

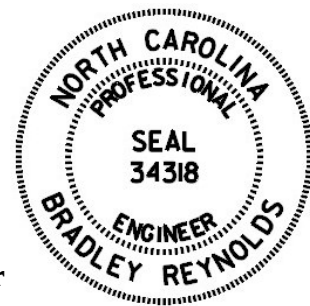
Bridge Approach Speed Investigation

Bridge #940093 over Laurel Fork on SR 1109 (Laurel Fork Rd)
Watauga County
Project Number 17BP.11.R.137



Document Prepared By:

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Principal Investigator

DocuSigned by:
Evan Brigham 1/5/2017
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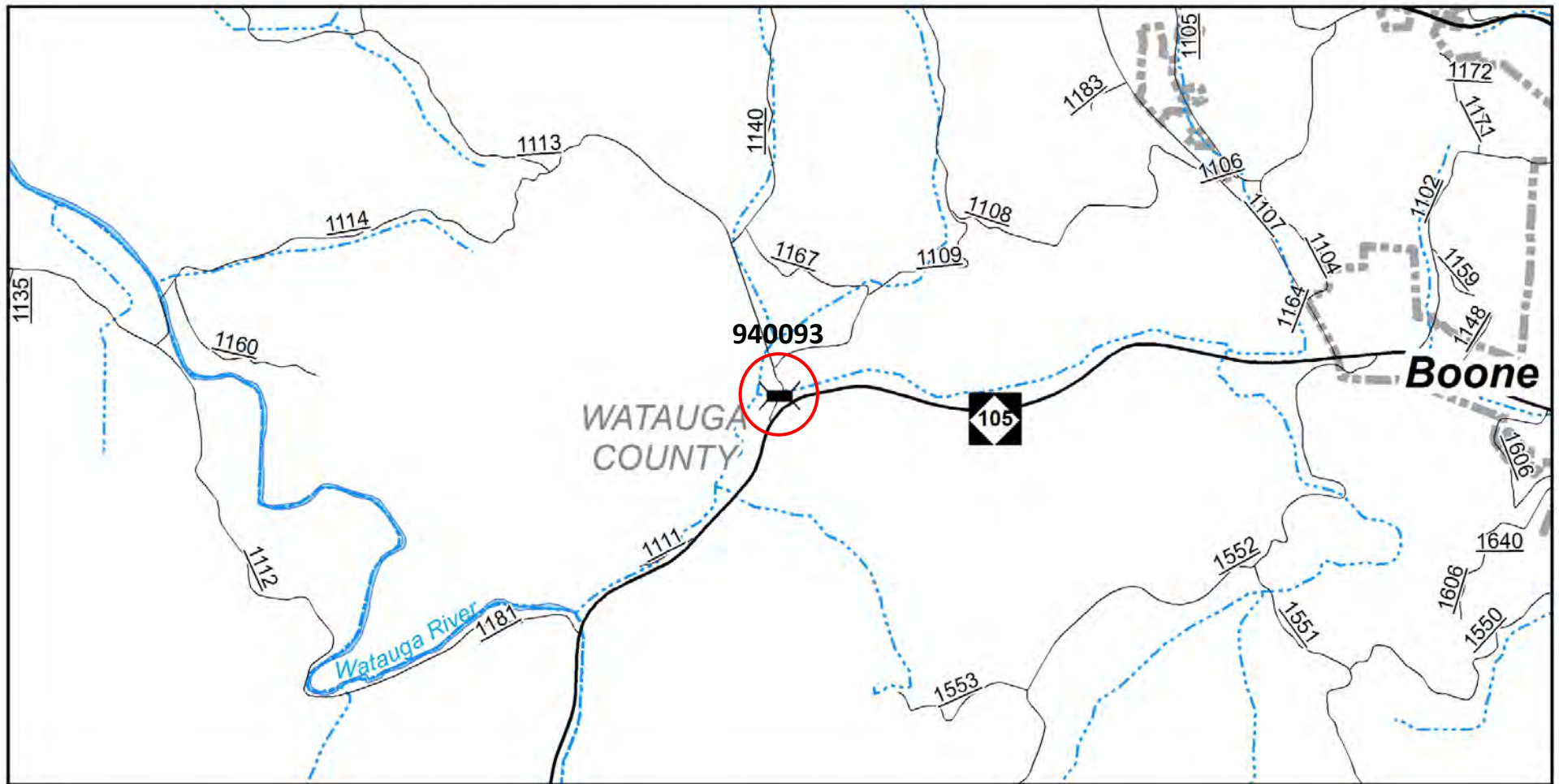
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Traffic Engineer

Project Manager

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Bradley Reynolds 1/5/2017
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Bradley Reynolds, PE
Project Manager

Division 11 - Watauga County Design Build Year 6/7 Bridge Program



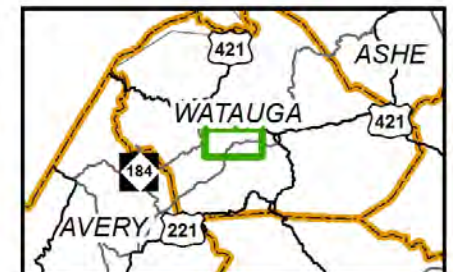
Structure Number	Division	County	Structure Description	Latitude	Longitude
940093	11	Watauga	Bridge #940093 over Laurel Fork	36.20448	-81.73493



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1 in = 2,500 ft
SCALE



Bridge and Approach Investigation Checklist

Project 17BP.11.R.137

Description Bridge #940093 over Laurel Fork

Route SR 1109 (Laurel Fork Rd)

Division 11

County Watauga

Existing Speed Limit 35 ☒ Posted ☐ Statutory

Reasonable & Comfortable Passenger Car Speed 25 mph

Speed Data Five (5) speed data points were collected: 20 mph, 26 mph, 28 mph, 28 mph, and 21 mph.

Ball Bank Speed Study Curve on NB approach ball banks: 8 at 20 mph, 12 at 25 mph, and 20 at 35 mph.
Curve on SB approach ball banks: 10 at 20 mph, and 20 at 30 mph.

Warning Signs at Bridge Object Markers (OM-3L & OM-3R) on each bridge approach
Weight Limit Signs - 1 x each approach

Roadside Development Residential

ADT History 1500 vpd from Crash Analysis
1600 vpd from 2012 AADT Map, Watauga County

Pedestrian/Bicycle Traffic Minimal amount expected

Bridge and Approach Digital Photos Attached

Approach Lane Width 22' overall pavement width with two 10' lanes.

Approach Shoulder Width: 1'
Shoulder Type Grass

Lane Width (existing bridge) 20' overall pavement width with two 8' lanes.

Shoulder width (existing bridge) 2'

Strategic Corridor / Thoroughfare Designation and Recommended Cross Section Local, Rural

Crash History and Safety Considerations Twelve (12) crashes have been reported in the vicinity of the bridge from 11/1/2006 to 10/31/2016 (10 years).
Four of the incidents involved vehicles striking the bridge guardrail at the northern approach to bridge.
Remaining incidents occurred at either NC 105 and SR 1109 or at SR 1113 and SR 1109.

Comments Signs on each approach include a Narrow Road sign. 35 mph speed limit sign NB prior to bridge.
Electrical lines laid across stream and weaved within bridge, running parallel to bridge on the west side.
Residential driveways on each approach. Signs of rust on bridge supports.
Curve on SB approach affects vehicles in both directions, NB vehicles slow at bridge to prepare for curve.

Reasonable Bridge Speed 30 mph

Investigated by: Evan Brigham, EI 12/13/2016 Reviewed by: Bradley Reynolds, PE

SR 1109 (Laurel Fork Rd) Northbound $\pm$ 250' from Bridge #93



SR 1109 (Laurel Fork Rd) Northbound $\pm$ 50' from Bridge #93



SR 1109 (Laurel Fork Rd) Southbound $\pm$ 250' from Bridge #93



SR 1109 (Laurel Fork Rd) Southbound $\pm$ 50' from Bridge #93



View of Bridge #93 Looking Southwest



View of Bridge #93 Looking Southeast



Narrow Bridge Sign Southbound Approach



Narrow Bridge Sign Northbound Approach



**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Study Criteria Summary

County: WATAUGA **City:** All and Rural
Date: 11/01/2011 to 10/31/2016 **Study:** WATAUGABRIDGE93
Location: SR 1109 (Bairds Creek Rd) from 500 feet north of Bridge 93 to NC 105

Report Details

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries				Condition			Road		Trfc Ctl	
						F	A	B	C	R	L	W	Ch	Cl	Dv	Op
1	104588000	2.450	12/15/2015 12:31	LEFT TURN, DIFFERENT ROADWAYS	\$ 6500	0	0	0	0	1	1	1	1	0	1	1
Unit	1 : 10	Alchl/Drugs:	0	Speed: 25 MPH Dir: N		Veh Mnvr/Ped Actn:				4	Obj Strk:					
Unit	2 : 1	Alchl/Drugs:	0	Speed: 5 MPH Dir: W		Veh Mnvr/Ped Actn:				8	Obj Strk:					
2	104735620	2.450	05/14/2016 08:05	LEFT TURN, DIFFERENT ROADWAYS	\$ 2300	0	0	0	0	1	1	1	1	0	1	1
Unit	1 : 2	Alchl/Drugs:	0	Speed: 25 MPH Dir: E		Veh Mnvr/Ped Actn:				4	Obj Strk:					
Unit	2 : 2	Alchl/Drugs:	0	Speed: 0 MPH Dir: E		Veh Mnvr/Ped Actn:				8	Obj Strk:					
3	104112091	2.505	07/26/2014 17:18	BACKING UP	\$ 1050	0	0	0	0	1	1	1	5	0	13	1
Unit	1 : 2	Alchl/Drugs:	0	Speed: 5 MPH Dir: N		Veh Mnvr/Ped Actn:				10	Obj Strk:					
Unit	2 : 4	Alchl/Drugs:	0	Speed: 0 MPH Dir: N		Veh Mnvr/Ped Actn:				1	Obj Strk:					
4	103634217	2.542	12/21/2012 07:50	FIXED OBJECT	\$ 4500	0	0	1	0	5	1	2	5	1	13	2
Unit	1 : 1	Alchl/Drugs:	0	Speed: 25 MPH Dir: S		Veh Mnvr/Ped Actn:				4	Obj Strk: 37					
5	103680853	2.542	02/03/2013 13:18	RAN OFF ROAD - LEFT	\$ 6000	0	0	0	1	5	1	4	5	1	13	1
Unit	1 : 4	Alchl/Drugs:	0	Speed: 30 MPH Dir: N		Veh Mnvr/Ped Actn:				4	Obj Strk:					
6	103957277	2.542	01/21/2014 16:35	SIDESWIPE, OPPOSITE DIRECTION	\$ 6000	0	0	0	0	5	1	2	5	0	13	2
Unit	1 : 2	Alchl/Drugs:	0	Speed: 20 MPH Dir: W		Veh Mnvr/Ped Actn:				4	Obj Strk:					
Unit	2 : 4	Alchl/Drugs:	0	Speed: 30 MPH Dir: E		Veh Mnvr/Ped Actn:				4	Obj Strk: 49					
7	104620515	2.542	01/22/2016 05:34	OVERTURN/ROLLOVER	\$ 4500	0	0	0	0	5	5	2	5	1	13	2
Unit	1 : 4	Alchl/Drugs:	0	Speed: 15 MPH Dir: E		Veh Mnvr/Ped Actn:				4	Obj Strk: 50					
8	104776501	2.628	06/28/2016 12:49	SIDESWIPE, OPPOSITE DIRECTION	\$ 2100	0	0	0	0	1	1	1	7	0	13	1
Unit	1 : 1	Alchl/Drugs:	0	Speed: 0 MPH Dir: S		Veh Mnvr/Ped Actn:				1	Obj Strk:					
Unit	2 : 10	Alchl/Drugs:	0	Speed: 10 MPH Dir: W		Veh Mnvr/Ped Actn:				7	Obj Strk:					

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Acc No	Crash ID	Milepost	Date	Accident Type	Total Damage	Injuries				Condition			Road		Trfc Ctl	
						F	A	B	C	R	L	W	Ch	Ci	Dv	Op
9	103836635	2.637	08/29/2013 17:56	LEFT TURN, SAME ROADWAY	\$ 1600	0	0	0	0	1	1	1	7	0	13	1
Unit	1 : 2	Alchl/Drgs:	0	Speed: 30 MPH Dir: E		Veh Mnvr/Ped Actn:				8	Obj Strk:					
Unit	2 : 1	Alchl/Drgs:	0	Speed: 45 MPH Dir: N		Veh Mnvr/Ped Actn:				8	Obj Strk:					
10	104185696	2.637	10/18/2014 15:29	REAR END, SLOW OR STOP	\$ 1000	0	0	0	0	1	1	1	3	0	13	1
Unit	1 : 1	Alchl/Drgs:	0	Speed: 45 MPH Dir: S		Veh Mnvr/Ped Actn:				4	Obj Strk:					
Unit	2 : 1	Alchl/Drgs:	0	Speed: 45 MPH Dir: S		Veh Mnvr/Ped Actn:				1	Obj Strk:					
11	104560988	2.637	11/20/2015 13:16	LEFT TURN, DIFFERENT ROADWAYS	\$ 2200	0	0	0	0	1	1	1	7	0	1	1
Unit	1 : 1	Alchl/Drgs:	0	Speed: 10 MPH Dir: W		Veh Mnvr/Ped Actn:				8	Obj Strk:					
Unit	2 : 2	Alchl/Drgs:	0	Speed: 0 MPH Dir: N		Veh Mnvr/Ped Actn:				8	Obj Strk:					
12	104885187	2.637	10/19/2016 11:01	LEFT TURN, DIFFERENT ROADWAYS	\$ 6000	0	0	1	0	1	1	1	3	0	1	1
Unit	1 : 4	Alchl/Drgs:	0	Speed: 45 MPH Dir: S		Veh Mnvr/Ped Actn:				4	Obj Strk:					
Unit	2 : 5	Alchl/Drgs:	0	Speed: 25 MPH Dir: NE		Veh Mnvr/Ped Actn:				8	Obj Strk:					

**Legend for
Report Details:**

Acc No - Accident Number
Injuries: F - Fatal, A - Class A, B - Class B, C - Class C
Condition: R - Road Surface, L - Ambient Light, W - Weather
Rd Ch - Road Character
Rd Ci - Roadway Contributing Circumstances
Trfc Ctl - Traffic Control: Dv - Device, Op - Operating
Alchl/Drgs - Alcohol Drugs Suspected
Veh Mnvr/Ped Actn - Vehicle Maneuver/Pedestrian Action
Obj Strk - Object Struck

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Summary Statistics

High Level Crash Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	12	100.00
Fatal Crashes	0	0.00
Non-Fatal Injury Crashes	3	25.00
Total Injury Crashes	3	25.00
Property Damage Only Crashes	9	75.00
Night Crashes	1	8.33
Wet Crashes	0	0.00
Alcohol/Drugs Involvement Crashes	0	0.00

Crash Severity Summary

Crash Type	Number of Crashes	Percent of Total
Total Crashes	12	100.00
Fatal Crashes	0	0.00
Class A Crashes	0	0.00
Class B Crashes	2	16.67
Class C Crashes	1	8.33
Property Damage Only Crashes	9	75.00

Vehicle Exposure Statistics

Annual ADT = 1500

Total Length = 0.19 (Miles)

0.306 (Kilometers)

Total Vehicle Exposure = 0.52 (MVMT)

0.84 (MVKMT)

Crash Rate	Crashes Per 100 Million Vehicle Miles	Crashes Per 100 Million Vehicle Kilometers
Total Crash Rate	2304.61	1432.02
Fatal Crash Rate	0.00	0.00
Non Fatal Crash Rate	576.15	358.00
Night Crash Rate	192.05	119.33
Wet Crash Rate	0.00	0.00
EPDO Rate	6568.14	4081.25

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Miscellaneous Statistics

Severity Index =	2.85
EPDO Crash Index =	34.20
Estimated Property Damage Total = \$	43750.00

Accident Type Summary

Accident Type	Number of Crashes	Percent of Total
BACKING UP	1	8.33
FIXED OBJECT	1	8.33
LEFT TURN, DIFFERENT ROADWAYS	4	33.33
LEFT TURN, SAME ROADWAY	1	8.33
OVERTURN/ROLLOVER	1	8.33
RAN OFF ROAD - LEFT	1	8.33
REAR END, SLOW OR STOP	1	8.33
SIDESWIPE, OPPOSITE DIRECTION	2	16.67

Injury Summary

Injury Type	Number of Injuries	Percent of Total
Fatal Injuries	0	0.00
Class A Injuries	0	0.00
Class B Injuries	2	66.67
Class C Injuries	1	33.33
Total Non-Fatal Injuries	3	100.00
Total Injuries	3	100.00

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Monthly Summary

Month	Number of Crashes	Percent of Total
Jan	2	16.67
Feb	1	8.33
Mar	0	0.00
Apr	0	0.00
May	1	8.33
Jun	1	8.33
Jul	1	8.33
Aug	1	8.33
Sep	0	0.00
Oct	2	16.67
Nov	1	8.33
Dec	2	16.67

Daily Summary

Day	Number of Crashes	Percent of Total
Mon	0	0.00
Tue	3	25.00
Wed	1	8.33
Thu	1	8.33
Fri	3	25.00
Sat	3	25.00
Sun	1	8.33

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Hourly Summary

Hour	Number of Crashes	Percent of Total
0000-0059	0	0.00
0100-0159	0	0.00
0200-0259	0	0.00
0300-0359	0	0.00
0400-0459	0	0.00
0500-0559	1	8.33
0600-0659	0	0.00
0700-0759	1	8.33
0800-0859	1	8.33
0900-0959	0	0.00
1000-1059	0	0.00
1100-1159	1	8.33
1200-1259	2	16.67
1300-1359	2	16.67
1400-1459	0	0.00
1500-1559	1	8.33
1600-1659	1	8.33
1700-1759	2	16.67
1800-1859	0	0.00
1900-1959	0	0.00
2000-2059	0	0.00
2100-2159	0	0.00
2200-2259	0	0.00
2300-2359	0	0.00

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Light and Road Conditions Summary

Condition	Dry	Wet	Other	Total
Day	8	0	3	11
Dark	0	0	1	1
Other	0	0	0	0
Total	8	0	4	12

Object Struck Summary

Object Type	Times Struck	Percent of Total
BRIDGE RAIL END	1	33.33
BRIDGE RAIL FACE	1	33.33
OFFICIAL HIGHWAY SIGN NON-BREAKAWAY	1	33.33

Vehicle Type Summary

Vehicle Type	Number Involved	Percent of Total
PASSENGER CAR	7	33.33
PICKUP	6	28.57
SINGLE UNIT TRUCK (2-AXLE, 6-TIRE)	2	9.52
SPORT UTILITY	5	23.81
VAN	1	4.76

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Yearly Totals Summary

Accident Totals

Year	Total Accidents	Fatal Accidents	Injury Accidents	Property Damage Only Accidents
2011	0	0	0	0
2012	1	0	1	0
2013	2	0	1	1
2014	3	0	0	3
2015	2	0	0	2
2016	4	0	1	3
Total	12	0	3	9

Injury Totals

Year	Fatal Injuries	Class A, B, or C Injuries
2011	0	0
2012	0	1
2013	0	1
2014	0	0
2015	0	0
2016	0	1
Total	0	3

Miscellaneous Totals

Year	Property Damage	EPDO Index
2011	\$ 0	0.00
2012	\$ 4500	8.40
2013	\$ 7600	9.40
2014	\$ 8050	3.00
2015	\$ 8700	2.00
2016	\$ 14900	11.40
Total	\$ 43750	34.20

Type of Accident Totals

Year	Left Turn	Right Turn	Rear End	Run Off Road & Fixed Object	Angle	Side Swipe	Other
2011	0	0	0	0	0	0	0
2012	0	0	0	1	0	0	0

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Run Off Road &							
Year	Left Turn	Right Turn	Rear End	Fixed Object	Angle	Side Swipe	Other
2013	1	0	0	1	0	0	0
2014	0	0	1	0	0	1	1
2015	2	0	0	0	0	0	0
2016	2	0	0	0	0	1	1
Total	5	0	1	2	0	2	2

North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report

Strip Diagram

Features	Milepost	Crash IDs
SR 1113	2.45	104588000 104735620
	2.46	
	2.47	
	2.48	
	2.49	
	2.50	
	2.51	104112091
	2.52	
	2.53	
	2.54	103634217 103680853 103957277 104620515
	2.55	
	2.56	
	2.57	
	2.58	
Structure:940071 Structure:940093	2.59	
	2.60	
	2.61	
	2.62	
	2.63	104776501
	2.64	103836635 104185696 104560988 104885187
NC 105		

**North Carolina Department of Transportation
Traffic Engineering Accident Analysis System
Strip Analysis Report**

Study Criteria

Study Name	Log No.	PH No.	TIP No.	K/A Cf.	B/C Cf.	ADT	ADT Route
WATAUGABRIDGE93				76.8	8.4	1500	40001109

Request Date	Courier Service	Phone No.	Ext.	Fax No.
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County			Municipality					
Name	Code	Div.	Name	Code	Y-Line Ft.	Begin Date	End Date	Years
WATAUGA	95	11	All and Rural		0	11/01/2011	10/31/2016	5.00

Location Text	Requestor
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SR 1109 (Bairds Creek Rd) from 500 feet north of
Bridge 93 to NC 105

Included Accidents	Old MP	New MP	Type
103634217	2.45	2.542	R
103680853		2.542	I
103957277		2.542	I
104620515	2.637	2.542	R
104112091		2.505	I

Fiche Roads

Name	Code
SR 1109	40001109
LAUREL FORK	50017185
SR 1113	40001113
BAIRDS CREEK	50001448
SR 1114	40001114
DEWITT BARNETT	50008370

Strip Road

Name	Code	Begin MP	End MP	Miles	Kilometers
SR 1109	40001109	2.447	2.637	0.190	0.306