

Alachua County Board of County Commissioners
Department of Public Works



Crash Analysis
CR 231 and NW 156th Avenue



Alachua County Public Works Department

**Ramon D. Gavarrete, P. E.,
Public Works Director**

The analysis in this document was performed using generally accepted engineering practices in the State of Florida and in accordance with the Manual on Uniform Traffic Control Studies (MUTS) published by the Florida Department of Transportation (FDOT) and the Highway Safety Manual 2010 published by the American Association of State Highway and Transportation Officials (AASHTO).

This Report and the content listed in the Table of Contents was prepared under the direction and responsible charge of:

A handwritten signature in blue ink is written over a horizontal line. The signature is cursive and appears to read "R. Gavarrete".

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Florida P.E. Registration Number 51372

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I. Introduction

The following report is intended to accompany Alachua County's Highway Safety Improvement Program (HSIP) application for improvements at the intersection of CR 231 and NW 156th Avenue. This report includes a crash and benefit cost analysis for the proposed modification to reduce crash frequency at the intersection.

II. Existing Conditions

CR 231 and NW 156th Avenue form a two-way, stop-controlled, intersection with four legs. The intersection is located in the northwest part of Alachua County. CR 231 and NW 156th Avenue are both two-way, two-lane rural undivided paved roads with CR 231 (major road) running north/south and NW 156th Avenue (minor road) running east/west. A typical day has an average of 4,267 vehicles per day entering the intersection from all approaches. The approaches on NW 156th Avenue have rumble strips. The rumble strips on the west leg are installed to current standards, the ones on the east leg are not. The intersection has adequate sight distance for both the posted approach speed of 55 MPH and the 85th percentile speed of 62 MPH. The west approach has a skew angle of 5 degrees.



Image 1 – Aerial View of County Road 231 & NW 156th Avenue



III. Crash Analysis

The crash analysis was completed for a five-year period beginning in 2012 and ending in 2016. The crash data was provided by law enforcement agency crash reports by responding officers of the Florida Highway Patrol and the Alachua County Sheriff's Office. These reports were compiled by the Signal 4 Analytics Database published by the UF GeoPlan Center.

A total of six crashes occurred at the intersection in the five-year period analyzed and each crash report was reviewed for accuracy. After further investigation it was determined that two of the six crashes were correctable angle crashes caused by failure to yield right-of-way. The four remaining crashes included one angle crash by running a stop sign, one other crash due to careless driving, one run off the road crash due to loss of control, and one rear end crash due to loss of control. One crash resulted in a fatality, two involved injuries, and three were property damage only.

All of the crashes are included in the Crash Summary and Collision Diagram found in Appendix A and B, respectively.

IV. Counter Measures

In an attempt to reduce the amount of angle crashes at the intersection an intersection conflict warning system (ICWS) with post mounted signs and flashers in advance of the intersection should be installed on CR 231, with detection loops on NW 156th Avenue.

V. Benefit/Cost Analysis

The benefit cost analysis was completed using a Crash Modification Factor (CMF) from the Crash Modification Factors Clearinghouse for installing an ICWS at the intersection. The CMF selected can be found in Appendix C. Construction costs were obtained using the most current FDOT Historical Cost information.

The estimated total cost to implement the ICWS, for a six-year span, is \$147,653.33 with annual cost of \$28,188.47. The calculated benefit/cost for the installation of the ICWS is 4.08 with a total annual benefit of \$115,072.12. The complete Benefit/Cost Analysis can be found in Appendix D.

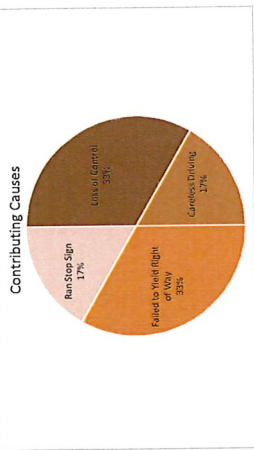


Appendix A: Crash Summary

CR 231 and NW 156th Avenue Crash Summary

DIAGRAM NO.	DHSMV NUMBER	DATE	DAY	TIME	COUNTY	ROADWAY	SEVERITY				FACTORS				CONDITIONS				CONTRIBUTING CAUSE	
							K	A	B	C	D	ALCOHOL	DRUGS	WEATHER	ROAD	CRASH TYPE	CRASH TYPE	CRASH TYPE		CRASH TYPE
1	85396889	10/10/2016	Mon	10:50:00 AM	Alachua	NW COUNTY ROAD 231	0	0	0	0	0	NW 156TH AVENUE	Cloudy	None	None	Daylight	None	None	None	Failed to Yield Right of Way
2	82815770	1/7/2012	Mon	1:24:00 PM	Alachua	CR 231	0	0	0	0	1	NE 156TH AVE	Clear	None	None	Daylight	None	None	None	Failed to Yield Right of Way
3	83826590	9/26/2014	Fri	1:50:00 PM	Alachua	COUNTY ROAD 231	0	0	0	0	1	NE 156TH AVE	Clear	None	None	Daylight	None	None	None	Ran Stop Sign
4	82897583	7/5/2012	Thu	4:44:00 PM	Alachua	CR-231	0	0	0	0	1	NW 156TH AVE	Clear	None	None	Daylight	None	None	None	Careless Driving
5	83928171	8/15/2013	Thu	7:30:00 PM	Alachua	NW CR 231	10	Esst	156TH AVE AND CR 231	0	0	156TH AVE AND CR 231	Rain	Road Surface Condition	None	Daylight	None	None	None	Lack of Control
6	83678686	12/10/2013	Tue	5:35:00 PM	Alachua	NW 156 AVE	20	Esst	CR 231	1	1	CR 231	Cloudy	None	None	Dark - Not Lighted	None	None	None	Lack of Control

CRASH TOTAL BY SEVERITY		CRASH TYPES		CONTRIBUTING CAUSES															
K	A	B	C	D	OTHER	Animal	Angle	Bicycle	Head On	Left Turn	Off Road	Pedestrian	Rear End	Right Turn	Rollover	Sideswipe	Other	Unknown	
16.7%	0.0%	16.7%	16.7%	50.0%	0.0%	0	3	0	0	0	1	0	1	1	0	0	0	0	0



CRASH TOTAL BY SEVERITY		ENVIRONMENT FACTORS	
K	A	WET	DRY
16.7%	0.0%	2	4

Denotes correctable crash

CONTRIBUTING CAUSES	
Improperly Backing	0
Lack of Control	2
Over-Correcting/Over Steering	0
Driver/Follower Aids	0
Failed to Yield in Proper Lane	0
Other	0
Careless Driving	1
Animal in Roadway	0
Failed to Yield Right of Way	2
Exceed Speed	0
Unknown	0
Under the Influence	0
Improper Lane Change	0
Equipment Failure	0
Over-Correcting/Over Steering	0
Ran Stop Sign	1



Appendix B: Collision Diagram

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION
COLLISION DIAGRAM - INTERSECTION

750-020-05
 TRAFFIC ENGINEERING
 OPERATIONS
 10/15

General Analysis Information

Site Information

Intersection Number [Redacted]
 Intersection Name CR 231 and NW 156th Avenue
 Analysis Years 2012-2016

Location Alachua County
 Project Number [Redacted]

Notes

- 1) Collision diagram symbology illustrated in Figure 5-4 of Chapter 5 of the Highway Safety Manual should be used.
- 2) The legend may be used to clarify symbology that identifies total number of crashes, injuries, fatalities, pavement conditions, etc.

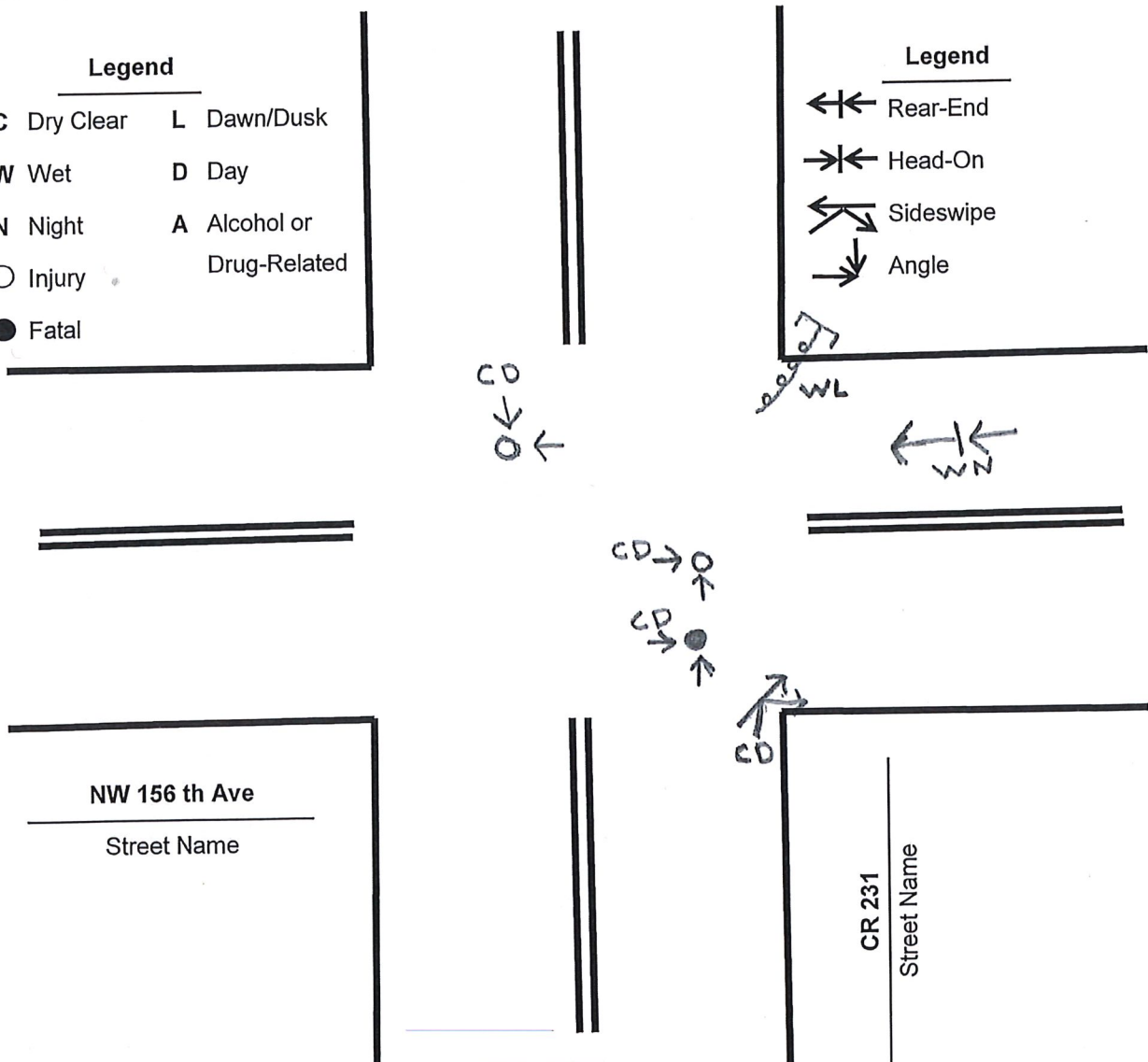
Field Data Collection

Legend

C Dry Clear	L Dawn/Dusk
W Wet	D Day
N Night	A Alcohol or Drug-Related
○ Injury	
● Fatal	

Legend

←←	Rear-End
→←	Head-On
↔	Sideswipe
↘	Angle



Total Intersection Crashes per the Crash Summary	
Total Crashes Graphed on this Page	6
Total Injury Crashes	2
Total Fatal Crashes	1
Total PDO Crashes	3

Source: Adapted from HSM Figure 5-4



Appendix C: Crash Modification Factor



CMF / CRF Details

CMF ID: 8464

Install an intersection conflict warning system (ICWS) with post mounted signs (various messages) and flashers in advance of the intersection on major; loop on minor

Description: Install an intersection conflict warning system (ICWS) with post mounted signs (various messages) and flashers in advance of the intersection on major; loop on minor

Prior Condition: No intersection conflict warning systems

Category: Signs

Study: [Multi-State Safety Evaluation of Intersection Conflict Warning Systems \(ICWS\), Himes et al, 2016](#)

Star Quality Rating:



[\[View score details\]](#)

Crash Modification Factor (CMF)

Value: 0.454

Adjusted Standard Error:

Unadjusted Standard Error: 0.067

Crash Reduction Factor (CRF)

Value:	54.6 (This value indicates a decrease in crashes)
Adjusted Standard Error:	
Unadjusted Standard Error:	6.7

Applicability

Crash Type:	Angle
Crash Severity:	All
Roadway Types:	Not specified
Number of Lanes:	2
Road Division Type:	
Speed Limit:	
Area Type:	Rural
Traffic Volume:	
Time of Day:	Not specified

If countermeasure is intersection-based

Intersection Type:	Roadway/roadway (not interchange related)
Intersection Geometry:	4-leg
Traffic Control:	Stop-controlled
Major Road Traffic Volume:	
Minor Road Traffic Volume:	

Development Details

Date Range of Data Used:	
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Municipality:	
State:	MN, MO, NC
Country:	
Type of Methodology Used:	Before/after using empirical Bayes or full Bayes
Sample Size Used:	

Other Details	
Included in Highway Safety Manual?	No
Date Added to Clearinghouse:	Jan-17-2017
Comments:	CMF for 2-lane at 2-lane intersections

This site is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center

The information contained in the Crash Modification Factors (CMF) Clearinghouse is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The U.S. Government assumes no liability for the use of the information contained in the CMF Clearinghouse. The information contained in the CMF Clearinghouse does not constitute a standard, specification, or regulation, nor is it a substitute for sound engineering judgment.



Appendix D: Benefit/Cost Analysis



HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP) BENEFIT/COST AND NET PRESENT VALUE ANALYSIS

1. PROJECT INFORMATION

PROJECT TITLE <u>County Road 231 & NW 156th Avenue</u>				PRIORITY NO. <u>1</u>	
COUNTY <u>Alachua</u>	SECTION _____	U.S. ROAD _____		SPEED (MPH) <u>55 on CR 231, 55 on NW 156th AV (Eastbound), and 45 on NW 156th AV (Westbound)</u>	
B.M.P. _____	E.M.P. _____	LENGTH _____	SR _____		
LOCATION <u>Intersection of County Road 231 and NW 156th Avenue</u>					
FACILITY TYPE <u>2 Lane Rural Undivided</u>					

2. CRASH REDUCTION INFORMATION

CAUSE OF CRASH PROBLEM	Vehicles entering the intersection on the westbound approach of NW 156th Avenue are failing to yield the right-of-way to vehicles traveling north on CR 231.	
PROPOSED IMPROVEMENTS (LIST AND DISCUSS):	Install an intersection conflict warning system (ICWS) with post mounted signs and flashers on major road (CR 231) in advance of the intersection with loops installed on the minor approach (NW 156th Avenue).	
CRASH REDUCTION FACTORS	<u>ICWS - post mounted signs/flasher</u>	<u>0.546</u>

Enter values as #.## numbers

3. CRASH TYPE AND FREQUENCY

CRASH TYPES	NO. OF CRASHES					CRF %	PREVENTED	CRASH INFORMATION FOR FACILITY				No. Years
	2012	2013	2014	2015	2016			COST PER CRASH	CRASH CLEANUP	INTEREST (DISCOUNT) RATE	ANNUAL COST OF IMPROVEMENTS	
FATAL (K), Injury (A) - Serious								\$ 526,887.00	\$100 per year	4.0%		5
ICWS - post mounted signs/flasher					1	55%	0.55					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
INJURY (B, C)												
ICWS - post mounted signs/flasher	1					55%	0.55					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
PDO (O)												
ICWS - post mounted signs/flasher						55%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
						0%	0.00					
TOTAL CRASHES (ALL TYPES)	1	0	0	0	1							
TOTAL CRASHES TO BE PREVENTED	0.546	0	0	0	0.546		1.09					
BENEFIT												
TOTAL CRASH BENEFIT								\$ 575,360.60	CURRENT YEAR		2018	
TOTAL ANNUAL BENEFIT								\$ 115,072.12	PROJECT COMPLETION YEAR		2023	
BENEFIT/COST								4.08	NET PRESENT VALUE		\$367,984.91	

COMMENTS

A total of six crashes occurred at the intersection in the five-year period analyzed. Two of the six crashes were angle crashes caused by failure to yield right-of-way on NW 156th Avenue which are correctable with the ICWS. CMF for ICWS utilized from the Crash Modification Factors Clearinghouse, CMF ID: 8464.

Prepared By: Alexandria Morgan

Date: 5/9/2018

Approved By: *[Signature]*

Date: 5/23/19