

# **Attachment 9:** US 74 Flood Mitigation at the Lumber River - Benefit Cost Analysis



**North Carolina Flood Mitigation:  
PROTECTing US 74 at the Lumber River**

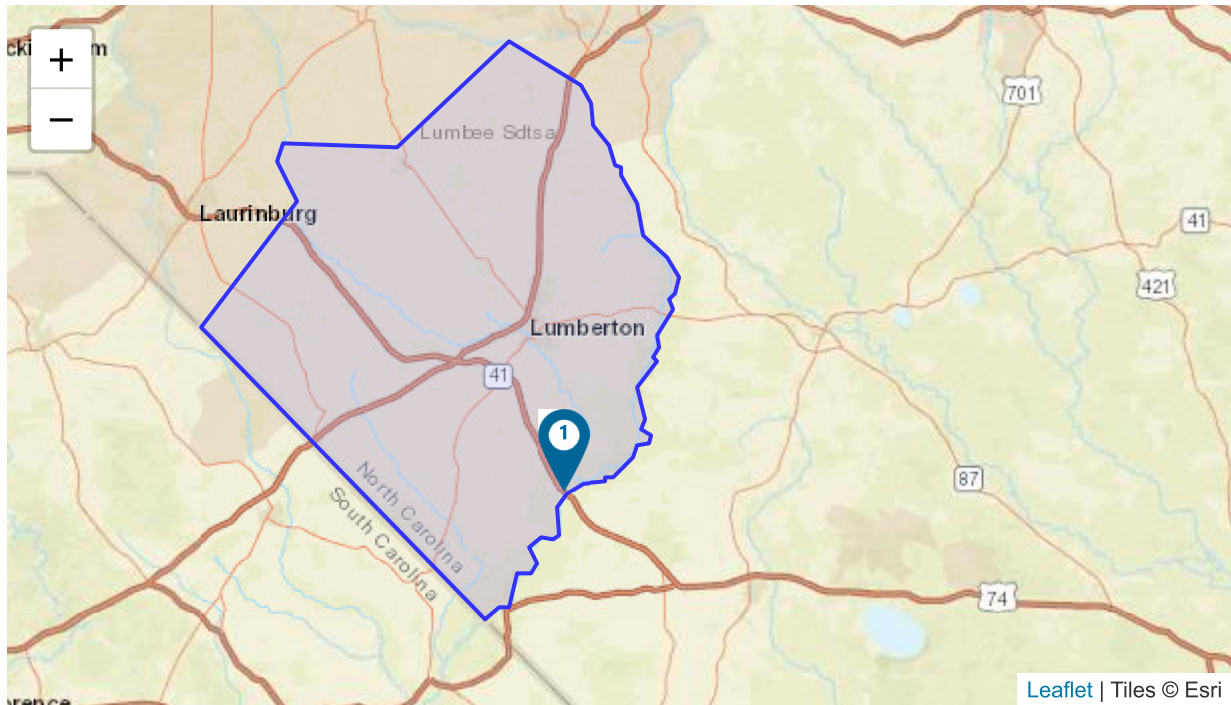


# Benefit-Cost Calculator

V.6.0 (Build 20230324.2039 | Release Notes)

## Benefit-Cost Analysis

Project Name: US 74 PROTECT Grant Application



Map Marker	Mitigation Title	Property Type	Hazard	Using 7% Discount Rate			Using 3% Discount Rate (For FY22 BRIC and FMA only)		
				Benefits (B)	Costs (C)	BCR (B/C)	Benefits (B)	Costs (C)	BCR (B/C)
1	Floodproofing Measures @ 34.4448000; -78.9606000		DFA - Riverine Flood	\$ 3,812,967	\$ 2,391,371	1.59	\$ 7,108,799	\$ 2,510,662	2.83
<b>TOTAL (SELECTED)</b>				<b>\$ 3,812,967</b>	<b>\$ 2,391,371</b>	<b>1.59</b>	<b>\$ 7,108,799</b>	<b>\$ 2,510,662</b>	<b>2.83</b>
<b>TOTAL</b>				<b>\$ 3,812,967</b>	<b>\$ 2,391,371</b>	<b>1.59</b>	<b>\$ 7,108,799</b>	<b>\$ 2,510,662</b>	<b>2.83</b>

Property Configuration	
Property Title:	Floodproofing Measures @ 34.4448000; -78.9606000
Property Location:	28369, Robeson, North Carolina
Property Coordinates:	34.4448, -78.9606
Hazard Type:	Riverine Flood
Mitigation Action Type:	Floodproofing Measures
Property Type:	Roads & Bridges
Analysis Method Type:	Professional Expected Damages

Cost Estimation	
Floodproofing Measures @ 34.4448000; -78.9606000	
Project Useful Life (years):	50
Project Cost:	\$2,253,364
Number of Maintenance Years:	50 Use Default:Yes
Annual Maintenance Cost:	\$10,000

Comments

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**Mitigation Project Cost:**

CONSTRUCTION COST \$1,950,000 DESIGN FEE \$262,500.00 PLANNING FEE \$42,000.00 TOTAL COST \$2,254,500

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**Annual Maintenance Cost:**

Guardrail repairs

Damage Analysis Parameters - Damage Frequency Assessment	
Floodproofing Measures @ 34.4448000; -78.9606000	
Year of Analysis was Conducted:	2023
Year Property was Built:	1997
Analysis Duration:	27 Use Default:Yes

Comments

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**Year Built:**

This was the year of improvements completed the comprise the roadway, bridge, and embankment geometry currently in place in the vicinity of the area.

Roads and Bridges Properties	
Floodproofing Measures @ 34.4448000; -78.9606000	
<b>Estimated Number of One-Way Traffic Detour Trips per Day:</b>	15,000
<b>Additional Time per One-Way Detour Trip (minutes):</b>	45
<b>Number of Additional Miles:</b>	30
<b>Federal Rate (\$):</b>	0.625 Use Default:Yes
<b>Economic Loss Per Day of Loss of Function (\$):</b>	681,750

Comments

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- 2-way 2045 project AADT for
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**Time per Trip:**

Trip detour time estimates were provided by members of NCDOT Division 6 familiar with the response to both Hurricane Matthew and Hurricane Florence.

**Number of Miles:**

Trip detour mileage estimates were provided by members of NCDOT Division 6 familiar with the response to both Hurricane Matthew and Hurricane Florence.

Professional Expected Damages Before Mitigation							
Floodproofing Measures @ 34.4448000; -78.9606000							
Recurrence Interval (years)	ROADS AND BRIDGES	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
	Impact (days)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)
25	7	1,932,091	0	0	0	0	6,704,341
100	7	2,258,978	0	0	0	0	7,031,228

Comments

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**Damages Before Mitigation:**

25-year is the 2070 50-year overtopping event and assigned Hurricane Matthew damage amount of \$1,932,091. 100-year is the 500-year event and assigned Hurricane Florence damage amount of \$2,258,978. Source of future rainfall intensity projections: Bowden, J.H., Lackmann, G.M., Hollinger, K.E., Kunkel, K., Dello, K., Ward, R., Lauffer M., 2022: An Investigation into Future Rainfall Extremes within North Carolina for State Transportation Needs. National Hydraulic Engineering Conference, August 2022. [Bowden et al. (2022)]

Annualized Damages Before Mitigation  
Floodproofing Measures @ 34.4448000; -78.9606000

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
25	6,704,341	205,975
100	7,031,228	70,312
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	13,735,569	276,287

Professional Expected Damages After Mitigation  
Floodproofing Measures @ 34.4448000; -78.9606000

Recurrence Interval (years)	ROADS AND BRIDGES		OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
	Impact (days)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)	
0	0	0	0	0	0	0	0	

Comments

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**Damages After Mitigation:**

NCDOT Division 6 reported that a similar shoulder hardening improvement project has held up without the need for repair or increased maintenance.

Annualized Damages After Mitigation  
Floodproofing Measures @ 34.4448000; -78.9606000

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
Sum Damages and Losses (\$)		Sum Annualized Damages and Losses (\$)
	0	0

Benefits-Costs Summary

Floodproofing Measures @ 34.4448000; -78.9606000

<b>Total Standard Mitigation Benefits:</b>	\$3,812,967
<b>Total Social Benefits:</b>	\$0
<b>Total Mitigation Project Benefits:</b>	\$3,812,967
<b>Total Mitigation Project Cost:</b>	\$2,391,371
<b>Benefit Cost Ratio - Standard:</b>	1.59
<b>Benefit Cost Ratio - Standard + Social:</b>	1.59