

Hazard Elimination Project Evaluation

Project Log #'s 200502102 & 200502104

Hazard Elimination Projects W-2923 & W-2933

**Evaluation of Shoulder Guardrail Installation on NC 107 from SR 1158 to SR 1737,
Jackson County**

Documents Prepared By:

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Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Projects W-2923 and W-2933 – Installation of shoulder guardrail on NC 107 from SR 1158 to SR 1737 in Jackson County

Project Information and Background from the Project File Folder

The safety countermeasure chosen for the subject location was the installation of approximately 55,000 linear feet of shoulder guardrail. NC 107 is a two-lane highway with shoulder widths of 3 feet and speed limit of 55 miles per hour. According to the project file, the alignment of the road is poor due to the mountainous terrain and a general deficiency in guardrail exists.

The initial crash analysis for this location was completed from January 1, 1989 through December 31, 1991 with a total of 77 reported crashes. The most prevalent crash pattern at the location was ran off road crashes, which make up 61 percent of the total crashes. The guardrail was installed to reduce the severity of the pattern of ran off road crashes. W-2923 was let in November of 1996 and was closed out in April of 1997 at an estimated cost of \$301,000. W-2933 was let in November of 1996 and was closed out in April of 1997 at an estimated cost of \$191,000.

Naïve Before and After Analysis

After reviewing the hazard elimination project file folder along with all the crashes at the subject locations, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 1996 through May 31, 1997. The before period consisted of reported crashes from March 1, 1990 through October 31, 1996 (6 Years, 8 Months) and the after period consisted of reported crashes from June 1, 1997 through January 1, 2004 (6 Years, 8 Months). The ending date for this analysis was determined by the available after period crash data.

The treatment data consisted of all crashes on NC 107 from SR 1158 to SR 1737 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	210	228	8.6%
Total Severity Index	6.89	5.78	-16.1%
Total Target Crashes	161	160	-0.6%
Target Severity Index	6.44	6.56	1.9%
Volume	2,600	4,600	76.9%

<u>Target Crash Information</u>	Before	After	Percent Reduction (-)/ Percent Increase (+)
<i>Target Crashes - Injuries</i>			
Fatal Injury Crashes	2	1	-50.0%
Non-Fatal Injury Crashes	61	73	19.7%
Total Injury Crashes	63	74	17.5%
<i>Target Crashes - Contributing Factors</i>			
Night Crashes	60	51	-15.0%
Wet Crashes	37	22	-40.5%
<i>Target Crashes - Crash Types</i>			
Ran Off Road	134	51	-61.9%
Fixed Object	1	73	7200.0%
Sideswipe, Total	19	27	42.1%
Sideswipe, Same Direction	19	9	-52.6%
Sideswipe, Opposite Direction	0	18	N/A
Head On	5	3	-40.0%
Overturn / Rollover	2	6	200.0%

The naïve before and after analysis at the treatment location resulted in a 9 percent increase in Total Crashes, a 1 percent decrease in Target Crashes, an 18 percent increase in Target Injury Crashes, and a 77 percent increase in Average Daily Traffic (ADT). Further investigation shows there was a 16 percent decrease in Severity Index for Total Crashes and a 2 percent increase in the Severity Index for Target Crashes. The before period ADT year was 1993 and the after period ADT year was 2000.

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 9 percent increase in Total Crashes and a 1 percent decrease in Target Crashes. Further investigation shows that the Severity Index of Total Crashes has decreased by 16 percent and the Severity Index for Target Crashes has increased by 2 percent using naïve methodologies. The summary results above demonstrate that the treatment location appears to have had a slight increase in Total Crashes, and little change in the frequency and Severity Index of Target Crashes from the before to the after period. Note that the volume on this particular project nearly doubled from the before to the after periods. Naïve methodologies do not account for this change in volume.

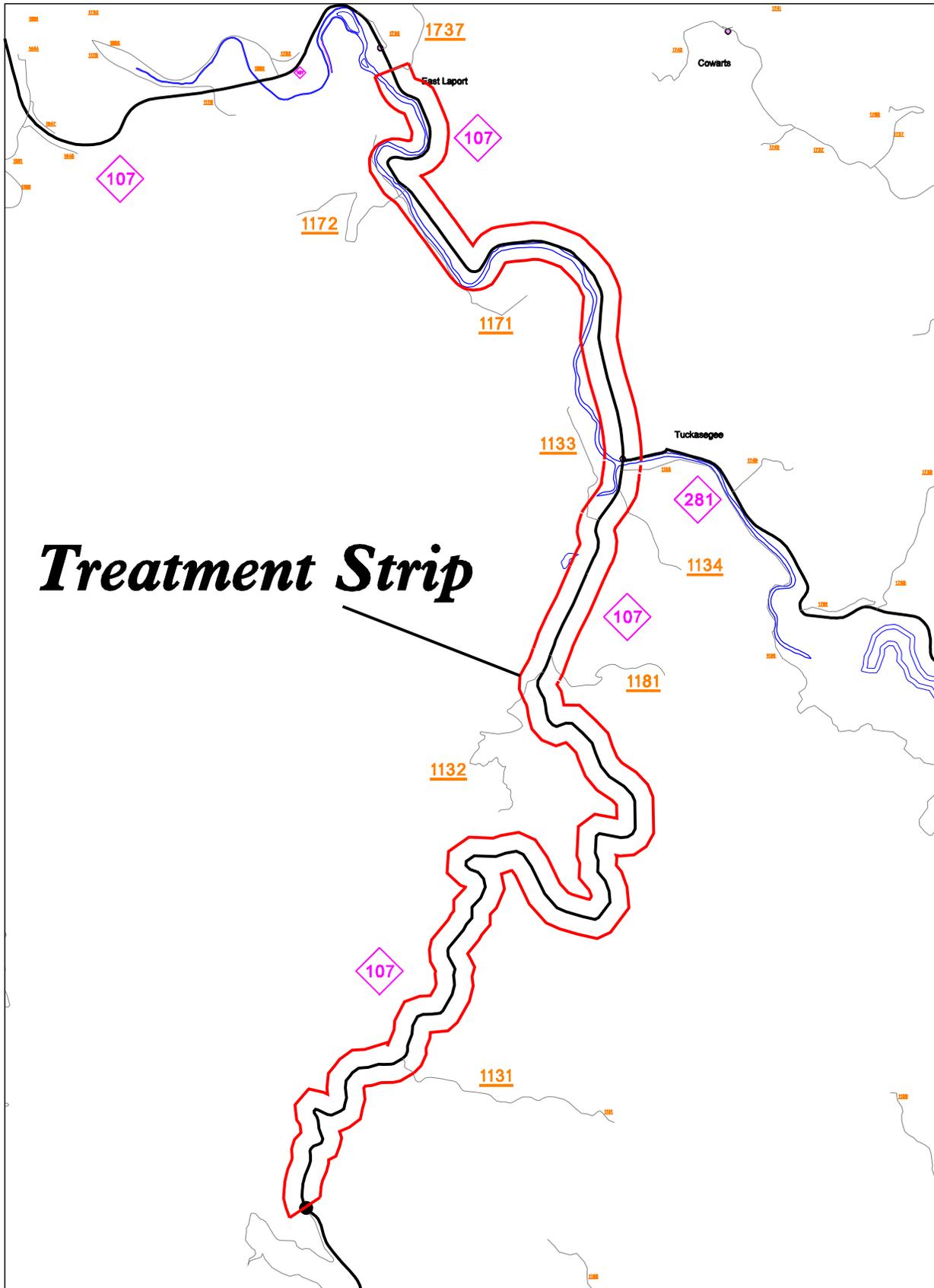
It should be noted that there was no specific information in the project file as to exactly where each run of guardrail was placed in this project. Therefore specific crash information for each run of guardrail could not be analyzed. The site visit confirmed where guardrail exists along the segment today,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

Sideswipe crashes from the before to the after periods have increased by 42 percent. This increase could be due to drivers shying away from the shoulder guardrail and drifting out of their lane. The existing shoulders on this section are approximately 3 feet according to the project file folder. This would require that the guardrail be placed fairly close to the travel lanes due to the existing design constraints. It should be noted that there was no crash type for "Sideswipe, Opposite Direction" on crash reports before year 2000. This would explain the dramatic increase shown for this particular crash type. The "Sideswipe, Total" category is more appropriate for before and after comparisons.

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. In this particular project, there seems to have been little change in the frequency or severity of Target Crashes. It may be beneficial to explore the possibility of placing countermeasures such as centerline or shoulder rumble strips to prevent drivers from leaving the roadway. This may help to decrease further the substantial number of Ran Off Road Crashes.

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.

Location Map, Jackson County Evaluation of W-2923 and W-2933

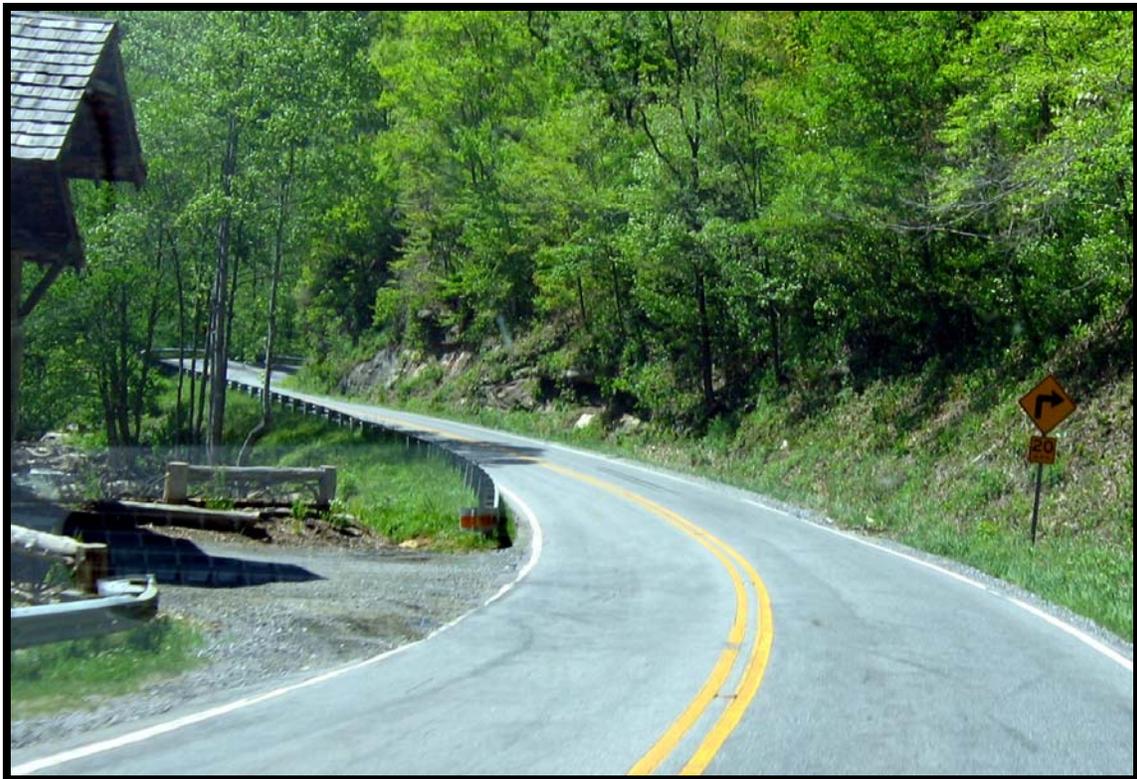


Treatment Strip: NC 107 From SR 1158 to SR 1737

Treatment Site Photos (Taken on May 3, 2006)



Driving North on NC 107 – South of SR 1131



Driving North on NC 107 – North of SR 1131

Treatment Site Photos (Taken on May 3, 2006)



Driving North on NC 107 – North of SR 1181



Driving North on NC 107 – North of NC 281