

Combined Concurrence Points 1 and 2

Purpose and Need and Study Area Detailed Study Alternative

**US 321/US 421 Improvements
from US 321/ US 421 junction north of Vilas, to SR 1107 (NC 105 Bypass) west of Boone
Watauga County
STIP No. R-2615**



May 16, 2019 at 8:00 a.m.
North Carolina Department of Transportation
Structures Conference Room C, NCDOT Century Center Building A
1000 Birch Ridge Drive, Raleigh, NC 27610

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PURPOSE OF THE MEETING

The purpose of the meeting is for the Merger Team to discuss issues pertaining to Concurrence Points 1 (Purpose and Need and Study Area) and 2 (Detailed Study Alternative), so that concurrence can be reached. The desire to move the project forward with a combined Concurrence Merger Meeting was discussed at the November 29, 2018 external scoping/pre-merger meeting.

Project Description

The project proposes to improve US 321/US 421 from its junction near Vilas to SR 1107 (105 Bypass) just west of Boone, in Watauga County (Figure 1).

US 321/US 421 is the primary route between Boone and the western portions of the county. The route is currently a two-lane facility with a varying speed limit between 45 and 60 miles per hour (mph). Currently, the facility has an annual average daily traffic (AADT) of approximately 15,200 vehicles per day (vpd) and is projected to grow to 19,500 vpd in 2040. The roadway is classified as other principal arterial according to the NCDOT functional classification system. The proposed improvements include widening this section of US 321/US 421, which would include four travel lanes, the addition of a median, and five-foot paved shoulders to accommodate bicycles.

Current land use along the project corridor is low density rural. The Watauga County Comprehensive Transportation Plan (2013) envisions future mixed-used development with the route to become an economic “Gateway” to Boone. The plan describes this corridor as “...vitality important to the economic future of the community.”

Nearby STIP Projects

There are no adjoining STIP projects. Four other projects listed in the 2018-2027 STIP are located within a 3-mile radius of the project area. They include:

- R-2566B – SR 1136 (Clarks Creek Road) to SR 1107 (NC 105 Bypass) in Boone,
- U-5715 – College Street intersection improvements,
- U-5603 – US 321 (Blowing Rock Road) to NC 105 Bypass roadway upgrades, and
- R-5872 – SR 1180 (Poplar Grove Connector) roundabout.

Project Status and Schedule

The project is in project development with several environmental and engineering studies underway or completed. A combined state Environmental Assessment/Finding of No Significant Impact (EA/FONSI) is planned for the project. The following technical reports have been completed including Traffic Technical Memorandum, Hydraulics Planning Report and Natural Resources Technical Report. Surveys for Historic Architecture and Archaeology are underway. The EA/FONSI is scheduled for signature in June 2020.

The project is included in the NCDOT's 2018-2027 State Transportation Program and is scheduled for right-of-way acquisition in fiscal year (FY) 2022 and construction let in FY 2024.

Merger Coordination History

November 28, 2018 Internal/External Scoping and Merger Screening – The project was introduced to regulatory agencies and NCDOT staff for scoping. Due to the potential for substantial impacts to Waters of the U.S., the Merger Team decided to screen the project into the Merger Process.

CONCURRENCE POINT 1 - PURPOSE & NEED and STUDY AREA

Purpose & Need Summary Statement

The need for the proposed improvements is the increasing traffic congestion along US 321/US 421. The primary purpose of the project is to provide additional capacity on US 321/US 421 and to ensure that roadway improvements can support forecasted traffic growth. The project's primary objective is to achieve an overall level of service (LOS) D or better for the corridor in design year 2045 during the highest average weekday traffic conditions. Another desirable outcome of the proposed action is to facilitate travel by bicycle along the US 421/US 321 project corridor.

Project Need

US 321/US 421 is a two-lane highway that is the primary route between the Town of Boone and the western portions Watauga County and eastern Tennessee. Boone is the home to Appalachian State University, which is Boone's largest employer (DataUSA, 2019). Appalachian State enrollment has grown steadily over the last 20 years (Appalachian State University, 2019) increasing by roughly 7,500 students over that 20-year period. The employment opportunities in Boone have expanded to handle the increased demand for services needed by a larger university. As Boone and the University continue to experience growth, traffic volumes on US 321/US 421 have also increased. Current traffic volumes (2018 AADT) range from 14,000 vpd to 15,100 vpd (Figure 3a).

The Watauga County Comprehensive Transportation Plan (CPT) (2013) notes that this section of highway would have a LOS D capacity at 12,100 vpd. The CPT proposes improving US 321/US 421 from the NC 105 Bypass to US 321 at Vilas to a four-lane divided, partially controlled access facility. The addition of accommodations for bicycles along this corridor is also recommended in the CTP. Previously, the 2002 *Watauga County Thoroughfare Plan* also identified this section of US 321/US 421 as being over-capacity. This plan recommended that the section of US 421 between US 321 in Boone and the Tennessee State Line be widened to multi-lanes.

It is notable that the crash rates for this section of US 321/US 421 are above statewide average and critical crash rates for total and non-fatal injury categories for the time period analyzed (Table 1). Of additional interest, a review of the 5-year crash data reveals a preponderance of rear-end and lane departure crash types (45% and 24%, respectively, of the total crashes). These types of crashes tend to be indicative of congested traffic flow, which in this case is also exacerbated by left-turn movements. The crashes are scattered throughout the corridor (Figure 2).

Table 1: 5-year crash rate comparison: US 321/US 421 from SR 1107 (NC 105 Bypass) to US 421

| Category | US 321/US 421 | | Statewide Average Crash Rate ^{1 and 2} | Critical Crash Rate ^{1 and 2} |
|------------------|---------------|-------------------------|--|---|
| | Crashes | Crash Rate ¹ | | |
| Total | 267 | 229.72 | 183.55 | 205.64 |
| Fatal | 2 | 0.00 | 1.48 | 4.02 |
| Non-Fatal Injury | 98 | 77.94 | 56.35 | 69.37 |

Notes: 1 – Crashes per 100 million vehicle miles. 2 - For comparison the Statewide Average Crash Rates and Critical Crash Rate for US Routes with 2 lanes (2015 - 2017). The US 321/US 421 cross section does vary in this section, but this is the prevailing cross section.

Development in Boone has led to overburdening US 321/US 421 capacity, leading to substantial congestion during morning and evening peak hours. By 2045, the project’s design year, traffic volumes will range from 18,200 to 19,600 AADT (Figure 3b). This volume of traffic continues to exceed the roadway’s capacity and causes substantial delay and queuing at most signalized and unsignalized intersections. Traffic capacity analysis results indicate that in a Future Year No-Build scenario, there is only one unsignalized intersection anticipated to have all movements operate at LOS D or better in both peak periods of the 2045 design year. The remaining five unsignalized intersections will operate at LOS E or F during one or both weekday peak periods (Tables 2 and 3). To alleviate this congestion and accommodate the increase in traffic, additional roadway capacity is needed.

Table 2: 2045 Future Year No-Build AM and PM Level of Service and Delay (sec/veh) - Signalized

| Signalized Intersection | 2045 Future Year No-Build | | | |
|---|------------------------------|-------------|----------|--------------|
| | AM | | PM | |
| | LOS | Delay | LOS | Delay |
| US 321/US 421/NC 194 and SR 1107 (NC 105 Bypass) | F | 91.8 | F | 608.5 |

Note: Items in bold indicate those movements that exceed Level of Service D.

Table 3: 2045 Future Year No-Build AM and PM Level of Service and Delay (sec/veh) – Unsignalized

| Unsignalized Intersection | Movement | 2045 Future Year No-Build | | | |
|--|--------------------|---------------------------|--------------|----------|--------------|
| | | AM | | PM | |
| | | LOS | Delay | LOS | Delay |
| US 421 & US 321 | EB Left-Turn | F | 91.8 | F | 608.5 |
| | EB Right- Turn | F | 184.1 | B | 12.7 |
| | NB Left-Turn | B | 11.4 | B | 10.2 |
| US 321/US 421 and NC 194 | EB Left/Right-Turn | E | 44.7 | D | 33.7 |
| | NB Thru/Left-Turn | B | 12.1 | A | 8.8 |
| US 321/US 421/NC 194 and SR 1311 (Linville Ck. Rd. W.) | WB Left/Right-Turn | F | 72.5 | F | 56.9 |
| | SB Thru/Left-Turn | A | 8.7 | B | 12.2 |
| US 321/US 421/NC 194 and SR 1313 (Linville Ck. Rd. E.) | EB Thru/Left-Turn | A | 8.7 | B | 12.4 |
| | SB Left/Right-Turn | F | 131.4 | F | 68.8 |
| US 321/US 421/NC194 and SR 1110 (Greer Lane) | WB Thru/Left-Turn | B | 12.3 | A | 8.7 |
| | NB Left/Right-Turn | E | 44.1 | E | 36.7 |
| US 321/US 421/ NC 194 and SR 1104 (Old Bristol Rd.) | EB Thru/Left-Turn | A | 8.1 | A | 9.7 |
| | SB Left/Right-Turn | C | 19.5 | C | 18.7 |

Note: Items in bold indicate those movements that exceed Level of Service D.

Future year build analysis of the intersections indicates that all signalized intersections are anticipated to operate at LOS D or better in both the AM and PM peak periods (Table 4). Additionally, the results shown in Table 5 indicate that all unsignalized intersections are anticipated to have all movements operating at LOS D or better in both the AM and PM peak periods, with one exception. At the Linville Creek Road East intersection, the southbound side street approach is anticipated to operate at LOS E in the PM peak hour.

Table 4: 2045 Future Year Build AM and PM Level of Service and Delay (sec/veh) - Signalized

| Signalized Intersection | 2045 Future Year Build | | | |
|--|------------------------|-------|-----|-------|
| | AM | | PM | |
| | LOS | Delay | LOS | Delay |
| US 421/321 & US 321 ¹ | B | 18.1 | B | 13.3 |
| US 321/US 421/NC 194 and SR 1107 (NC 105 Bypass) | C | 33.2 | D | 38.9 |

1 – Recommended signal.

Note: Items in bold indicate those movements that exceed Level of Service D.

Table 5: 2045 Future Year Build AM and PM Level of Service and Delay (sec/veh) – Unsignalized

| Unsignalized Intersection | Movement | 2045 Future Year Build | | | |
|--|----------------------|------------------------|-------|----------|-------------|
| | | AM | | PM | |
| | | LOS | Delay | LOS | Delay |
| US 421 /US 321 & NC 194 | EB Left/Right-Turn | D | 28.8 | C | 17.6 |
| | NB Left- Turn/U-Turn | C | 21.6 | A | 9.4 |
| US 321/US 421/NC 194 and SR 1311 (Linville Ck. Rd. W.) | WB Left/Right-Turn | B | 10.4 | B | 14.7 |
| US 321/US 421/NC 194 and SR 1313 (Linville Ck. Rd. E.) | EB Left-Turn | A | 8.7 | B | 12.6 |
| | SB Left/Right-Turn | D | 34.5 | E | 49.5 |
| US 321/US 421/NC194 and SR 1110 (Greer Lane) | WB Left-Turn | B | 12.4 | A | 8.7 |
| | NB Left/Right-Turn | D | 32.0 | C | 19.4 |
| US 321/US 421 & U-Turn | SB U-Turn | B | 10.9 | C | 24.0 |

Note: Items in bold indicate those movements that exceed Level of Service D.

Logical Termini and Independent Utility

The northern project terminus is the junction of US 321 and US 421. US 321 enters the project from the west. It crosses from Tennessee into North Carolina approximately 11 miles travel

distance from the project area. US 421 enters the project area from the north. It also enters the state from Tennessee approximately 7.5 travel miles from the project area. Traffic estimates indicate that the traffic load splits between the two highways roughly by one-third/two-thirds at this junction.

The southern project terminus is the intersection with SR 1107 (NC 105 Bypass). US 321/US 421 continues into downtown Boone at a 45-mph posted speed. The NC 105 Bypass takes traffic around Boone to the south. Traffic estimates indicate that the traffic load at this terminus roughly splits fifty-fifty between the two highways.

Study Area Boundary

The proposed study area boundary illustrated on the project's Environmental Features Maps (Figures 4a and 4b) includes logical termini and is of sufficient size to allow the development of one or more alternatives that meet the Purpose and Need for the proposed project. The study area extends along US 321/US 421 from the US 321 junction to SR 1107 (NC 1065 Bypass), generally encompassing an area 250 feet on each side of the existing road centerline. The study area includes sufficient area along y-lines, as appropriate, on the proposed project.

CONCURRENCE POINT 2 – ALTERNATIVES CARRIED FORWARD FOR DETAILED STUDY

It is the intent of the project team to only carry the Build Alternative (Best Fit Widening) and the No-Build Alternative through detailed impact analysis documented in the EA/FONSI.

Build Alternative

Proposed Typical Section

The proposed typical-section for widening this section of US 321/US 421 includes four 12-foot travel lanes, a 30-foot depressed grass median, and 5-foot paved shoulders to accommodate for bicycles (Figure 5). The proposed design speed is 50 to 55 mph, variable. The typical section is consistent with the NCDOT Roadway Design Manual for this type of facility and design speeds.

Best Fit Widening Alternative

Utilizing known environmental and community features, a preliminary best-fit alignment was created (Figures 6a through 6g). This best fit alternative proposes to widen US 321/ US 421 with a best fit alignment from its junction near Vilas to SR 1107 (105 Bypass) just west of Boone. This alignment allows for the opportunity to avoid impacts to historical architecture and jurisdictional resources, as needed.

Other Alternatives

East Side Widening Alternative

The east side widening alternative (visually to the north) proposed to widen US 321/US 421 from its junction near Vilas to SR 1107 (105 Bypass) just west of Boone (Figures 7a and 7b). This alternative would have the majority of its impacts to properties on the east side of the facility with limited opportunities to avoid resources. The project team does not recommend carrying this alternative forward for detailed analysis in the EA.

West Side Widening Alternative

The west side widening alternative (visually to the south) proposed to widen US 321/US 421 from its junction near Vilas to SR 1107 (105 Bypass) just west of Boone (Figures 8a and 8b). This alternative would have the majority of its impacts to properties on the west side of the facility with limited opportunities to avoid resources. The project team does not recommend carrying this alternative forward for detailed analysis in the EA.

No Build Alternative

The No-Build alternative consists only of routine maintenance along US 321/US 421 within the project study area. This alternative does not include any pavement widening. This alternative would not meet the Purpose and Need.

Alternative Modes of Transportation

AppleCart is the public transportation service provider for Watauga County. It currently operates 11 bus routes in and surrounding the Town of Boone. Daily service is also provided to Greensboro and Charlotte by Sunway Charters with twice daily round-trip regional service. Regularly scheduled service along the project corridor is not provided and currently no service is planned. This alternative would not meet the Purpose and Need and the project team does not recommend carrying this alternative forward for detailed analysis in the EA.

Natural Environment Considerations

Information regarding the natural environment in the study area is from the Natural Resources Technical Report (April 2019) for this project.

Waters

The project corridor lies within the Watauga River basin (USGS Hydrologic Unit 06010103). The study area is located within a watershed designated by the North Carolina Wildlife Resources Commission (NCWRC) as a trout watershed. No Outstanding Resource Waters (ORW), High Quality Waters (HQW), or water supply watersheds (WS-I or WS-II) are located within the study area or within 1.0 mile downstream of the study area.

A total of 33 streams, comprising 26,976 linear feet, were identified in the study area (Appendix A, Table 1). They include Brushy Fork Creek, George Branch, Linville Creek and 30 connecting unnamed tributaries. All are classified as Class C waters. No streams within the study area are identified as impaired on the North Carolina Final 2016 303(d) list. The streams in the project study area have been designated as coldwater streams for the purposes of stream mitigation. The study area is not located within a basin to which N.C. river basin buffer rules apply; therefore, no streams within the study area are subject to protection under these rules.

Sixty jurisdictional wetlands were identified within the study area totaling 2.30 acres (Appendix A, Table 2). They primarily consist of Headwater Forest and Non-Tidal Freshwater Marsh.

Two surface waters were identified in the study area (Appendix A, Table 3).

Impacts to streams, wetlands, and surface waters were quantified using a **conceptual design footprint of slope stakes plus 40 feet** for a Best-Fit Alignment and are presented in Table 6. Additionally, impacts for an East Widening Alignment and a West Widening Alignment are presented for comparison. Calculations do not include impacts along Y-lines.

Table 6: Impacts to Waters

| Resources | Best-Fit Widening Alignment | East Widening Alignment | West Widening Alignment |
|------------------------|-----------------------------|-------------------------|-------------------------|
| Streams (linear feet) | 11,950 | 11,820 | 13,930 |
| Wetlands (acres) | 1.63 | 1.80 | 1.69 |
| Surface waters (acres) | 0.06 | 0.06 | 0.10 |

Federally Protected Species

As of June 27, 2018, the United States Fish and Wildlife (USFWS) lists 11 federally protected species, under the Endangered Species Act (ESA) for Watauga County. For each species, a discussion of the presence or absence of habitat is included below along with the Biological Conclusion rendered based on survey results in the **study area** (Table 7).

Table 7: Federally protected species listed for Watauga County

| Scientific Name | Common Name | Federal Status | Habitat Present | Biological Conclusion |
|--|-----------------------------------|----------------|-----------------|-----------------------|
| <i>Glyptemys muhlenbergii</i> | bog turtle | T(S/A) | No | Not Required |
| <i>Glaucomys sabrinus coloratus</i> | Carolina northern flying squirrel | E | No | No Effect |
| <i>Myotis grisescens</i> | gray bat | E | Undetermined | Unresolved |
| <i>Myotis septentrionalis</i> | northern long-eared bat | T | Undetermined | Unresolved |
| <i>Corynorhinus townsendii virginianus</i> | Virginia big-eared bat | E | Undetermined | Unresolved |
| <i>Bombus affinis</i> * | rusty-patched bumble bee | E | No | No Effect |
| <i>Microhexura montivaga</i> | spruce-fir moss spider | E | No | No Effect |
| <i>Solidago spithamea</i> | Blue Ridge goldenrod | T | No | No Effect |
| <i>Liatris helleri</i> | Heller’s blazing star | T | No | No Effect |
| <i>Hedyotis purpurea var. montana</i> | Roan Mountain bluet | E | No | No Effect |
| <i>Geum radiatum</i> | spreading avens | E | No | No Effect |

E - Endangered

T - Threatened

T(S/A) - Threatened due to similarity of appearance

* - Historic record (the species was last observed in the county more than 50 years ago)

Human Environment Considerations

Cultural Resources

Known historic structures as identified in the study area on available GIS mapping are labeled on the Environmental Features Maps (Figures 4a and 4b). NCDOT Cultural Resources staff have completed preliminary screening of the study area for both archaeological and architectural

resources. It was determined that additional surveys would be required. Surveys are ongoing and will likely identify additional potentially-eligible structures not included on current mapping. The best-fit alignment allows for avoidance and minimization of impacts to cultural resources, as needed.

Community Resources

The study area was field surveyed for community resources and information was gathered from available GIS mapping. These resources are identified on the Environmental Features Maps (Figures 4a and 4b).

Environmental Justice

A Community Impact Assessment is currently in progress for the project. Preliminary research indicates three of the five Block Groups within the Demographic Study Area (DSA) meet or exceed the NCDOT threshold for minority populations. These block groups are located at the north and south ends of the project study area.

Utilities

The study area was field surveyed for utilities and information was gathered from available GIS mapping.

No major utility transmission lines are located within the project study area.

Local transmission lines (buried and overhead) are located along US 321/ US 421 for electricity, telephone and cable. The project area is located in Watauga County and water and sewer service are not available. Some water and/or sewer lines maybe located in the project area at the southern terminus near Boone city limits. Natural gas service is not available in the study area.

GeoEnvironmental Hazards

NCDOT Geotechnical Engineering Unit identified fourteen sites of concern within the proposed project study area. Most sites contain Underground Storage Tanks (USTs). In addition, naturally occurring asbestos material has also been documented in the vicinity of Rich Mountain (north of the project area) and at the headwaters of Brushy Fork (along the project).

Preliminary Impacts

Impacts to the Human Environment were quantified using **a conceptual design footprint of slope stakes plus 40 feet** for the Best-Fit Widening Alignment and are presented in Table 8. Additionally, impacts for an East Widening Alignment (visually north) and a West Widening Alignment (visually south) are presented for comparison. Calculations do not include impacts along Y-lines.

Table 8: Impacts to the Human Environment

| Resource Type | Best-Fit Widening Alignment | East Widening Alignment | West Widening Alignment |
|---|------------------------------------|--------------------------------|--------------------------------|
| Hospitals | -- | -- | -- |
| Nursing Homes | -- | -- | -- |
| Churches | 3 | 3 | 3 |
| Cemeteries | 0 | 0 | 0 |
| Public Schools | -- | -- | -- |
| Private Schools/Daycare | 0 | 0 | 0 |
| Historic Sites | TBD | TBD | TBD |
| Public Parks | -- | -- | -- |
| Greenways | -- | -- | -- |
| Game Lands or LWCF Properties | -- | -- | -- |
| Residential Properties | 45 | 46 | 63 |
| Multi-Family Bldg. w approx. 6 units each | 2 | 2 | 2 |
| Business Properties | 24 | 25 | 25 |
| Natural Gas Pipelines | -- | -- | -- |
| Power transmission lines | -- | -- | -- |
| Suspected/known Hazardous Material Sites | 9 | 9 | 9 |
| FEMA Buyout Properties | -- | -- | -- |

Note: "--" indicates that the resource is not found in the study area. "0" – indicates that the resource is found in the study area but is not impacted by the alternative. TBD – To be determined.

APPENDIX A
WATERS OF THE US

Table 1: Streams in the Study Area

| Stream Name | ID | NCDWR Index Number | Classification | Compensatory Mitigation Required |
|-------------------------|-------------------|---------------------------|-----------------------|---|
| Brushy Fork Creek | Brushy Fork Creek | 8-15-10 | Perennial | Yes |
| George Branch | George Branch | 8-15-10-2 | Perennial | Yes |
| Linville Creek | Linville Creek | 8-15-10-1 | Perennial | Yes |
| UT to Brushy Fork Creek | SA | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SB | 8-15-10 | Perennial | Yes |
| UT to George Branch | SC | 8-15-10-2 | Perennial | Yes |
| UT to Brushy Fork Creek | SD | 8-15-10 | Intermittent | Undetermined |
| UT to George Branch | SE | 8-15-10-2 | Perennial | Yes |
| UT to Brushy Fork Creek | SF | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SG | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SH | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SI | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SJ | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SK | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SL | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SM | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SN | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SO | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SP | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SQ | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SR | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SS | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | ST | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SU | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SV | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SW | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SX | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SY | 8-15-10 | Inter/Peren | Undermined/Yes |
| UT to Brushy Fork Creek | SZ | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SAA | 8-15-10 | Perennial | Yes |
| UT to Brushy Fork Creek | SAB | 8-15-10 | Intermittent | Undetermined |
| UT to Brushy Fork Creek | SAC | 8-15-10 | Inter/Peren | Undermined/Yes |
| UT to Brushy Fork Creek | SAD | 8-15-10 | Perennial | Yes |

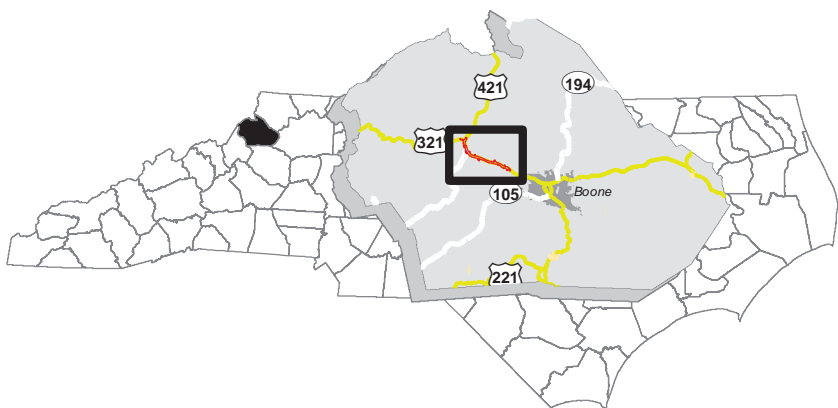
Table 2. Characteristics of jurisdictional wetlands in the study area

| ID | NCWAM Classification | NCWAM Rating | Hydrologic Classification | Area (ac.) in Study Area |
|-----------|-----------------------------|---------------------|----------------------------------|---------------------------------|
| WA | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.18 |
| WB | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.01 |
| WC | Headwater Forest | High | Riparian | 0.01 |
| WD | Headwater Forest | Medium | Riparian | 0.01 |
| WE | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.01 |
| WF | Headwater Forest | Medium | Riparian | 0.13 |
| WG | Headwater Forest | Medium | Riparian | 0.10 |
| WH | Headwater Forest | Low | Riparian | 0.06 |
| WI | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.01 |
| WJ | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.01 |
| WK | Headwater Forest | Low | Riparian | 0.17 |
| WL | Headwater Forest | High | Riparian | 0.01 |
| WM | Headwater Forest | Medium | Riparian | 0.13 |
| WN | Headwater Forest | High | Riparian | 0.01 |
| WO | Headwater Forest | Medium | Riparian | 0.05 |
| WP | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.02 |
| WQ | Non-Tidal Freshwater Marsh | Low | Riparian | 0.02 |
| WR | Bottomland Hardwood Forest | High | Riparian | 0.02 |
| WS | Non-Tidal Freshwater Marsh | Low | Riparian | 0.03 |
| WT | Non-Tidal Freshwater Marsh | Low | Riparian | 0.06 |
| WU | Non-Tidal Freshwater Marsh | Low | Riparian | 0.03 |
| WV | Headwater Forest | Low | Riparian | 0.04 |
| WW | Headwater Forest | High | Riparian | 0.01 |
| WX | Headwater Forest | High | Riparian | 0.01 |
| WY | Headwater Forest | High | Riparian | 0.03 |
| WZ | Non-Tidal Freshwater Marsh | Low | Riparian | <0.01 |
| WAA | Non-Tidal Freshwater Marsh | Low | Riparian | 0.05 |
| WAB | Headwater Forest | High | Riparian | 0.04 |
| WAC | Headwater Forest | Medium | Riparian | 0.02 |
| WAD | Headwater Forest | High | Riparian | 0.02 |
| WAE | Non-Tidal Freshwater Marsh | Medium | Riparian | 0.01 |
| WAF | Headwater Forest | Medium | Riparian | 0.01 |
| WAG | Headwater Forest | High | Riparian | 0.11 |
| WAH | Headwater Forest | Low | Riparian | 0.03 |
| WAI | Headwater Forest | Medium | Riparian | 0.01 |
| WAJ | Bottomland Hardwood Forest | High | Riparian | 0.03 |
| WAK | Headwater Forest | Medium | Riparian | 0.01 |
| WAL | Non-Tidal Freshwater Marsh | High | Riparian | 0.09 |

| ID | NCWAM Classification | NCWAM Rating | Hydrologic Classification | Area (ac.) in Study Area |
|-----|----------------------|--------------|---------------------------|--------------------------|
| WAM | Headwater Forest | Medium | Riparian | 0.03 |
| WAN | Headwater Forest | Medium | Riparian | 0.11 |
| WAO | Headwater Forest | Medium | Riparian | 0.05 |
| WAP | Headwater Forest | High | Riparian | 0.01 |
| WAQ | Headwater Forest | High | Riparian | 0.03 |
| WAR | Headwater Forest | Low | Riparian | 0.01 |
| WAS | Headwater Forest | Low | Riparian | 0.03 |
| WAT | Headwater Forest | Low | Riparian | 0.06 |
| WAU | Headwater Forest | Medium | Riparian | 0.09 |
| WAV | Headwater Forest | Medium | Riparian | 0.02 |
| WAW | Headwater Forest | Medium | Riparian | 0.02 |
| WAX | Headwater Forest | Medium | Riparian | 0.01 |
| WAY | Headwater Forest | Medium | Riparian | 0.06 |
| WAZ | Headwater Forest | Low | Riparian | 0.02 |
| WBA | Headwater Forest | High | Riparian | 0.01 |
| WBB | Headwater Forest | Medium | Riparian | 0.02 |
| WBC | Headwater Forest | Low | Riparian | 0.04 |
| WBD | Headwater Forest | High | Riparian | <0.01 |
| WBE | Headwater Forest | Medium | Riparian | 0.01 |
| WBF | Headwater Forest | Medium | Riparian | 0.07 |
| WBG | Headwater Forest | Medium | Riparian | <0.01 |
| WBH | Seep | High | Riparian | <0.01 |

Table 3. Surface waters in the study area

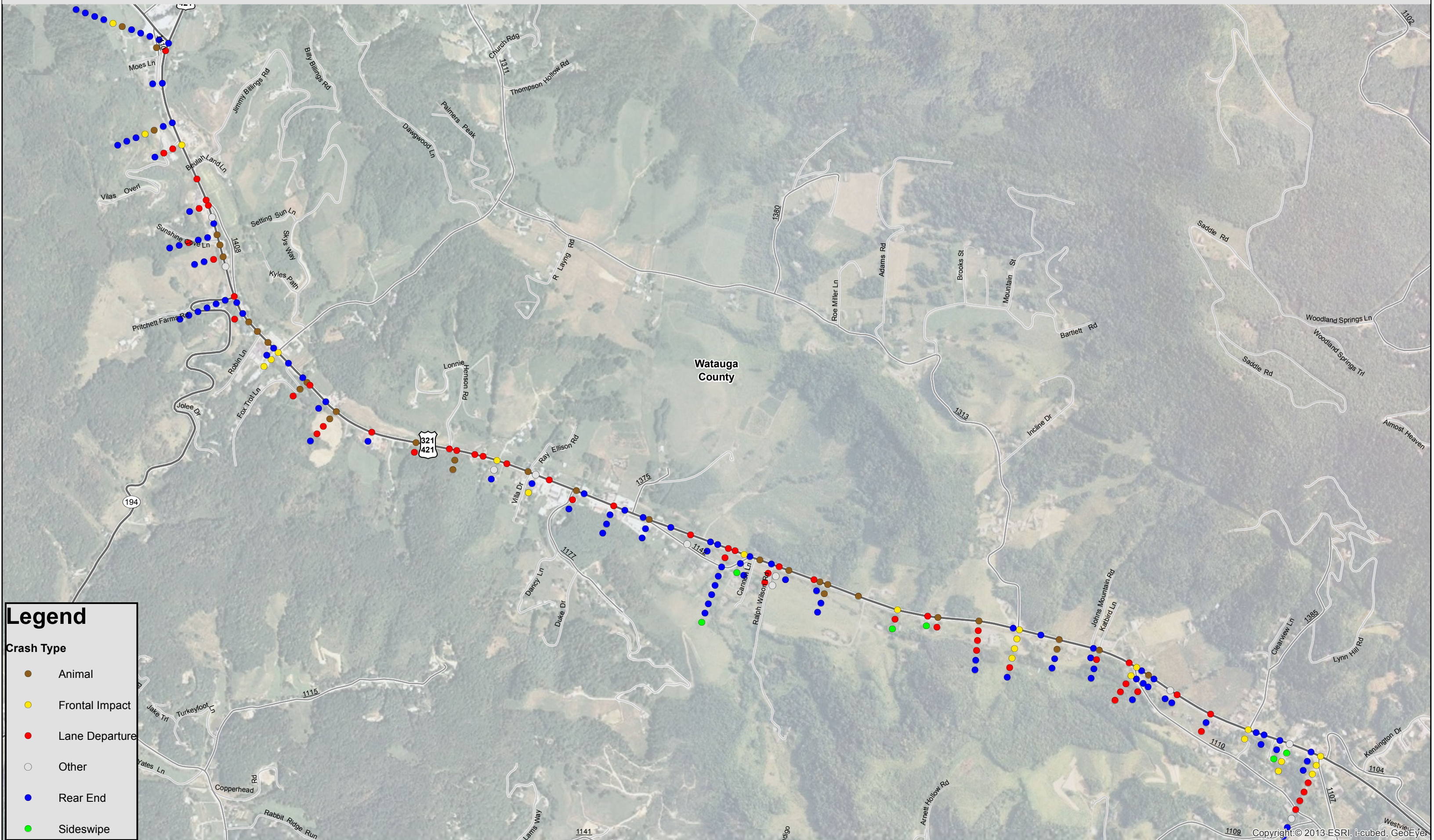
| Surface Water | Jurisdictional | Map ID of Connection | Area (ac) in Study Area |
|------------------|----------------|-----------------------|-------------------------|
| Pond A (PA) | Yes | Brushy Fork Creek | 0.1 |
| Tributary A (TA) | Yes | WAU/Brushy Fork Creek | 0.0 |



Vicinity Map
WATAUGA COUNTY
 US 321/421 IMPROVEMENTS
 R - 2615
 Figure 1



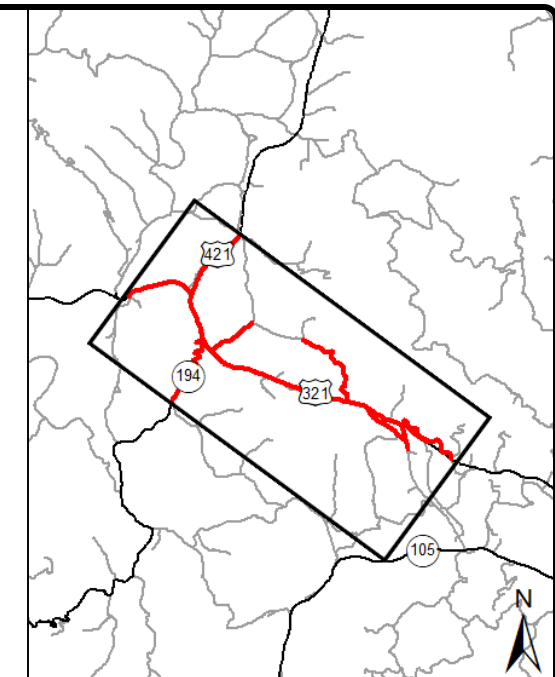
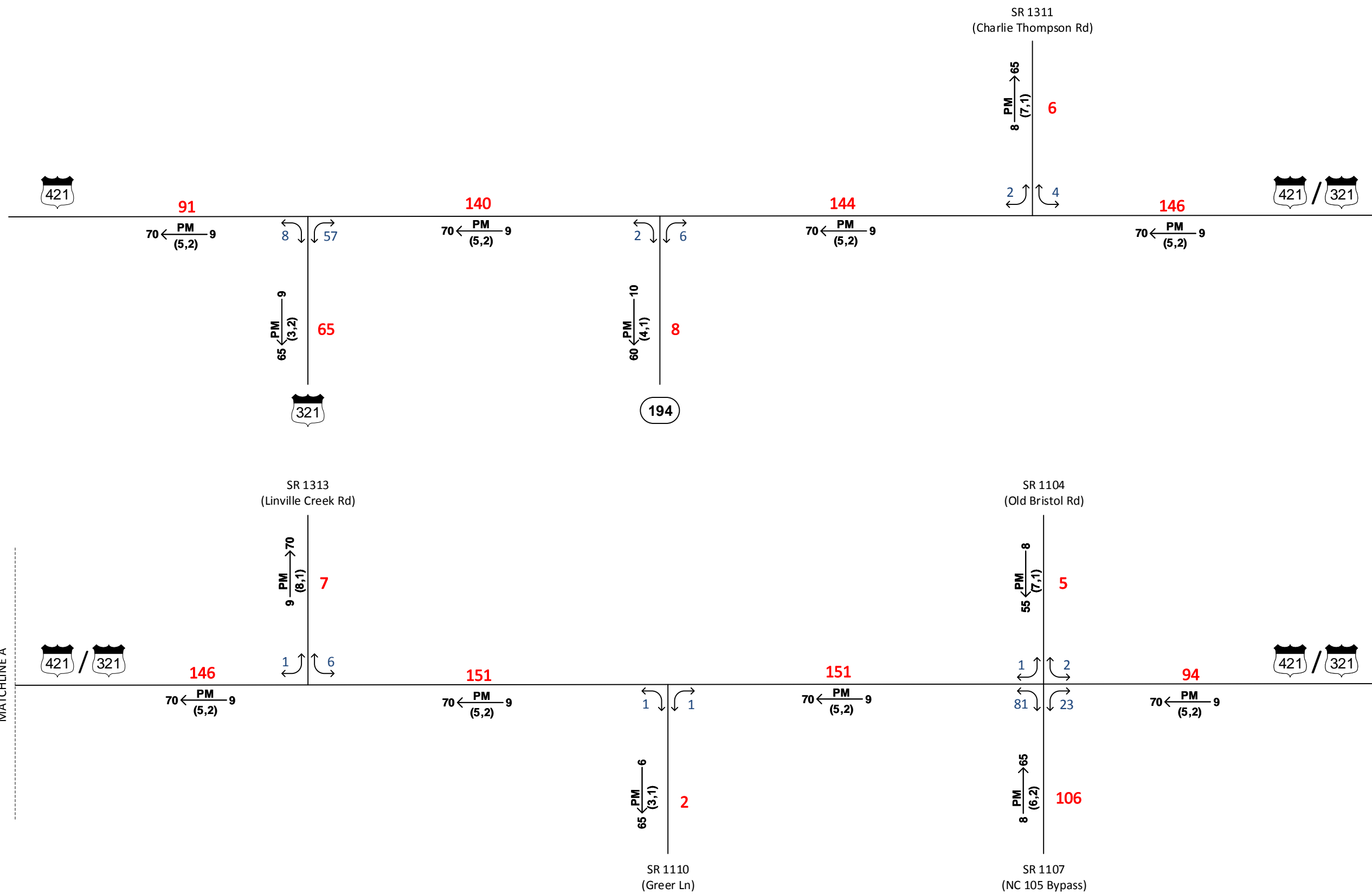
Figure 2. US 321 / US 421 from SR 1107 (NC 105 Bypass)
to US 421 (8/1/2013 - 7/31/2018)



Legend

Crash Type

- Animal
- Frontal Impact
- Lane Departure
- Other
- Rear End
- Sideswipe



2018

AVERAGE ANNUAL DAILY TRAFFIC

VOLUME ESTIMATE

Figure 3A

LEGEND

- $\frac{PM}{(d, t)} \rightarrow D$
- ### No. of Vehicles Per Day (VPD) in 100s
- 1- Less than 50 VPD
- X Movement Prohibited
- Roadway
- K Design Hour Factor (%)
- PM PM Peak Period
- D Peak Hour Directional Split
- Indicates Direction of D
- (d,t) Duals, TT-STs (%)

TIP: R-2615 WBS:

COUNTIES: Watauga DIVISION: 11

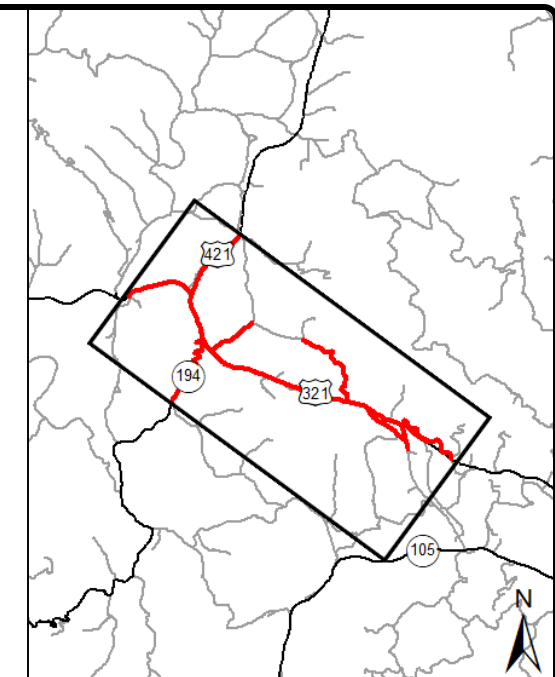
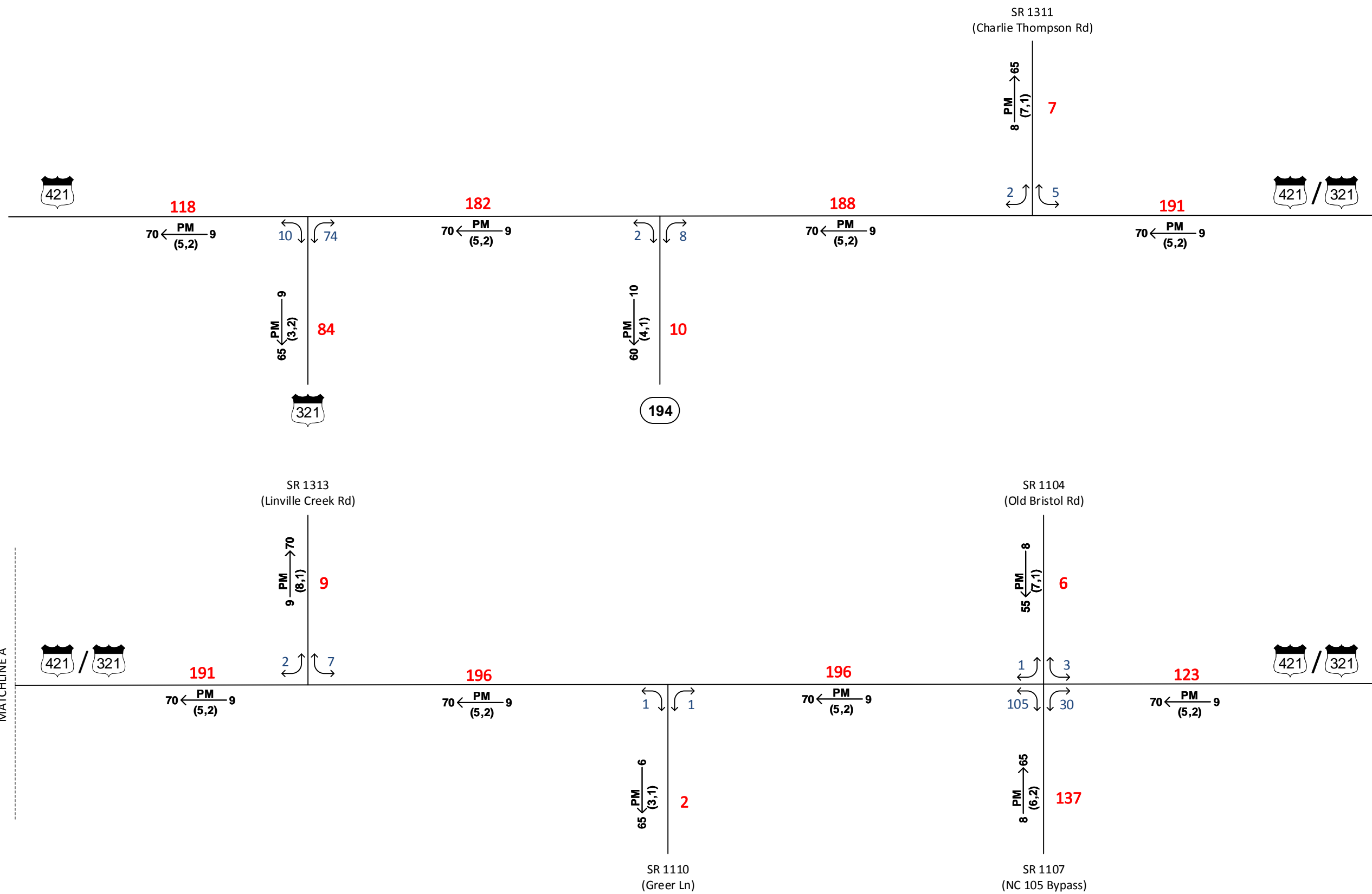
DATE: July 2018

PREPARED BY: Kimberly Levine

LOCATION: US 321/US 421 from US 321 to SR 1107 (NC 105 Bypass)

PROJECT: Improvements to US 421/US 321





2045

AVERAGE ANNUAL DAILY TRAFFIC

VOLUME ESTIMATE

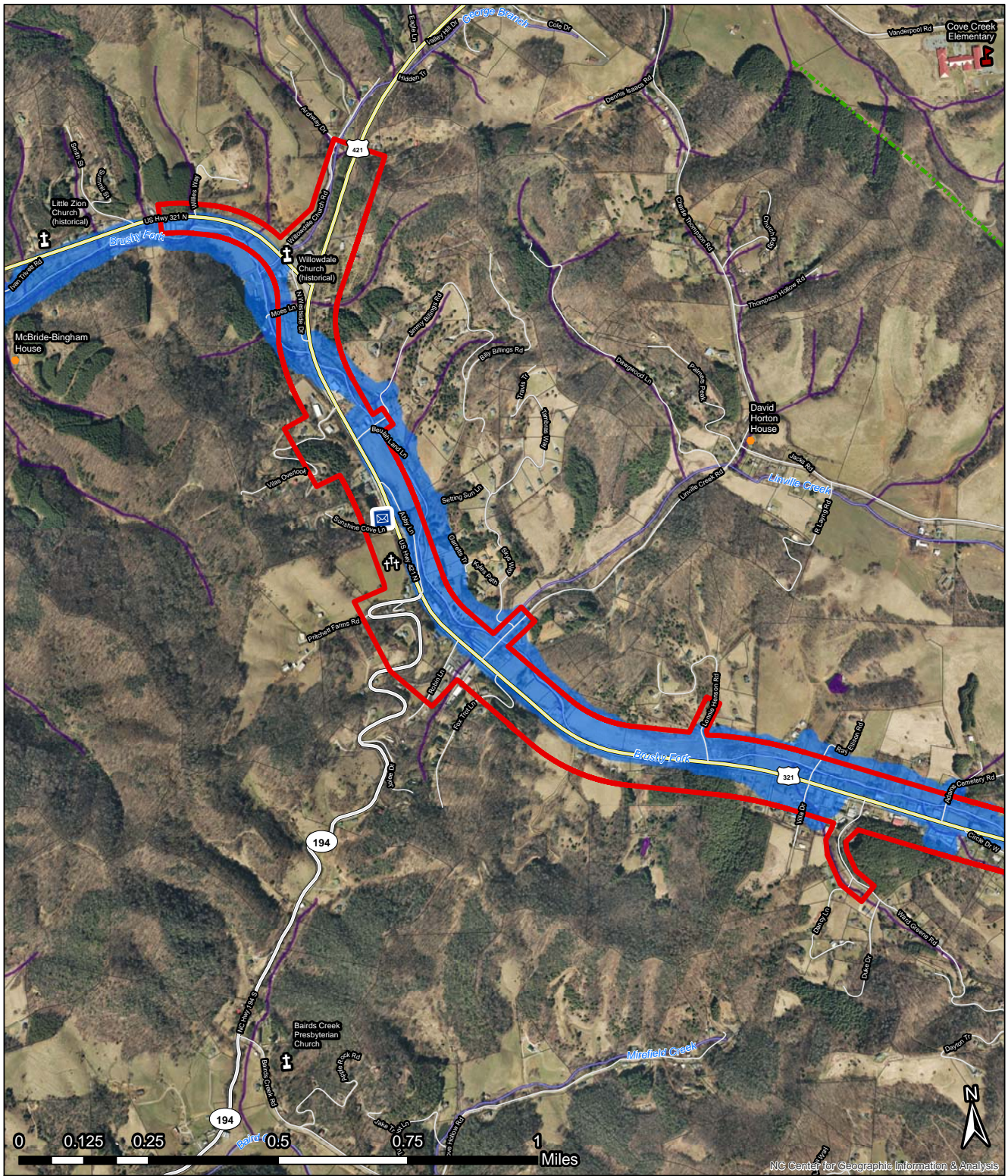
Figure 3B

LEGEND

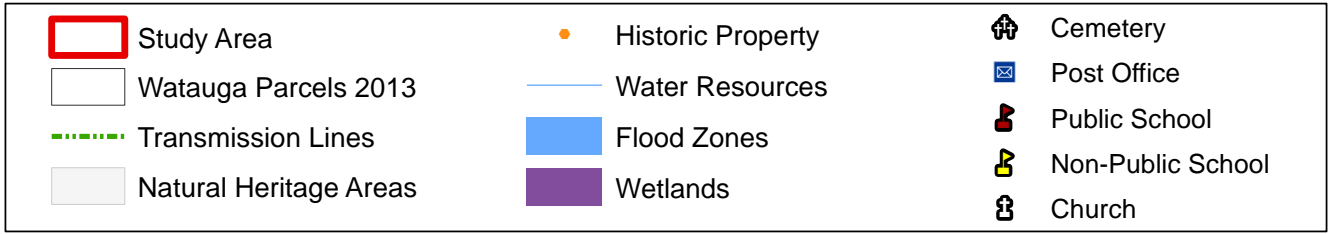
- $K \xrightarrow{PM} D$
(d, t)
- ### No. of Vehicles Per Day (VPD) in 100s
- 1- Less than 50 VPD
- X Movement Prohibited
- Roadway
- K Design Hour Factor (%)
- PM PM Peak Period
- D Peak Hour Directional Split
- Indicates Direction of D
- (d,t) Duals, TT-STs (%)

| | |
|---|---------------------|
| TIP: R-2615 | WBS: |
| COUNTIES: Watauga | DIVISION: 11 |
| DATE: July 2018 | |
| PREPARED BY: Kimberly Levine | |
| LOCATION: US 321/US 421 from US 321 to SR 1107 (NC 105 Bypass) | |
| PROJECT: Improvements to US 421/US 321 | |



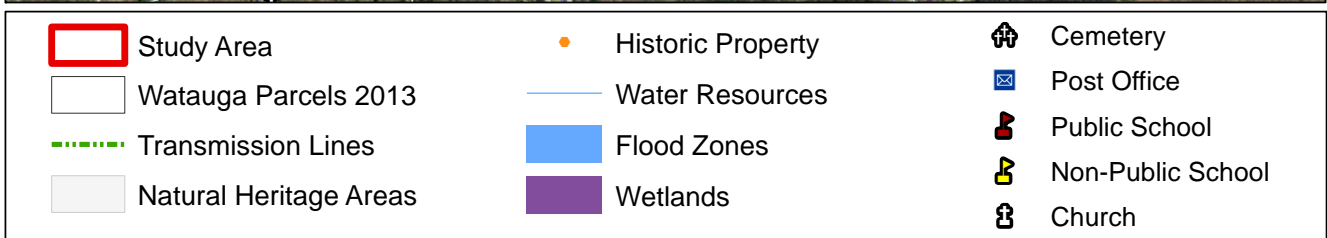
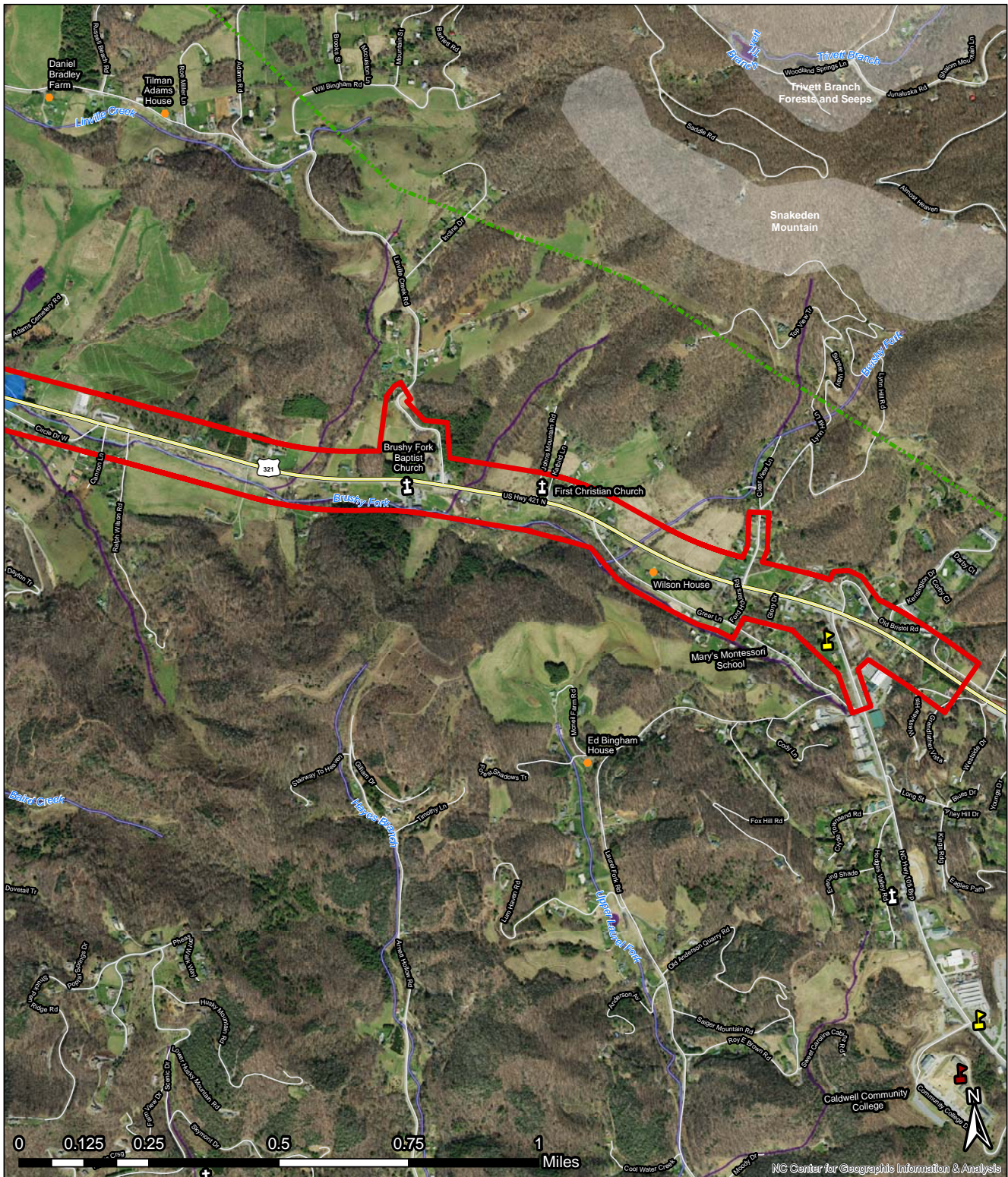


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| | |
|---|--------------------|
| <h2>Environmental Features</h2> <p>STIP Project No. R-2615 US 421/321 Improvements Watauga County</p> | <h2>Figure 4A</h2> |
|---|--------------------|

Source: NCDOT GIS Unit, NC OneMap, USFWS, USGS, USDA, FEMA

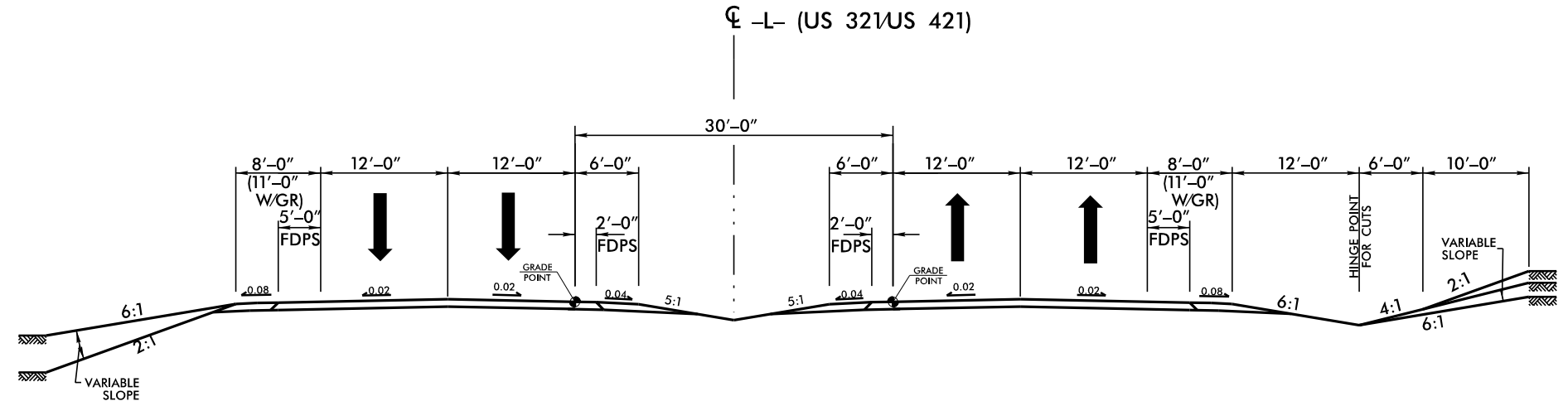


Environmental Features

STIP Project No. R-2615
US 421/321 Improvements
Watauga County

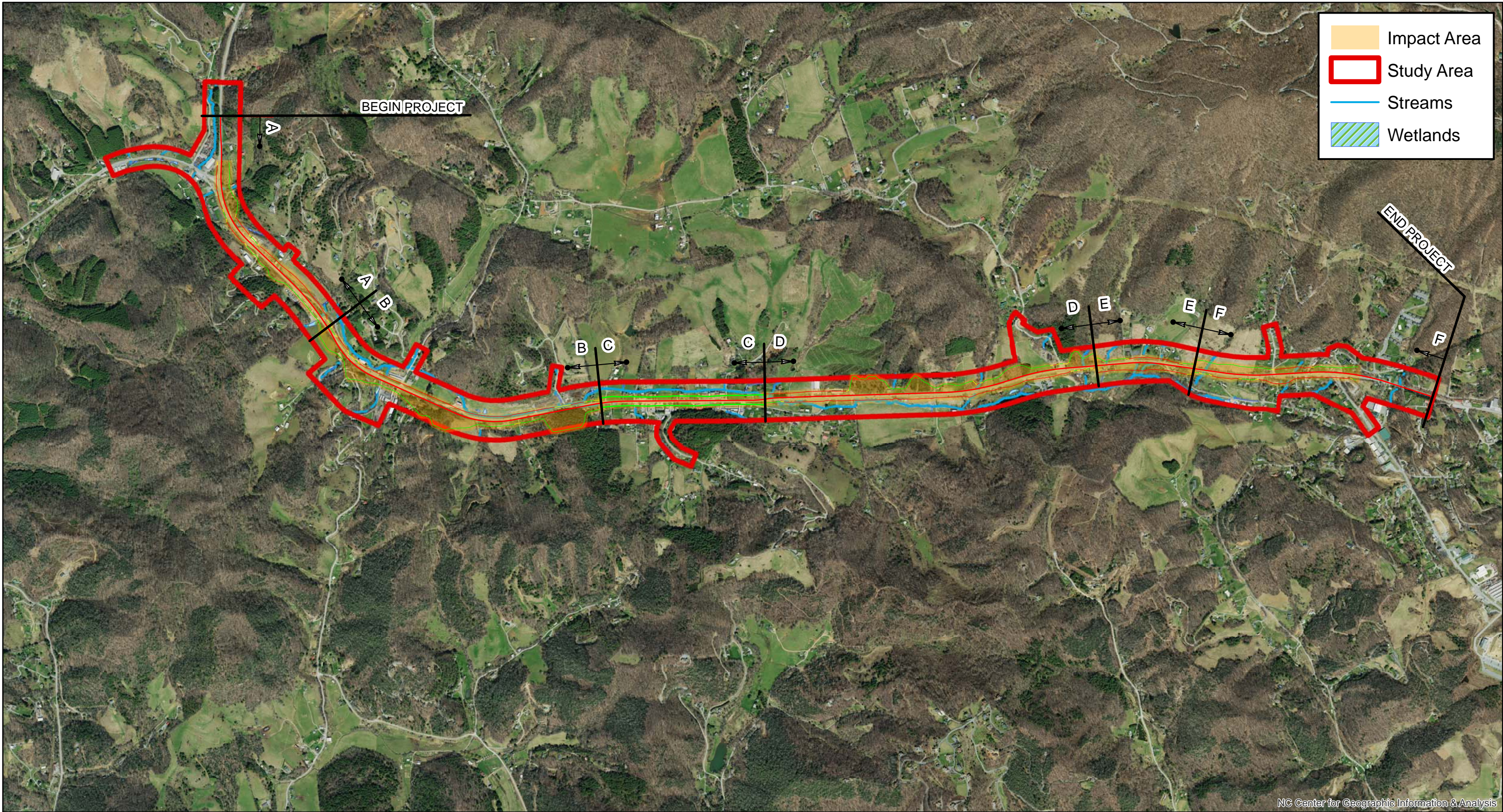
Figure 4B

Source: NCDOT GIS Unit, NC OneMap, USFWS, USGS, USDA, FEMA



TYPICAL SECTION NO. 1:

Figure 5



Impact Area
 Study Area
 Streams
 Wetlands

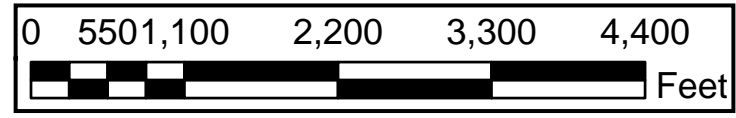
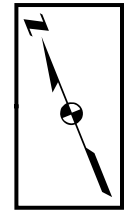
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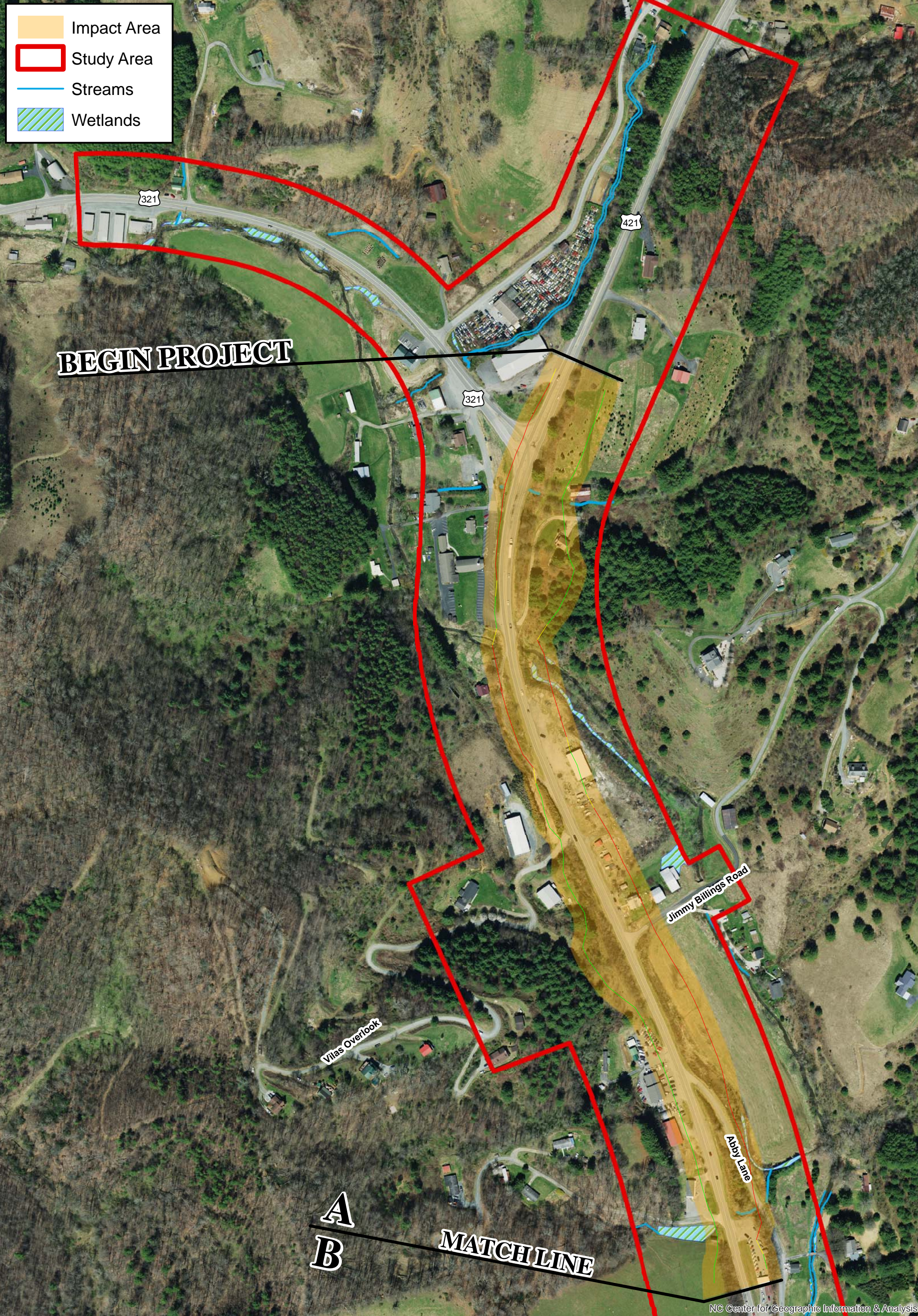
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DIVISION 11

R-2615
Widen US 321/US 421
Junction near Vilas to SR 1107 (105 Bypass)
Best Fit Alignment

County: Watauga
 Division: 11
 WBS: 44385.1.3
 Date: April 2019



6A



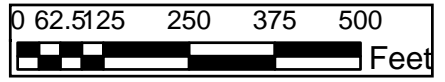
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
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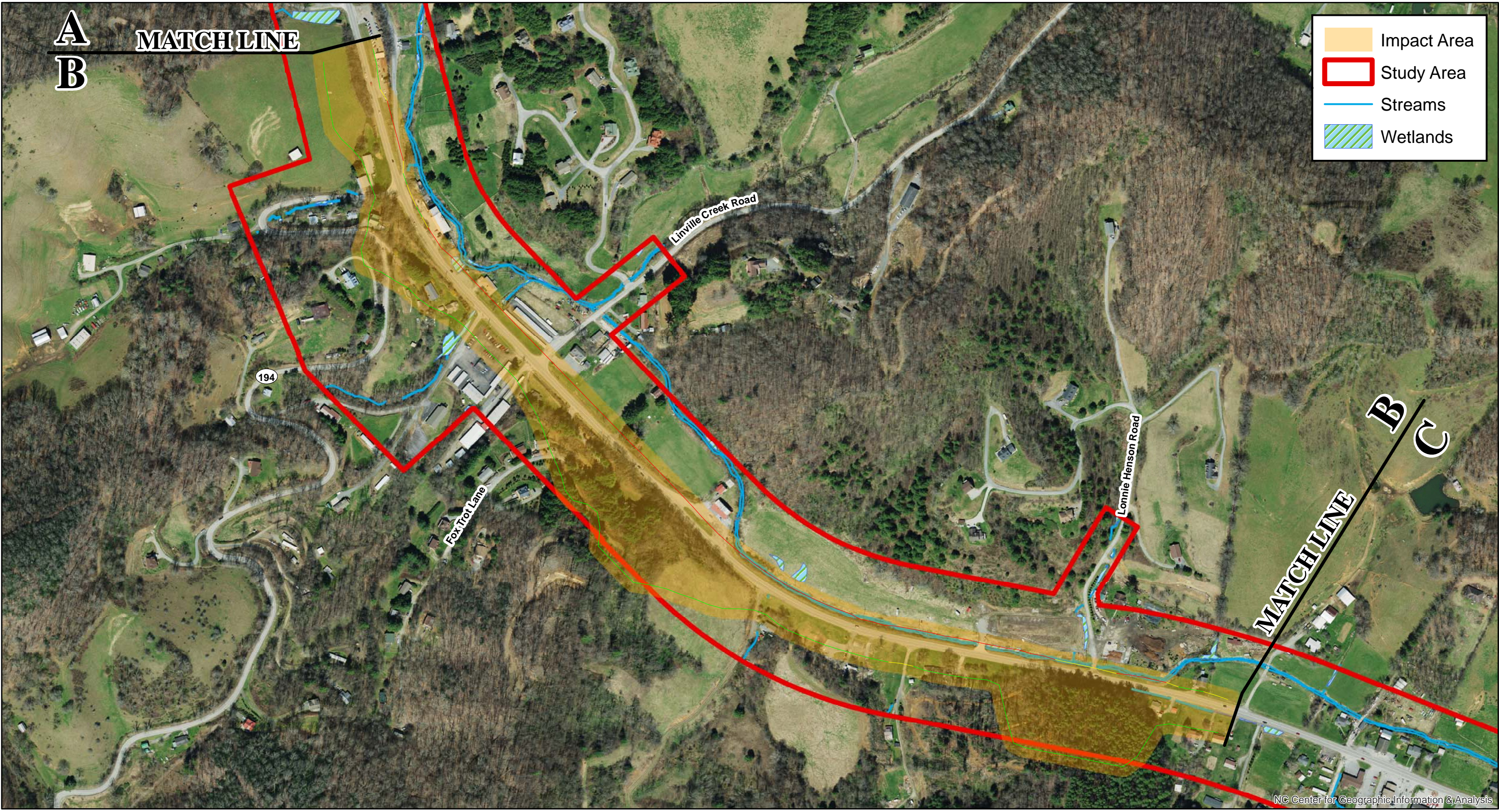
County: Watauga
Division: 11
WBS: 44385.1.3
Date: April 2019



6B

A
B
MATCH LINE

Impact Area
Study Area
Streams
Wetlands



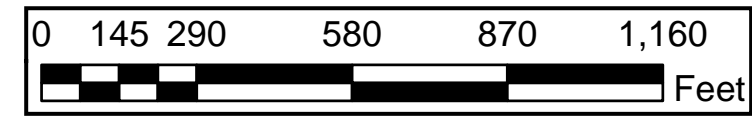
NC Center for Geographic Information & Analysis



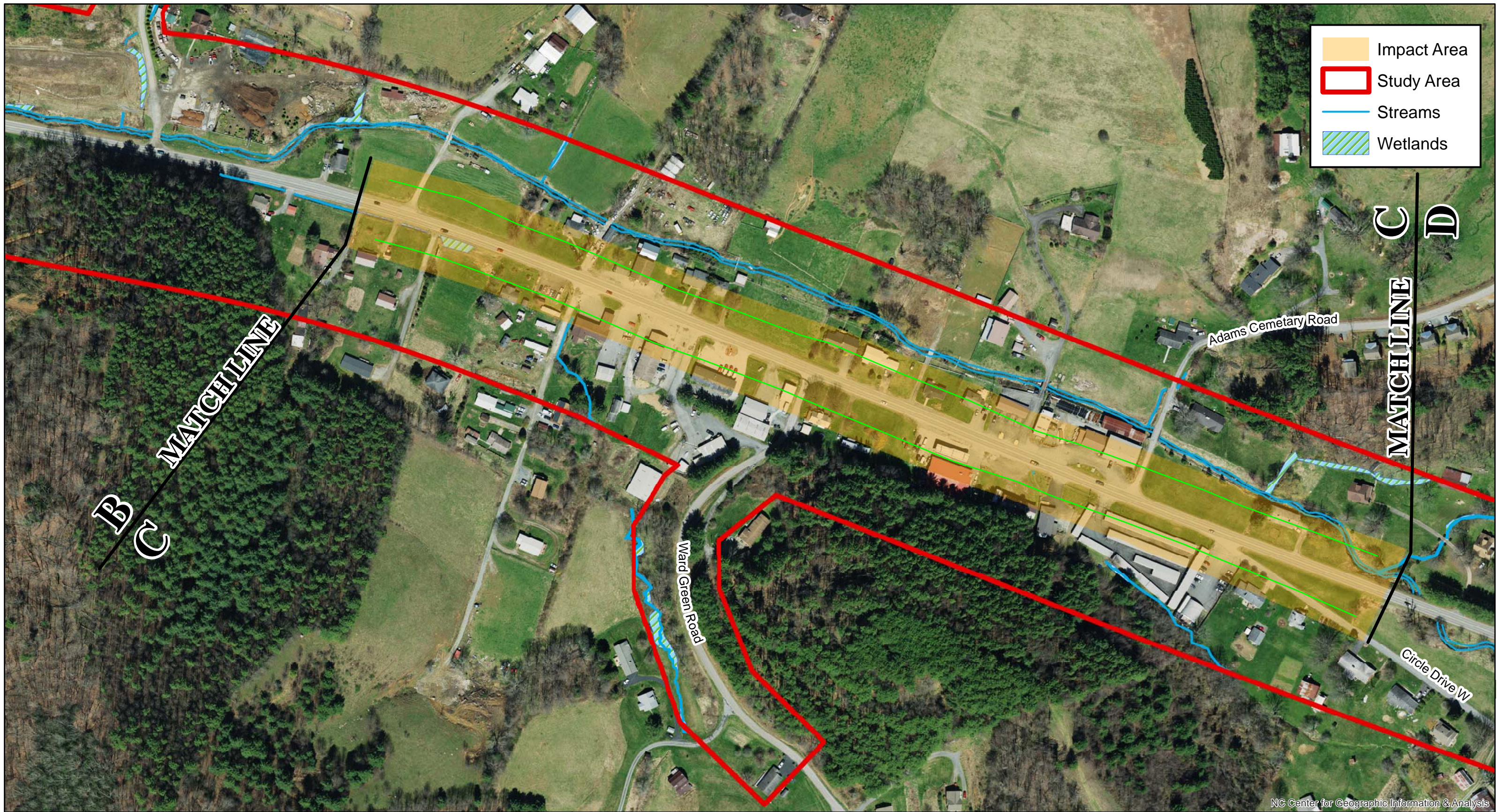
NORTH CAROLINA DEPARTMENT
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Date: April 2019



6C



| | |
|--|-------------|
| | Impact Area |
| | Study Area |
| | Streams |
| | Wetlands |

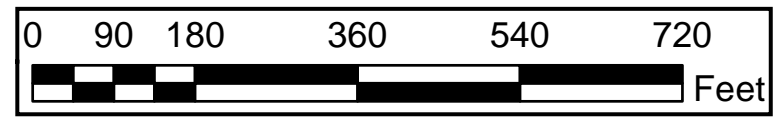
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6D



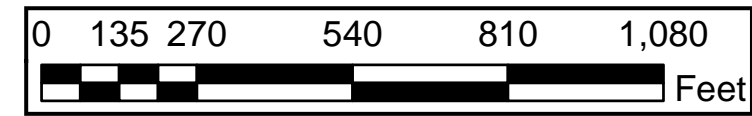
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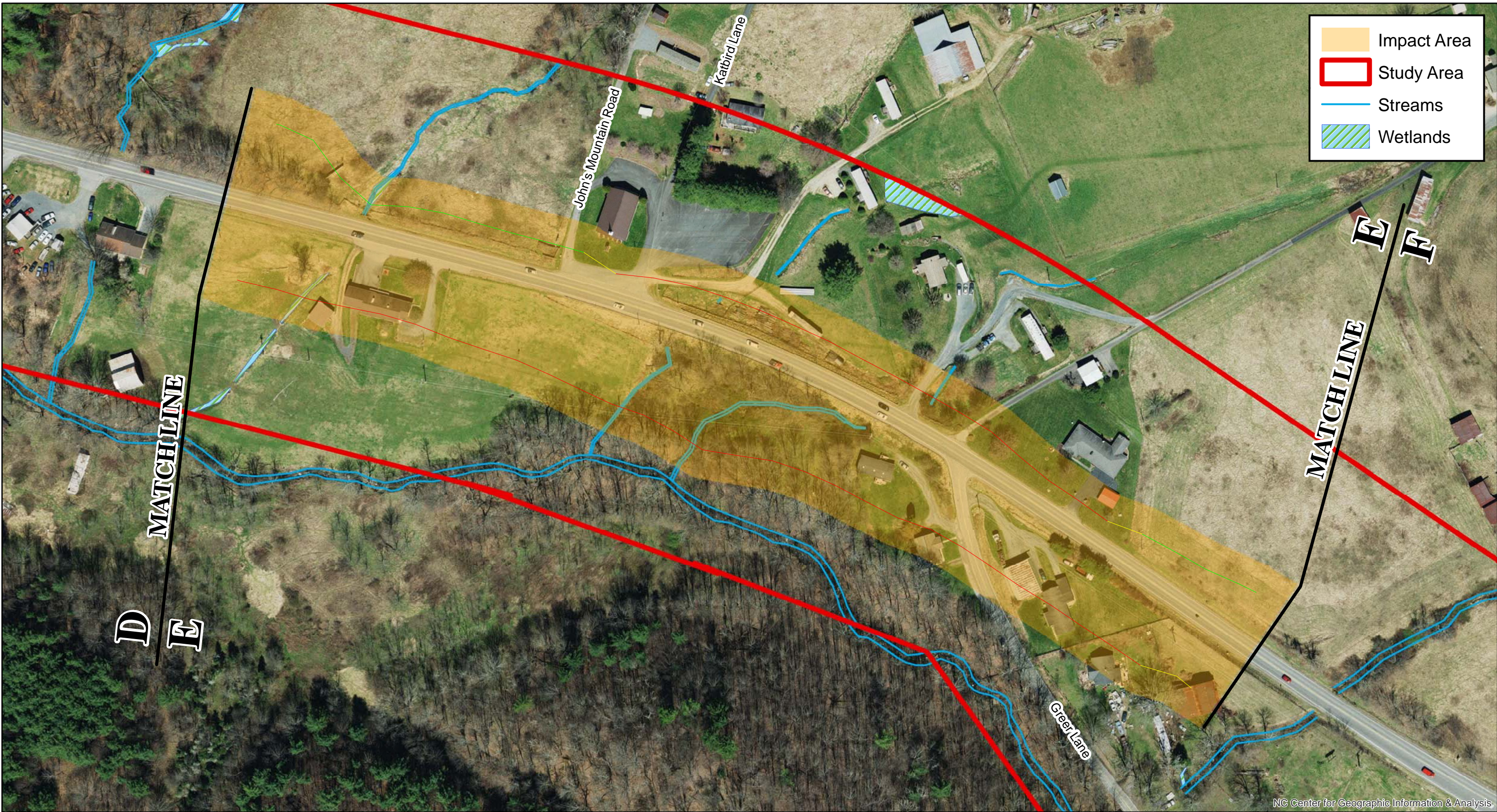
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6E



Impact Area
 Study Area
 Streams
 Wetlands

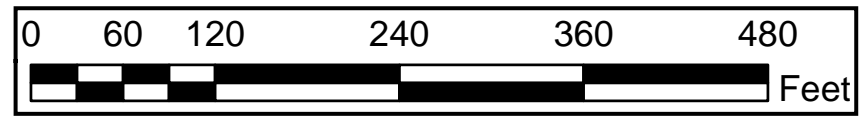
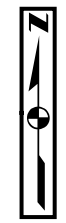
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6F



- Impact Area
- Study Area
- Streams
- Wetlands

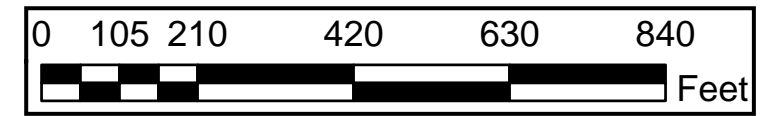
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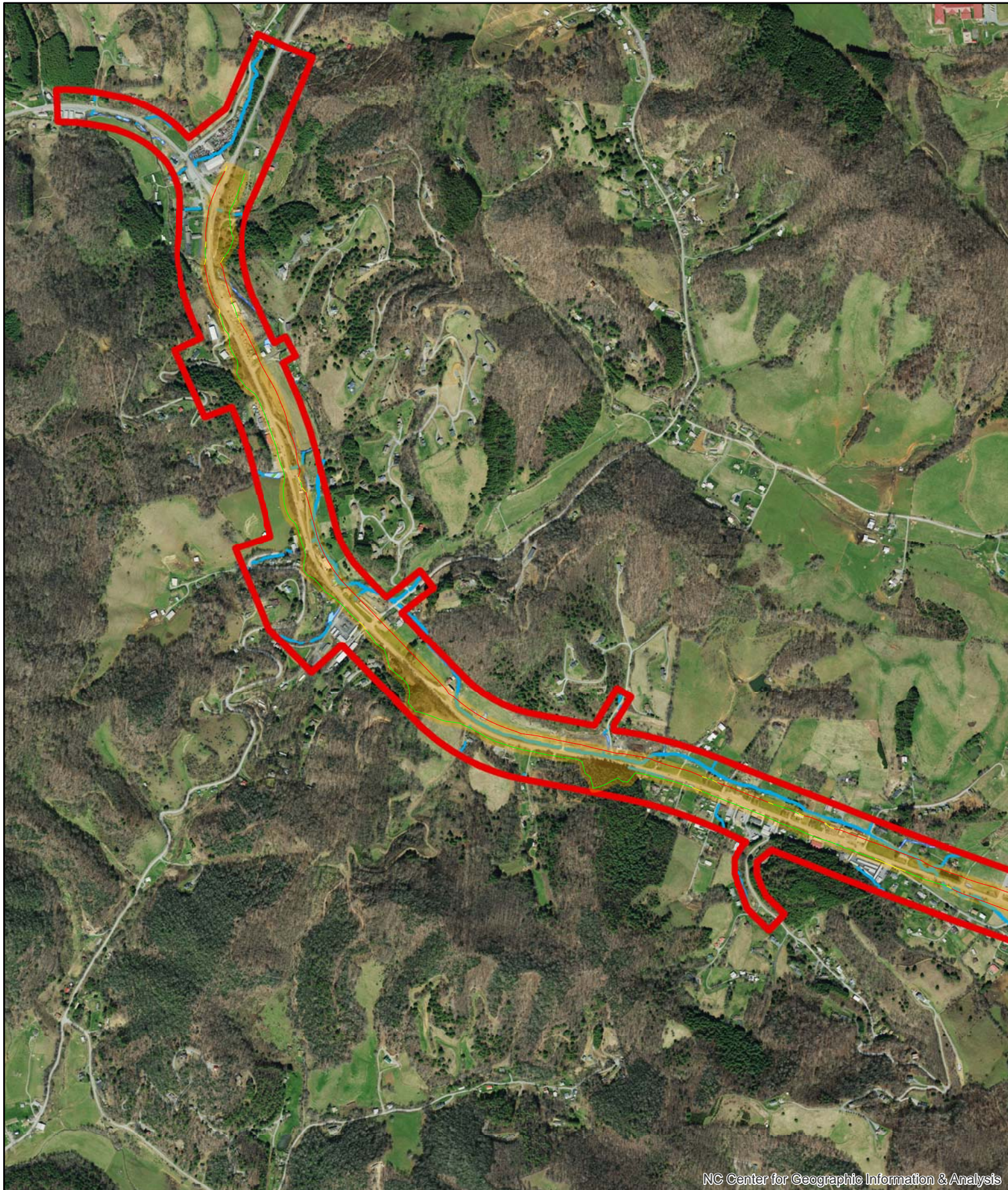
NORTH CAROLINA DEPARTMENT
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6G



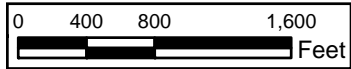
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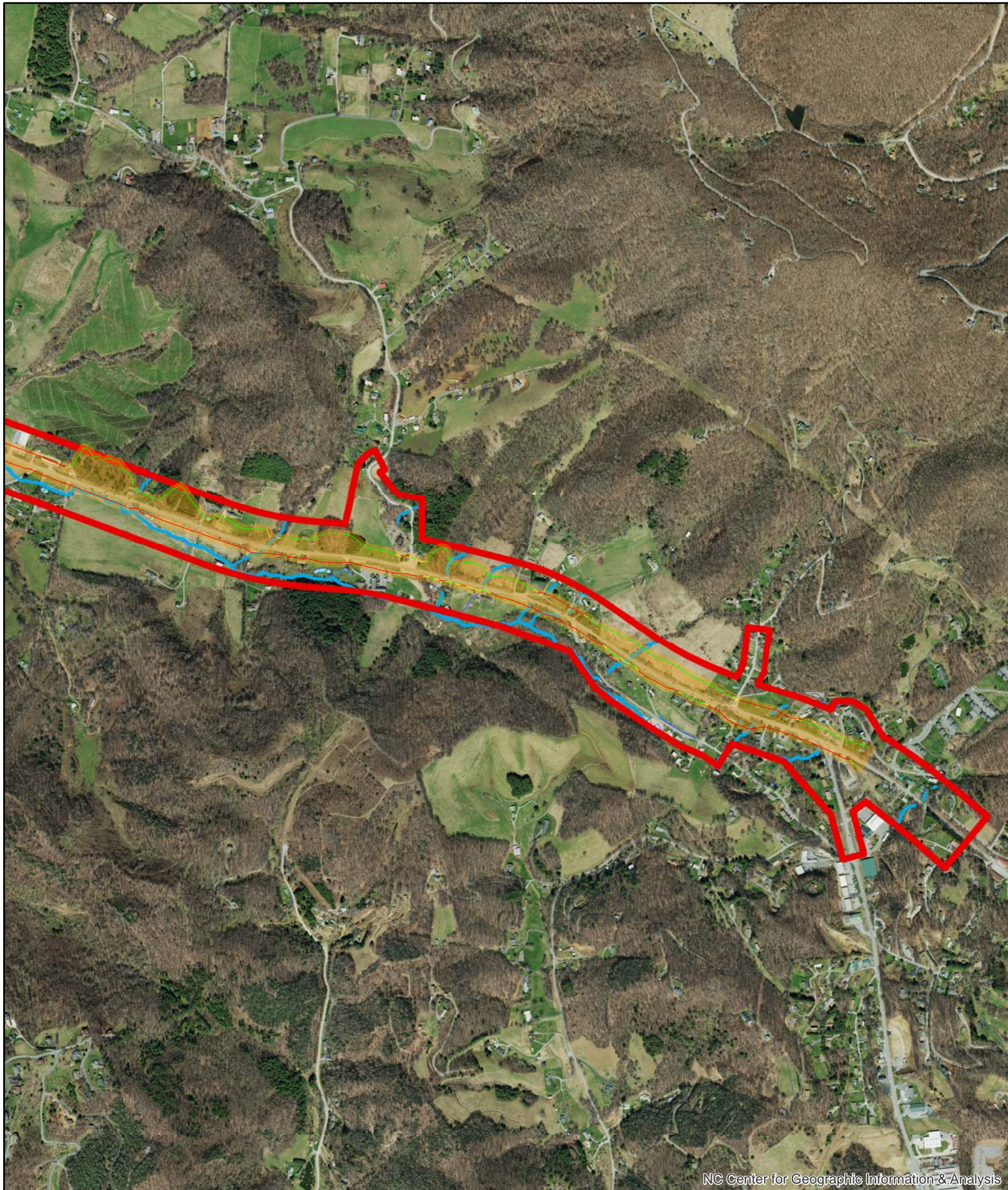
NORTH CAROLINA DEPARTMENT
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to SR 1107 (105 Bypass)
East Alignment

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Division: 11
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Date: May 2019



7A



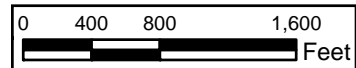
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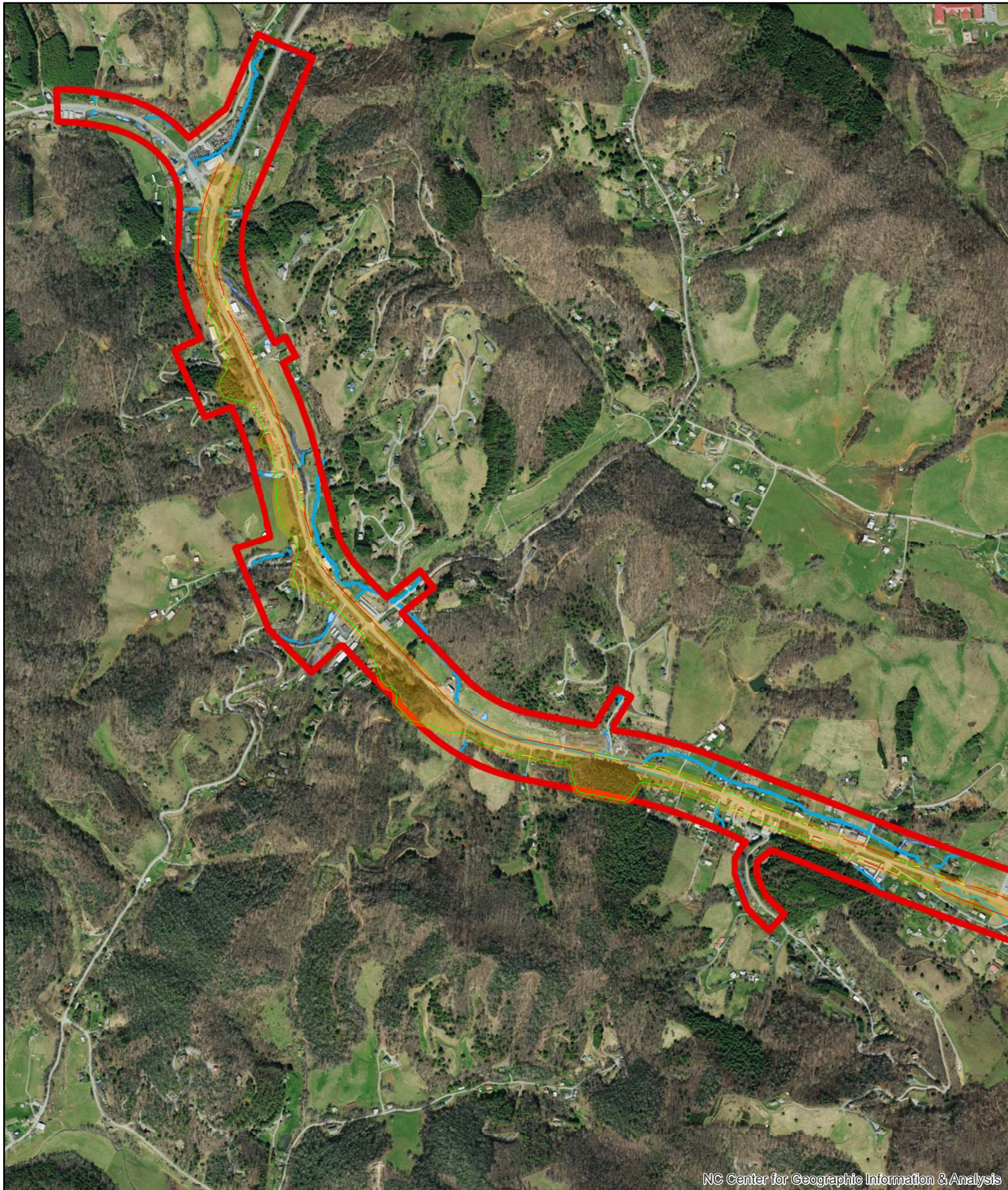
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7B



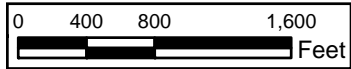
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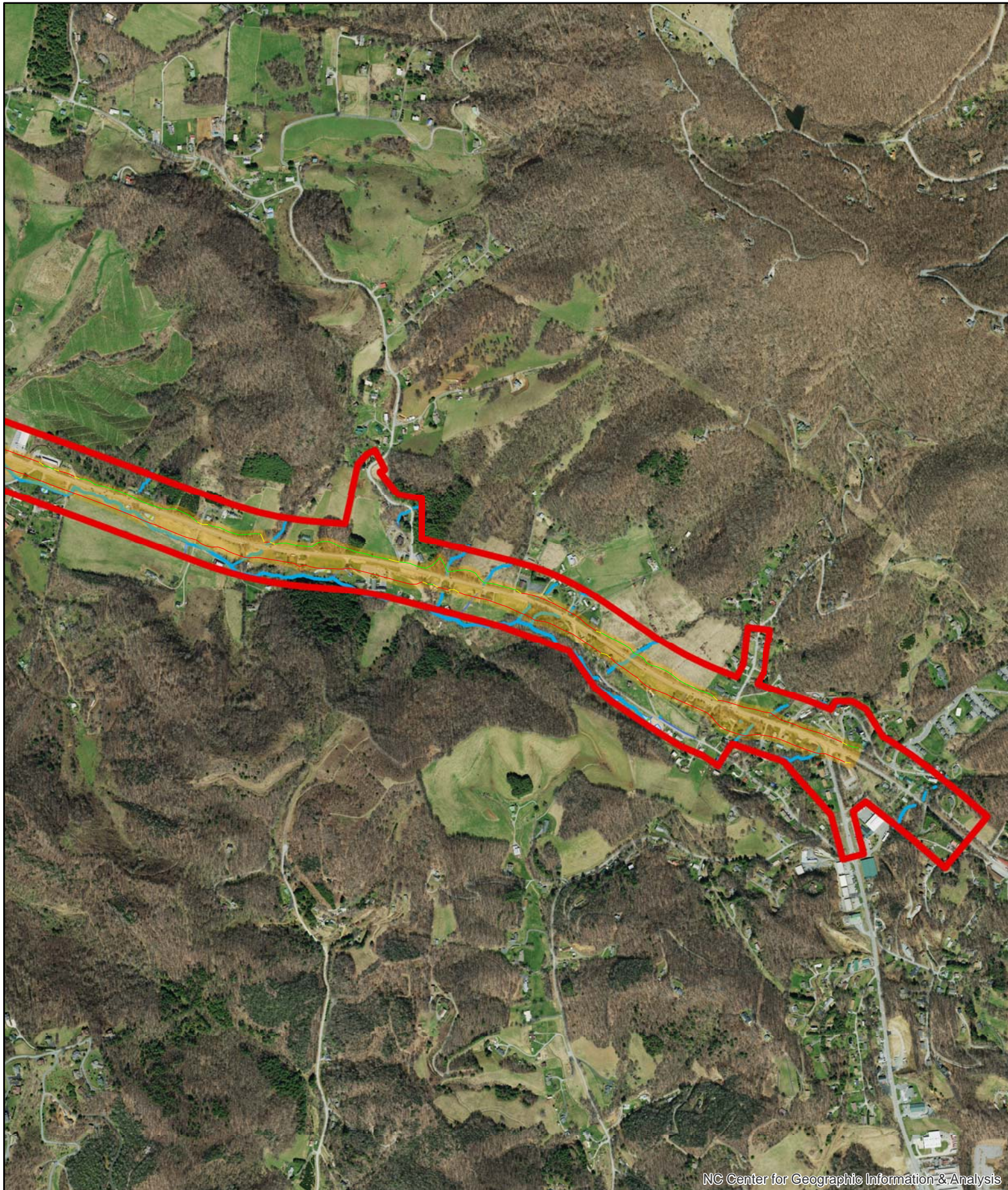
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Date: May 2019



8A



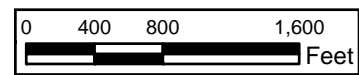
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8B