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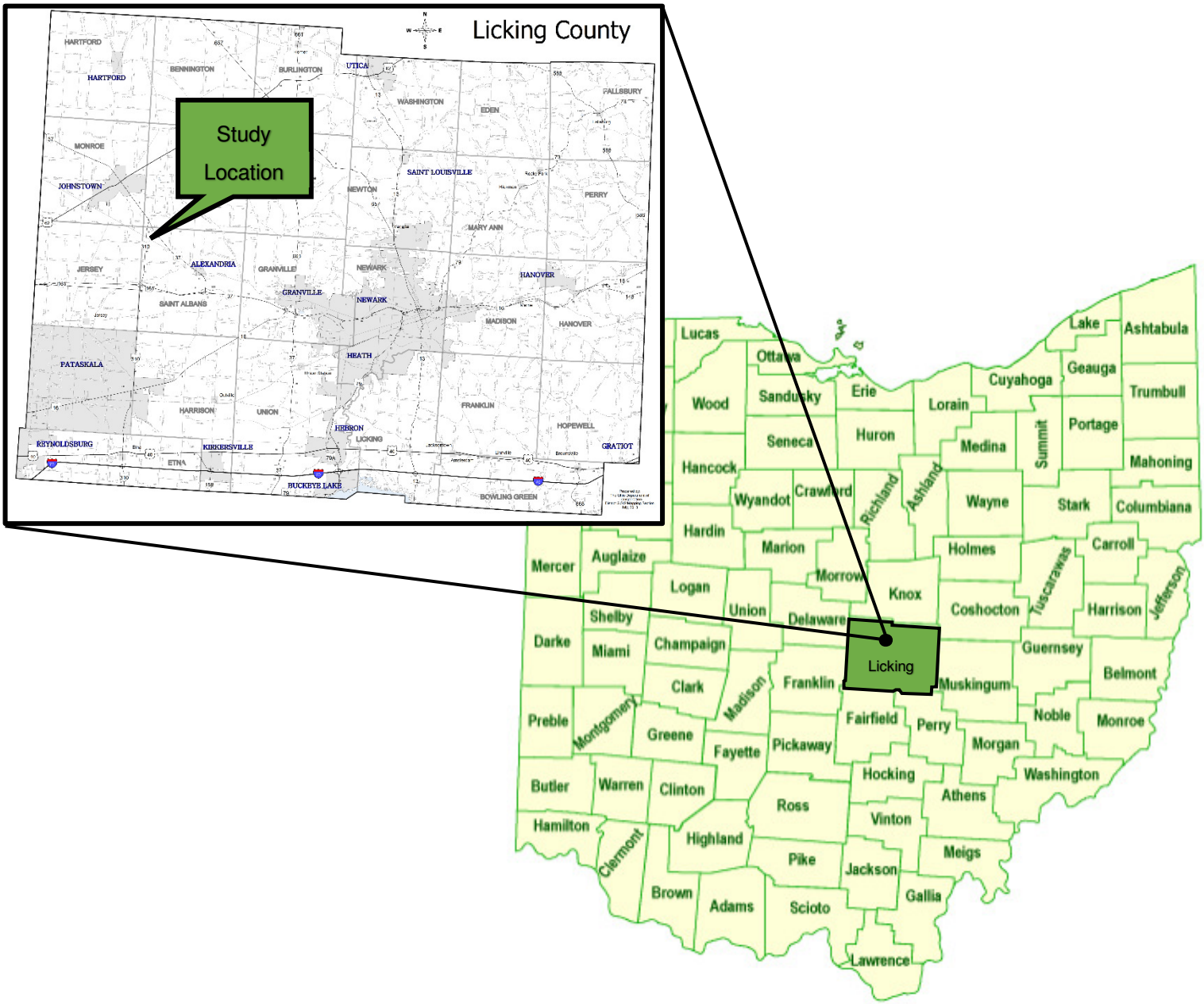
ODOT District 5 HSIP Safety Study
LIC-310-12.62 - SR 310 & Duncan Plains Road
2021 HSIP Priority List #76 Rural Intersection



Completed By: Joshua Otworth, PE

Completion Date: August 2023

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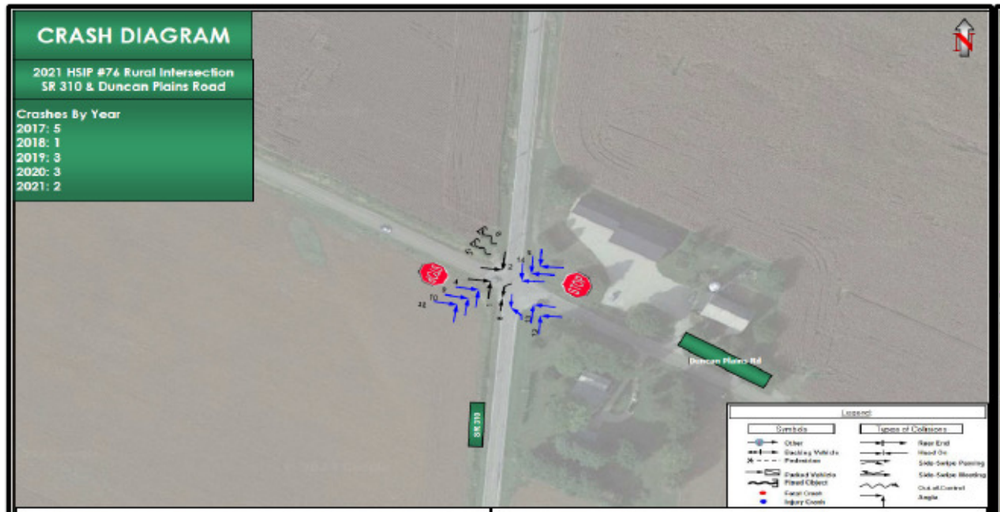
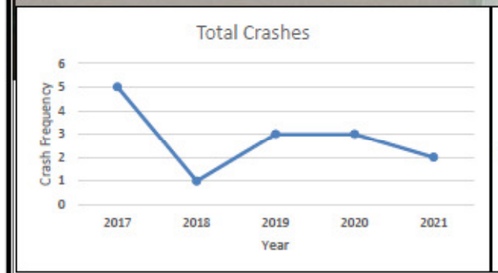
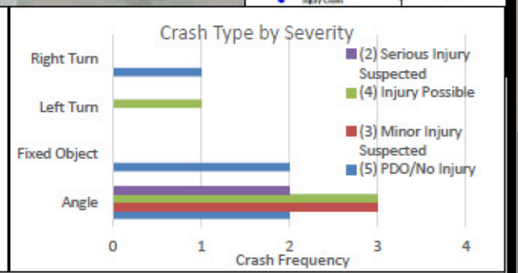
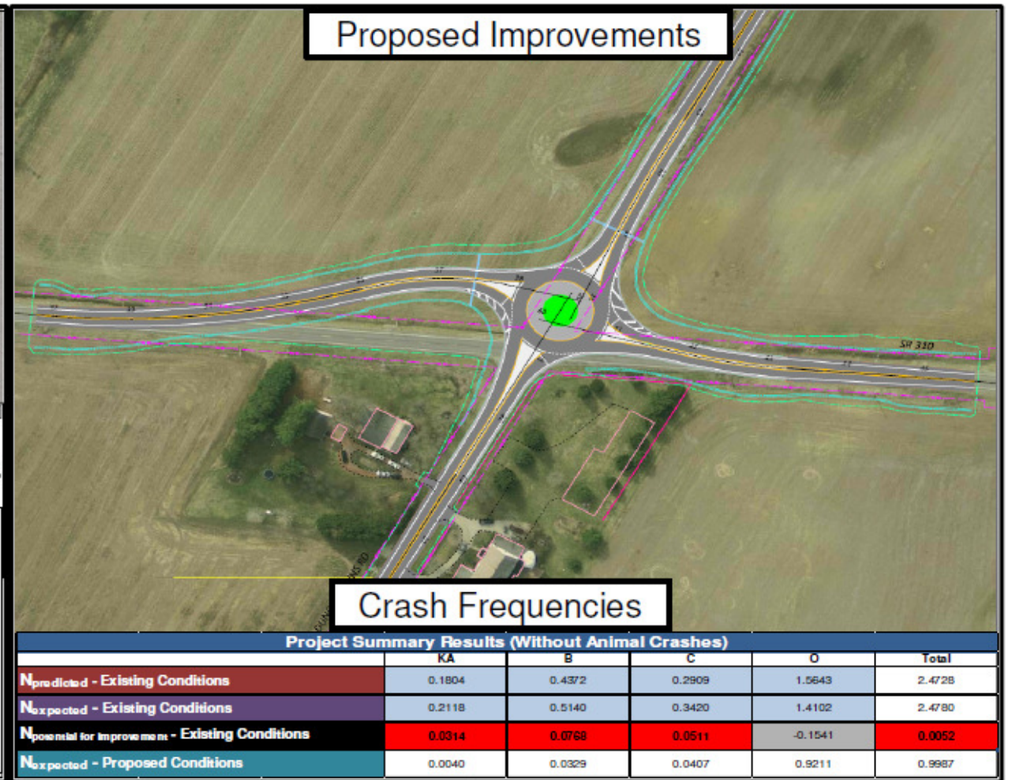
One Page Project Summary



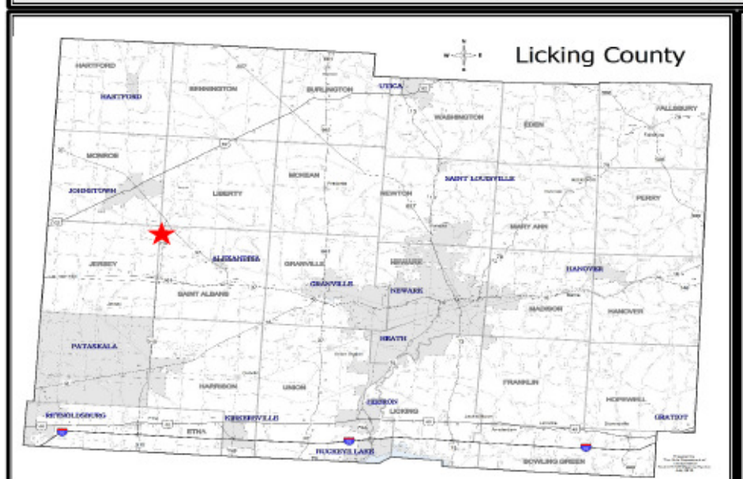






Crash Frequencies

Project Summary Results (Without Animal Crashes)					
	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1804	0.4372	0.2909	1.5643	2.4728
$N_{expected}$ - Existing Conditions	0.2118	0.5140	0.3420	1.4102	2.4780
$N_{potential\ for\ improvement}$ - Existing Conditions	0.0314	0.0768	0.0511	-0.1541	0.0052
$N_{expected}$ - Proposed Conditions	0.0040	0.0329	0.0407	0.9211	0.9987



Safety Application Score

Application Scoring			
Category	Scoring Value	Points Awarded	Points Possible
Ratio of Observed Fatal and Serious Injuries to Observed Total Crashes	0.14	28	30
Percentage of the Potential for Safety Improvement to Total Expected Crashes	0.40%	0	20
Relative Severity Index	57,780.40	20	20
Equivalent Property Damage Only Index	6.46	20	20
Location Equity Measure	7.00%	0	10
	Total	68	100

Countermeasures:

- Construct a roundabout.
- Implement intersection lighting.

Project Summary:

- Construction of roundabout. R/W acquisition and utility relocation required.

Application Request:

Design (FY 2025/26)	$600,000
R/W & Utilities (FY 2027)	$425,000
Construction (FY 2028)	$2,500,000
Total	$3,525,000

LIC-310-12.62 Safety Improvements
Intersection of SR 310 & Duncan Plains Road
ODOT District 5

OHIO DEPARTMENT OF TRANSPORTATION

Executive Summary

Purpose and Need

The following study provides an overview of the purpose and need, possible causes, recommended countermeasures, and estimated costs from a safety engineering study at the intersection of SR 310 and Duncan Plains Road (CR 33) in Saint Albans Township, Licking County. The study location is ranked the 76th Suburban Intersection on ODOT's 2021 HSIP Priority List. .

Background

The intersection of SR 310 and Duncan Plains Road is located approximately 2.5 miles southeast of the City of Johnstown, 3.5 miles northwest of the Village of Alexandria, 8 miles northeast of the City of New Albany and 8 miles northwest of the Village of Granville.

SR 310 runs north/south connecting I-70, US 40, the City of Pataskala and the City of Johnstown. Duncan Plains Road runs northwest/southeast connecting US 62 and SR 37.

SR 310 is classified as a major collector with a 2021 AADT of 3,633 vpd and 10% daily truck percentage. Duncan Plains Road is classified as a minor collector with a 2021 AADT of 1,369 vpd and 9% daily truck percentage. The regulatory speed limit on all intersection approaches is 55 mph.

Crash Data

Crash data from 2017-2021 was compiled and 14 crashes were observed within the study area. A review of the crash data shows:

- Angle crashes were the most prevalent with 10 crashes (71% of total crashes).
    - 7 of 10 Angle crashes (70%) involved northbound SR 310 vehicles.
- 9 of 14 total crashes (64%) were injury crashes.
    - There were 2 serious injury crashes – both were angle crashes.

An existing conditions safety analysis calculated the predicted average crash frequency of the intersection to be 2.47 crashes per year and the expected crash frequency to be 2.48 crashes per year.

Recommended Countermeasures and Related Costs

From 2017 to 2021, 14 crashes occurred at the intersection including 10 angle crashes with 64% of all crashes resulting in injury. A safety performance analysis of the SR 310 & Duncan Plains Road intersection calculated expected crash frequency with existing site conditions as 2.48 crashes per year.

Converting the intersection to a roundabout would eliminate conflict points while also providing traffic capacity improvements. Roundabouts significantly reduce injury crash frequency and provide traffic capacity comparable to, if not better than, signalized intersections. The roundabout alternative would require right-of-way acquisition and utility relocation. The proposed expected crash frequency is 1.00 crashes per year with an expected reduction of 1.48 crashes per year. The estimated final construction cost (including right-of-way acquisition, utility relocation, design and construction) for the roundabout alternative is $3,525,000.

Purpose and Need

The following study provides an overview of the purpose and need, possible causes, recommended countermeasures, and estimated costs from a safety engineering study at the intersection of SR 310 and Duncan Plains Road (CR 33) in Saint Albans Township, Licking County. The purpose of this safety study is to evaluate the safety conditions at the intersection and determine crash countermeasures which will mitigate crash frequency and severity. The study location is ranked the 76th Rural Intersection on ODOT's 2021 HSIP Priority List.

Existing Conditions

The intersection of SR 310 and Duncan Plains Road is located approximately:

- 2.5 miles southeast of the City of Johnstown
- 3.5 miles northwest of the Village of Alexandria
- 8 miles northeast of the City of New Albany
- 8 miles northwest of the Village of Granville

SR 310 runs north/south connecting I-70, US 40, the City of Pataskala and the City of Johnstown. Duncan Plains Road runs northwest/southeast connecting US 62 and SR 37.

SR 310 is classified as a major collector with a 2021 AADT of 3,633 vpd and 10% daily truck percentage. Duncan Plains Road is classified as a minor collector with a 2021 AADT of 1,369 vpd and 9% daily truck percentage. The regulatory speed limit on all intersection approaches is 55 mph.

Figure 1: SR 310 & Duncan Plains Road intersection (looking southeast)

The SR 310 and Duncan Plains Road intersection has four legs with each approach having two travel lanes (one shared through-left-right lane and one receiving lane). The traffic control at the intersection

is stop control on the minor road approaches (Duncan Plains Road). There is no existing roadway lighting. Duncan Plains Road intersects SR 310 at an approximate 25-degree skew.

SR 310 has 11-feet lanes with 1-foot unpaved shoulders. SR 310 approaches have Intersection Ahead warning signs. Duncan Plains Road has 10-feet lanes with 1-foot unpaved shoulders. Duncan Plains Road approaches have STOP signs and dual STOP AHEAD warning signs. Roadside objects and hazards adjacent to both roads include ditches, trees and utility poles. Adjacent land use within the study area is primarily residential and agricultural. The existing conditions diagram are presented in **Appendix A**.

Crash Data

Crash Data Summary

Crash data from 2017-2021 was compiled and 14 crashes were observed within the study area. The following tables provide an overview of the crash data:

Table 1: Crashes observed by year

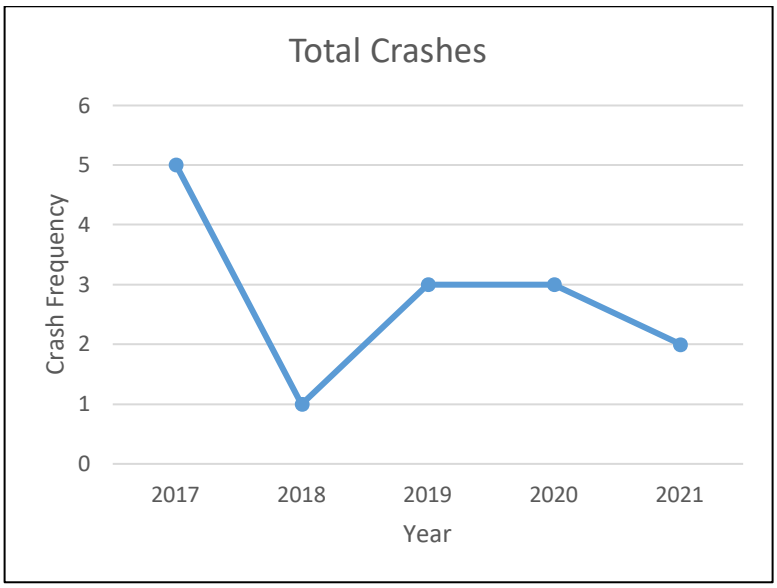
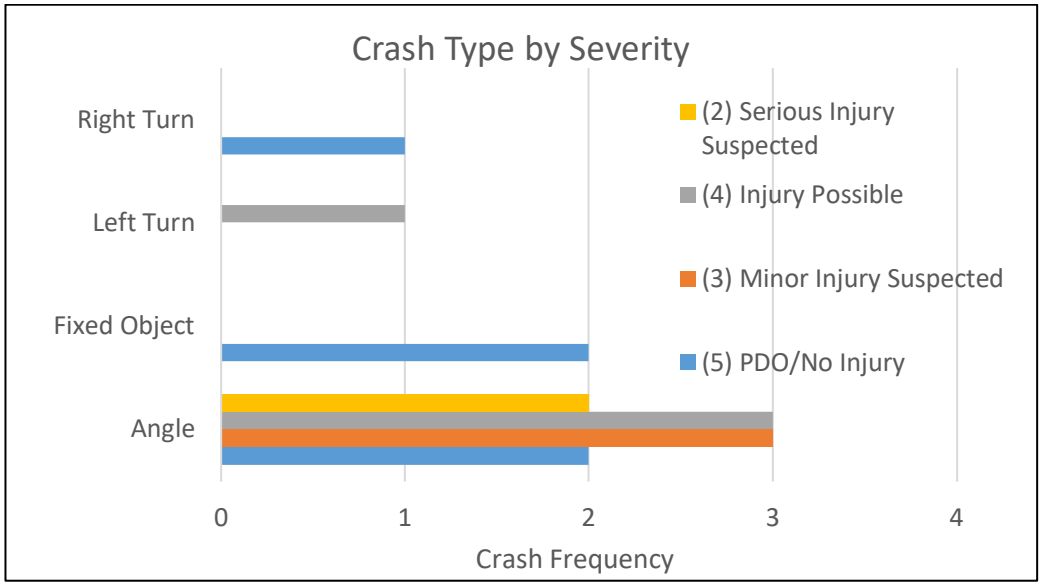


Table 2: Crashes observed by type and severity



A complete analysis of the crash data and crash diagram showing the location and severity of each accident can be found in **Appendix B**.

Crash Analysis

A review of the crash data shows:

- Angle crashes were the most prevalent with 10 crashes (71% of total crashes).
  - 7 of 10 Angle crashes (70%) involved northbound SR 310 vehicles.
- 9 of 14 total crashes (64%) were injury crashes.
  - There were 2 serious injury crashes – both were angle crashes.
- Failure to yield was the primary crash contributing factor in 64% of crashes.

An existing conditions safety analysis calculated the predicted average crash frequency of the intersection to be 2.47 crashes per year and the expected crash frequency to be 2.48 crashes per year.

Figure 2: SR 310 & Duncan Plains Road intersection (looking south)

Other Traffic Analysis

An intersection turning movement count was performed on April 18th, 2023. Signal warrant analysis was conducted using guidance from the OMUTCD Chapter 4C and Traffic Engineering Manual Section 402-3. The analysis determined the intersection does not meets any traffic signal warrants. The signal warrant analysis summary is presented in **Appendix F**.

The following traffic operations were analyzed using 2023 peak hour count data and linearly-grown 2028/2048 peak hour traffic volumes:

- Two-Way Stop Control (No Build)
- Modern Roundabout

Due to the nearby Intel plant development expected impact on traffic volumes, linear growth rates were produced and provided by MORPC for the study intersection. Linear growth rates were applied to turn movement volumes as follows:

- Duncan Plains Road east of SR 310 – 2.80%
- SR 310 north of Duncan Plains Road – 1.60%
- Duncan Plains Road west of SR 310 – 2.70%
- SR 310 south of Duncan Plains Road – 1.20%

The roundabout alternative results in traffic operations with LOS A in the opening and design years. **Table 3** below shows a summary of the HCS analysis for each of the alternatives. The HCS reports for each analyzed condition and MORPC growth rates documentation can be found in **Appendix F**.

Table 3: Capacity Analysis Summary

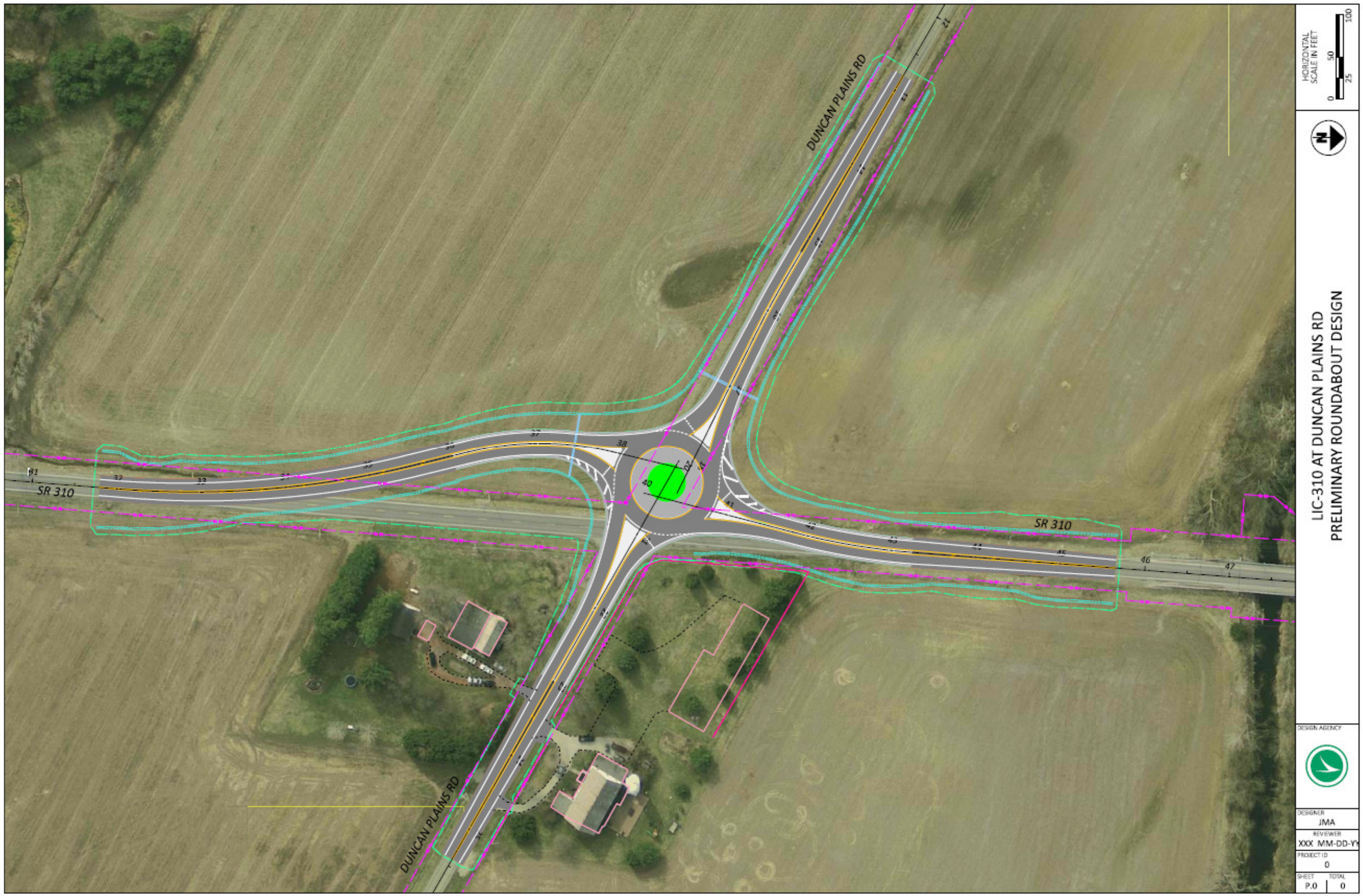
Traffic Control Condition	Approach LOS & Delay (s/veh)				Intersection LOS & Delay (s/veh)
	EB	WB	NB	SB	
Two-Way Stop (TWSC) - 2023	B (11.8)	B (13.1)	-	-	-
TWSC (No Build) - 2028	B (12.3)	B (13.6)	-	-	-
Roundabout - 2028	A (4.1)	A (4.1)	A (4.8)	A (4.0)	A (4.4)
TWSC (No Build) - 2048	C (15.2)	C (16.3)	-	-	-
Roundabout - 2048	A (4.7)	A (4.6)	A (5.4)	A (4.4)	A (5.0)

Identification of Potential Countermeasures

Short-term crash countermeasures (signage improvements) have been implemented in the past. Long-term countermeasures could include:

- Left turn lane widening
- Constructing a roundabout
- Installing intersection lighting

Proposed Conditions Diagram



Proposed Countermeasure Evaluation

Signalization and Left Turn Lane Widening

SR 310 left turn lane widening would remove left-turning vehicles from through-traffic stream reducing crash frequency and improving ease of driver gap judgements. Traffic signalization would provide LED signal heads with reflectorized backplates (proven crash countermeasures) and RADAR vehicle detection. Traffic signal timing and/or phasing providing yellow and red clearance intervals per the latest NCHRP guidance will optimize traffic operations and safety while mitigating red light running. The proposed widening would require right-of-way acquisition and utility relocation.

A signalization and left turn lane widening alternative was not formally evaluated because the intersection does not meet traffic signal warrants and the benefit cost ratio for such improvements are not sufficient to justify the alternative's cost.

Roundabout

Converting the intersection to a roundabout would eliminate conflict points while also providing traffic capacity improvements. Roundabouts significantly reduce injury crash frequency and provide traffic capacity comparable to, if not better than, signalized intersections.

The Office of Roadway Engineering assisted with preliminary engineering for a roundabout alternative at the study intersection. During design, District 5 will evaluate design layout's which will mitigate MOT costs by relocating the intersection outside of the existing SR 310 footprint. But, at this time, the expected MOT alternatives are a full closure with detour *or* maintaining traffic via temporary pavement. While a MOT plan has not been evaluated or selected, district staff wish to include costs to cover the more expensive MOT alternative of maintaining traffic during construction. An additional $500,000 is included in the project cost estimate beyond the Roadway Engineering $30,000 MOT estimate (assumed to cover the cost of the full closure with detour). Note a larger inflation adjustment was also used due to the expected construction year having a 6 year horizon (2029) - not 2 years as shown in the Roadway Engineering construction estimate.

The roundabout alternative will require right-of-way acquisition and utility relocation. The estimated final construction cost (including right-of-way acquisition, utility relocation, design and construction) for the roundabout alternative is $3,525,000. This alternative has a proposed expected crash frequency is 1.00 crashes per year with an expected decrease of 1.48 crashes per year. The net present value of safety benefits was found to be $2,040,299 and with a safety benefit-cost ratio of 0.58.

Cost estimates are in **Appendix C**, ECAT safety analysis is in **Appendix D and** the proposed condition diagrams are in **Appendix E**.

Conclusions

From 2017 to 2021, 14 crashes occurred at the intersection including 10 angle crashes with 64% of all crashes resulting in injury. A safety performance analysis of the SR 310 & Duncan Plains Road intersection calculated expected crash frequency with existing site conditions as 2.48 crashes per year.

ODOT District 5 has chosen a modern roundabout as the preferred alternative. Converting the intersection to a roundabout would eliminate conflict points while also providing traffic capacity improvements. Roundabouts significantly reduce injury crash frequency and provide traffic capacity comparable to, if not better than, signalized intersections.

The roundabout alternative would require right-of-way acquisition and utility relocation. The proposed expected crash frequency is 1.00 crashes per year with an expected reduction of 1.48 crashes per year. The estimated final construction cost (including right-of-way acquisition, utility relocation, design and construction) for the roundabout alternative is $3,525,000.

Implementation Plan

Design and other project development services for the preferred countermeasure alternative will need to be performed via consultant services. The estimated start of construction for the project is FY2029.

Appendix A: Existing Conditions Diagram

I:\Planning\Safety\Safety Studies\2023 Safety Studies\LIC-310 & Duncan Plains Rd\Existing Condition - LIC-310 & Duncan Plains.dgn Sheet 4/12/2023 2:37:57 PM Jotworth

LIC-310-12.62

LIC-310 & DUNCAN PLAINS ROAD
EXISTING CONDITIONS

CALCULATED XXX
CHECKED XXX

0 75
37.5 150
HORIZONTAL SCALE IN FEET

N

Appendix B: Crash Data & Crash Diagram

LIC-310 & Duncan Plains Rd

Crash Summary Sheet

Fatalities	0
Serious Injuries	2
Other Injuries	14

Crashes Per Year	2.80
Fatal and All Injury Crashes	9
Percent Injury	64.3%
Equivalent PDO Index Value	9.49

Crash Severity	Crashes	%
(2) Serious Injury Suspected	2	14.29%
(3) Minor Injury Suspected	3	21.43%
(4) Injury Possible	4	28.57%
(5) PDO/No Injury	5	35.71%
Grand Total	14	100.00%

Year	Crashes	%
2017	5	35.71%
2018	1	7.14%
2019	3	21.43%
2020	3	21.43%
2021	2	14.29%
Grand Total	14	100.00%

Day of Week	Crashes	%
(1) Sunday	1	7.14%
(2) Monday	1	7.14%
(3) Tuesday	2	14.29%
(4) Wednesday	3	21.43%
(5) Thursday	2	14.29%
(6) Friday	3	21.43%
(7) Saturday	2	14.29%
Grand Total	14	100.00%

Crash Type	Crashes	%
Angle	10	71.43%
Fixed Object	2	14.29%
Right Turn	1	7.14%
Left Turn	1	7.14%
Grand Total	14	100.00%

Hour of Day	Crashes	%
7	1	7.14%
8	3	21.43%
10	2	14.29%
11	1	7.14%
13	2	14.29%
15	2	14.29%
16	1	7.14%
18	1	7.14%
20	1	7.14%
Grand Total	14	100.00%

Month	Crashes	%
1	3	21.43%
2	1	7.14%
4	1	7.14%
7	2	14.29%
8	1	7.14%
9	1	7.14%
10	1	7.14%
11	2	14.29%
12	2	14.29%
Grand Total	14	100.00%

LIC-310 & Duncan Plains Rd

Crash Summary Sheet

Weather Condition	Crashes	%
Clear	9	64.29%
Cloudy	4	28.57%
Rain	1	7.14%
Grand Total	14	100.00%

Road Condition	Crashes	%
Dry	13	92.86%
Wet	1	7.14%
Grand Total	14	100.00%

Light Condition	Crashes	%
Daylight	11	78.57%
Dark - Roadway Not Lighted	2	14.29%
Dawn/Dusk	1	7.14%
Grand Total	14	100.00%

Number of Units	Crashes	%
2	10	71.43%
1	3	21.43%
3	1	7.14%
Grand Total	14	100.00%

ODOT Location	Crashes	%
Four-Way Intersection	14	100.00%
Grand Total	14	100.00%

Work Zone Related	Crashes	%
No	14	100.00%
Grand Total	14	100.00%

Alcohol Related	Crashes	%
No	14	100.00%
Grand Total	14	100.00%

Drug Related (Inc. Marijuana)	Crashes	%
No	14	100.00%
Grand Total	14	100.00%

Contour	Crashes	%
Straight Grade	4	28.57%
Straight Level	10	71.43%
Grand Total	14	100.00%

Marijuana Related	Crashes	%
No	14	100.00%
Grand Total	14	100.00%

Roadway Departure	Crashes	%
No	11	78.57%
Yes	3	21.43%
Grand Total	14	100.00%

Older Driver (65+)	Crashes	%
No	9	64.29%
Yes	5	35.71%
Grand Total	14	100.00%

Intersection Related	Crashes	%
Yes	13	92.86%
No	1	7.14%
Grand Total	14	100.00%

Young Driver (15-25)	Crashes	%
No	10	71.43%
Yes	4	28.57%
Grand Total	14	100.00%

Speed Related	Crashes	%
No	13	92.86%
Yes	1	7.14%
Grand Total	14	100.00%

Motorcycle Involved	Crashes	%
No	14	100.00%
Grand Total	14	100.00%

LIC-310 & Duncan Plains Rd

Crash Summary Sheet

Unit 1 Summary

Unit 1 Pre-Crash Action	Crashes	%
Straight Ahead	9	64.29%
Making Left Turn	2	14.29%
Other / Unknown	1	7.14%
Entering Traffic Lane	1	7.14%
Making Right Turn	1	7.14%
Grand Total	14	100.00%

Unit 1 Contributing Factor	Crashes	%
Failure to Yield	9	64.29%
Ran Stop Sign	2	14.29%
Improper Turn	1	7.14%
Drove off Road	1	7.14%
Improper Lane Change	1	7.14%
Grand Total	14	100.00%

Unit 1 Object Struck	Crashes	%
Ditch	5	35.71%
Nothing Struck	5	35.71%
Fence	2	14.29%
Tree	1	7.14%
Embankment	1	7.14%
Grand Total	14	100.00%

Unit 1 Traffic Control	Crashes	%
Stop Sign	8	57.14%
No Control	6	42.86%
Grand Total	14	100.00%

Unit 1 Posted Speed	Crashes	%
55	14	100.00%
Grand Total	14	100.00%

Unit 1 Direction From	Crashes	%
East	4	28.57%
South	3	21.43%
West	3	21.43%
Northwest	2	14.29%
North	1	7.14%
Southeast	1	7.14%
Grand Total	14	100.00%

Unit 1 Direction To	Crashes	%
West	7	50.00%
East	3	21.43%
Southeast	2	14.29%
North	1	7.14%
Northwest	1	7.14%
Grand Total	14	100.00%

LIC-310 & Duncan Plains Rd

Crash Summary Sheet

Unit 1 Summary

Unit 1 Type	Crashes	%
Passenger Car	6	42.86%
Sport Utility Vehicle	4	28.57%
Pick up	3	21.43%
Passenger Van (minivan)	1	7.14%
Grand Total	14	100.00%

Unit 1 Special Function	Crashes	%
None	14	100.00%
Grand Total	14	100.00%

LIC-310 & Duncan Plains Rd
Crash Summary Sheet

Unit 2 Summary

Unit 2 Pre-Crash Action	Crashes	%
Straight Ahead	11	78.57%
	3	21.43%
Grand Total	14	100.00%

Unit 2 Contributing Factor	Crashes	%
None	11	78.57%
	3	21.43%
Grand Total	14	100.00%

Unit 2 Direction From	Crashes	%
	3	21.43%
North	5	35.71%
South	6	42.86%
Grand Total	14	100.00%

Unit 2 Direction To	Crashes	%
	3	21.43%
North	6	42.86%
South	5	35.71%
Grand Total	14	100.00%

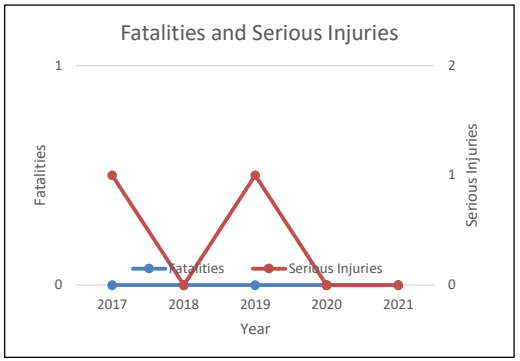
Unit 2 Type	Crashes	%
Pick up	3	21.43%
Sport Utility Vehicle	3	21.43%
Passenger Car	3	21.43%
	3	21.43%
Semi-Tractor	1	7.14%
Passenger Van (minivan)	1	7.14%
Grand Total	14	100.00%

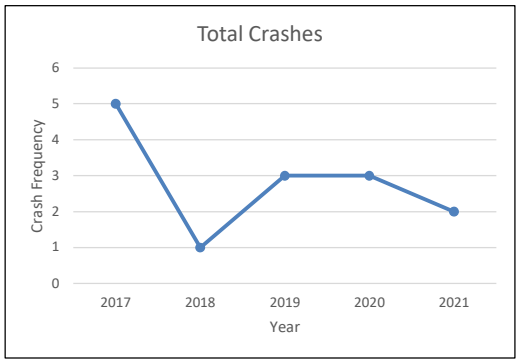
Unit 2 Special Function	Crashes	%
None	11	78.57%
	3	21.43%
Grand Total	14	100.00%

LIC-310 & Duncan Plains Rd
Crash Summary Sheet

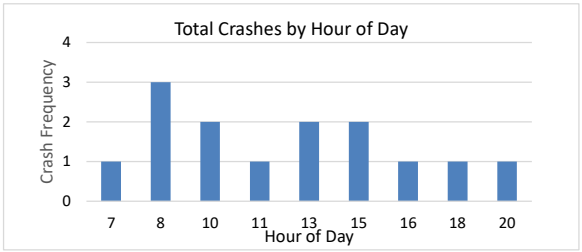
Crashes Per Year	2.80	Percent Injury	64.3%	EPDO	9.49

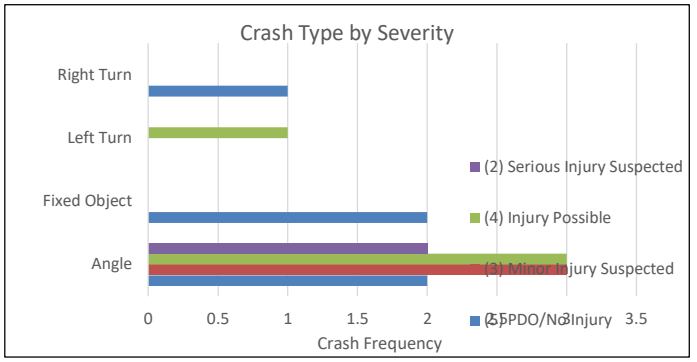
Year	Total Crashes	Fatalities	Serious Injuries
2017	5	0	1
2018	1	0	0
2019	3	0	1
2020	3	0	0
2021	2	0	0
Grand Total	14	0	2





Total Crashes Crash Type	Injury Level (2) Serious Inju	(3) Minor Injury	(4) Injury Possi	(5) PDO/No Inj	Grand Total
Angle	2	3	3	2	10
Fixed Object	0	0	0	2	2
Right Turn	0	0	0	1	1
Left Turn	0	0	1	0	1
Grand Total	2	3	4	5	14





LIC-310 & Duncan Plains Rd
Crash Summary Sheet

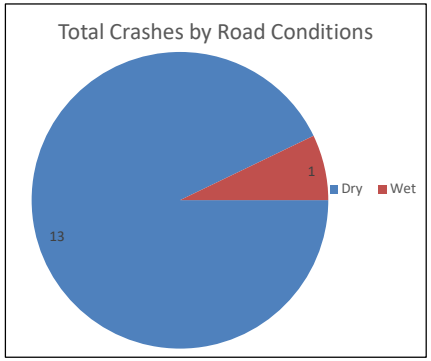
Crashes Per Year	2.80	Percent Injury	64.3%	EPDO	9.49

Road Condition	Total Crashes	Fatalities	Serious Injuries
Dry	13	0	2
Wet	1	0	0
Grand Total	14	0	2

Hour of Day	Total Crashes
7	1
8	3
10	2
11	1
13	2
15	2
16	1
18	1
20	1
Grand Total	14

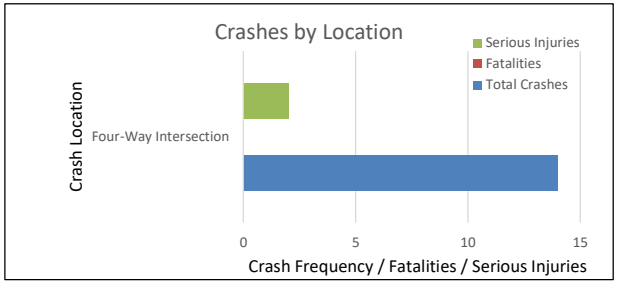
Month	Total Crashes
January	3
February	1
April	1
July	2
August	1
September	1
October	1
November	2
December	2
Grand Total	14

Weather	Total Crashes	Fatalities	Serious Injuries
Clear	9	0	1
Cloudy	4	0	1
Rain	1	0	0
Grand Total	14	0	2

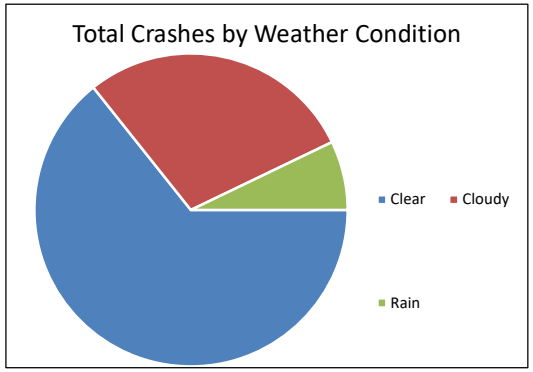


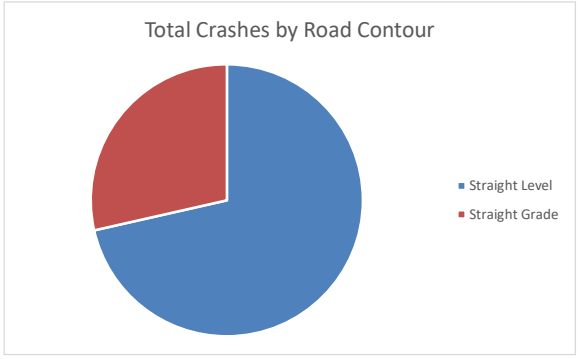
Day in Week	Total Crashes
(1) Sunday	1
(2) Monday	1
(3) Tuesday	2
(4) Wednesday	3
(5) Thursday	2
(6) Friday	3
(7) Saturday	2
Grand Total	14

Crash Location	Total Crashes	Fatalities	Serious Injuries
Four-Way Intersection	14	0	2
Grand Total	14	0	2



Roadway Contour	Total Crashes	Fatalities	Serious Injuries
Straight Level	10	0	1
Straight Grade	4	0	1
Grand Total	14	0	2

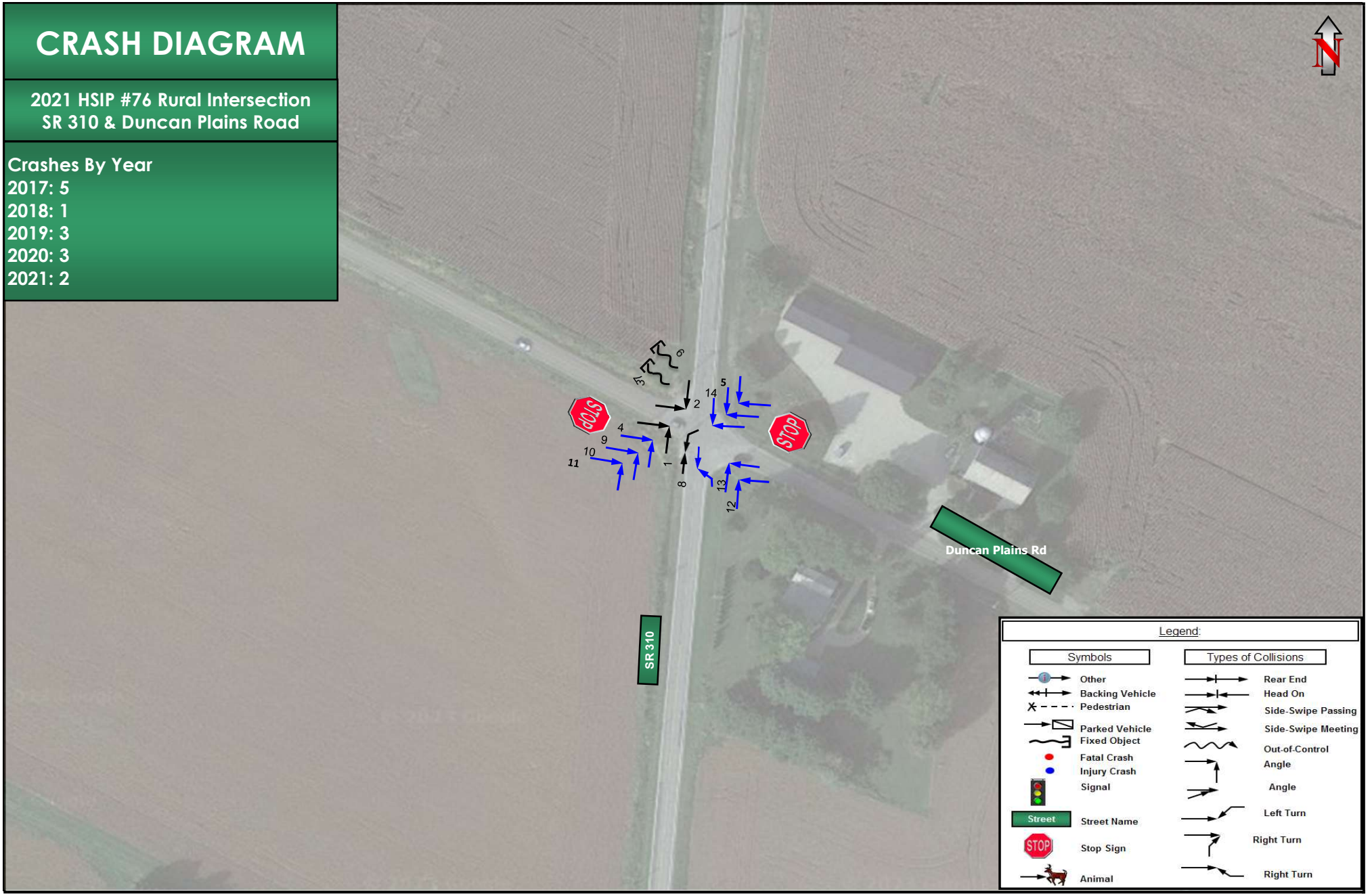




CRASH DIAGRAM

2021 HSIP #76 Rural Intersection
SR 310 & Duncan Plains Road

Crashes By Year
2017: 5
2018: 1
2019: 3
2020: 3
2021: 2



Appendix C: Cost Estimate

Preliminary Construction Estimate

LIC-310 at Duncan Plains Rd - Roundabout

1	Roadway Pavement	Non-Reinforced Concrete Pavement	Sq. Yds.	399	$86.65	$34,573
2		Asphalt Surface	Cu. Yds.	41	$383.75	$15,734
		Asphalt Intermediate	Cu. Yds.	58	$395.42	$22,934
		Asphalt Base	Cu. Yds.	198	$298.68	$59,139
		Aggregate Base	Cu. Yds.	198	$94.00	$18,612
3		Planing	Sq. Yds.		$0.00	$0
4		Stabilization	Sq. Yds.		$0.00	$0
5	Earthwork	Excavation	Cu. Yds.	5,051	$20.38	$102,939
6		Embankment	Cu. Yds.	3,970	$14.96	$59,391
7	Curb and Gutter, Type 4		Ft.	1,978	$50.30	$99,493
8	Curb, Type 6		Ft.	143	$67.06	$9,590
9	Curb and Gutter, Type 9		Ft.	267	$35.22	$9,404
10	Curb, Type 10		Ft.	1,926	$28.00	$53,928
11	Concrete Median		Sq. Yds.	646	$96.63	$62,423
SUBTOTAL						$548,160
12	Erosion Control		≈ 1% Construction Cost			$15,000
13	Drainage		See Quantities Sheet			$419,075
14	Traffic Control		See Quantities Sheet			$25,000
15	Maintenance of Traffic		Rural ≈ 2% Construction Cost			$30,000
16	Lighting		$100/FT ($85,000/RAB)			$85,000
17	Incidentals		See Quantities Sheet			$51,000
18	Utilities (No longer included in PE)					$0
19	Misc.					$0
SUBTOTAL						$625,075
TOTAL ROADWAY COSTS						$1,173,235
20	Contingency		% of Items 1-19	25.0%		$293,000
21	Inflation (Assuming 2 years)			6.0%		$87,974
TOTAL CONSTRUCTION COST				**$1,554,210**		

Date: August 02, 2023

CY 2023-2027 Business Plan Inflation Calculator:

Not sure if you have the latest calculator? Click here.

Last Modified: 1/26/2023

Today's Date:
August 18, 2023

Please Enter Values in the Yellow Areas Only:

Estimation Start Date:
Less than or Equal to Today's Date
(mm/dd/yyyy)

8/18/2023
Start Date:

Enter Construction Mid-Point Date:
(cannot exceed 08/18/2048)
(mm/dd/yyyy)

7/29/2029
Construction Mid-Point Date:

Present-Day Estimated Cost:

$1,966,235.00
Estimated Dollar Amount:

Estimate Start Date to Construction Mid-Point Date: **71** **Months**

Inflation - Start to Mid-Point of Construction:

	(compounded growth rate)	Inflated Dollar Amount:
Business Plan	**27.2%**	**$2,502,033.28**

Estimator's Name:

County - Route - Section:

PID:

Estimator's Notes:

Otworth, Joshua

From: Wooldridge, John
Sent: Friday, August 18, 2023 4:14 PM
To: Otworth, Joshua; Schmelzer, Edward
Subject: RE: LIC-310 at Duncan Plains Roundabout

Hi Josh,

Looks like additional:

ALT – Circular Offset Roundabout Option:

- $115,000.00 R/W Acquisition
- $60,000.00 R/W Services
- $250,000.00 R/W Utilities

Total R/W: $425,000.00 for R/W

Thanks.

Respectfully,

John R. Wooldridge
Real Estate Administrator
ODOT District 5
9600 Jacksontown Road, Jacksontown, OH 43030
740.323.5427
transportation.ohio.gov

From: Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>
Sent: Friday, August 18, 2023 3:17 PM
To: Schmelzer, Edward <Ed.Schmelzer@dot.ohio.gov>
Cc: Wooldridge, John <John.Wooldridge@dot.ohio.gov>
Subject: RE: LIC-310 at Duncan Plains Roundabout

Ed,
Are you saying $250,000 for utilities only **or** $250,000 for the R/W & Utilities total ($75,000 for utilities)?

Thanks,
Josh Otworth, PE
740.323.5274

From: Schmelzer, Edward <Ed.Schmelzer@dot.ohio.gov>
Sent: Monday, August 14, 2023 12:41 PM
To: Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>; Wooldridge, John <John.Wooldridge@dot.ohio.gov>
Cc: Deitrich, William <William.Deitrich@dot.ohio.gov>; Thompson, Tyrell <Ty.Thompson@dot.ohio.gov>; Morgan,

Douglas <Doug.Morgan@dot.ohio.gov>
Subject: RE: LIC-310 at Duncan Plains Roundabout

Josh,

It appears that all the existing utilities are in road right of way. I think we should estimate $250,000 in case there is something we are not seeing at this time.

Thanks,

Ed Schmelzer
Utility Relocation Coordinator
ODOT District 5
9600 Jacksontown Road, Jacksontown, Ohio 43030
740-323-5126
740-503-0534
transportation.ohio.gov
OHIO DEPARTMENT OF TRANSPORTATION

From: Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>
Sent: Monday, August 7, 2023 11:15 AM
To: Wooldridge, John <John.Wooldridge@dot.ohio.gov>; Schmelzer, Edward <Ed.Schmelzer@dot.ohio.gov>
Cc: Deitrich, William <William.Deitrich@dot.ohio.gov>; Thompson, Tyrell <Ty.Thompson@dot.ohio.gov>; Morgan, Douglas <Doug.Morgan@dot.ohio.gov>
Subject: FW: LIC-310 at Duncan Plains Roundabout

JR & Ed,
I have the RABT exhibit for LIC-310 & Duncan Plains Road for the previously mentioned safety study. Please provide the R/W acquisition and utility relocation cost estimates per usual. Reach out with questions.

Thanks,
Josh Otworth, PE
740.323.5274

From: Thompson, Tyrell <Ty.Thompson@dot.ohio.gov>
Sent: Thursday, August 3, 2023 6:43 AM
To: Alford, Jennifer <Jennifer.Alford@dot.ohio.gov>; Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>; Morgan, Douglas <Doug.Morgan@dot.ohio.gov>
Cc: Koenig, Adam <Adam.Koenig@dot.ohio.gov>; Yount, Christopher <Chris.Yount@dot.ohio.gov>
Subject: RE: LIC-310 at Duncan Plains Roundabout

Jennifer/Chris/Adam – thanks for the assistance on this intersection, it is greatly appreciated!

Josh – when you have a chance, let's review this application (and the other applications) prior to submittal.

Ty Thompson, P.E.
(p) 740.323.5194
transportation.ohio.gov

From: Alford, Jennifer <Jennifer.Alford@dot.ohio.gov>
Sent: Wednesday, August 2, 2023 2:59 PM
To: Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>; Thompson, Tyrell <Ty.Thompson@dot.ohio.gov>; Morgan, Douglas <Doug.Morgan@dot.ohio.gov>
Cc: Koenig, Adam <Adam.Koenig@dot.ohio.gov>; Yount, Christopher <Chris.Yount@dot.ohio.gov>
Subject: LIC-310 at Duncan Plains Roundabout

Citrix Attachments Expires September 1, 2023

LIC-310 at Duncan Plains RDBT Estimate.pdf 82.7 KB

LIC-310 at Duncan Plains_BP005-layout-.pdf 2.3 MB

Download Attachments

Jennifer Alford uses Citrix Files to share documents securely.

Guys,

Attached is the preliminary layout and cost estimate for the roundabout at the intersection of SR 310 & Duncan Plains Rd. The files are also available on ProjectWise in the folder: LIC-310 at Duncan Plains

Please note that the estimate does not include any r/w or utility work needed as part of the project. Let me know if you have any questions or would like further refinements.

Thanks,
Jen

Jennifer M. Alford, PE, PTOE
Roadway Section Head
Traffic Studies Engineer (Districts 1 and 2)
ODOT Office of Roadway Engineering
1980 W. Broad Street, Columbus, Ohio 43223
614.387.2389
transportation.ohio.gov

Appendix D: ECAT Analysis

Otworth, Joshua

From: Bogard, Brenton
Sent: Tuesday, February 21, 2023 1:31 PM
To: Otworth, Joshua
Cc: Griffith, Caraline; Janek, Drew
Subject: RE: LIC-310 & Duncan Plains Rd ECAT Sanity Check

Hi Josh - I think the results make sense.

Of the crash severities that factor into the B/C ratio (KA, B, C), B & C crashes account for 79% of the reduction in crashes, with A crashes accounting for the other 21%. The crash cost for B & C severities is much lower than KA. This may explain why the safety benefits seem low.

	Reduction in Crashes		Costs per Crash
KA	(0.1768)	21%	$460,098
B	(0.4062)	49%	$66,621
C	(0.2522)	30%	$45,156

Overall, I think the safety benefits are pretty good. I wouldn't get too hung up on the low-ish B/C. The average B/C of approved roundabouts last round was 0.72. I threw this into our roundabout analysis sheet from last Fall's formal app review and this roundabout would have ranked in the middle of the pack of the roundabouts that were approved… so I think this one would be a competitive location.

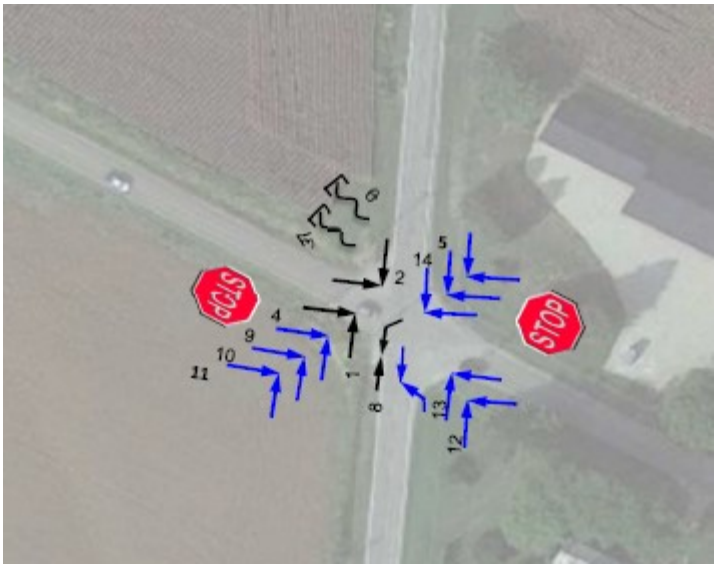
Let me know if you'd like to discuss further, thanks!

Brenton Bogard, PE
Highway Safety Program – Safety Engineer
ODOT Office of Transportation and Economic Development
1980 W. Broad Street, Columbus, OH 43223
614.752.5575
transportation.ohio.gov

From: Otworth, Joshua <Joshua.Otworth@dot.ohio.gov>
Sent: Tuesday, February 21, 2023 10:23 AM
To: Bogard, Brenton <Brenton.Bogard@dot.ohio.gov>; Griffith, Caraline <Caraline.Griffith@dot.ohio.gov>; Janek, Drew <Drew.Janek@dot.ohio.gov>
Subject: LIC-310 & Duncan Plains Rd ECAT Sanity Check

FOS,
With the number of injury angle crashes at the subject intersection, I expected the calculated safety benefits ($1.9M) to be higher for a roundabout alternative.

I'm humbly requesting an ECAT sanity check review be conducted with the attached data (no other district staff are trained on the ECAT). FYI This is one of our 2023 sign-off studies so there is no rush.



Thank you,

Joshua Otworth, PE
Traffic & Safety Engineer
ODOT District 5 Capital Programs
9600 Jacksontown Road, Jacksontown, Ohio 43030
740.323.5274
transportation.ohio.gov

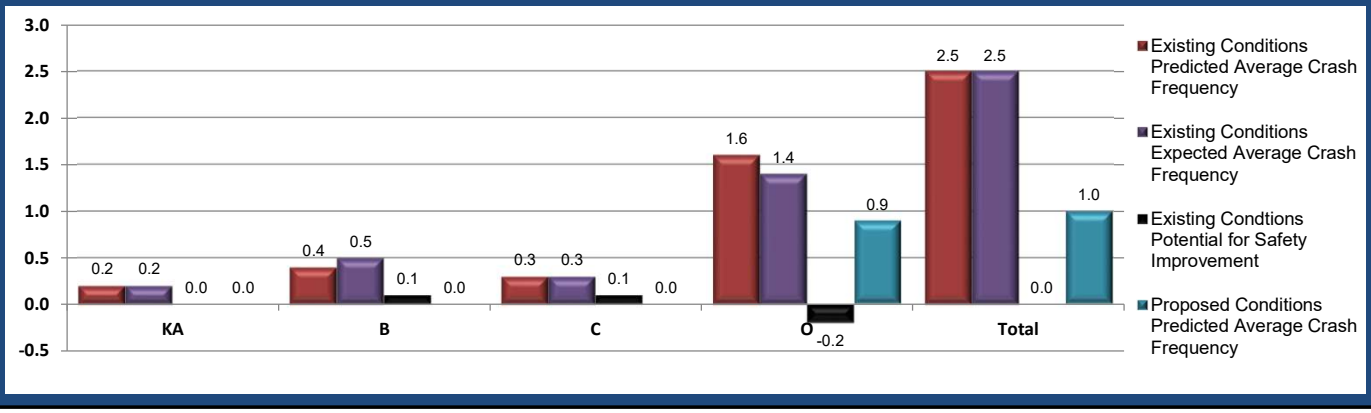
EXCELLENCE IN GOVERNMENT

Project Safety Performance Report

General Information

Project Name	LIC-310 & Duncan Plains Road	Contact Email	
Project Description	Roundabout	Contact Phone	
Reference Number		Date Performed	
Analyst	Josh Otworth	Analysis Year	2023
Agency/Company	ODOT D5		

Summary of Anticipated Safety Performance of the Project (average crashes/year)



Project Summary Results (Without Animal Crashes)

	KA	B	C	O	Total
$N_{predicted}$ - Existing Conditions	0.1804	0.4372	0.2909	1.5643	2.4728
$N_{expected}$ - Existing Conditions	0.2118	0.5140	0.3420	1.4102	2.4780
$N_{potential\ for\ improvement}$ - Existing Conditions	**0.0314**	**0.0768**	**0.0511**	-0.1541	**0.0052**
$N_{expected}$ - Proposed Conditions	0.0040	0.0329	0.0407	0.9211	0.9987

Safety Benefit - Cost Analysis

General Information

Project Name	LIC-310 & Duncan Plains Road	Contact Email	
Project Description	Roundabout	Contact Phone	
Reference Number		Date Performed	
Analyst	Josh Otworth	Analysis Year	2023
Agency/Company	ODOT D5		

Select Site Types to be used in Benefit-Cost Analysis:

All Sites

Comments:

Countermeasure Service Lives, Costs, and Safety Benefits

Countermeasures	Service Life (Years)	Initial Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value	Net Present Cost of Countermeasure	Total Cost of Countermeasures	Summary of Annual Crash Modifications	Net Present Value of Safety Benefits
Roundabout	20	$3,525,000.00			$3,525,000.00	$3,525,000.00	-1.474	$2,040,299
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00		
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
		$0.00			$0.00	$0.00	0.000	$0
Totals		**$3,525,000.00**	**$0.00**	**$0.00**	**$3,525,000.00**	**$3,525,000.00**	**-1.474**	**$2,040,299**

Safety Benefit - Cost Analysis

ECAT Economic Crash Analysis Tool

General Information

Project Name	LIC-310 & Duncan Plains Road	Contact Email	
Project Description	Roundabout	Contact Phone	
Reference Number		Date Performed	
Analyst	Josh Otworth	Analysis Year	2023
Agency/Company	ODOT D5		

Benefit - Cost Calculator

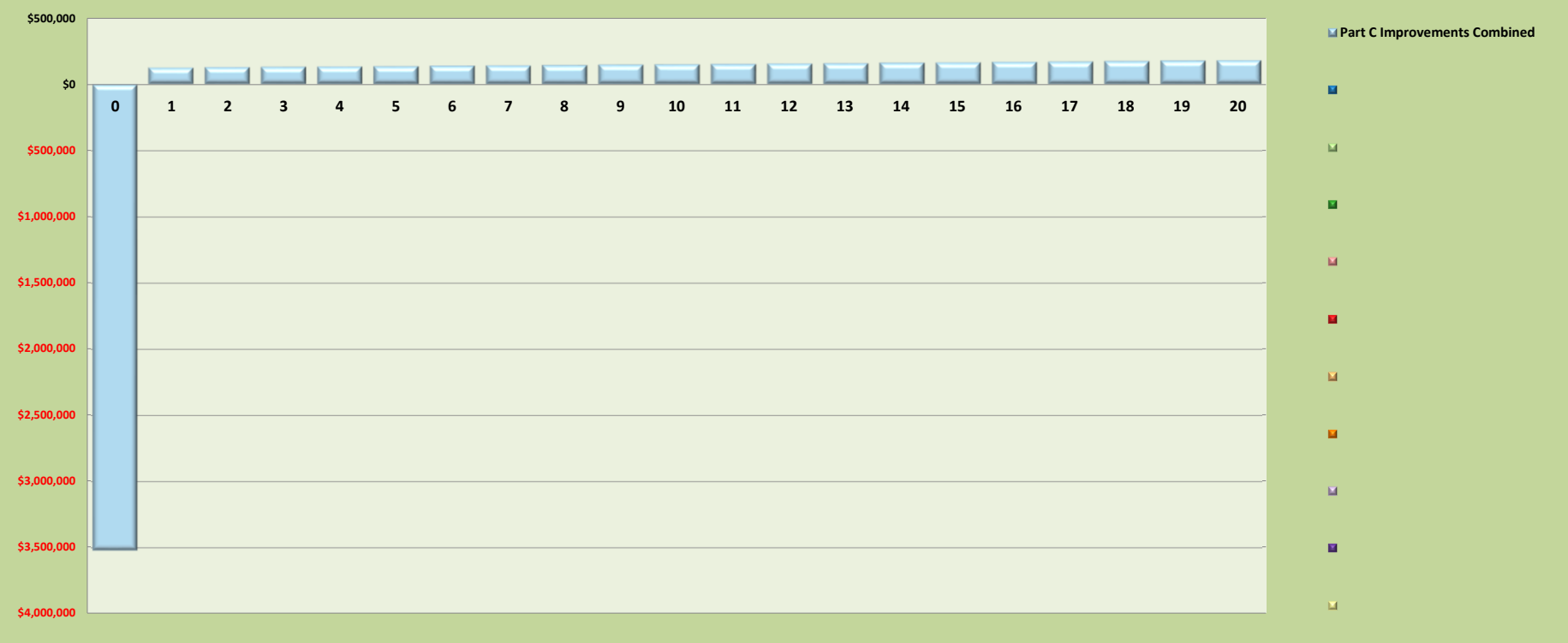
Net Present Value of Project	$3,525,000.00
Net Present Value of Safety Benefits	$2,040,298.58
Net Benefit	($1,484,701.42)
Benefit / Cost Ratio	0.58

Expected Annual Crash Adjustment

Number of Fatal & Incapacitating Injury Crashes	-0.176
Number of Injury Crashes	-0.831
Number of Total Crashes	-1.474

Comments:

Safety Benefits and Project Costs Combined Cash Flows By Countermeasure Per Year

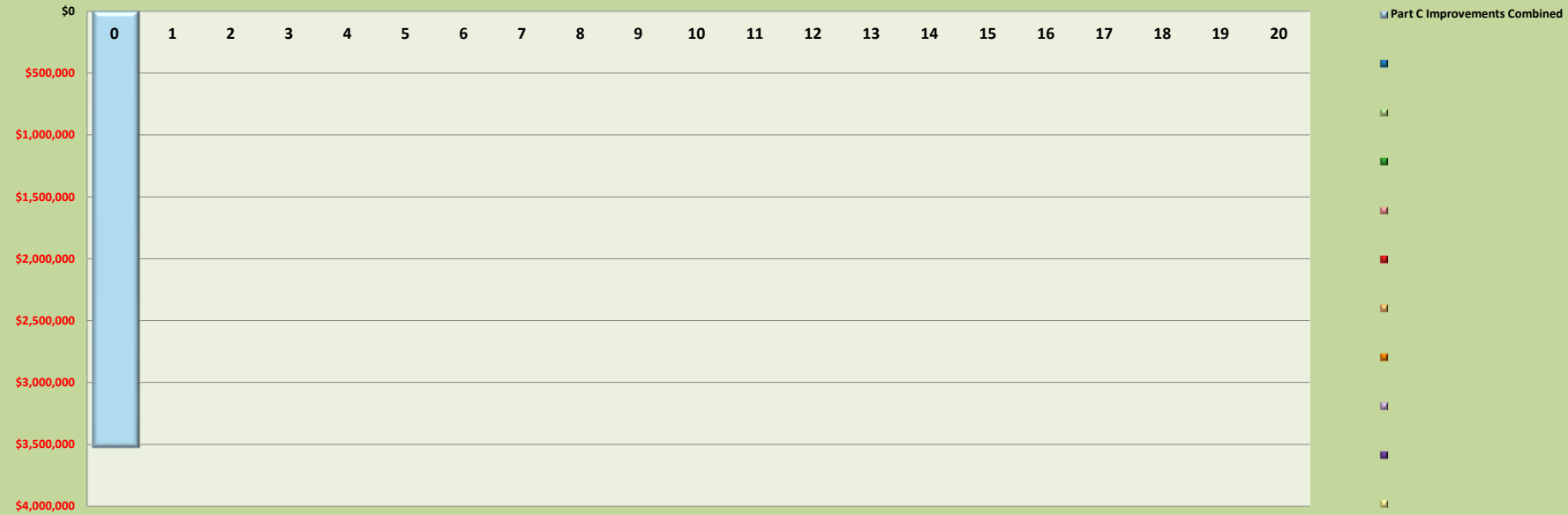


Safety Benefit - Cost Analysis

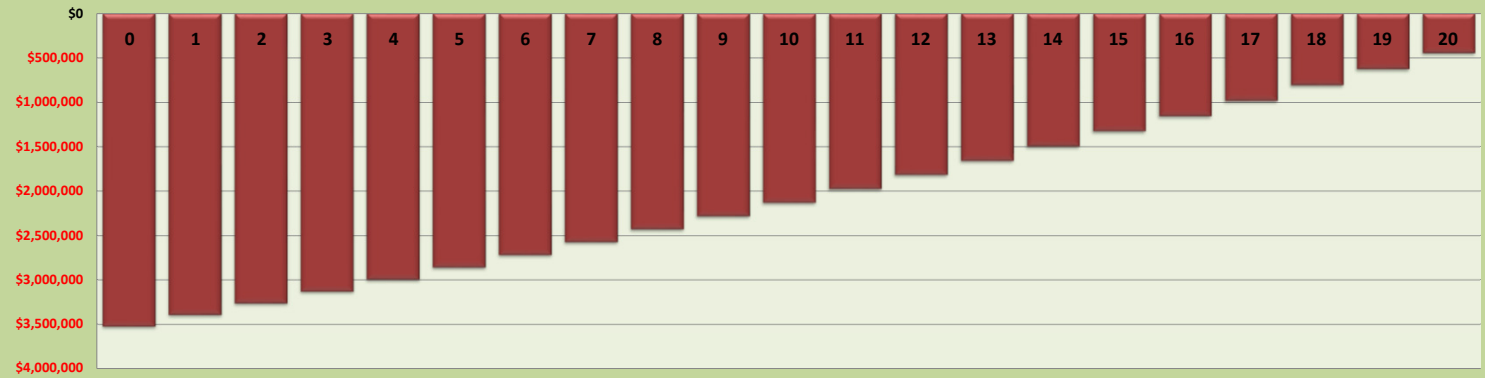
General Information

Project Name	LIC-310 & Duncan Plains Road	Contact Email	
Project Description	Roundabout	Contact Phone	
Reference Number		Date Performed	
Analyst	Josh Otworth	Analysis Year	2023
Agency/Company	ODOT D5		

Project Costs Only Cash Flows By Countermeasure Per Year



Return on Investment (Safety Benefits and Project Investments)



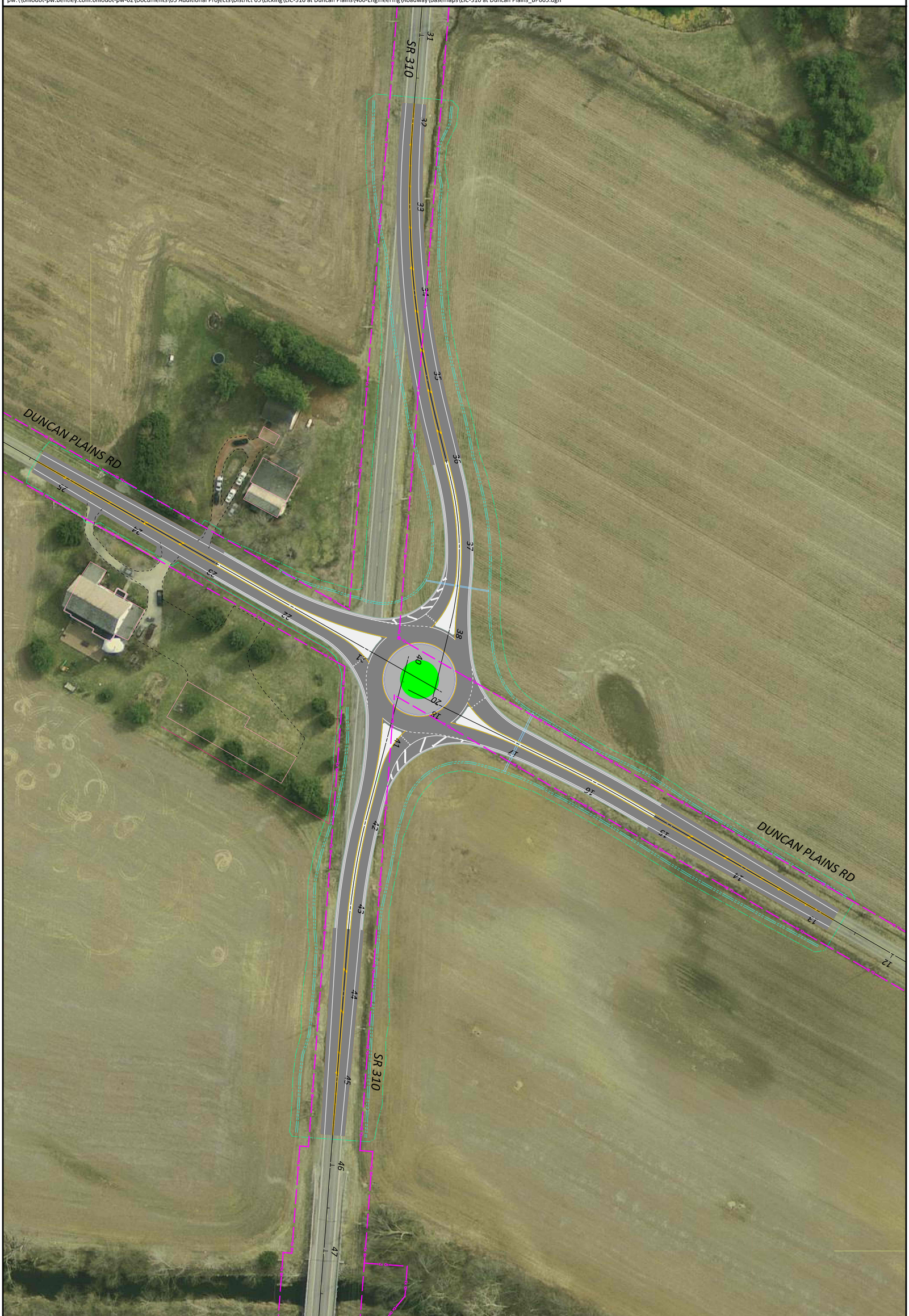
First year to observe a positive return on investiment: Unknown (Unknown years)

Percentage of Service Life to observe a continuous Positive Return on Investment: Unknown%

Appendix E: Proposed Conditions Diagram

LIC-310

MODEL: layout PAPERSIZE: 17x11 (in.) DATE: 8/2/2023 TIME: 2:51:11 PM USER: jalford
pw:\\ohiodot-pw.bentley.com:ohiodot-pw-02\Documents\05 Additional Projects\District 05\Licking\LIC-310 at Duncan Plains\400-Engineering\Roadway\Basemaps\LIC-310 at Duncan Plains_BP005.dgn



SHEET P.0 | TOTAL 0

PROJECT ID 0

REVIEWER XXX MM-DD-YY

DESIGNER JNA

DESIGN AGENCY

LIC-310 AT DUNCAN PLAINS RD
PRELIMINARY ROUNDABOUT DESIGN

HORIZONTAL SCALE IN FEET
0 50
25 100

Appendix F: Other Traffic Analysis

Otworth, Joshua

From: Hwashik Jang <hjang@morpc.org>
Sent: Thursday, May 25, 2023 4:54 PM
To: Otworth, Joshua
Cc: Thompson, Tyrell; Nick Gill
Subject: RE: Growth Rates - LIC-310/Duncan Plains Rd & LIC-37/SR 310

Joshua,

We have completed processing growth rates for your traffic study.

Please use linear annual growth rates as summarized below.

Location	Linear Annual Growth Rate
SR 310 e/o SR 37	3.90%
SR 37 n/o SR 310	1.20%
SR 310 w/o SR 37	1.60%
SR 37 s/o SR 310	1.80%
Duncan Plains Rd e/o SR 310	2.80%
SR 310 n/o Duncan Plains Rd	1.60%
Duncan Plains Rd w/o SR 310	2.70%
SR 310 s/o Duncan Plains Rd	1.20%

Note: The rates provided should only be used for short term growth projections. Although, the planning level model runs used to calculate the rates includes the first phase of Intel area development (that expected to be open in 2025), it does not yet incorporate changes that the townships and local communities have made over the past year (or in process of making) to their visions for their jurisdiction's growth. Thus, applying these growth rates to develop 2047 design traffic will under state the future volumes. MORPC, along with LCATS are working to incorporate these into the development our official forecasts. These should be completed within the next 4-6 weeks to better inform long range traffic projections for this area of the region.

If you have any questions, please let me know.

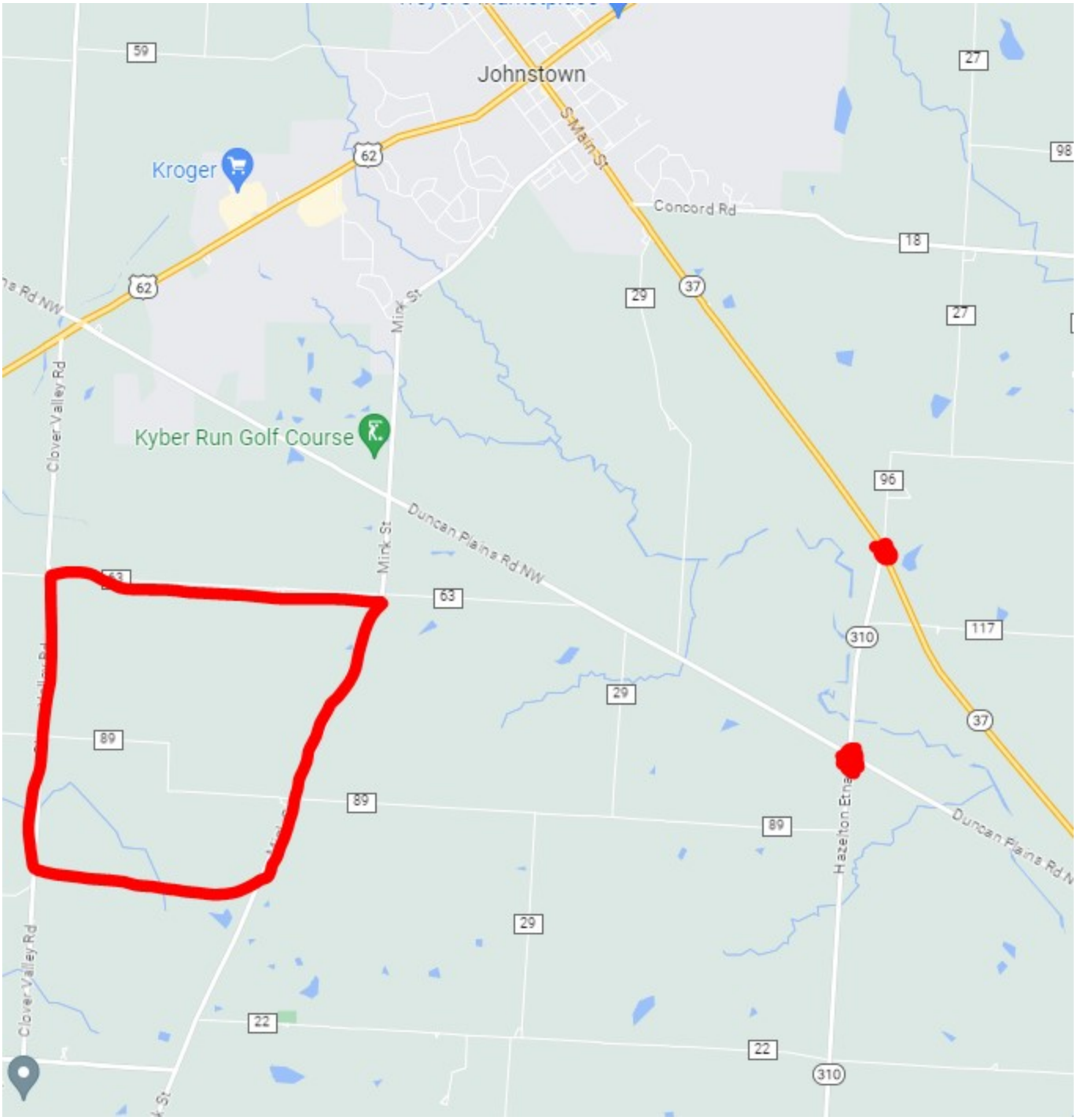
Thanks,

HWASHIK JANG
Senior Planner | **Mid-Ohio Regional Planning Commission**
T: 614.233.4145 | hjang@morpc.org
111 Liberty Street, Suite 100 | Columbus, OH 43215

From: Joshua.Otworth@dot.ohio.gov <Joshua.Otworth@dot.ohio.gov>
Sent: Wednesday, May 10, 2023 12:52 PM
To: Nick Gill <NGILL@morpc.org>; Hwashik Jang <hjang@morpc.org>
Cc: Thompson, Tyrell <ty.thompson@dot.ohio.gov>
Subject: Growth Rates - LIC-310/Duncan Plains Rd & LIC-37/SR 310

Nick,
We are working on safety studies (and some preliminary engineering) at the intersections of SR 310/Duncan Plains Rd (CR 33) and SR 37/SR 310 in Licking County near the Intel site. Due to the anticipated development in this area, we are requesting growth rates for this intersection to project existing turning movement counts to opening year 2027 and design year 2047. You may recall you provided similar rates for a safety study last year for the nearby intersection of Duncan Plains Rd./ Mink St.

I have attached turning movement counts for the both locations. Reach out with questions.



Thanks,

Joshua Otworth, PE
Traffic & Safety Engineer
ODOT District 5 Capital Programs
9600 Jacksontown Road, Jacksontown, Ohio 43030
740.323.5274
transportation.ohio.gov

EXCELLENCE IN GOVERNMENT

STUDY AND ANALYSIS INFORMATION

Municipality:		**Traffic Volumes Obtained By:**	STS
County:	Licking	**Analysis Date:**	5/26/2023
ODOT Engineering District:	5	**Agency/ Company Name Performing Warrant Analysis:**	ODOT D5
Google map link:	o.gl/maps/3aLjEYov1		

Analysis Information

Data Collection Date:	4/18/2023
Day of the Week:	Tuesday

Is the intersection in a built-up area of an isolated community of <10,000 population?	No
Existing Traffic Signal at intersection:	No
Total Number of Approaches at Intersection:	4

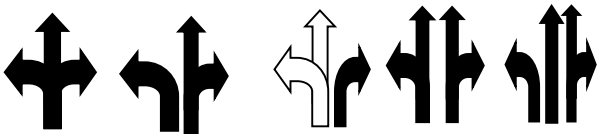
Major Street Information

Major Street Name and Route Number:	SR 310 (Hazelton Etna Road)	
Major Street Approach Direction:	N-Bound	
	S-Bound	
Number of Thru Lanes on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street*:	55	**MPH**

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number:	Duncan Plains Road	
Minor Street Approach Configuration:	1	E-Bound
	1	W-Bound



1 2 3 4 5

Number of Thru Lanes on Each Minor Street Approach:	1	**LANE(S)**
Apply Right Turn Lane Reduction*:	Yes	

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Satisfied?	Notes and Comments:	
Warrant 1, Eight-Hour Vehicular Volume	Yes	**No**		
Warrant 2, Four-Hour Vehicular Volume	Yes	**No**		
Warrant 3, Peak Hour	Yes	**No**	Signals installed under Warrant 3 should be traffic actuated.	**Peak Hour** 3:30 PM 4:30 PM
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)				
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.	**Peak Hour** 3:30 PM 4:30 PM
Warrant 5, School Crossing	No		N/A	
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 7, Crash Experience	Yes	**No**	If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.	
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9	
Multi-Way Stop Warrant	Yes	**Yes**	May be used as an interim measure if traffic signal warrants are satisfied.	

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: Do Not Install New Traffic Signal

Notes:

HCS Two-Way Stop-Control Report

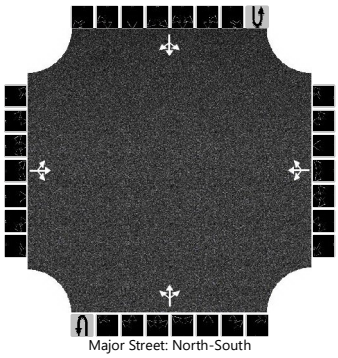
General Information

Analyst	Josh Otworth
Agency/Co.	ODOT D5
Date Performed	8/18/2023
Analysis Year	2023
Time Analyzed	2023 PM Peak
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	SR 310 & Duncan Plains Road
Jurisdiction	
East/West Street	Duncan Plains Road
North/South Street	SR 310
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		18	33	50		6	22	0		51	183	17		0	103	6
Percent Heavy Vehicles (%)		11	6	2		1	9	0		2				7		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.21	6.56	6.22		7.11	6.59	6.20		4.12				4.17		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.60	4.05	3.32		3.51	4.08	3.30		2.22				2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			107				30			54				0		
Capacity, c (veh/h)			635				473			1473				1328		
v/c Ratio			0.17				0.06			0.04				0.00		
95% Queue Length, Q_{95} (veh)			0.6				0.2			0.1				0.0		
Control Delay (s/veh)			11.8				13.1			7.5	0.3	0.3		7.7	0.0	0.0
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)	11.8				13.1				1.8				0.0			
Approach LOS	B				B				A				A			

HCS Two-Way Stop-Control Report

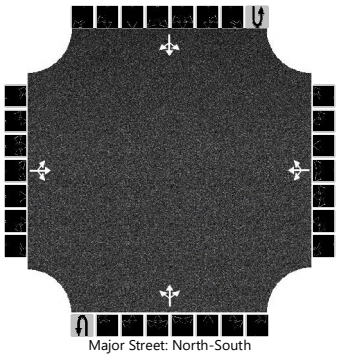
General Information

Analyst	Josh Otworth
Agency/Co.	ODOT D5
Date Performed	8/18/2023
Analysis Year	2023
Time Analyzed	2028 PM Peak
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	SR 310 & Duncan Plains Road
Jurisdiction	
East/West Street	Duncan Plains Road
North/South Street	SR 310
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		20	37	57		7	25	0		54	194	18		0	111	6
Percent Heavy Vehicles (%)		11	6	2		1	9	0		2				7		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.21	6.56	6.22		7.11	6.59	6.20		4.12				4.17		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.60	4.05	3.32		3.51	4.08	3.30		2.22				2.26		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			121				34			57				0		
Capacity, c (veh/h)			616				450			1462				1314		
v/c Ratio			0.20				0.08			0.04				0.00		
95% Queue Length, Q_{95} (veh)			0.7				0.2			0.1				0.0		
Control Delay (s/veh)			12.3				13.6			7.6	0.3	0.3		7.7	0.0	0.0
Level of Service (LOS)			B				B			A	A	A		A	A	A
Approach Delay (s/veh)	12.3				13.6				1.8				0.0			
Approach LOS	B				B				A				A			

HCS Two-Way Stop-Control Report

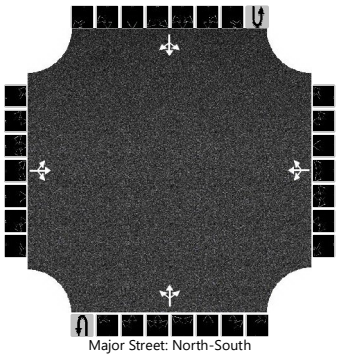
General Information

Analyst	Josh Otworth
Agency/Co.	ODOT D5
Date Performed	8/18/2023
Analysis Year	2023
Time Analyzed	2048 PM Peak
Intersection Orientation	North-South
Project Description	

Site Information

Intersection	SR 310 & Duncan Plains Road
Jurisdiction	
East/West Street	Duncan Plains Road
North/South Street	SR 310
Peak Hour Factor	0.94
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		30	55	84		10	37	0		66	238	22		0	144	8
Percent Heavy Vehicles (%)		11	6	2		1	9	0		2				7		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.21	6.56	6.22		7.11	6.59	6.20		4.12				4.17		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.60	4.05	3.32		3.51	4.08	3.30		2.22				2.26		

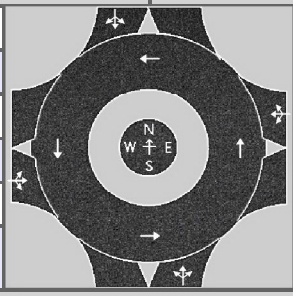
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			180				50			70				0		
Capacity, c (veh/h)			531				368			1417				1258		
v/c Ratio			0.34				0.14			0.05				0.00		
95% Queue Length, Q_{95} (veh)			1.5				0.5			0.2				0.0		
Control Delay (s/veh)			15.2				16.3			7.7	0.5	0.5		7.9	0.0	0.0
Level of Service (LOS)			C				C			A	A	A		A	A	A
Approach Delay (s/veh)	15.2				16.3				1.9				0.0			
Approach LOS	C				C				A				A			

HCS Roundabouts Report

General Information

Analyst	Josh Otworth
Agency or Co.	ODOT D5
Date Performed	8/18/2023
Analysis Year	2023
Time Analyzed	2028 PM Peak
Project Description	



Site Information

Intersection	SR 310 & Duncan Plains Road
E/W Street Name	Duncan Plains Road
N/S Street Name	SR 310
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.94
Jurisdiction	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	20	37	57	0	7	25	0	0	54	194	18	0	0	111	6
Percent Heavy Vehicles, %	3	11	6	2	3	1	9	1	3	1	3	1	3	1	8	1
Flow Rate (v_{PCE}), pc/h	0	24	42	62	0	8	29	0	0	58	213	19	0	0	128	6
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		128			37			290			134	
Entry Volume, veh/h		122			35			283			124	
Circulating Flow (v_c), pc/h	136			295			66			95		
Exiting Flow (v_{ex}), pc/h	61			93			237			198		
Capacity (c_{pce}), pc/h		1201			1021			1290			1253	
Capacity (c), veh/h		1145			953			1259			1163	
v/c Ratio (x)		0.11			0.04			0.22			0.11	

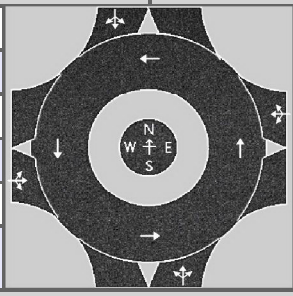
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.1			4.1			4.8			4.0	
Lane LOS		A			A			A			A	
95% Queue, veh		0.4			0.1			0.9			0.4	
Approach Delay, s/veh | LOS	4.1	A		4.1	A		4.8	A		4.0	A	
Intersection Delay, s/veh | LOS	4.4						A					

HCS Roundabouts Report

General Information

Analyst	Josh Otworth
Agency or Co.	ODOT D5
Date Performed	8/18/2023
Analysis Year	2023
Time Analyzed	2048 PM Peak
Project Description	



Site Information

Intersection	SR 310 & Duncan Plains Road
E/W Street Name	Duncan Plains Road
N/S Street Name	SR 310
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.94
Jurisdiction	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	30	55	84	0	10	37	0	0	66	238	22	0	0	144	8
Percent Heavy Vehicles, %	3	11	6	2	3	1	9	1	3	1	3	1	3	1	8	1
Flow Rate (v_{PCE}), pc/h	0	35	62	91	0	11	43	0	0	71	261	24	0	0	165	9
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		188			54			356			174	
Entry Volume, veh/h		179			50			347			162	
Circulating Flow (v_c), pc/h	176			367			97			125		
Exiting Flow (v_{ex}), pc/h	86			123			296			267		
Capacity (c_{pce}), pc/h		1153			949			1250			1215	
Capacity (c), veh/h		1099			885			1220			1129	
v/c Ratio (x)		0.16			0.06			0.28			0.14	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.7			4.6			5.5			4.4	
Lane LOS		A			A			A			A	
95% Queue, veh		0.6			0.2			1.2			0.5	
Approach Delay, s/veh | LOS	4.7	A		4.6	A		5.5	A		4.4	A	
Intersection Delay, s/veh | LOS	5.0						A					