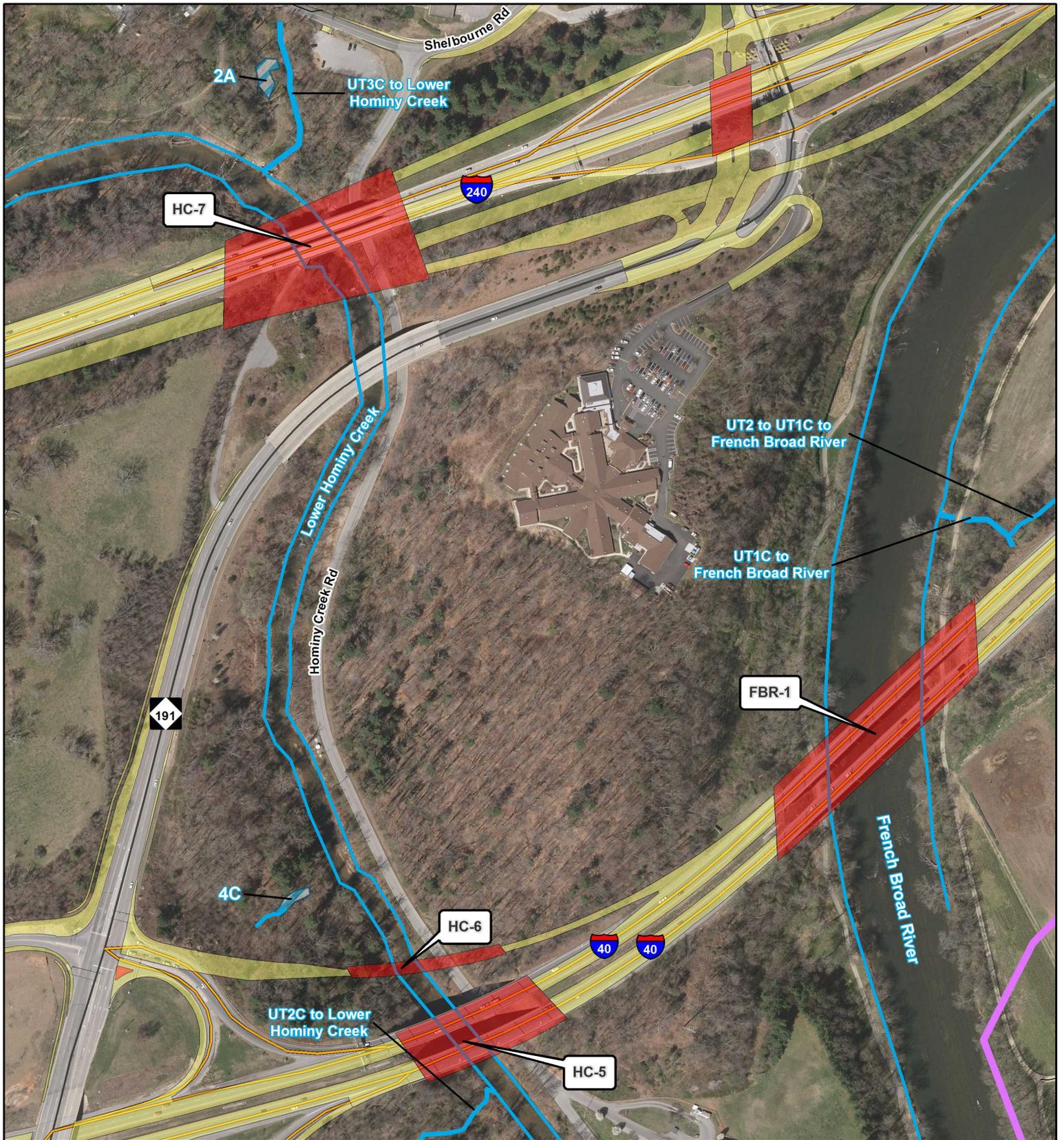


Figure 1A
Crossing Locations

Source: NC OneMap, CALYX Engineers and Consultants
 Map Date: 2/20/2019




NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

I-26 Asheville Connector
 TIP Project I-2513
 Buncombe County, NC

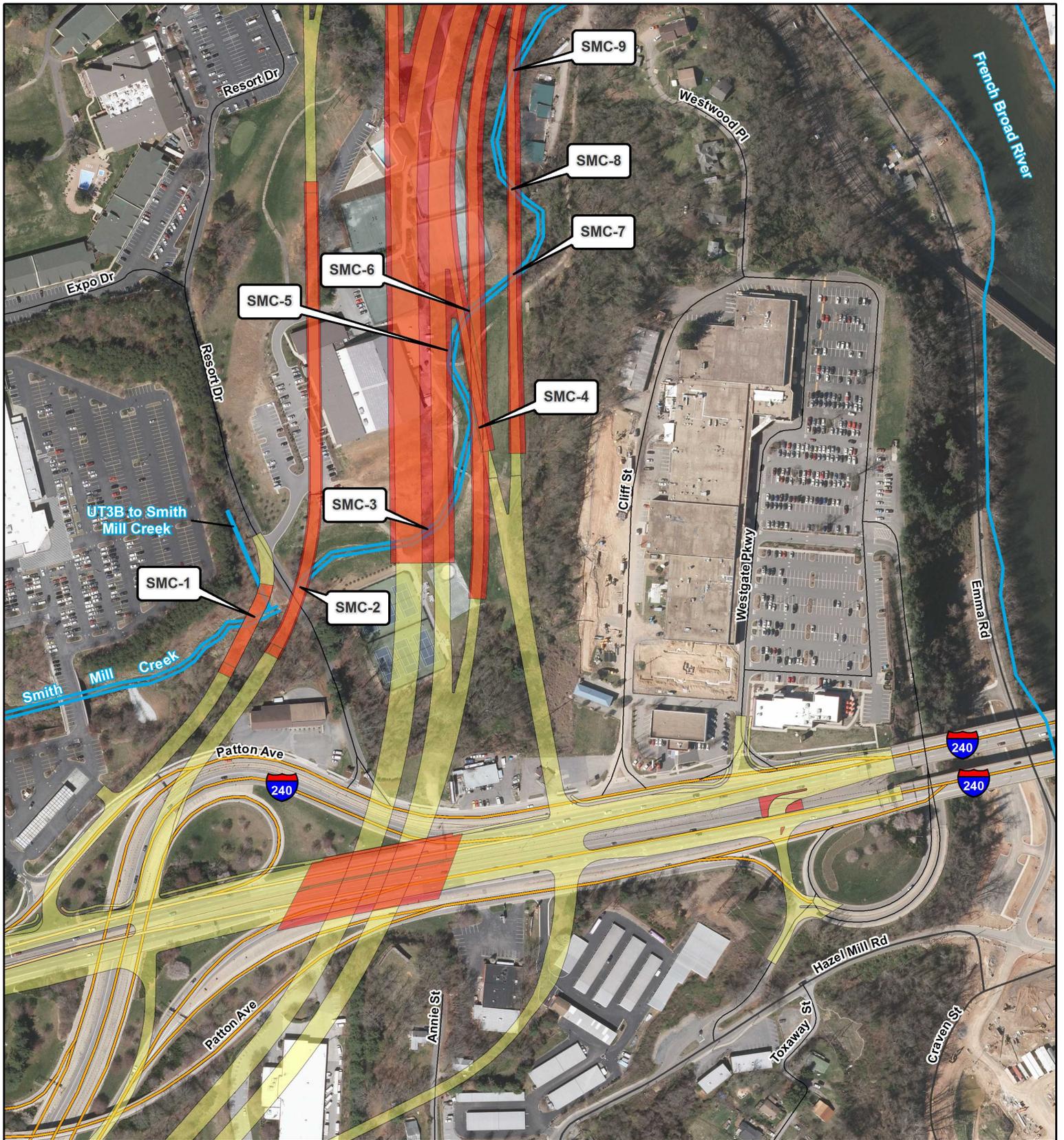
Legend

	Action Area		Delineated Stream
	Crossing		Interstate
	Proposed Bridge		US Route
	Proposed Roadway		NC Route
	Delineated Wetland		Major Road
			Local Road


 0 150 300 600
 Feet
 1 in = 300 ft

Figure 1B
Crossing Locations

Source: NC OneMap, CALYX Engineers and Consultants
 Map Date: 2/20/2019

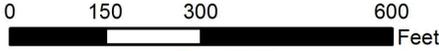



**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION**

I-26 Asheville Connector
TIP Project I-2513
Buncombe County, NC

Legend

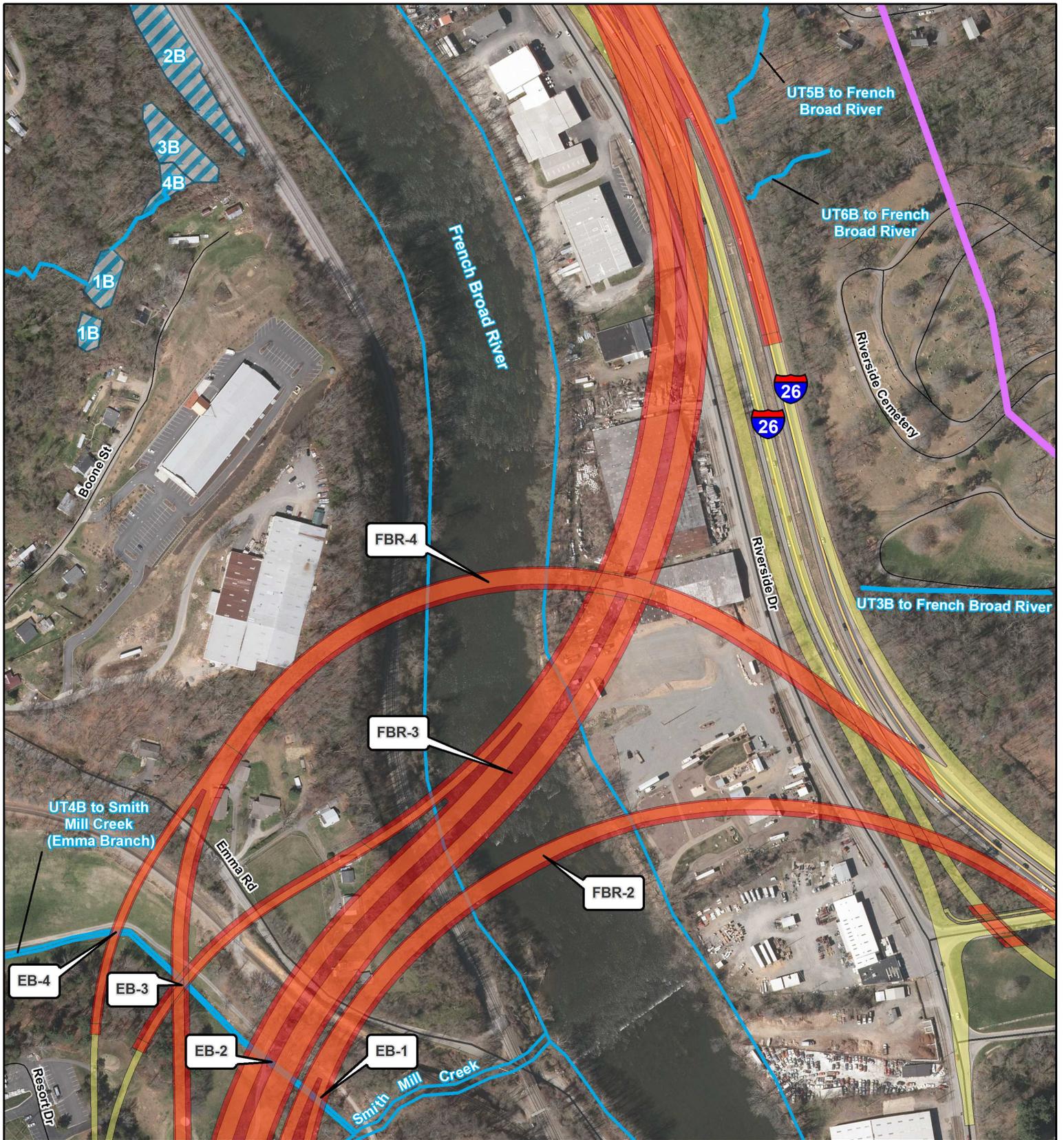
	Action Area		Delineated Stream
	Crossing		Interstate
	Proposed Bridge		US Route
	Proposed Roadway		NC Route
	Delineated Wetland		Major Road
			Local Road

1 in = 300 ft

**Figure 1C
Crossing Locations**

Source: NC OneMap, CALYX Engineers and Consultants
Map Date: 2/20/2019




**NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION**

I-26 Asheville Connector
 TIP Project I-2513
 Buncombe County, NC

Legend

	Action Area		Delineated Stream
	Crossing		Interstate
	Proposed Bridge		US Route
	Proposed Roadway		NC Route
	Delineated Wetland		Major Road
			Local Road



0 150 300 600
 Feet
 1 in = 300 ft

Figure 1D
Crossing Locations

Source: NC OneMap, CALYX Engineers and Consultants
 Map Date: 2/20/2019