Concurrence Point 1

Purpose and Need

NC 143 Improvements

From West Buffalo Creek to NC 143 Business, west of Robbinsville

Graham County

WBS No. 34508.1.1

STIP Project No. R-2822B

March 22, 2018 at 10:00 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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1.0 Introduction and Project Summary

1.1 Purpose of Today's Meeting

The purpose of today's meeting is to reach concurrence on the revised purpose and need statement for the project (Concurrence Point 1) and determine which alternatives will be carried forward for detailed study (Concurrence Point 2).

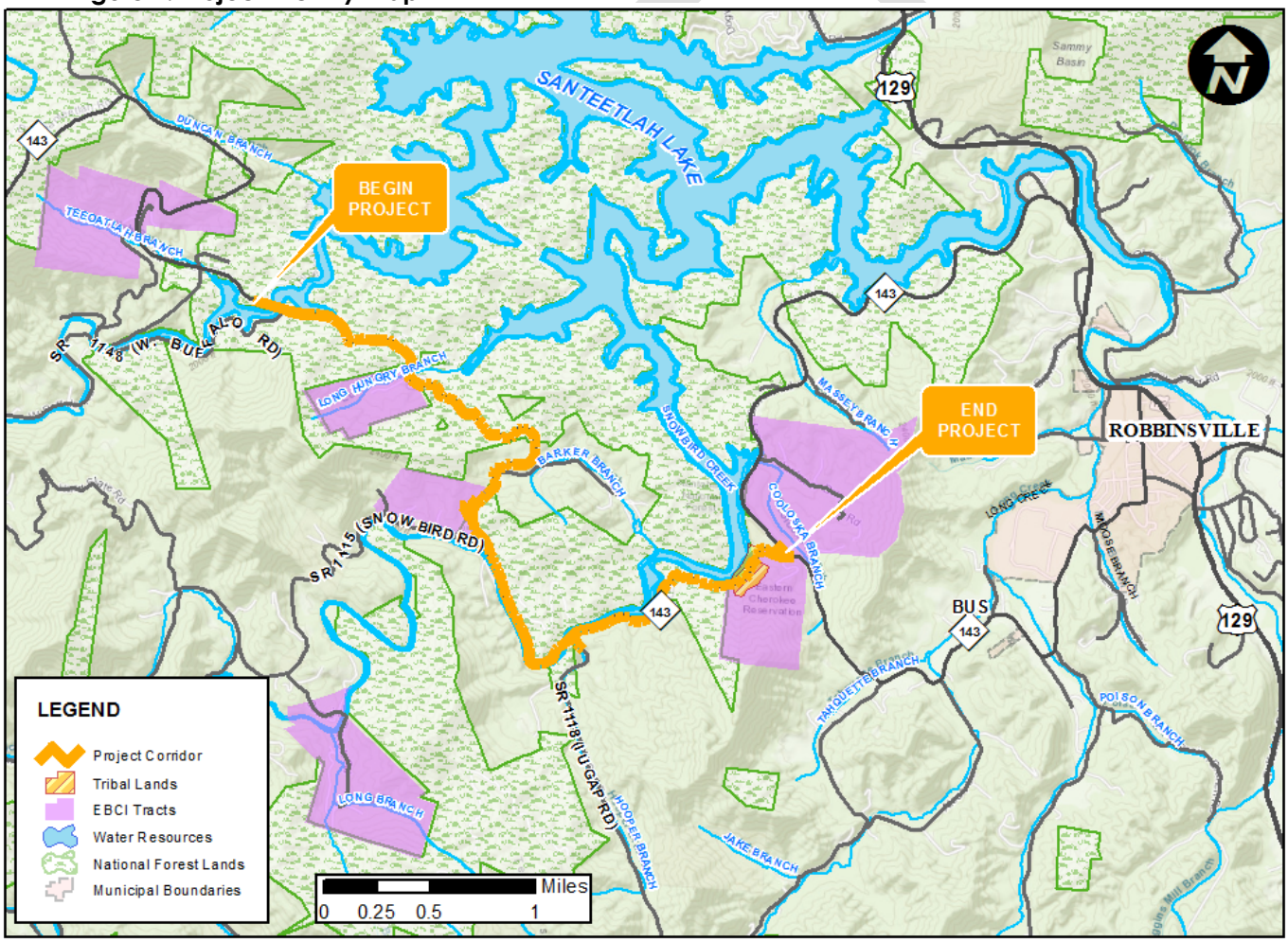
1.2 Project Description

The North Carolina Department of Transportation (NCDOT) proposes to make safety improvements along NC 143 from West Buffalo Creek to NC 143 Business, near Robbinsville in Graham County. The project corridor is approximately 4.5 miles long. The project location is shown below in Figure 1. This project is included in the 2018 - 2027 State Transportation Improvement Program (STIP) as Project R-2822B.

Currently, NC 143, within the project limits, is a two-lane facility with nine-foot travel lanes.

2.0 Project History

Figure 1: Project Vicinity Map



The proposed project was initially programmed in the 2007-2013 NCDOT STIP with federal funds and Right-of-way acquisition and construction was scheduled for FY 2011 and FY 2013, respectively. However, in 2015, it was determined that the project would not be funded in the 2016 – 2025 STIP and planning activities were paused. The project was reprioritized with state-funding in January 2017 and included in the 2018 – 2027 STIP.

2.1 NEPA/Section 404 Merger Coordination History

Table 1: NEPA/Section 404 Merger Coordination History and Upcoming Meetings

January 23, 2007	Concurrence Point 1 (Purpose and Need) ***"The purpose of this action is to improve safety along NC 143 using context sensitive solutions."***
December 16, 2010	Concurrence Point 2 (Detailed Study Alternatives) • The project study area was revised to encompass the alignment for Alternative 2, which was the Section 4(f) Avoidance Alternative. This alternative was developed to avoid impacts to the Snowbird Picnic Area. • Alternative 1, 2, and 4 were carried forward for detailed study.
May 8, 2013 March 25, 2015	Concurrence Point 2A (Bridging Decisions and Alignment Review) Project Coordination Meeting • Informed the Merger Team of the reprioritization of the project which resulted in the project being unfunded.
July 20, 2017	Merger Update Meeting • Project funding shifted from federal to state. • NCDOT requested the introduction of an alternative using 3-R guidelines (requires revisiting CP 2/2A). • USACE (lead agency) recommended revisiting CP 1 to reconstruct the purpose and need statement to [incorporate metrics into the concurrence form] establish safety screening criteria.
March 22, 2018	Concurrence Points 1,2, and 2A revisited • Revise Purpose and Need and introduce Alternative 4A
August 2018	Concurrence Points 3/4A (date TBD)

3.0 Purpose and Need

3.1 Summary of Project Purpose

Proposed Purpose and Need Statement

"The purpose of the project is to achieve the minimum geometric standards consistent with the facility's functional classification.

Secondary Benefit

The proposed geometric/upgrade improvements would reduce the potential for geometry-related crashes.

3.2 Summary of Project Need

The need for the proposed roadway improvements to NC 143 is driven by the fact that the current roadway geometrics (pavement and shoulder width and horizontal and vertical curve design speeds) are not consistent with the roadway's functional classification and associated design standards. The numerous sharp curves, steep grades, narrow lane widths, and lack of paved shoulders contribute to the facility's high crash rate the high percentage of lane departure crashes.

Functional Classification

NC 143 serves as one of only two east-west oriented routes through the Nantahala National Forest. NC 143 connects Robbinsville (the Graham County Seat), US 129 and NC 28 to Tellico Plains, Tennessee via TN 165. In addition to serving regional traffic traveling between Robbinsville and Tellico Plains, NC 143 serves as the eastern gateway for tourist traffic to the Joyce Kilmer Memorial Forest and the Cherohala Skyway.

NC 143 is classified as a major collector. The purpose of the rural major collector is to link population and employment centers or to provide connectivity to higher classified roadways (arterials and freeways).[1]

Existing Conditions

Geometric Deficiencies

- *Pavement Width* - This section of NC 143 is a narrow two-lane facility with a two, nine-foot wide lanes and grassed shoulders ranging in width from one to four feet.

- *Horizontal Alignment* - Figure 2 provides a breakout of the number of horizontal curves and their respective design speeds along NC 143 within the project study area.

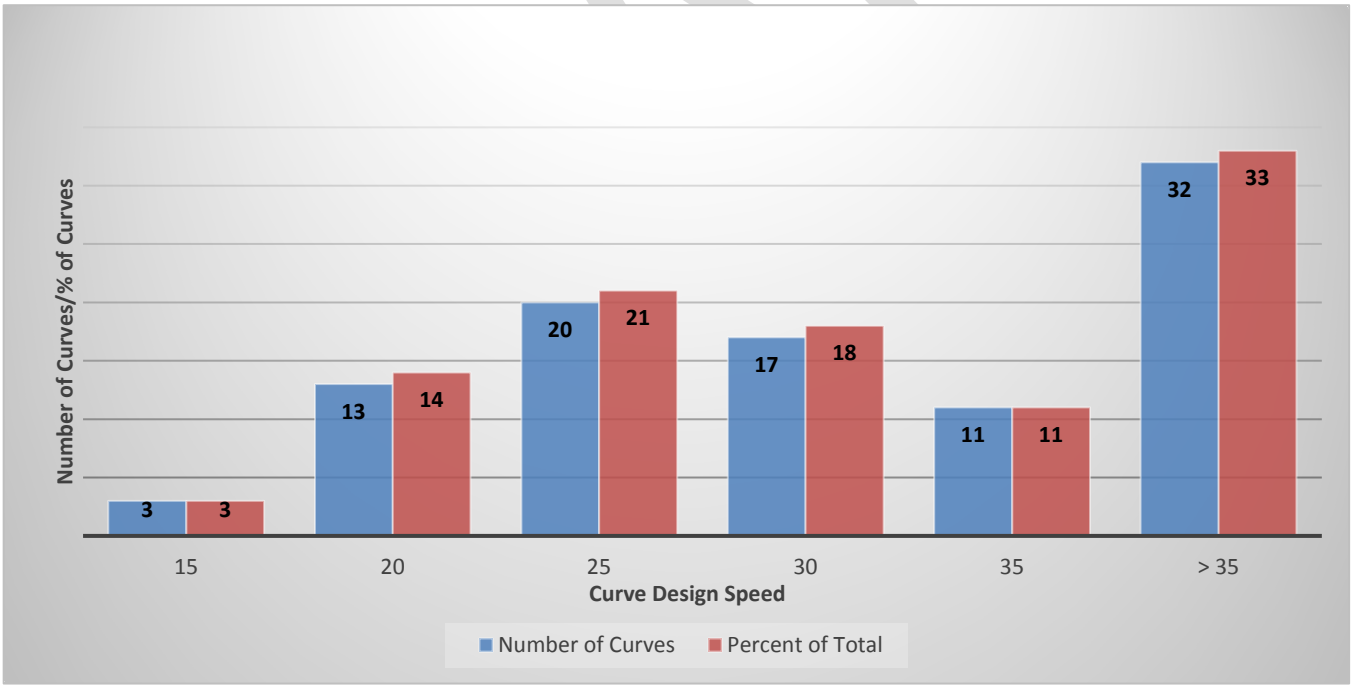
    - The average attainable speed is approximately 25 to 30 mph due to the numerous curves where travel speeds are reduced to as low as 15 mph.

    - The highest concentration of curves is located between SR 1148 (West Buffalo Road) and SR 1125 (Buchanan Branch Road) and SR 1118 (I U Gap Road) and NC 143 Business.

    - Of the 96 horizontal curves, 64 are below a 35-mph design speed.

    - 29 of 64 (45%) of the horizontal curves with a design speed of < 35 mph are between W. Buffalo Road and Buchanan Branch Road.

Figure 2: Horizontal Curve Summary (Existing Curves)

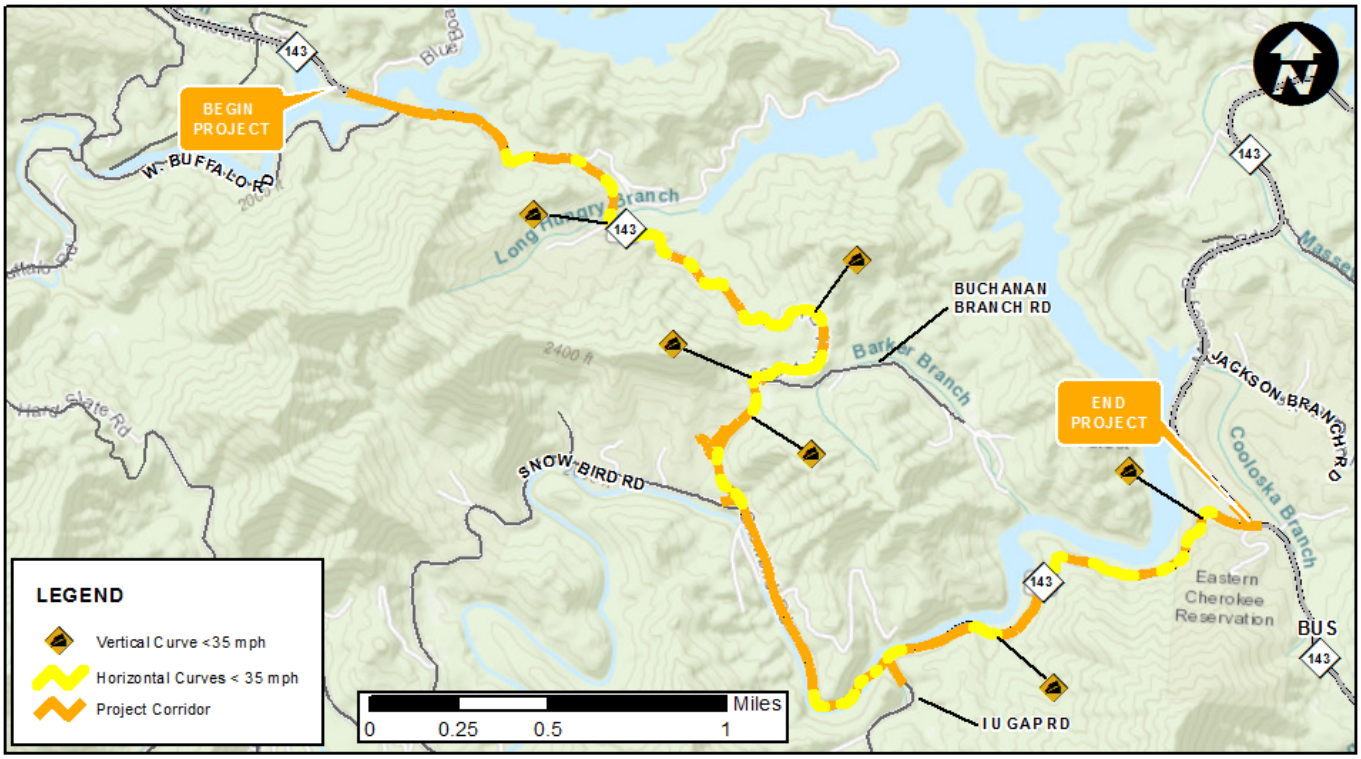


- *Vertical Alignment* - The vertical curvature along NC 143 also contributes to the safety issues along the project corridor.
    - Six of the 17 vertical curves do not meet the 35-mph design speed.

[1] FHWA Functional Classification Guidelines (https://www.fhwa.dot.gov/planning/processes/statewide/related/functional_classification/fc03.cfm#cors)

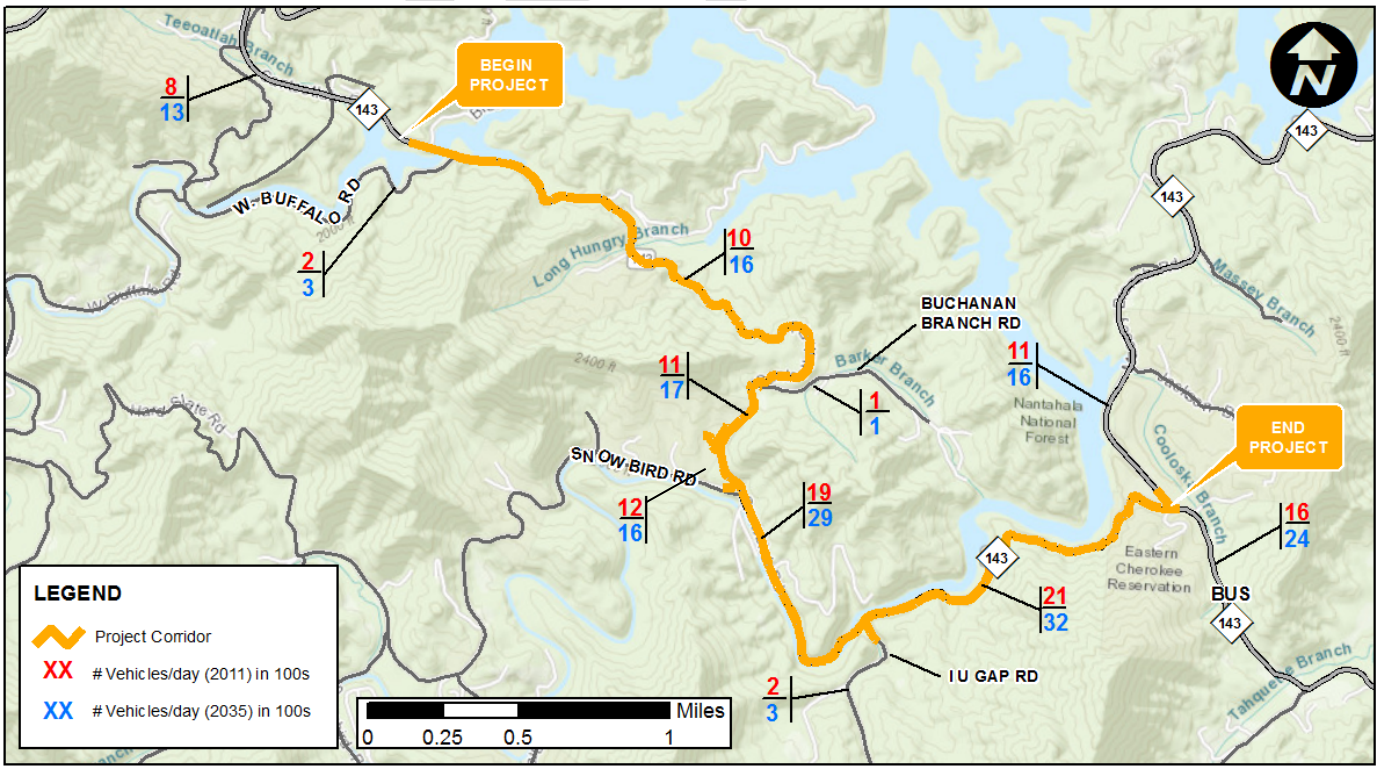
- Figure 3, provides the location of all curves (vertical and horizontal) with a design speed below 35 mph.

Figure 3: Vertical and Horizontal Curves (Design Speed < 35 mph)



Existing (2011) and Projected (2035) Traffic Volumes

Figure 4: 2011 and Projected (2035) Traffic Volumes



Crash History

- Between November 1, 2008 and October 31, 2013, 89 crashes occurred within the project study limits.

Table 2: Crash Rate Comparison - Rural NC Routes (Per 100 million vehicle miles traveled)

Category	Crashes[1]	Crash Rate	Statewide Average Crash Rate[2]	Critical Crash Rate[3]	Exceeds Critical Rate?
Total	*89*	*749.35*	*164.87*	*230.39*	✓
Fatal	*2*	*16.84*	*1.80*	*12.42*	✓
Non-Fatal	*54*	*454.66*	*50.07*	*88.07*	✓
Night	*8*	*67.36*	*64.01*	*106.42*	
Wet	*9*	*75.78*	*28.25*	*57.84*	✓

[1]November 1, 2008 – October 31, 2013
[2] 2013 - 2015 Statewide Crash Rate for rural two-lane undivided NC Routes
[3]Based on the statewide crash rate (95% level of confidence). Critical crash rate (a statistically derived value against which a calculated rate can be compared to see if the rate is above an average far enough so that something besides chance must be the cause) is used to denote statistical significance.

- 90% of the crashes are lane departure crashes.
- Of the 89 crashes, 20 (22%) are considered severe (2 were fatal).
- 63 of 89 (70%) crashes occurred between W. Buffalo Road and Buchanan Branch Road, which also includes the highest cluster of curves with a design speed below 35 mph.
- 40% of crashes were rollovers / overturned vehicles.

Figure 5: Crash Locations and Substandard Curve Locations

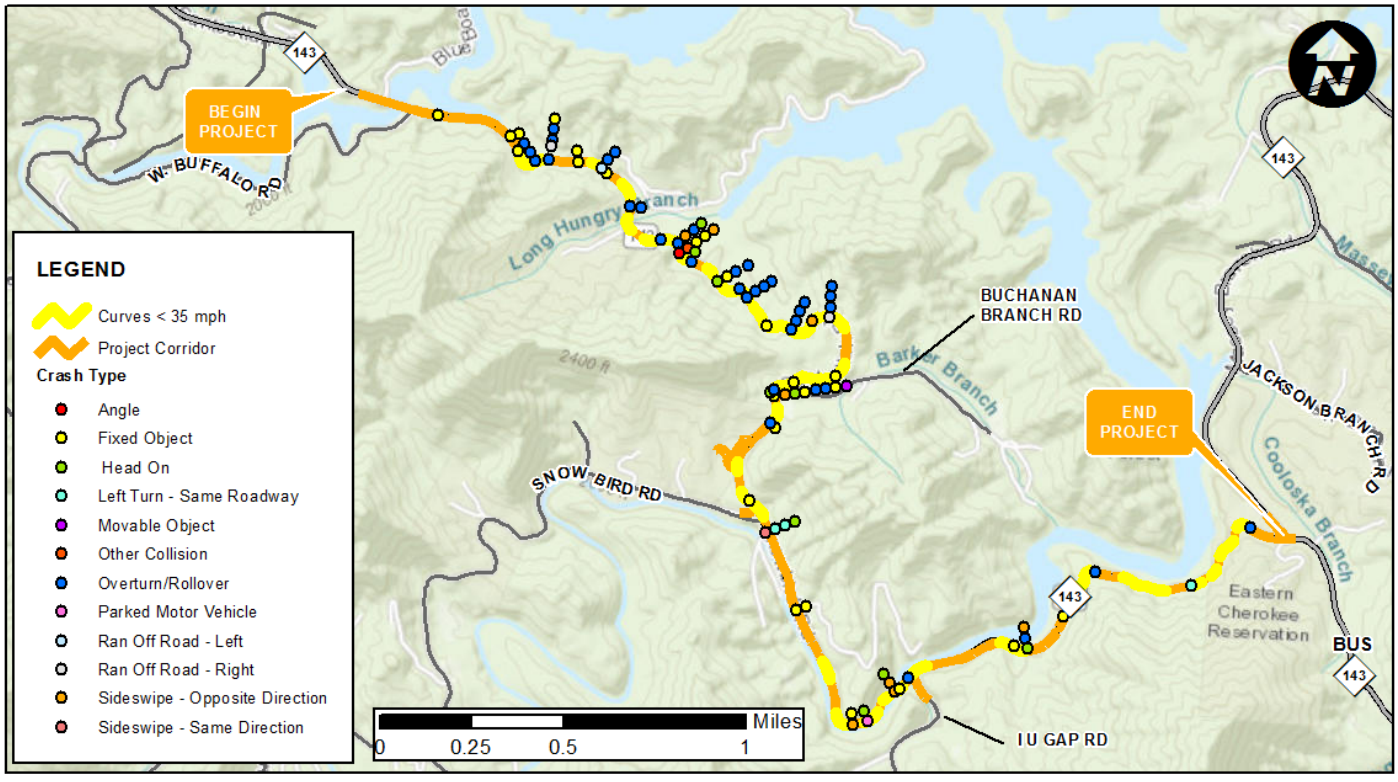


Figure 6: Crash Type Summary

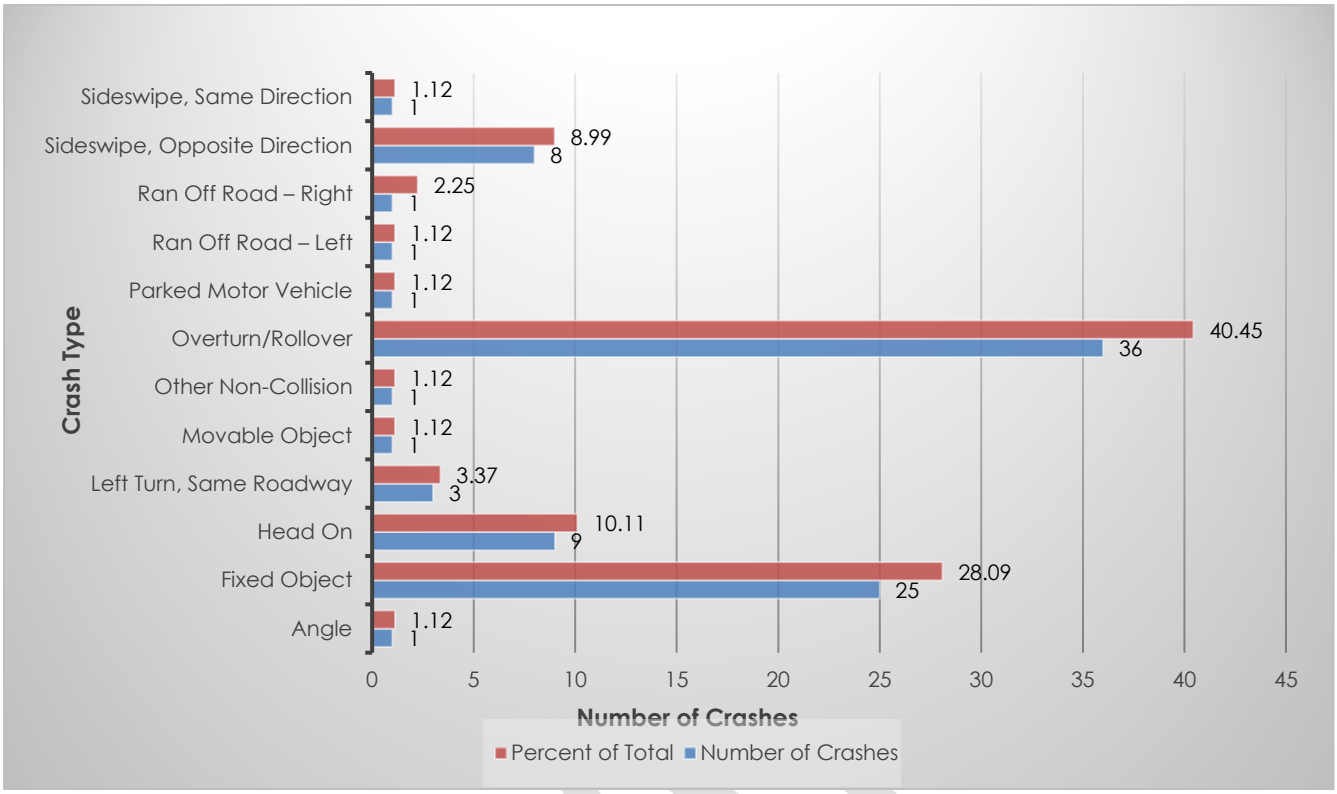


Figure 7: Vehicle Type Summary

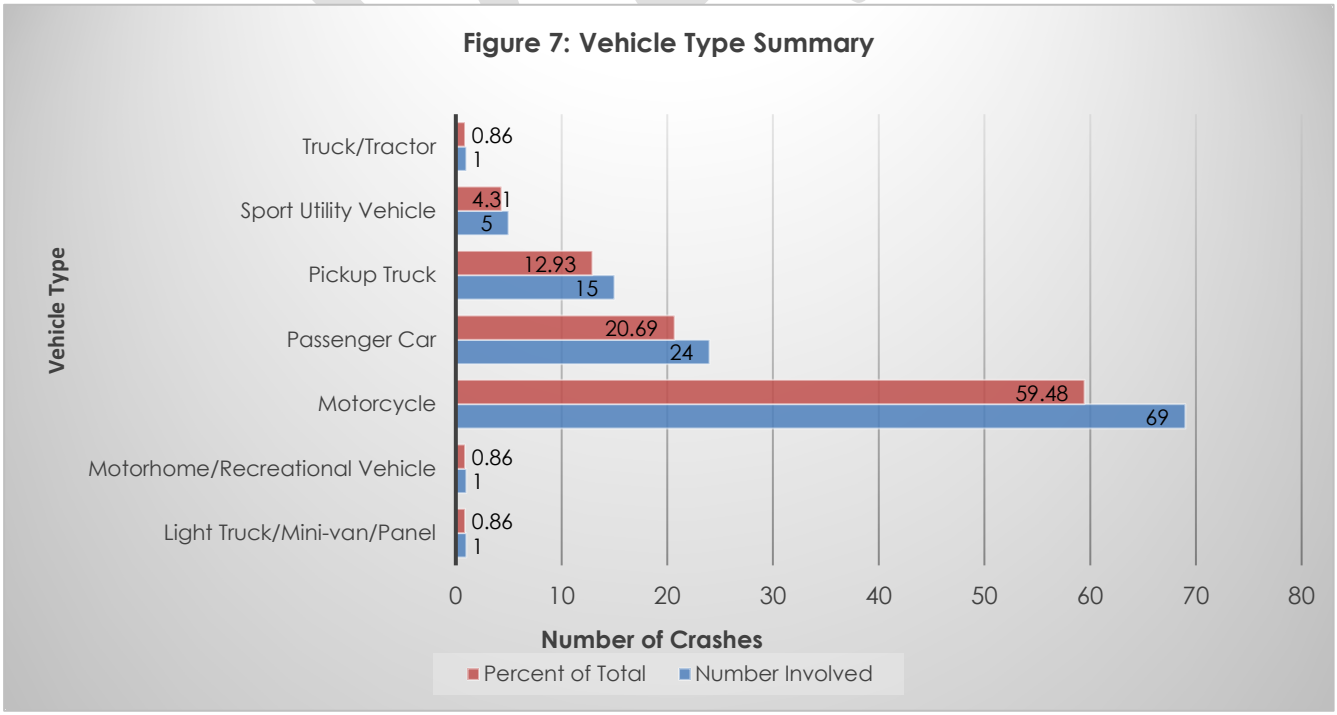
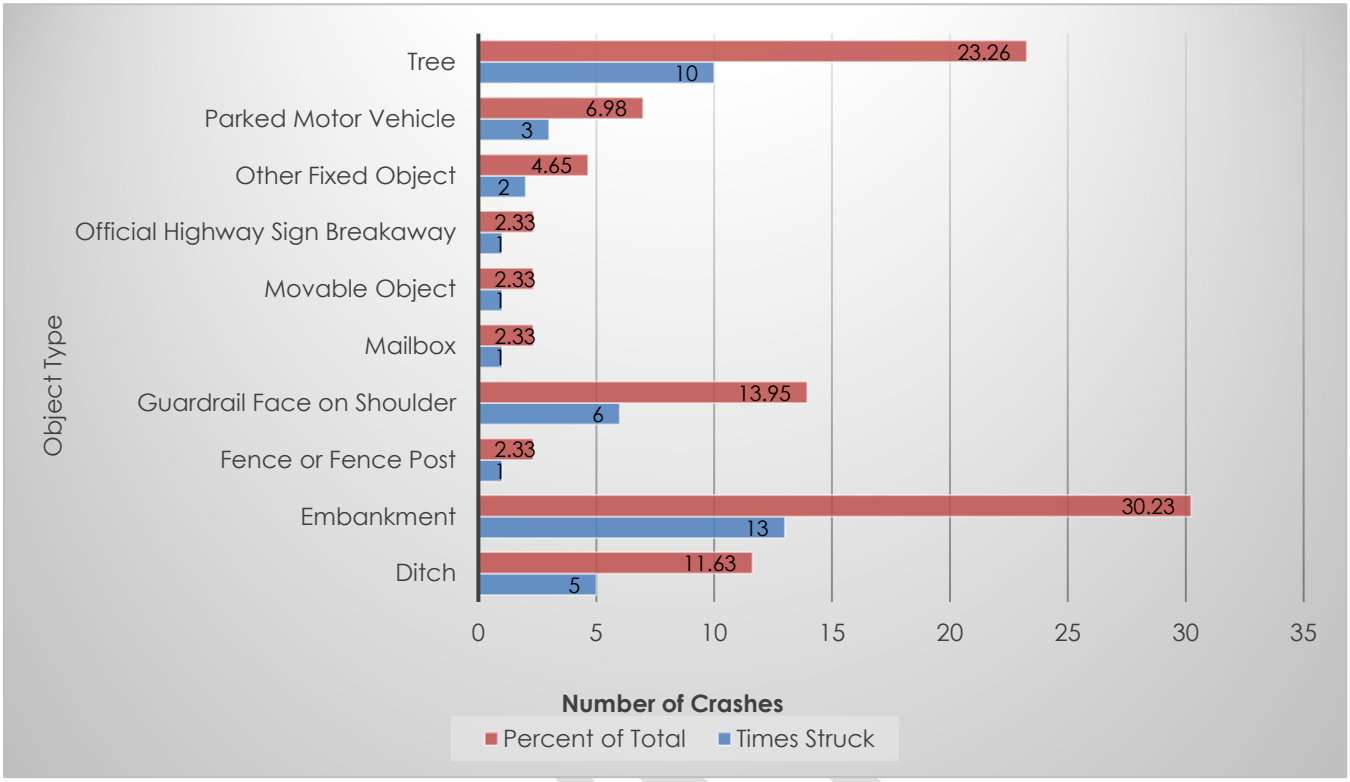


Figure 8: Object Struck Summary



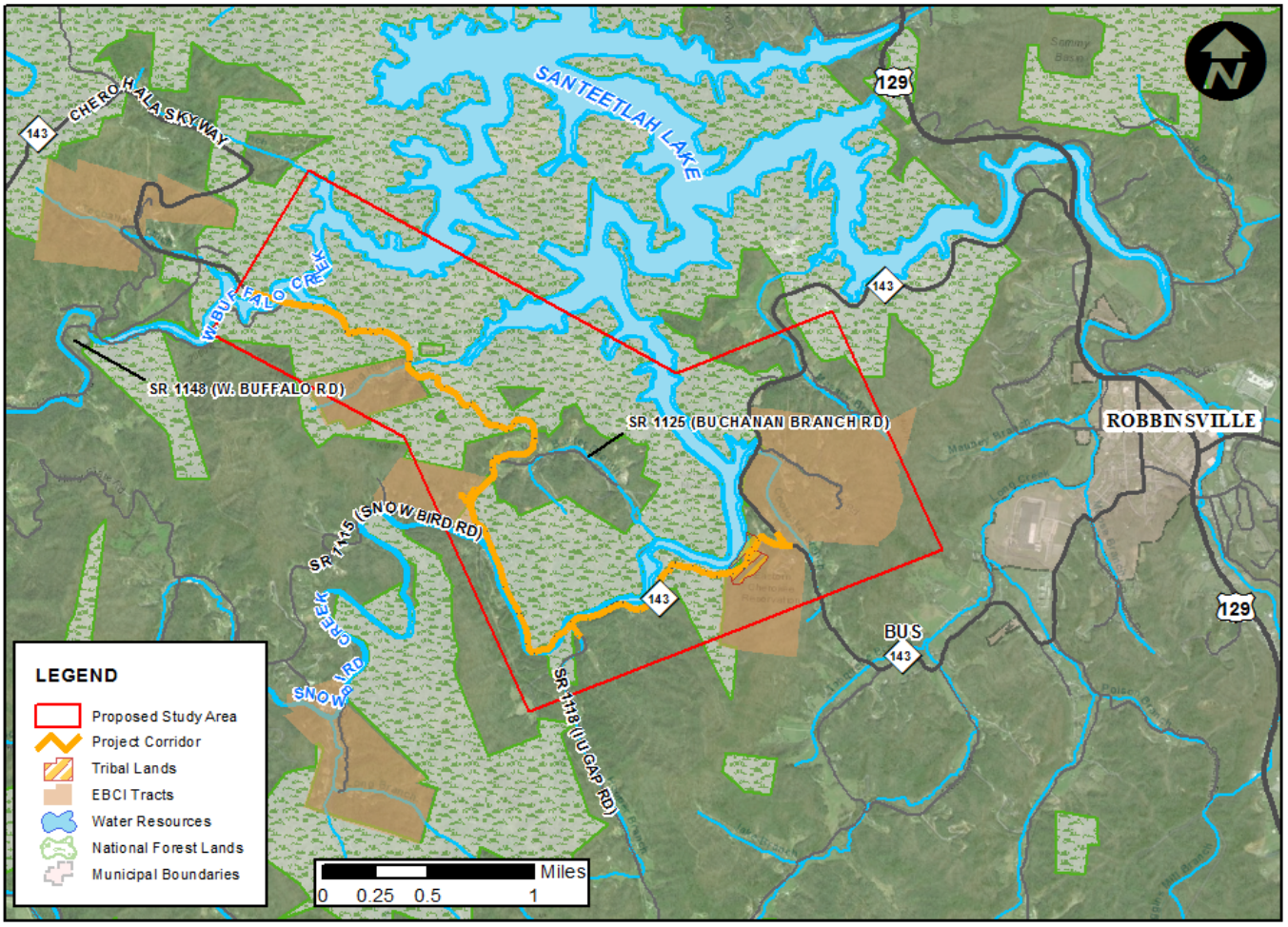
3.3 Logical Termini and Project Study Area

Logical Termini

- *Western Project Limit* - West of West Buffalo Creek, NC 143 has a pavement width of 22-feet with 6-foot grassed shoulders. East of West Buffalo Creek, the typical section transitions to a pavement width of 18-feet (including 9-foot wide travel lanes) and 2-foot wide grassed shoulders. Due to the transition to a substandard pavement width, West Buffalo Creek, was established as the logical western project terminus.

- *Eastern Project Limit* - At the NC 143/NC 143 Business intersection, NC 143 continues north of Robbinsville, to intersect US 129, while NC 143 Business continues in an easterly direction into Robbinsville. East of the intersection, both NC 143 and NC 143 Business consist of 20-foot wide pavement (10-foot travel lanes) and unpaved grassed shoulders, which is below the standards recommended for a Rural Collector. However, neither. contain a high concentration of below standard vertical or horizontal curves, as does NC 143 west of the intersection. Therefore, the NC 143/NC 143 Business intersection was established as the logical eastern project terminus.

Figure 9: Project Study Area



Independent Utility

The project has independent utility because it addresses the transportation needs and can serve its intended use without relying on other improvements. The project limits are of sufficient length to consider a range of alternatives without restricting other reasonably foreseeable transportation improvements.

4.0 Measures of Effectiveness

The measures of effectiveness will be determined by each alternatives ability to meet the minimum standards established by the following design guides which established geometric requirements for roadways classified as Rural Collectors and application of the Context Sensitive Solutions (CSS) Design Controls and Criteria.

4.1 AASHTO Policy on Geometric Design of Highways and Streets – 2011 (Green Book)

Minimum Width of Traveled Way and Shoulders

Table 3: Minimum Width of Traveled Way and Shoulders

Design Speed (mph)	Minimum Width of Traveled Way (ft) for Specified Design Volume (vpd)			
	Under 400	400 to 1,500	1,500 to 2,000	Over 2,000
20	20	20	22	***24***
25	20	20	22	***24***
30	20	20	22	***24***
35	22	22	22	***24***
40	22	22	22	***24***
45	22	22	22	***24***
50	22	22	22	***24***
55	22	22	24	***24***
60	22	22	24	***24***
65	22	22	24	***24***
Width of Shoulders on Each Side of Road (ft)				
All Speeds	2.0	5.0	6.0	***6.0***

Note: Shoulder width may be reduced for design speeds greater than 50 km/h [30 mph] provided that a minimum roadway width of 30-ft is maintained.

Design Speeds

Table 4: Minimum Design Speeds for Rural Collectors

Current ADT (vpd)	***Design Speed (mph) for Specified Design Volume (vpd)***		
	0 to 400	***400 to 2,000***	***Over 2,000***
Level	40	50	60
Rolling	30	40	50
Mountainous	***20***	***30***	***40***

Note: Where practical, design speeds higher than those shown should be considered.

4.2 Resurfacing, Restoration, and Rehabilitation (3-R) Design Standards

3-R guidelines indicate that projects should include examinations of potential hazards at intersections, sharp horizontal curves, short crest vertical curves or narrow bridges hidden by a vertical curve, particularly when the highway stopping sight distance falls below new construction standards.

Minimum Width of Traveled Way and Shoulders

Table 5: 3-R Under 50 mph (Mountainous Terrain) Minimum Shoulder and Lane Width Criteria

Design Speed	Current ADT (vpd)	Arterial		Collector		Local	
		Lane Width (ft)	Shoulder (ft)	Lane Width (ft)	Shoulder (ft)	Lane Width (ft)	Shoulder (ft)
Under 50 mph (Mountainous Terrain)	0 – 1,000	10	3	10	3	10	3
	1,000 – 2,000	10	3	10	3	10	3
	Over 2,000	*12*	*6*	***11***	***6***	*11*	*4*

NOTES:
1. Shoulder dimensions indicate graded widths and include paved shoulder widths.
2. Where guardrail is to be installed, graded shoulder width must be increased by 3 feet.
3. For current ADT less than 1000, paved shoulder should be considered. For current ADT between 1000 - 3000, 2' paved shoulders are recommended. For current ADT over 3000, 4' paved shoulders should be used.

Design Speed (horizontal and vertical curves)

Design Speed
3-R Guidelines state the design speed selected should best coordinate the various geometric elements to produce a safe highway. There are two methods available in selecting the project design speed. ***One method is to select an overall design speed that meets or exceeds the posted or statutory speed limit***. The selected design speed shall meet the posted speed limit, statutory speed limit, or the design speed recommended by the Traffic Engineering Branch. The current posted speed limit along NC 143 in the western portion of the study area is 30 mph.

- *Horizontal Curves* - An existing horizontal curve may be retained as is without further evaluation if:
  - ***X*** The existing curve design, assuming correct super-elevation is provided, corresponds to a speed that is within 10 miles of the posted speed and the crash rate is below statewide averages provided by Traffic Engineering Branch. ***The current crash rate exceeds the statewide average.***
  - ✓ Reconstruction to either new construction standards or to these R-R-R standards is to be considered and evaluated when the previously discussed speed and crash criteria are exceeded.
- *Vertical Curves* - An existing vertical curve may be retained if:
  - ***X*** The curve's design speed is within 20 mph of the posted or statutory speed limit and the design volumes are less than 1,500 vpd ADT. ***Design volumes exceed 1,500 vpd ADT.***
  - ***X*** An existing vertical curve may be retained if the curve's design speed is within 10 mph of the posted or statutory speed limit and the crash rate is below the statewide average. A design exception is required for horizontal and vertical curves that do not meet the above R-R-R.
- *Grades* - The existing roadway grade may be retained if:
  - ***X*** The crash rate is below the statewide average. ***The crash rate exceeds the statewide average.***

4.3 Performance Measure

The following performance measure is recommended to evaluate which preliminary alternatives should be carried forward for additional studies.

Reduction in identified roadway deficiencies

- Roadway deficiencies are defined as:
  - ✓ Substandard pavement width: < 11-foot wide travel lanes and 6-foot wide shoulders
  - ✓ Substandard horizontal and vertical curves: < 35 mph design speed

- ***80% reduction of identified roadway deficiencies***
  - ✓ 93.25% of the preventable crashes are related to the deficient pavement width and deficient vertical and horizontal alignment.
  - ✓ At an 80% target reduction, the crash rate would theoretically be 149.87 (80% reduction in crashes) and would be below the statewide average crash rate (164.87).
  - ✓ An 80% reduction in deficiencies allows for a 95% confidence level of reducing the crashes below the statewide average.

Application of Context Sensitive Solutions Design Controls and Criteria as applicable.

"Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist."

Core Principles

1. Strive towards a shared stakeholder vision to provide a basis for decisions
2. Demonstrate a comprehensive understanding of contexts
3. Foster continuing communication and collaboration to achieve consensus
4. Exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.

Applicable CSS Design Controls and Criteria

(https://www.fhwa.dot.gov/planning/css/design/controls/index.cfm)

- Design Flexibility and Exceptions:
  - ✓ Encourages highway designers to expand their consideration in applying the Green Book criteria.
  - ✓ A design exception is a documented decision to design a highway element or segment of highway to a design criterion or value that does not meet the minimum value that has been established for that highway or project.

- Road Classification
  - ✓ A design process integrating the principles of CSS emphasizes that as context changes, thoroughfare design should also change to support the activity generated by the context.

- Safety
  - ✓ Safety practitioners are encouraged to consider this set of countermeasures that are research-proven, but not widely applied on a national basis.

- ***Documented consideration and application (where feasible) of CSS Design Controls and Criteria.***