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RSA Background

The Brooke Hancock Jefferson Metropolitan Planning Commission (BHJ MPC) along with the Cross Creek Police Department, Township Board of Trustees, and Ohio Department of Transportation conducted a Road Safety Audit (RSA) for Cadiz Road between Springdale Ave to Two Ridge Road from August 27th to August 28th. BHJ MPC selected this urban non-freeway segment based on crash vulnerable locations identified in the Jefferson County Local Road Safety Plan. Although the local safety plan ranked this location as 18th highest vehicle crash location between calendar years 2013 through 2018, this segment experienced the highest number of non-motorized fatalities and serious-injuries.

RSA Team

The RSA team included representatives from BHJ MPC, Cross Creek Township Trustees, law enforcement, and Ohio Department of Transportation (ODOT) District 11. This study took an innovative approach of reaching out residents of Cross Creek and users of this road for comment and input through Facebook, Twitter, e-mail, and local television media. This report will include those observations, recommendations, and comments.

Name	Organization	Affiliation
John C. Stasiulewicz	Cross Creek Police Department	Police Chief
Louis Vanderborn	Cross Creek Township	Trustee
Paul Cesaro	Cross Creek Township	Trustee
David A. Hoffman	Ohio Department of Transportation	Transportation Engineer
Jessica Haberley	WTOV9	News Reporter
Cody Cresap	BHJ MPC	Transportation Engineer
Michael J. Paprocki	BHJ MPC	Executive Director, BHJ MPC
Panini A. Chowdhury	BHJ MPC	Transportation Engineer

Site Characteristics

Site Characteristics (Springdale Station)	
Site Owner	Jefferson County
Corridor Type	Principal Arterial
Length	.60 Mile
Traffic Volume (ADT)	9505
Posted Speed	45 MPH
85 th Percentile Speed	44.80 MPH



Figure 1 West Bound Cadiz Road approaching towards Two Ridge Road

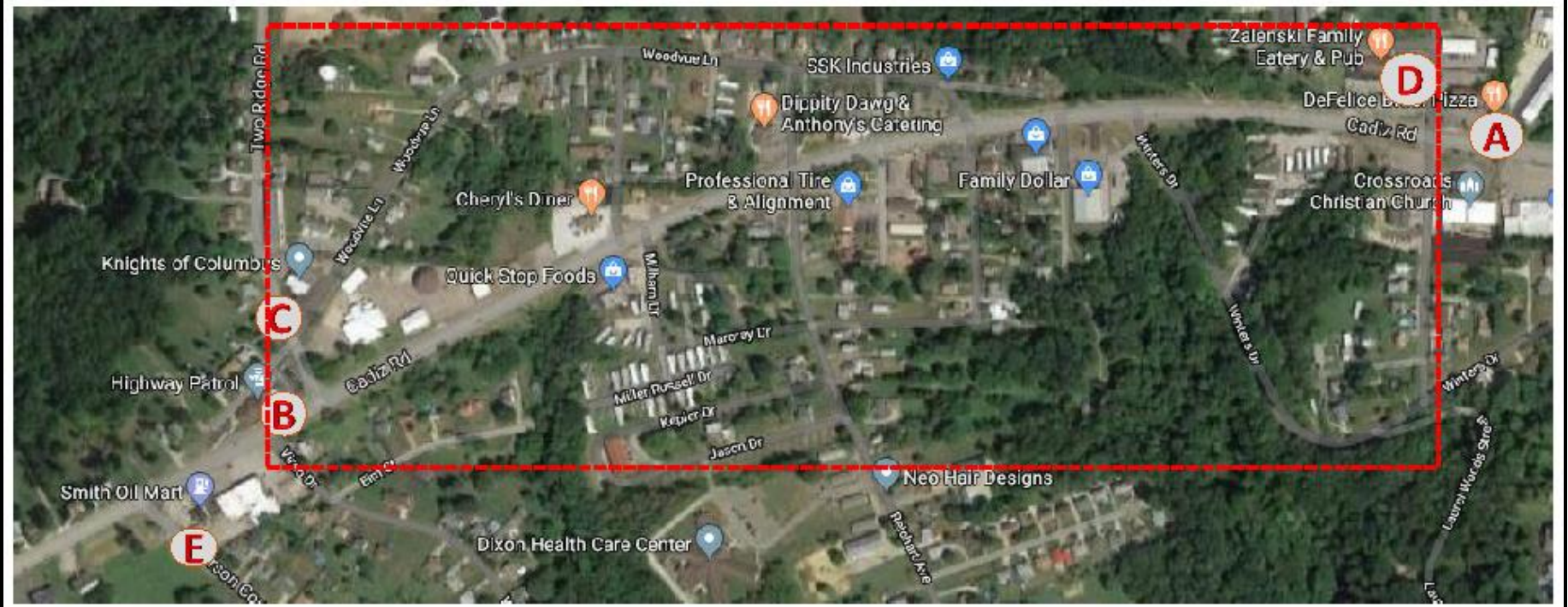
Site Characteristics (Two Ridge Station)	
Site Owner	Jefferson County
Corridor Type	Principal Arterial
Length	.60 Mile
Traffic Volume (ADT)	7302
Posted Speed	45 MPH
85 th Percentile Speed	44.70 MPH



Figure 2 East Bound Cadiz Road approaching towards Springdale Road

TRAFFIC COUNT 2019

LOCATION	NAME	VOLUME			POSTED SPEED	SPEED		
		2016	2019	CHANGE		2016	2019	CHANGE
A	CADIZ- SPRINGDALE TO PARK DR	9800	9505	-295	35	31.01	44.8	13.79
B	CADIZ-TWO RIDGE TO VIREO DR.	9360	7302	-2058	45	37.78	44.7	6.92
C	TWO RIDGE RD- CR0022A TO LONGVUE	3410	3961	551	35	38	38.33	0.33
D	SPRINGDALE AVE- SUNSET BLVD TO SR0043	N/A	1760	N/A	25	N/A	29.8	N/A
E	BANTOM RIDGE - CADIZ TO VIREO DR	4400	4672	272	35	35.4	28.2	-7.2



Pedestrian & Bike Trips

For this report, BHH MPC used Streetlight Data® to research the number of pedestrian and bicycle trips occurring on an average weekday in the study area. The data showed on average 118 pedestrian trips daily crossing Cadiz Road from one side of the road to the other. The pedestrian trip destination and origination is typically the Quick Stop Food and Cheryl's Diner (see location on previous traffic count map). On average, 18 pedestrians walk daily through this segment of Cadiz Road. There is a concrete walkway on the westbound but not on the eastbound side. Bicycle trips average three (3) per day.

Observed Crash Data (2013-18)

For a five-year period between 2013 and 2018, law enforcement recorded 53 crashes within this segment of Cadiz Road. Crash reports showed one (1) fatal and two (2) serious injury pedestrian crashes as well as twenty (20) serious injury vehicle crashes. Of the three pedestrian crashes, the pedestrian was responsible for two of the three collisions. The report for the fatal pedestrian crash stated alcohol as the contributing factor. The blood alcohol content of the pedestrian involved tested higher than the legal impaired limit. The pedestrian crash reports listed poor lighting conditions, road grade, and speed as other contributing factors. Seventeen (17) of the vehicle crashes occurred at the Cadiz Rd- Two Ridge Rd intersection. Improper left turns and failure to yield the right of way were the contributing factor for fourteen of these crashes. Overall, wet road conditions impacted 30% of the total 53 crashes.

CRASH SEVERITY

CRASH SEVERITY	Number	%
Fatal Crash	1	1.9%
Injury Crash	20	37.7%
Property Damage Crash	32	60.4%
Grand Total	53	100.0%

TRAFFIC CRASH BY YEAR

TRAFFIC CRASH BY YEAR	Number	%
2013	4	7.5%
2014	11	20.8%
2015	10	18.9%
2016	11	20.8%
2017	9	17.0%
2018	8	15.1%
Grand Total	53	100.0%

TYPE OF CRASH

TYPE OF CRASH	Number	%
Left Turn	20	37.7%
Rear End	8	15.1%
Sideswipe - Passing	7	13.2%
Right Turn	4	7.5%
Angle	4	7.5%
Pedestrian	3	5.7%
Backing	2	3.8%
Animal	2	3.8%
Head On	1	1.9%
Pedal cycles	1	1.9%
Fixed Object	1	1.9%
Grand Total	53	100.0%

WEATHER CONDITION

WEATHER CONDITION	Number	%
Clear	30	56.6%
Cloudy	14	26.4%
Rain	7	13.2%
Snow	2	3.8%
Grand Total	53	100.0%

ROAD CONDITION

ROAD CONDITION	Number	%
Dry	37	69.8%
Wet	15	28.3%
Snow	1	1.9%
Grand Total	53	100.0%

LIGHT CONDITION

LIGHT CONDITION	Number	%
Daylight	38	71.7%
Dark - Roadway Not Lighted	8	15.1%
Dark - Lighted Roadway	4	7.5%
Dawn	2	3.8%
Dusk	1	1.9%
Grand Total	53	100.0%

LOCATION

LOCATION	Number	%
T-Intersection	25	47.2%
Four-Way Intersection	13	24.5%
Not an Intersection	12	22.6%
Driveway/Alley Access	3	5.7%
Grand Total	53	100.0%

TYPE OF CRASH AND YEARLY DISTRIBUTIONS

TYPE OF CRASH	CRASH SEVERITY	TRAFFIC CRASH YEAR	NUMBER OF CRASHES
Pedestrian	Injury Crash	2013	1
		2018	1
	Fatal Crash	2013	1
Pedestrian Total			3
Left Turn	Injury Crash	2014	2
		2015	1
		2016	2
		2017	2
		2018	2
	Property Damage Crash	2013	1
		2014	4
		2015	1
		2016	1
		2017	2
		2018	2
Left Turn Total			20
Fixed Object	Property Damage Crash	2013	1
Fixed Object Total			1
Head On	Injury Crash	2014	1
Head on Total			1
Rear End	Injury Crash	2015	2
	Property Damage Crash	2014	2
		2015	1
		2017	2
		2018	1
Rear End Total			8

TYPE OF CRASH	CRASH SEVERITY	TRAFFIC CRASH YEAR	NUMBER OF CRASHES
Angle	Injury Crash	2014	1
		2015	1
	Property Damage Crash	2016	1
		2018	1
Angle Total			4
Right Turn	Injury Crash	2014	1
		2016	1
	Property Damage Crash	2016	1
		2017	1
Right Turn Total			4
Sideswipe - Passing	Injury Crash	2016	1
	Property Damage Crash	2015	3
		2016	2
		2017	1
Sideswipe - Passing Total			7
Animal	Property Damage Crash	2015	1
		2016	1
Animal Total			2
Backing	Property Damage Crash	2016	1
		2018	1
Backing Total			2
Pedalcycles	Injury Crash	2017	1
Pedal cycles Total			1
Grand Total			53

ACTION

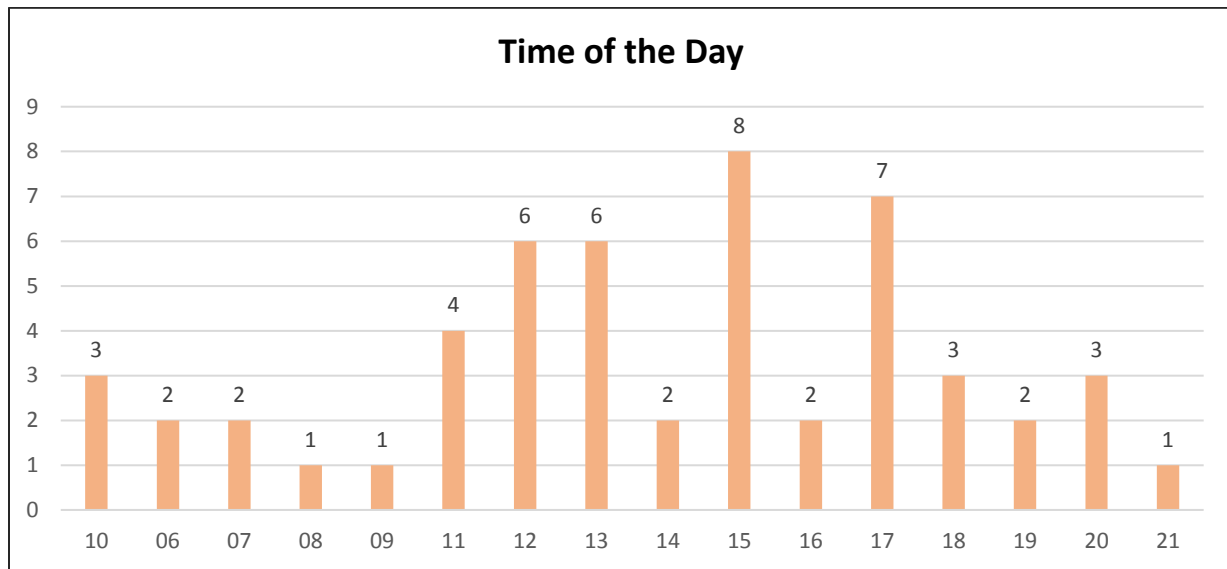
ACTION	Number	%
Making Left Turn	20	37.7%
Straight Ahead	18	34.0%
Changing Lanes	6	11.3%
Entering Traffic Lane	3	5.7%
Backing	2	3.8%
Making Right Turn	2	3.8%
Walking, Running, Jogging, Playing, Cycling	2	3.8%
Grand Total	53	100.0%

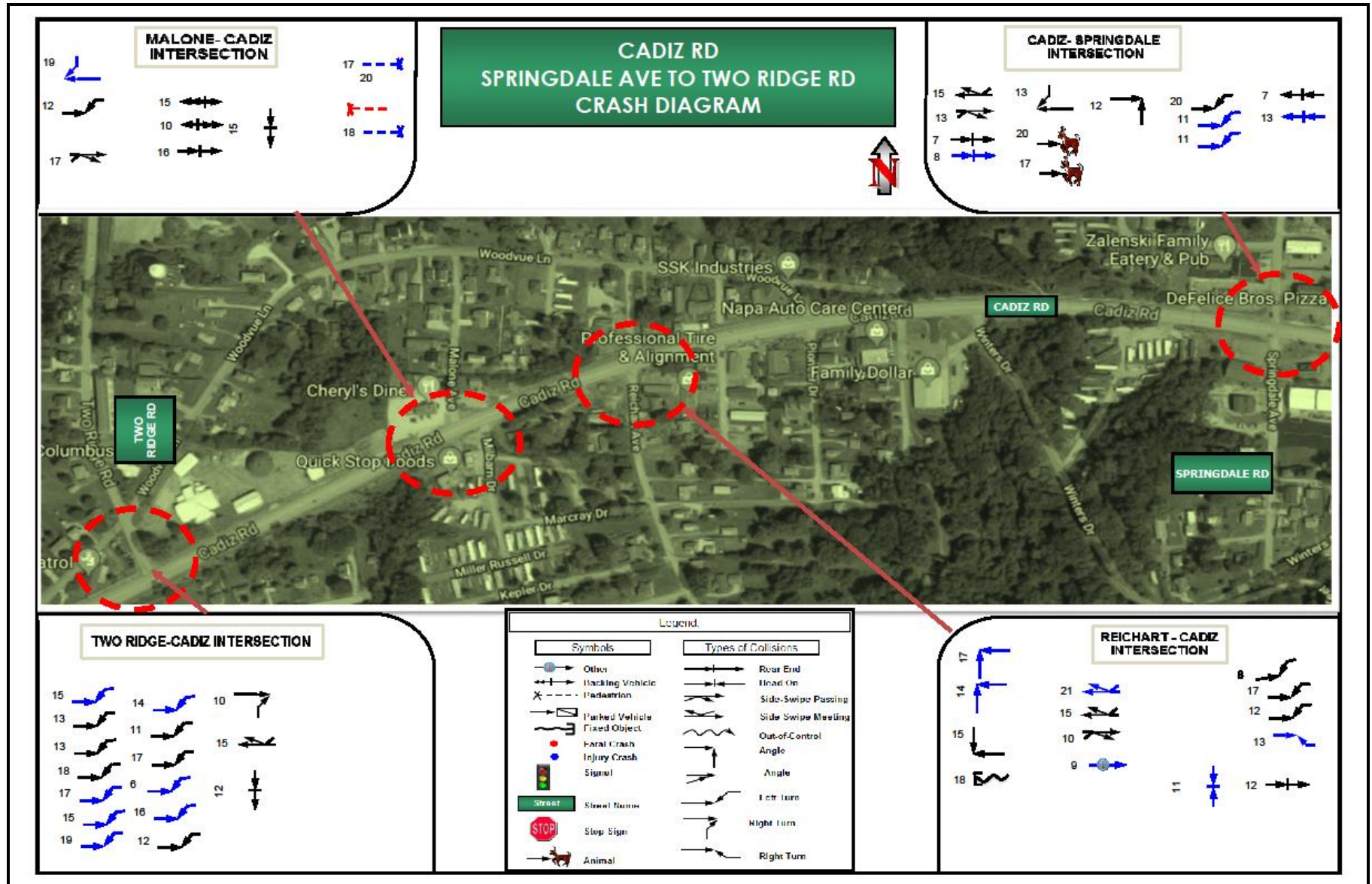
CONTRIBUTING FACTOR

CONTRIBUTING FACTOR	Number	%
Failure to Yield	25	47.2%
Followed too Closely/ACDA	8	15.1%
Improper Lane Change/Passing/Off-road	5	9.4%
None-Motorist	4	7.5%
Failure To Yield Right Of Way	2	3.8%
Improper Backing	2	3.8%
Ran Red Light	2	3.8%
Improper Turn	2	3.8%
Swerving to Avoid	1	1.9%
Ran Stop Sign	1	1.9%
Failure to Control	1	1.9%
Grand Total	53	100.0%

SUBSTANCE ABUSE


SUBSTANCE ABUSE	Number	%
No	51	96.2%
Yes	2	3.8%
Grand Total	53	100.0%










Existing Condition of the Study area In Picture


Positive Features

Features	Picture
1. Sidewalk ramp	



Features	Picture
2. Walkway on westbound.	


Features	Picture
3. Crosswalk marking on the Eastbound side of the road.	
4. Traffic Control Signs at Two Ridge Road.	


Features	Picture
<p>5. Presence of Lane markers and median left turn lane with overhead sign.</p>	
<p>6. Presence of Guardrails.</p>	

Features	Picture
<p>7. Signalized Traffic Control Springdale Ave – Cadiz Rd Intersection.</p>	


Negative Features


Features	Pictures
<p>1. Stop-controlled Intersection at Two Ridge and Cadiz roads. Area of concern for multiple left turn crashes turning from Two Ridge to Cadiz Road.</p>	
<p>2. No marked Crosswalk. All the pedestrian crashes took place at this Malone Ave-Cadiz Rd intersection.</p>	

Features	Pictures
<p>3. Limited sight distance due to horizontal and vertical curves.</p>	

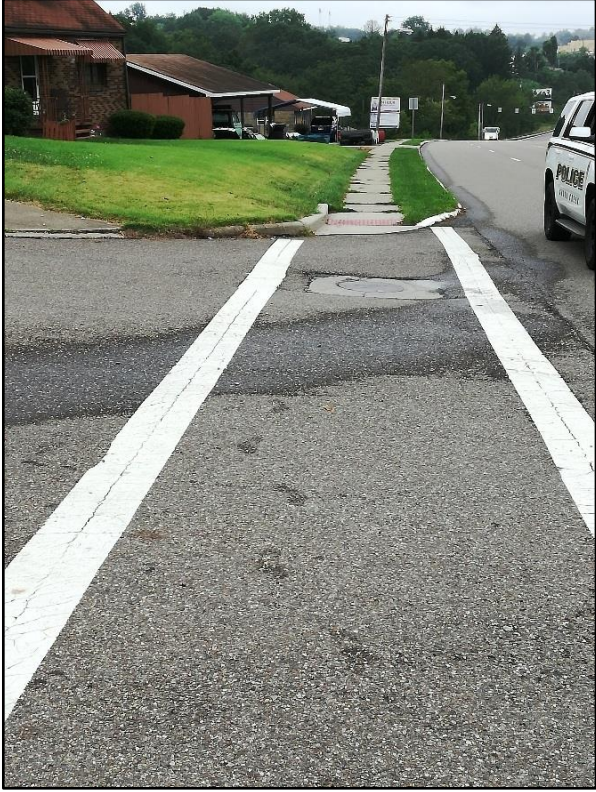
Features	Pictures
4. Antiquated Lighting System	


Features	Pictures
5. Broken curbs.	

Features	Pictures
<p>6. No Sidewalk on East bound side of the road. Evidence of pedestrian traffic walking over the grass.</p>	

Features	Pictures
<p>7. Poor sight distance due to signs, structures and, vegetation.</p>	 <p>The photograph shows a road intersection with a grassy median. On the left side of the median, there are several large signs and structures, including a white building and a red structure, which obstruct the view. The road is paved with asphalt and has yellow double lines. The background is filled with dense green trees and vegetation. The sky is overcast and grey.</p>

Features	Pictures
	
<p>8. No walkway. Pedestrians are using road shoulder on eastbound side of Cadiz Road.</p>	

Features	Pictures
9. Obstruction in crosswalk.	

Features	Pictures
10. Median turn lane with no access driveways.	

Observed Safety Issues and Prioritization

The following table organizes the observed safety issues using the GORE format, where issues correspond to Geometry, Operations, Roadway User/ Human factors and the factors related with environment. Each observed safety issue then assigned with a crash rating from “The Risk Rating Matrix” based on the frequency and severity of the issue. This rating represents the relative priority for addressing safety issues, where higher rating (E-F) indicates higher priority.

RISK RATING MATRIX:				
Frequency:	Severity:			
	Negligible:	PDO	Injury Crashes	Fatal
Frequent:	C	D	E	F
Occasional:	B	C	D	E
Rare:	A	B	C	D

Observed Safety Issues	Priority
Geometry	
Horizontal and Vertical curvature issue.	D
Sight visibility Block from signs, trees and hill sides at Reichart ave, Millbarn Dr, Pioneer dr and Winters Dr.	D
Inappropriate speed limit considering the gradient/ slope of the corridor.	E
Need access management in some of the business driveways.	C
Absence of medians and crosswalks with wide 5-lane cross section road.	E
Operation	
Dangerous left turn configurations at Two ridge-Cadiz intersection	E
Continuous and same turning lane for smith oil mart, bantam ridge road and two ridge road create head on collision risk.	D
Speed limit is not appropriate considering the slope, curve, pedestrian presence and sight distance.	E
Absence of pedestrian crosswalks.	F
Absence of lighting in different segments of the study area and poor illumination of the existing street lights.	E
Signal timing issue at Springdale-Cadiz intersection.	C
Absence of pedestrian crossing signs and approaching side road intersection sign at two ridge-Cadiz intersection. Some of the signs are not retroreflective and fading.	E
Stop line at Reichart ave, Malone and Pioneer ave are not appropriate to see thru traffic that encourage drivers to move further inside the road and create risk for the right lane passing vehicles specially coming from the blind curves in east bound	E
Complete absence of sidewalk in Eastbound and deplorable condition on Westbound.	E
Roadway Users/ Human Factors	
Absence of Crosswalk and pedestrian crossing signs.	F
Complete absence of sidewalk in Eastbound .	E
Absence of bike lane	C
Existing sidewalks are not totally ADA compliant and need attention.	D
No Median for pedestrian crossings and holding rails for elderly.	E
School bus stop in a blind curve of west bound	D
Environment	
Dark Roadway, lack of lighting	E
Issue of sun glare in in the morning and evening period due to slope and gradients of the road segment.	C

RSA through Online Crowdsourcing

This safety audit process attempted to involve everyday road users and citizens that that reside in the Cadiz Road area. BHJ MPC and the local television news media reached out through online networking sites Facebook and Twitter. BHJ received a total of 41 comments and 2 Email

responses on different issues and solution recommendations through this approach (example available in Appendix B). Most responses align with the RSA group conclusions. Their user experience creates a better idea about the possible solutions. Appendix B is a compilation of the comments.

Top identified Safety issues

Issues	Level of Priority
Absence of Crosswalk	*****
Speed discrepancy before and after the segment	****
Distracted Driving	****
Failure to yield and ineffective stop signs	***
Poor lighting	***
Lack of Police Enforcement	***
Poor Sidewalk condition	**
Poor Road Surface Condition	*

Top Identified Recommendations

Recommended Countermeasures	Level of Priority
Traffic Signal light on Two Ridge Rd - Cadiz Rd Intersection	*****
Streetlight	****
Pedestrian Crossings	****
Sidewalks	***
Continuous Left turn lane reconfiguration	*

Note-

Highest Priority- *****

Mid High Priority- ****

Medium Priority- ***

Lower Medium Priority- **

Lowest Priority- *

Safety Issues and Recommendations

In the following chapter, the priority safety issues identified by the group and through crowdsourcing are being prioritized and then divided in Short, medium- and Long-term countermeasures. An anticipated cost is also being used to give a generalized idea about the monetary cost for these recommended countermeasures where,

Anticipated cost

\$=Low

\$\$=Medium

\$\$\$= High


Priority 1


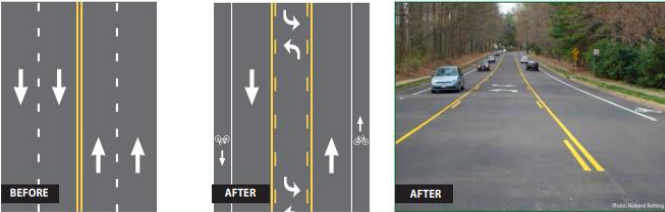

Overwhelming number of left turn crashes in Two Ridge Rd – Cadiz Rd intersection.


Observation-

The Two Ridge and Cadiz Road intersection is stop-controlled. The left turn movement from Two Ridge road to Cadiz road is a major safety concern for this road. As traffic is taking a left turn from Two Ridge, must cross 3 lanes (two thru and one turning) with west bound traffic approaching at average over 45 MPH. Drivers are unable to properly yield to oncoming traffic which may be cause for many of the left turn related crashes. Inadequate night lighting may also contribute.

Recommendations

Time Period	Recommendation	Example	Anticipated Cost
Short (<1 Year)	Reduce Speed Limit.	Perform Engineering Study to determine proper speed limit for known conditions and step up law enforcement to reduce speeding. See Appendix A for preliminary findings.	\$
	Clear intersection obstructions		\$
	Consider constructing center median turn lane at intersections.	 <p>Source- FHWA Proven Safety Countermeasures.</p>	\$

Time Period	Recommendation	Example	Anticipated Cost
	Install/maintain auxiliary and transverse pavement markings.	 <p>Source - FHWA Traffic Calming E primer</p>	\$\$
Medium (2-3 years)	Consider Road diet solutions for active transportation and traffic calming.	 <p>Example- FHWA Road Diet Case Studies Location- Reston, Virginia.</p>	\$\$
Long (4-5 Years)	Review traffic signal warrants at selected intersections.	 <p>Example- Traffic Signal with Reflective Backplate Source- Concrete Construction</p>	\$\$\$ Approximate Estimate- 125000-150,000/Per system

Time Period	Recommendation	Example	Anticipated Cost
	Construct highway lighting system	 <p>Example- Overhead LED Lighting System Source- FHWA Safety Measures guidebook</p>	<p>\$\$\$ Approximate Estimate- 30,000/Per system.</p>


Priority 2

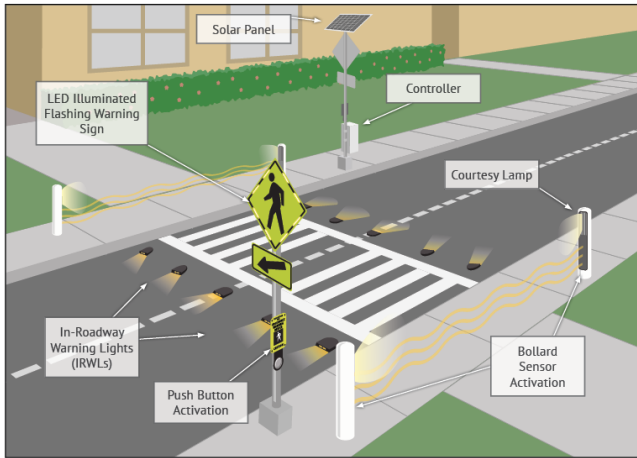

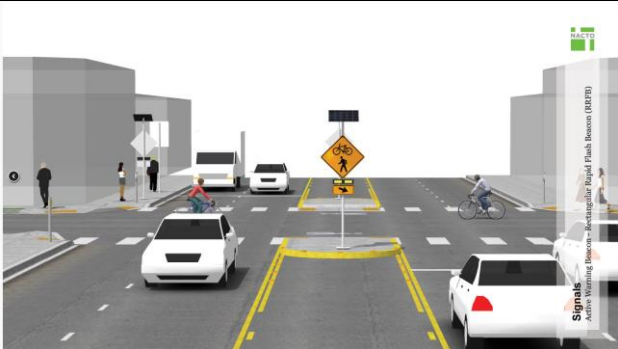
Pedestrian crosswalks near Quick Stop and sidewalk improvement.




Observation-

From 2013-18 this segment of road observed 3 pedestrian incidents where one person died and two were found seriously injured. Since there is no crosswalk in this whole road segment and there are retails, food and convenient stores and residential development on both sides of the roads, this is an urgent necessity. Due to the speed and lack of lighting at night time, it is a very hazardous location for pedestrian crossing. Moreover, these businesses are situated in a position where the vehicles are already at a high speed due to uphill grade, and the risk of severe crash goes higher.

Recommendations

Time Period	Recommendation	Example	Anticipated Cost
Short (<1 Year)	Construct Mid-Block offset pedestrian crossings with pedestrian refuge at selected locations	 <p>Source- FHWA, Pedestrian Safety measures.</p>	\$\$

Time Period	Recommendation	Example	Anticipated Cost
	Low cost lighting system like Bollard pedestrian lighting system with flashing warning light and roadway warning light installation.	 <p>Source - Smart Crosswalk System, NHI.</p>	\$\$
	Advance pedestrian crossing warning sign and yield sign with retroreflective longitudinal traverse marking.	 <p>Source- Pedestrian Safety Guide and Countermeasure Selection System, FHWA</p>	\$
Medium (2-3 years)	Rectangular Rapid Flashing Beacon (RRFB),	 <p>Source- National Association of City Transportation Officials (NACTO)</p>	\$\$

Time Period	Recommendation	Example	Anticipated Cost
Long (4-5 Years)	Sidewalk on East Bound	 <p>Source- National Association of City Transportation Officials (NACTO)</p>	\$\$\$
	Street lighting System.	 <p>Example- Overhead LED Lighting System Source- FHWA Safety Measures guidebook</p>	\$\$\$
	Ensure ADA Compliance along the sidewalks and crossings.	 <p>Source- Pedestrian Safety Guide and Countermeasure Selection System, FHWA</p>	\$\$\$


Priority 3


Lower the Speed Limit and Sight Distance.

Observation-

The current speed limit on this road is 45 MPH, but just before this segment, the speed limit is 35 MPH, which has the same roadway configuration as this study area. This stretch of road has multiple side streets and driveways that access residential and retail stores. Line of sight distance is restricted due to vegetation and business signing along with vertical and horizontal road alignment.

Recommendations

Time Period	Recommendation	Example	Anticipated Cost
Short (<1 Year)	Review speed limit.	Perform Engineering Study to determine proper speed limit for known conditions and step up law enforcement to reduce speeding. See Appendix A for preliminary findings.	\$
Medium (2-3 years)	Install Rumble Strips specially before pedestrian crossings and blind curve locations.	 <p>Source- Road Safety Toolkit</p>	\$

Time Period	Recommendation	Example	Anticipated Cost
Long (4-5 Years)	Evaluate stop sign placement at entrance roads and remove sight distance obstructions.	 <p>Source- Improving rural Intersection Safety, NACTO.</p>	\$\$



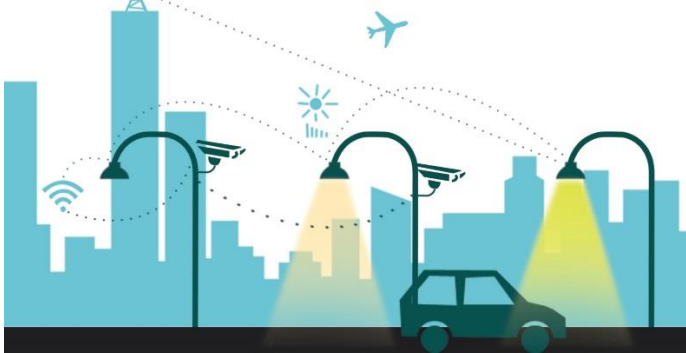
Priority 4


Poor Visibility at night due to minimal/outdated highway lighting.

Observation-

Roadway lighting condition along the corridor is poor. The existing lighting system is outdated.

Recommendations

Time Period	Recommendation	Example	Anticipated Cost
Short (<1 Year)	Low cost lighting system installation	 <p>Source- Pedestrian Low-cost cross walk lighting, PED SAFE</p>	\$
	Change the existing street light bulbs to LED	 <p>Source- Department of Energy</p>	\$
Medium (2-3 years)	Install Intelligent Street Lighting System near selected locations for pedestrian safety and crash vulnerable intersections	 <p>Source – Electrical and Power Review, Smart City</p>	\$\$\$

Time Period	Recommendation	Example	Anticipated Cost
Long (4-5 Years)	Highway Lighting Project for the entire corridor.	 <p>Source- LUX Solution</p>	\$\$\$

Appendix A

Preliminary Speed Limit Findings

USLIMITS2 Speed Zoning Report

Project Name: Road Safety Audit- Cadiz Road

Analyst: Panini Chowdhury

Date: 08-27-2019

Basic Project Information

Route Name: Cadiz Road
From: Springdale
To: Two Ridge
State: Ohio
County: Jefferson County
City: Cross Creek Township
Route Type: Road Section in Developed Area
Route Status: Existing

Crash Data Information

Crash Data Years: 6.00
Crash AADT: 9505 veh/day
Total Number of Crashes: 53
Total Number of Injury Crashes: 21
Section Crash Rate: 424 per 100 MVM
Section Injury Crash Rate: 168 per 100 MVM
Crash Rate Average for Similar Roads: 234
Injury Rate Average for Similar Roads: 70

Roadway Information

Section Length: .60 mile(s)
Statutory Speed Limit: 45 mph
Existing Speed Limit: 45 mph
Adverse Alignment: Yes
One-Way Street: No
Divided/Undivided: TWLTL
Number of Through Lanes: 4
Area Type: Commercial
Number of Driveways: 8
Number of Signals: 1

Traffic Information

85th Percentile Speed: 45 mph
50th Percentile Speed: 38 mph
AADT: 9505 veh/day
On Street Parking and Usage: Not High
Pedestrian / Bicyclist Activity: High

Project Description: Brooke Hancock Jefferson Metropolitan Planning Commission (BHH MPC) along with Cross Creek Police Department, Township board of Trustee and Ohio Department of Transportation conducted a Road Safety Audit (RSA) at the Cadiz Road between Springdale ave to Two Ridge road between august 27th to august 28th. This location is selected based on the crash vulnerable priority locations that were identified in the Jefferson County Local Road Safety Plan. This location is ranked 18th in the urban non-freeway high crash location of this region.

Recommended Speed Limit:



Note: Sections with adverse alignments may need specific 'advisory speed warnings' which may be different from the general speed limit for the section. See [Procedures for Setting Advisory Speeds on Curves](#), Publication No. FHWA-SA-11-22, June 2011, for more guidance.

Note: The section crash rate of 424 per 100 MVM is above the critical rate (309). The injury crash rate for the section of 168 per 100 MVM is above the critical rate (113). A comprehensive crash study should be undertaken to identify engineering and traffic control deficiencies and appropriate corrective actions. The speed limit should only be reduced as a last measure after all other treatments have either been tried or ruled out.

Note: The road section is in an area with high pedestrian or bicycle activity. Consider implementing engineering measures to reduce speeds before lowering the recommended speed limit. See [Engineering Countermeasures for Speed Management](#) and [PedSafe](#) for more guidance.

Disclaimer: The U.S. Government assumes no liability for the use of the information contained in this report. This report does not constitute a standard, specification, or regulation.

Appendix B

Some Snapshots of Public Opinions through online crowdsourcing



Figure 3 News of WTOV9 on RSA

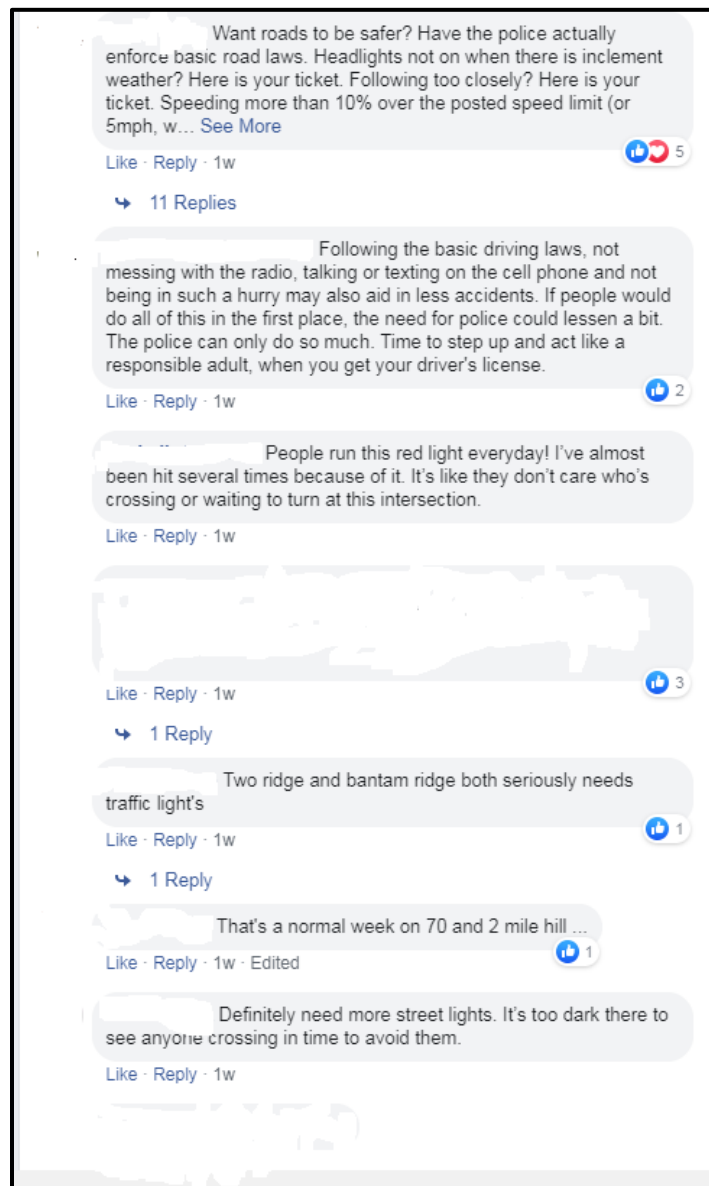


Figure 4 Selected comments from Facebook

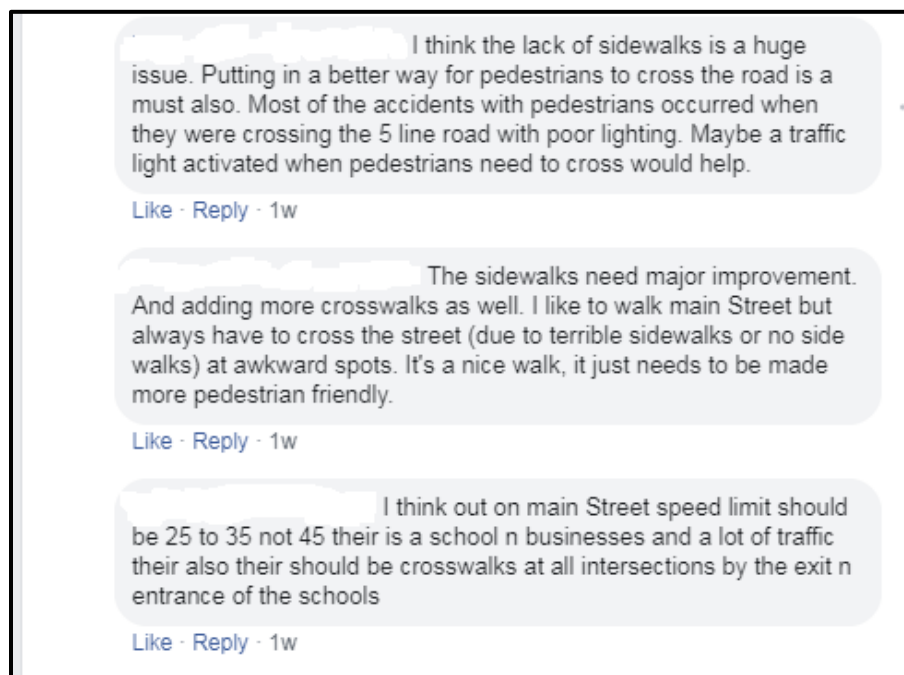


Figure 5 Selected Comments from Facebook