

Hazard Elimination Project Evaluation

Project Log #'s 200608061

Hazard Elimination Projects W-2939

**Evaluation of Shoulder Guardrail Installation on US 64
From SR 1001 (Ellijay) to SR 1620 (Turtle Pond)
Macon County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
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Principal Investigator

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3/31/2008
Date

Traffic Safety Project Engineer

Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project W-2939 – Installation of shoulder guardrail on US 64 from SR 1001 (Ellijay) to SR 1620 (Turtle Pond) in Macon County.

Project Information and Background from the Project File Folder

The safety countermeasure chosen for the subject location was the installation of approximately 31,412 linear feet of shoulder guardrail. US 64 is a two lane highway with a shoulder width of 3 feet and a speed limit of 55 mph. According the project folder the alignment of the road is generally poor.

The initial crash analysis for this location was completed from January 1, 1989 through December 31, 1991 with a total of 68 reported crashes. Ran Off Road crashes made up 44 percent of the total crashes. The guardrail was installed to reduce the severity of the pattern of ran off road crashes. The project was completed on December 30, 2002 with a total cost of \$554,000.00

Naïve Before and After Analysis

After reviewing the hazard elimination project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from June 1, 2002 through February 28, 2003. The before period consisted of reported crashes from January 1, 1998 through May 31, 2002 (4 Years, 5 Months) and the after period consisted of reported crashes from March 1, 2003 through July 31, 2007 (4 Years, 5 Months). The ending date for this analysis was determined by the available after period crash data.

The treatment data consisted of all crashes on US 64 from SR 1001 (MP 19.49) to SR 1620 (MP 28.9) with a 0 foot y-line. Please see the attached *Location Map* for further detail.

The following table depicts the Naïve Before and After Analysis for the Total Crashes and Target Crashes at the treatment location. Please note that Ran Off Road crash types were the target crashes for the applied countermeasure. Ran Off Road crash types considered are as follows: Ran Off Road – Left, Ran Off Road – Right, Ran Off Road – Straight, Fixed Object, Head-on, Sideswipe – Same Direction, Sideswipe – Opposite Direction, and Overturn / Rollover.

<u>Treatment Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	99	129	30.3
Total Severity Index	8.77	4.11	-53.1
Total Target Crashes	70	94	34.3
Target Severity Index	8.55	4.01	-53.1
Volume	4,300	4,300	0.0

<u>Target Crash Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
<i>Target Crashes - Injuries</i>			
Fatal Injury Crashes	1	0	-100.0
Non-Fatal Injury Crashes	15	29	93.3
Total Injury Crashes	16	29	81.3
<i>Target Crashes - Contributing Factors</i>			
Night Crashes	15	19	26.7
Wet Crashes	14	21	50.0
<i>Target Crashes - Crash Types</i>			
Ran Off Road	27	9	-66.7
Fixed Object	11	47	327.3
Sideswipe-Total	29	26	-10.3
Head On	1	5	400.0
Overturn / Rollover	2	7	250.0
<i>Target Crashes – Crash Severity Summary</i>			
Fatal Crashes	1	0	-100.0
Class A Crashes	5	1	-80.0
Class B Crashes	8	16	100.0
Class C Crashes	2	12	500.0
Property Damage Only Crashes	54	65	20.4

The naïve before and after analysis at the treatment location resulted in a 30 percent increase in Total Crashes, a 34 percent increase in Target Crashes, and no change in Average Daily Traffic (ADT). Further investigation shows there was a 53 percent decrease in the Severity Index for both Total Crashes and for Target Crashes. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 30 percent increase in Total Crashes and a 34 percent increase in Target Crashes. Further investigation shows that the Severity Index for both Total Crashes and Target Crashes has decreased by 53 percent using naïve methodologies. The summary results above demonstrate that the treatment location appears to have had an increase in both Total Crashes and Target Crashes and a decrease in the Severity Index from the before to the after period.

The calculated benefit to cost ratio for this project is 8.03 considering total crashes. The benefit to cost ratio considering only target crashes is 5.62. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

It should be noted that there was no specific information in the project file as to exactly where each run of guardrail was placed in this project. Therefore specific crash information for each run of guardrail could not be analyzed. The site visit confirmed where guardrail exists along the segment today, but there was no way to determine where guardrail existed before the project.

Typically, one would expect guardrail installation projects to result in an increased number of Ran Off Road Crashes and a decrease in the severity of Ran Off Road crashes. The increase in Ran Off Road Crashes is expected due to the placement of a fixed object (guardrail) near the travel way. The decrease in the severity of Ran Off Road Crashes is expected due to the guardrail being more forgiving than the object it is protecting. The results from this project seem to be in concurrence with the above-mentioned expectations

Crashes coded as Fixed Object Crashes seemed to undergo a large increase (327%), while crashes coded as Ran Off Road appeared to undergo a large decrease (67%) from the before to the after period. Although the guardrail installation helped contribute to these numbers, it should be noted that Fixed Object Crashes were re-defined for law enforcement officers in the year 2000. For example, a vehicle running off the roadway and hitting a tree or ditch might have been coded as a Ran Off Road Crash in the before 2000, while a similar crash in the after period might have been coded as a Fixed Object Crash after 2000.

It should also be noted that there was no crash type for “Sideswipe-Opposite Direction” on crash reports before the year 2000. For this reason, Sideswipe-Opposite Direction and Sideswipe-Same Direction Crashes were combined into the “Sideswipe-Total” category for a more appropriate before and after comparison.

Please see the attached Treatment Site Photos for additional visual information. As the Safety Evaluation Group completes additional reviews for this type of countermeasure, we will be able to provide more objective and definite information regarding actual crash reduction factors.

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 64 from SR 1001 to SR 1620
 COUNTY: Macon
 FILE NO.: W-2939

BY: Brad Robinson
 DATE: 3/7/2008

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$554,000	10	0.149	\$82,562
	\$0	0	0.000	\$0
TOTALS	\$554,000	10	0.149	\$82,562

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$8,500
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$91,062
 TOTAL COST OF PROJECT= \$554,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.42	8	1.81	22	4.98	69	15.61	\$1,117,851
AFTER	4.42	1	0.23	44	9.95	84	19.00	\$386,968

Annual Benefits from Crash Cost Savings \$730,882

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$639,820

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 8.03

TOTAL COST OF PROJECT - \$554,000 COMPREHENSIVE B/C RATIO - 8.03

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 64 from SR 1001 to SR 1620
 COUNTY: Macon
 FILE NO.: W-2939 Target Crashes

BY: Brad Robinson
 DATE: 3/7/2008

DETAILED COST: TYPE IMPROVEMENT - Shoulder Guardrail

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$0	0	0.000	\$0
Right-of-Way	\$554,000	10	0.149	\$82,562
	\$0	0	0.000	\$0
TOTALS	\$554,000	10	0.149	\$82,562

ESTIMATED INCREASE IN ANNUAL MAINT. COST = \$8,500
 ESTIMATED INCREASE IN ANNUAL UTILITY COST = \$0
 TOTAL ANNUAL COST= \$91,062
 TOTAL COST OF PROJECT= \$554,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO		ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	CRASHES	CRASHES PER YR	
BEFORE	4.42	6	1.36	10	2.26	54	12.22	\$812,534
AFTER	4.42	1	0.23	28	6.33	65	14.71	\$300,566

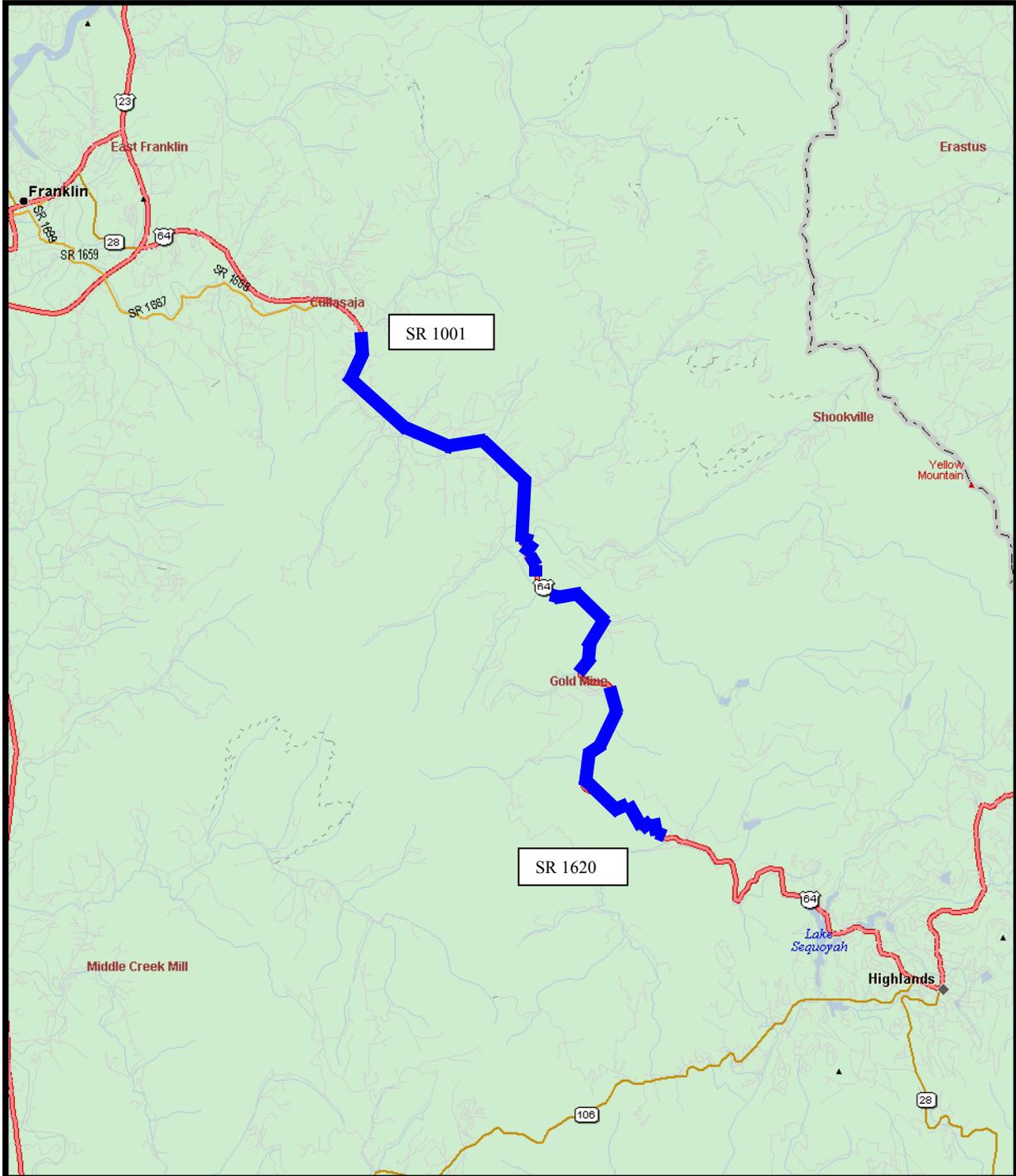
Annual Benefits from Crash Cost Savings \$511,968

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$420,906

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 5.62

TOTAL COST OF PROJECT - \$554,000 COMPREHENSIVE B/C RATIO - 5.62

Location Map
Macon County
Evaluation of W-2939



Treatment Location: US 64 from SR 1001 (Ellijay) to SR 1620 (Turtle Pond)

Treatment Site Photos Taken March 18, 2008



Traveling Westbound on US 64



Traveling Westbound on US 64



Traveling Westbound on US 64



Traveling Westbound on US 64



Traveling Westbound on US 64



Traveling Westbound on US 64