

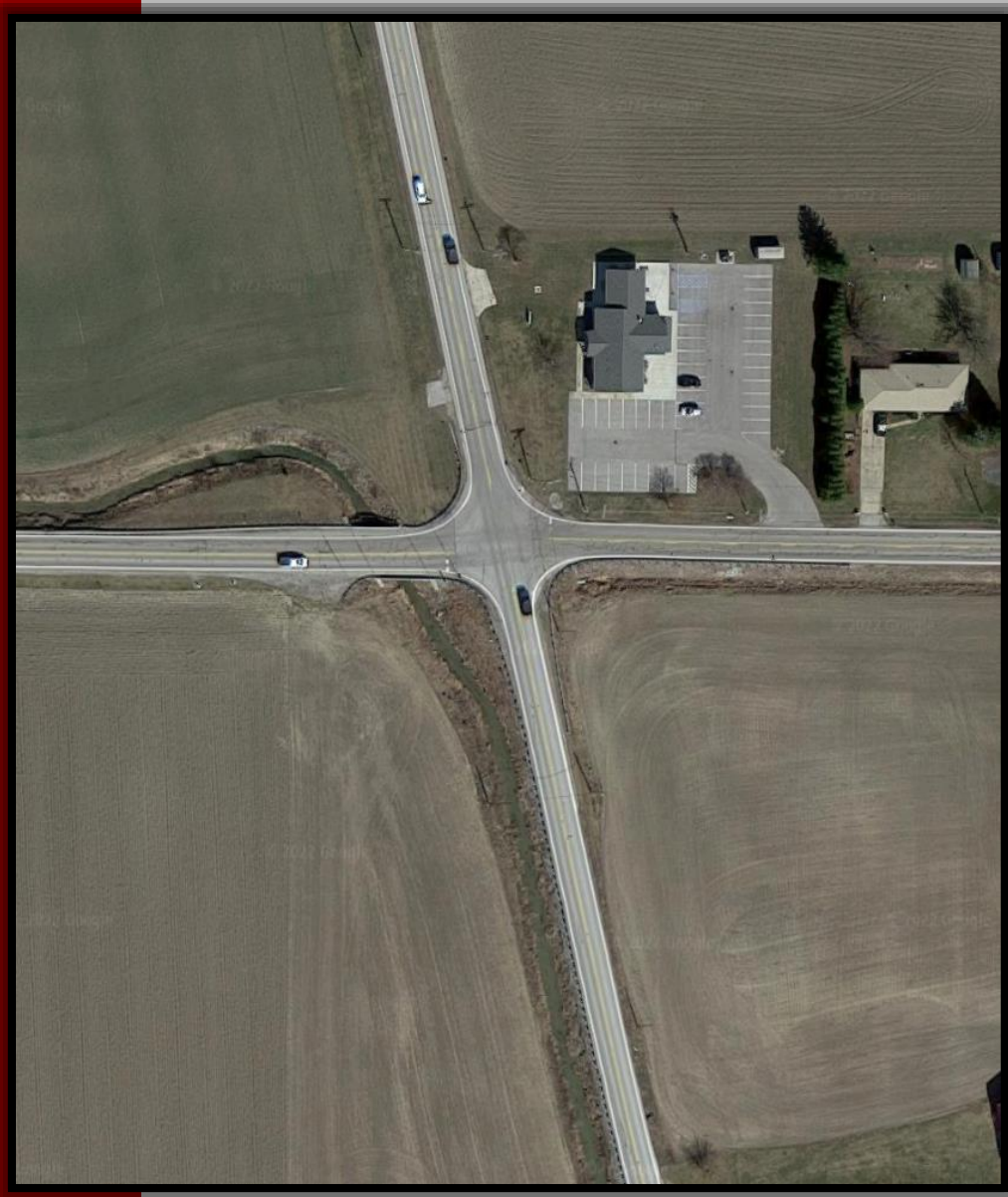
W00-582-2.61

SR-582 & SR-64 Safety Study

Final Report

PID 117091

January 6, 2023



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I. Executive Summary

A. Purpose and Need

The purpose of this study is to analyze existing conditions of the study area and identify potential countermeasures to reduce crash frequency and severity. The study limits include the intersection of SR-582 & SR-64 in the Village of Haskins, Ohio. The study intersection is ranked #97 on the ODOT Rural Intersection HSIP list.

B. Overview of Existing Conditions Analysis

Capacity analysis results show all intersection approaches have generally acceptable capacity based on present and future traffic projections. Sight distance analysis shows sight lines for eastbound and westbound vehicles may be obstructed. The turn lane warrant analysis shows that a 285' southbound left turn lane, inclusive of a 50' diverging taper, is warranted at the study intersection. Signal warrant analysis results show a traffic signal is not warranted based on vehicular volumes per ODOT standards, but crash experience (Warrant 7) is met. Results of the speed zone analysis show calculated speeds ranging from 52-55 MPH south of the study intersection, 45 MPH from the study intersection to the railroad tracks, 30-34 MPH from the railroad tracks to the police station, and 45-47 MPH from the police station to the north.

C. Overview of Safety Issues

Crash data was obtained from ODOT Transportation Information Mapping System (TIMS) for five complete years, 2017-2021. There were 18 crashes in the study area during the five-year study period. Of the 18 crashes that occurred at the intersection, ten were injury crashes (55.6%) and eight were property damage only crashes (44.4%). The primary crash type was angle crashes (72.2%), followed by the secondary crash types of rear end crashes (22.2%) and fixed object crashes (5.6%). Eleven of the angle crashes involved a westbound vehicle striking a southbound vehicle.

D. Recommended Countermeasures and Related Costs

Below is a brief overview of the recommended countermeasures and associated costs. See section VI Countermeasures for further details.

Short-term countermeasures:

- Revise posted speed limits

Medium-term countermeasures (\$1,705,700):

- Install northbound and southbound left turn lanes
- Add a sidewalk connection and enhanced crossing north of intersection

Long-term countermeasures (\$2,867,800-\$3,096,500):

- Reconfigure intersection to be a roundabout (two configurations were explored)

Countermeasure for future consideration:

- Revise Lusher Park infrastructure

It is recommended the short-term countermeasure of revising the posted speed limits be implemented as soon as feasible. It is recommended the installation of a roundabout be further considered/refined, and the sidewalk connection and enhanced crossing north of intersection be installed in conjunction with the proposed roundabout project. The implementation of a roundabout is expected to mitigate this primary crash concern of angle crashes at the intersection.

II. Purpose and Need

The purpose of this study is to analyze existing conditions of the study area and identify potential countermeasures to reduce crash frequency and severity. The study limits include the intersection of SR-582 (Middleton Pike) & SR-64 (Haskins Road) and extend approximately 500' on each intersection approach. A speed study of SR-64 is also included, which extends north of King Road and south of SR-582. The study intersection is ranked #97 on the ODOT Rural Intersection HSIP list. A project location map is provided in **Figure 1**, surrounding area map in **Figure 2**, and study intersection map in **Figure 3**.

Figure 1 - Project Location Map (Wood County outlined in red)

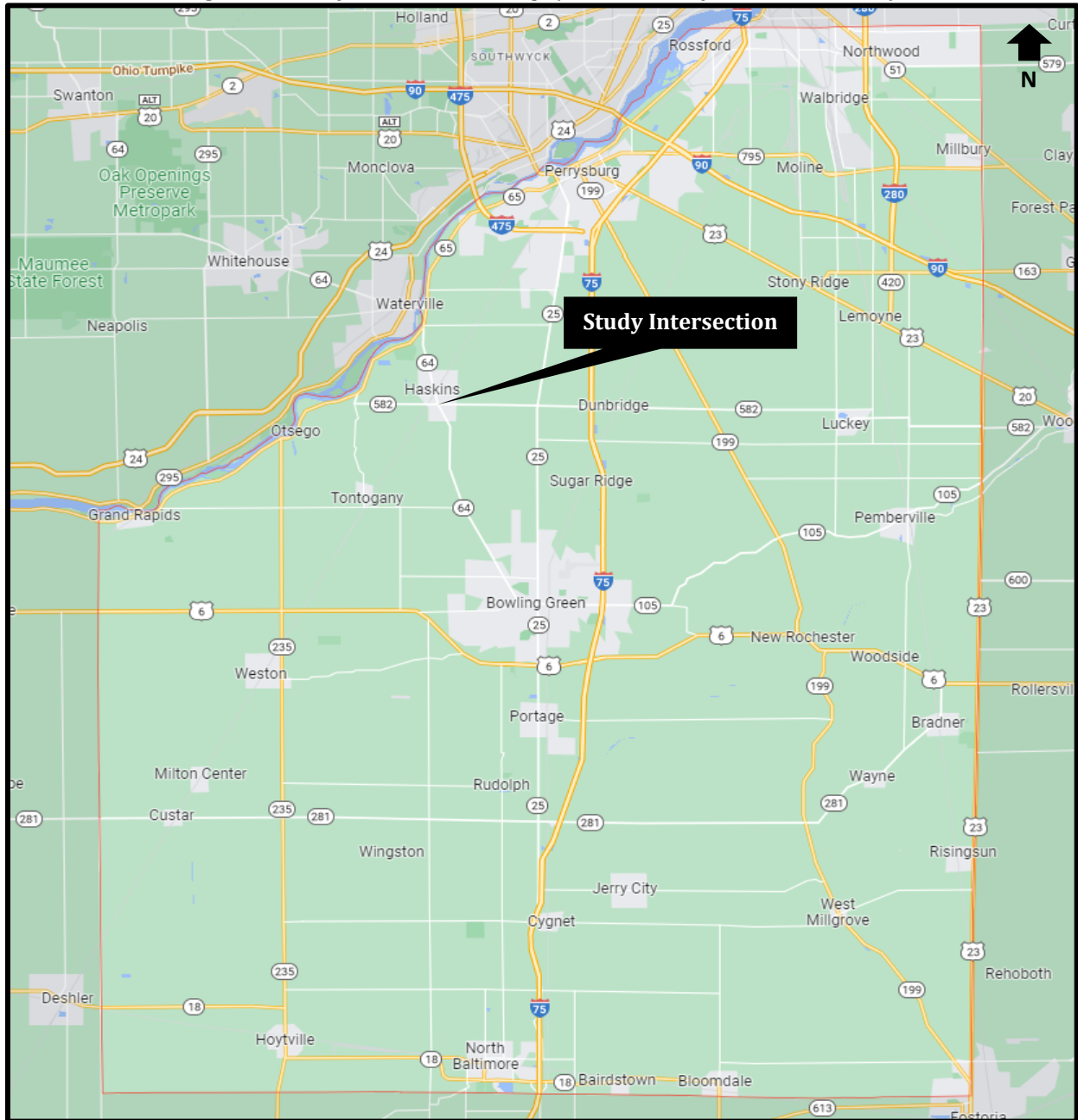


Figure 2 – Surrounding Area Map



Figure 3 – Study Intersection Map



III. Existing Conditions

A. Land Use and Development

The study area is located in the Village of Haskins in north Wood County. The cities of Waterville and Perrysburg are to the north, and the City of Bowling Green is to the south. The area surrounding the study intersection includes an ice cream shop (Sundaze) in the northeast corner, some single-family homes, and undeveloped, agricultural land. A constructed channel ditch runs along the north side of SR-582, crosses under the roadway west of SR-64, and continues south along the west side of SR-64.

B. Roadway Conditions

SR-64

SR-64 serves as a north-south connector linking the cities of Waterville and Bowling Green. The roadway is classified as a Rural Major Collector and has a two-lane typical section. Raised pavement markers (RPMs) are present south of the study intersection. Guardrail is present at the study intersection and extends south on the west side of the roadway. Each through lane is approximately 10' wide. A paved shoulder is present on each side of the roadway, approximately 1-2' wide. The roadway generally has no lighting, curb, gutter, rumble strips/stripes, or sidewalk. SR-64 has a posted speed limit of 50 MPH at the study intersection. Additional details of the posted speed limit north and south of the study intersection is provided in *Section IV. F. Speed Zone Analysis*.

SR-582

SR-582 serves as an east-west connector from SR-65 to SR-105, linking IR-75, US-23, and US-20. SR-582 has a posted speed limit of 50 MPH within the study area. The roadway is classified as a Rural Major Collector and has a two-lane typical section. RPMs are present on SR-582. Guardrail is present at the study intersection and extends west on the north side of the roadway. Each through lane is approximately 10' wide. A paved shoulder is present on each side of the roadway, ranging from approximately 1-2' wide. The roadway generally has no lighting, curb, gutter, rumble-strips/stripes, or sidewalk.

C. Intersection Conditions

SR-582 & SR-64 is a four-leg intersection with single-lane approaches. The intersection configuration can be seen in **Figure 3**.

The intersection currently operates as two-way stop-control (TWSC), with the SR-582 approaches being stop-controlled. Each approach has one stop sign with LED blinkers posted in the right-hand corner of the intersection. A yellow "cross traffic does not stop" plaque and signpost reflector is posted below the stop sign for the westbound approach. A white "cross traffic does not stop" is posted below the stop sign for the eastbound approach, with no signpost reflector. Stop ahead warning signs with signpost reflectors are posted on the right side of the road in advance of the intersection on each approach as follows: 750' westbound and 745' eastbound. Two utility poles are located in the northeast corner of the intersection.

D. Field Observations

Field observations were conducted on June 29th and June 30th, 2022. The following observations were noted:

- During peak times, some drivers on the SR-582 approaches to the study intersection experienced longer delays. No excessive delays were noted.
- Sight distance at the study intersection for westbound drivers looking left may be an issue even if the analysis exhibits show otherwise (described later in report). The curvature on the south leg can make opposing vehicles appear to be approaching at a different rate than they are operating.
- Front-in angle parking is provided along the frontage of Lusher Park located approximately ¼ mile north of the study intersection along SR-64. This operates well for vehicles arriving. However, when vehicles are departing, their vision could be blocked by adjacent parked vehicles, and the drivers must blindly back up into traffic on SR-64.
- The SR-64 & Main Street intersection and railroad crossing of north of the study intersection poses potential issues. Atypical geometry and sight distance issues are present. The railroad appears to be relatively active and causes notable queuing when a train is present.

E. Data Collection

Turning movement counts were collected at the study intersection from 6 AM to 6 PM on Tuesday, June 28, 2022. It was determined the AM peak hour is from 7:15-8:15 and the PM peak hour is from 4:30-5:30. See a summary of the data in **Figure 4** and **Figure 5**. Segment count data along SR-64 from 2018 was also obtained from the ODOT Transportation Data Management System (TDMS). All count data is provided in **Appendix A**.

Speed data along SR-64 was collected on June 29-30, 2022. An explanation of this data can be found in *Section IV. F. Speed Zone Analysis*.

Figure 4 – AM Peak Hour Count Data Summary

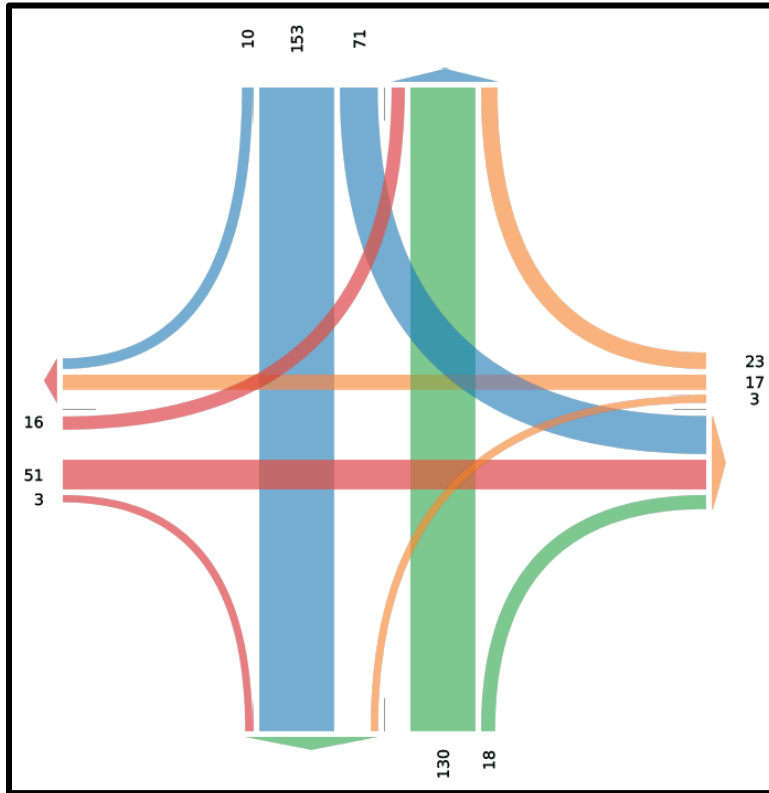
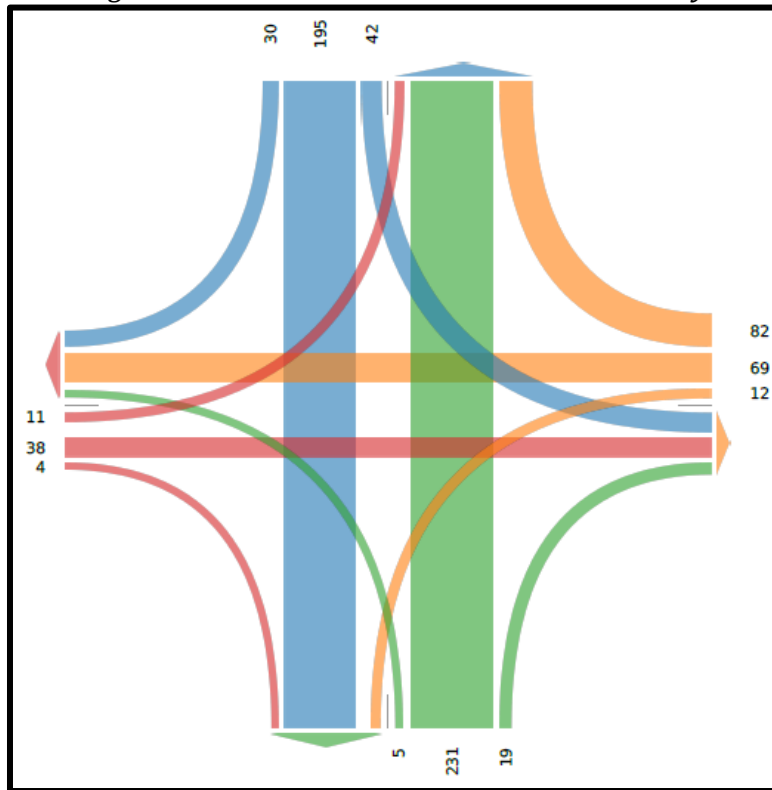


Figure 5 – PM Peak Hour Count Data Summary



F. Traffic Volume Development

The 2022 count data was compared to 2018 data to determine if adjustments were needed to account for impacts on traffic volumes caused by the COVID-19 pandemic. It was determined that, while the PM peak count data fell within the ODOT accepted range of 15%, the AM peak count data fell outside the range. An adjustment factor of 1.32 was applied to the 2022 AM peak count data to create 2022 adjusted AM peak volumes.

Toledo Metropolitan Area Council of Governments (TMACOG) provided a linear annual growth rate of 0.08% for all approaches to the study intersection. The Opening Year of an assumed improvement project is expected to be 2024. Therefore, a Design Year of 2044 is assumed for analysis purposes. The 2022 volumes were projected to a Design Year of 2044 using the growth rate. COVID adjustment factor calculations, TMACOG growth rate correspondence, and volume calculations are provided in **Appendix B**.

IV. Existing Conditions Analysis

A. Capacity Analysis

Highway Capacity Software (HCS) version 2022 was used to analyze capacity at the study intersection under existing TWSC conditions. AM and PM peak hour volumes for 2022 (Existing Year) and 2044 (Design Year) were used for this analysis.

Existing conditions capacity analysis results for 2022 and 2044 are provided in **Table 1**. In general, a level of service (LOS) of D for the overall intersection, approaches, and individual movements is considered acceptable. Full capacity analysis results are provided in **Appendix C**.

Table 1 – Existing Conditions Capacity Analysis Results

Approach/ Movement	2022 AM		2022 PM		2044 AM		2044 PM	
	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS
Eastbound	21.3	C	15.0	C	21.9	C	15.2	C
Westbound	14.0	B	14.5	B	14.1	B	14.6	B
Northbound Left	7.7	A	7.7	A	7.8	A	7.7	A
Southbound Left	7.9	A	7.8	A	7.9	A	7.8	A

a – Average delay in seconds per vehicle

The results show all approaches have acceptable LOS in all scenarios.

B. Sight Distance Analysis

Since the intersection is TWSC, sight distance is generally only a concern for the stop-controlled approaches. Therefore, horizontal intersection sight distance for turning vehicles on the eastbound and westbound approaches was evaluated per methodologies in the ODOT Location and Design (L&D) Manual. Exhibits showing sight triangles for each turning movement for the eastbound and westbound approaches can be found in **Appendix D**.

Based on the analysis, sight distance for eastbound left turning vehicles may be obstructed by signs present in the southwest corner of the intersection. No issues appear to be present for the westbound left turning vehicles. However, based on the crash analysis discussed in the next section, some issues may be present. **Figure 6** shows a photo taken while at the westbound stop line looking right.

Figure 6 – Photo at Westbound Stop Line Looking Right



As shown in the photo, if the vehicles are not pulled up past the stop line, utility poles and signs in the northeast corner of the intersection may be obstructing sight distance. Also, as previously described, at the westbound stop line looking left, the curvature on the south leg can make opposing vehicles appear to be approaching at a different rate than they are operating.

C. Turn Lane Warrant Analysis

A turn lane warrant analysis was conducted assuming the existing, TWSC intersection condition. The analysis was conducted using ODOT standard turn lane warrant graphs and Design Year 2044 data. As stated previously, SR-64 has a posted speed limit of 50 MPH, so a design speed of 55 MPH was utilized for analysis. Results of the turn lane warrant analysis show that a 285' southbound left turn lane, inclusive of a 50' diverging taper, is warranted at the study intersection. Detailed turn lane warrant analysis is provided in **Appendix E**.

D. All-Way Stop-Control (AWSC) Warrant Analysis

An AWSC warrant analysis was performed at the study intersection using methodologies located in the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). In general, AWSC is used where the volume of traffic on the intersecting roads is approximately equal.

The analysis shows that AWSC is not warranted with 2022 traffic volumes. This was expected, as the volume of traffic on SR-64 is about 3-4 times greater than the volume on SR-582. The full AWSC warrant analysis can be seen in **Appendix F**.

E. Signal Warrant Analysis

A signal warrant analysis was performed at the study intersection. Eight-hour, four-hour, and peak hour (Warrants 1, 2, and 3) signal warrant analyses were evaluated per the OMUTCD. Analyses were conducted for 2022 and 2044 volumes without right turn reductions (RTR).

The results show a traffic signal is not warranted per ODOT standards with current traffic volumes. However, crash experience (Warrant 7) is met since five angle crashes occurred in 2017, which could be corrected by a traffic signal installation. This does not necessarily mean a traffic signal is recommended for this intersection. While the installation of a traffic signal would mitigate the noted severe angle crashes, it is expected it would increase the frequency of crashes overall. General practice for District 2 has been that if Warrant 7 is met, at least one of Warrants 1-3 also needs to be met using the 70% volumes to officially consider installing a signal. Since these warrants were not met using 70% volumes, a traffic signal installation was not considered further. The full signal warrant analysis can be seen in **Appendix G**.

F. Speed Zone Analysis

A speed zone study was conducted for SR-64 in accordance with the ODOT Traffic Engineering Manual (TEM) to determine the recommended posted speed limit for SR-64 through Haskins. The data collection and analysis conducted are described below.

Data Collection

Speed data was collected at four locations along the corridor on June 29-30, 2022. A graphic of the data collection locations can be seen in **Figure 7**. The speed data collection outputs are provided in **Appendix H**.

Raw crash data was obtained from ODOT TIMS for use in the analysis. Crashes were reviewed based on the criteria provided. Crashes occurring under inclement pavement conditions (wet, snow, etc.) were reviewed, and crashes caused by pavement conditions were excluded from the analysis. Animal and side street related crashes were also excluded from the analysis. Average daily traffic (ADT) volumes were also obtained from ODOT TIMS.

The typical section characteristics and number/type of access points in the study area was quantified based on the aerial, street-view data from Google Maps, and notes taken during the study site visit. Lane and shoulder widths were averaged throughout the zone segment areas.

The posted speed limits in this area are as follows (also shown in **Figure 7**):

- For northbound vehicles:
 - 55 MPH posted south of the corporation limits
 - 50 MPH posted at the corporation limits and just north of the intersection of SR-64 & SR-582
 - 35 MPH posted near the Lusher Park baseball diamond
 - 25 MPH posted just south of the railroad
 - 35 MPH posted at SR-64 & Roche De Beouf Street
 - 50 MPH posted just south of Kingsbury Avenue
 - 55 MPH posted north of the corporation limits
- For southbound vehicles:
 - Unposted (assumed 55 MPH) speed north of the corporation limits
 - 35 MPH posted just south of Kingsbury Avenue
 - 25 MPH posted at High Street
 - 35 MPH posted just south of the railroad
 - 50 MPH posted just south of the Lusher Park baseball diamond
 - 55 MPH posted approximately 0.33 miles south of the corporation limits

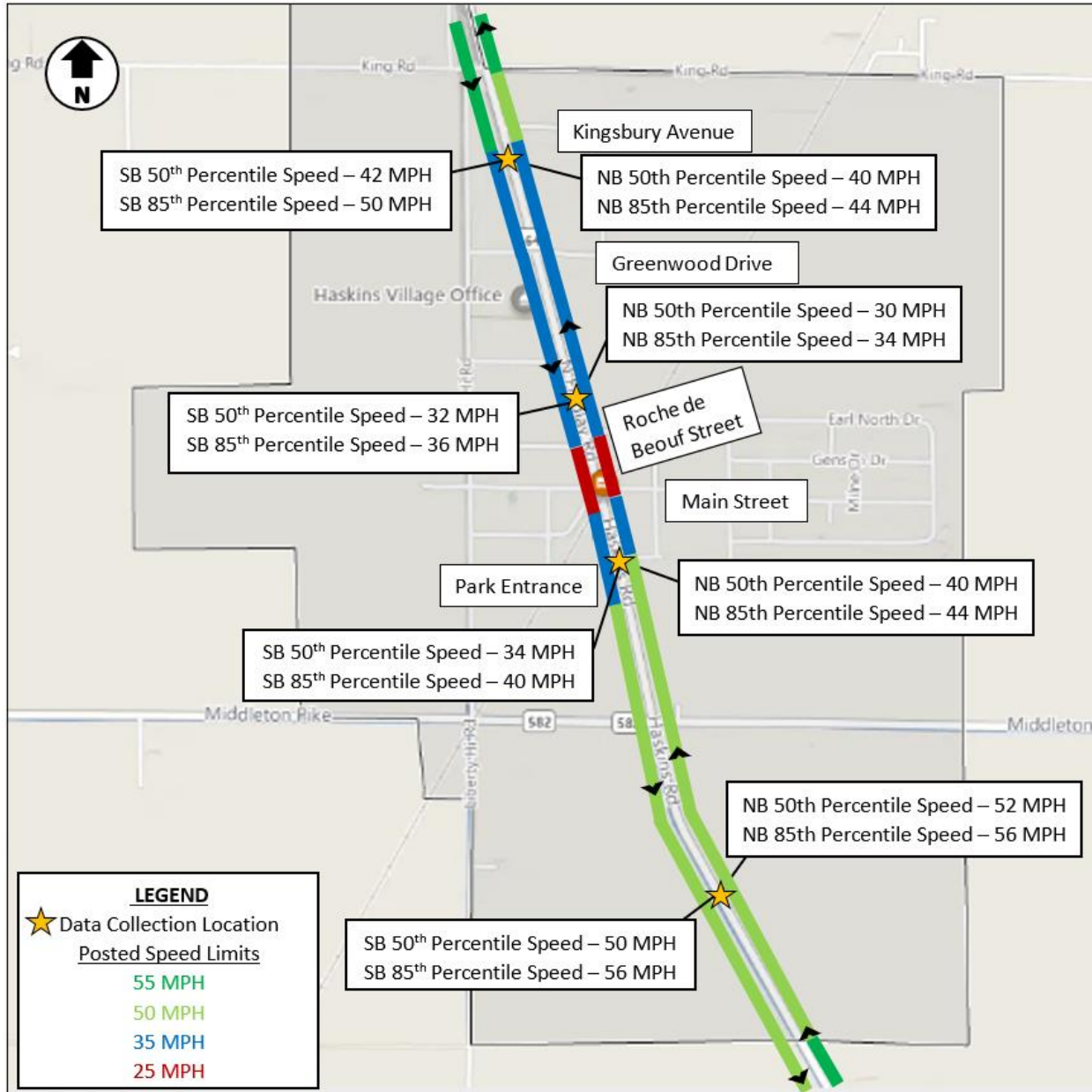
The collected 50th and 85th percentile speeds in each direction are summarized in **Figure 7**.

Analysis

The ODOT TEM Form 1296-2 Speed Zone Evaluation Sheet for Non-Freeway and Non-Expressway Highways was used to analyze speeds in the study area. Additionally, each zone segment was analyzed using USLIMITS2. This is a web-based tool created and maintained by the Federal Highway Administration (FHWA) to provide planning-level guidance on possible speed limit recommendations.

Working with ODOT District 2, three different speed zone options were analyzed. This included an analysis of the existing statutory speed limits and two other proposed options. The options and detailed calculation sheets are provided in **Appendix H**.

Figure 7 – Data Collection Locations, Existing Posted Speed Limits, and 50th/85th Percentile Speeds (Collected)



G. Stakeholder Engagement

A kickoff meeting was held at 10 AM on June 27, 2022 with the Village of Haskins, ODOT District 2, and Carpenter Marty Transportation.

The Village of Haskins representatives provided the following key general takeaways:

- The Village is planning to extend Sullivan Drive southwest along the property line to connect to Haskins Road, south of the Lusher Park baseball diamond. The purpose of this project is to provide an additional access to the neighborhood. No expansion of the neighborhood is planned at this time.
- The guardrail surrounding the study intersection gets struck frequently (approximately 2-3 times per year). The guardrail in the southeast corner of the intersection gets struck the most.
- The LED blinker stop signs were implemented in 2019.
- The Sundaze ice cream shop in the northwest corner used to be a bank, but redeveloped in 2018. Patrons at Lusher Park oftentimes walk or drive to Sundaze. There is no sidewalk or pedestrian crossing infrastructure present.
- Farming surrounding the study intersection encroaches into the right-of-way.
- Flooding issues are present surrounding the intersection.

H. Active Transportation Need/Demand Analysis

ODOT TIMS provides an evaluation of the active transportation demand and need. Active transportation planning aims to provide communities safe and convenient access to home, work, school, recreation, and transit via walking and biking. The outputs show the lightest colors available for both demand and need at the study intersection, which shows a low demand and need for active transportation. However, the anecdotal knowledge of people going from the neighborhood and Lusher Park to Sundaze shows a latent demand for pedestrian infrastructure.

V. Crash Data

A. Crash Data Summary

Crash data was obtained from ODOT TIMS for five complete years (2017-2021). A total of 19 crashes were obtained. The OH-1 report for each documented crash was reviewed to correct information, where necessary, and properly locate crashes within the study limits.

The original crash data query included 19 crashes, which was adjusted to 18 crashes after reviewing and relocating crashes. **Table 2** shows a breakdown of the crash data. Crash data for the study intersection was plotted on an aerial map to identify crash patterns and probable causes. The crash diagram for the study intersection is shown in **Figure 8**.

Table 2 - Crash Statistics

Crash Year	Number	Percent
2017	4	22.2%
2018	3	16.7%
2019	7	38.9%
2020	2	11.1%
2021	2	11.1%

Crash Severity	Number	Percent
Injury Crash	10	55.6%
Property Damage Crash	8	44.4%

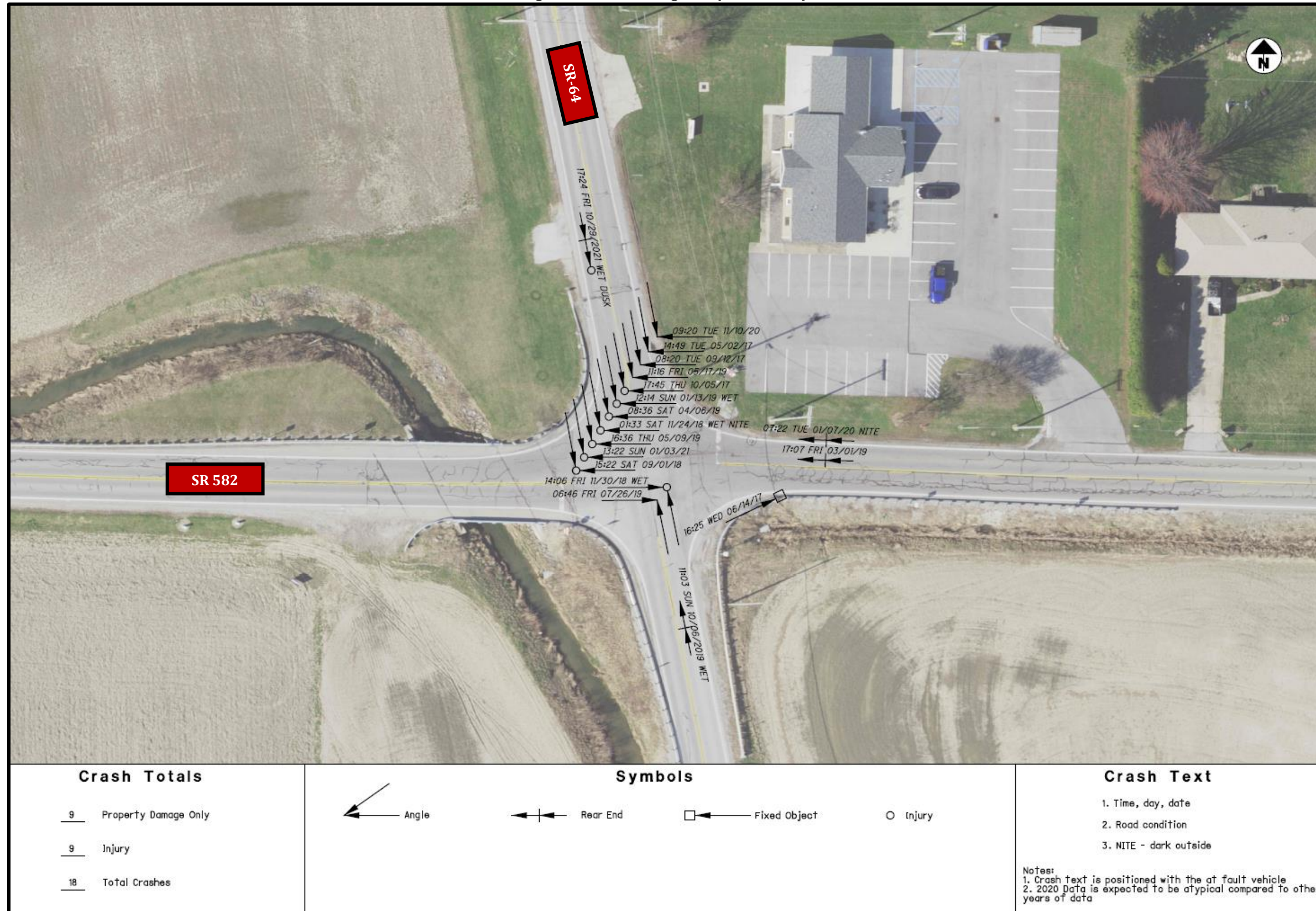
Crash Type	Number	Percent
Angle	13	72.2%
Rear End	4	22.2%
Fixed Object	1	5.6%

Road Condition	Number	Percent
Dry	13	72.2%
Wet	5	27.8%

Hour of Day	Number	Percent
1:00 AM	1	5.6%
6:00 AM	1	5.6%
7:00 AM	1	5.6%
8:00 AM	2	11.1%
9:00 AM	1	5.6%
11:00 AM	2	11.1%
12:00 PM	1	5.6%
1:00 PM	1	5.6%
2:00 PM	2	11.1%
3:00 PM	1	5.6%
4:00 PM	2	11.1%
5:00 PM	3	16.7%

Day of Week	Number	Percent
Sunday	3	16.7%
Tuesday	4	22.2%
Wednesday	1	5.6%
Thursday	2	11.1%
Friday	5	27.8%
Saturday	3	16.7%

Figure 8 – Crash Diagram (2017-2021)



B. Probable Causes

Noteworthy crash patterns in the study area are summarized with supporting details and probable causes as follows:

- **Angle Crashes**
 Angle crashes are the most prevalent crash type at the study intersection. A total of 13 angle crashes were reported. Angle crashes represent 72.2% of the total crashes, higher than the statewide average of 29.6%. Eleven of the angle crashes involved a westbound vehicle striking a southbound vehicle. As discussed in the sight distance analysis section, no issues appear to be present for the westbound left turning vehicles. However, site photos show if the vehicles are not pulled up past the stop line, utility poles and signs in the northeast corner of the intersection may obstruct sight lines. The two remaining angle crashes involved an eastbound vehicle striking a northbound vehicle. This is also expected to be due to sight distance obstructions.
- **Rear End Crashes**
 Rear end crashes are the second most prevalent crash type at the study intersection. A total of four rear end crashes were reported. Rear end crashes represent 22.2% of the total crashes, which is higher than the statewide average of 12.8%. Two of the crashes occurred on the westbound approach, one occurred on the northbound approach, and one occurred on the southbound approach to the study intersection. These crashes are likely due to drivers not expecting to have to stop and/or not expecting the vehicle in front of them to slow down to make a turn.

C. Safety Analysis

The Highway Safety Manual (HSM) predictive method for rural two-lane, two-way intersections was applied to the study area to determine the potential for safety improvement using the ODOT Economic Crash Analysis Tool (ECAT). See **Appendix I** for an overview of the HSM methodology. The results presented in **Table 3** show the expected crash frequency calculated using HSM predictive method with cleaned crash data and existing conditions for the study area elements.

Table 3 - HSM Results for Existing Conditions for All Crashes (shown in crashes/year)

Predicted Average Crash Frequency	2.2868
Expected Average Crash Frequency – Existing Conditions	2.5209
Expected Excess Crashes	0.2341
Potential for Improvement	Yes

The results conclude the expected crash frequency is greater than the predicted crash frequency for the study intersection. This suggests the intersection experiences more average crashes per year than its peers and has a potential to reduce crashes based on HSM methodology. HSM output reports is provided in **Appendix I**.

VI. Countermeasures

The following section addresses possible countermeasures to mitigate the prevalent crash types in the study area. The countermeasures listed may be independent solutions and are not necessarily recommended to be implemented concurrently.

A. Short-Term Countermeasure

Revise posted speed limits

It is important that set speed limits are considered reasonable by a majority of drivers. Studies have shown that most drivers tend to drive at a speed with which they are comfortable, so raising or lowering the speed limits does not have a significant effect on speed. However, when the speed limit is set at a level that most drivers consider reasonable, the speed of vehicles is more uniform, which has proven to be a safer traffic pattern.

Based on the speed zone analysis, the existing speed limits currently posted on SR-64 through the Village of Haskins are not in line with the calculated speeds or actual operating speeds of vehicles. Working with ODOT District 2, three different proposed speed zone options were presented. The options are provided in **Appendix H**. It is recommended that the Village work with ODOT District 2 to choose and implement the preferred option. Additionally, an advisory speed zone plaque could be posted prior to the railroad for both directions of traffic.

B. Medium-Term Countermeasure

Install northbound and southbound left turn lanes

The turn lane warrant analysis shows a southbound left turn lane is warranted in the AM peak with existing 2022 traffic volumes. It is recommended that a southbound left turn lane be implemented, along with a northbound left turn lane, to provide a zero offset and acceptable sight lines. The added left turn lanes are expected to mitigate rear end crashes associated with vehicles slowing/stopping to make a left turn.

Capacity analysis was conducted, using HCS with 2022 and 2044 traffic volumes, to assess capacity with the proposed left turn lane installation. LOS and vehicle delay results are summarized in **Table 4**. Detailed capacity analysis results are provided in **Appendix J**.

Table 4 – Proposed Northbound/Southbound Left Turn Lane Addition Capacity Analysis

Approach/ Movement	2022 AM		2022 PM		2044 AM		2044 PM	
	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS
Eastbound	20.9	C	15.0	B	21.5	C	15.2	C
Westbound	13.9	B	14.4	B	14.0	B	14.6	B
Northbound Left	7.7	A	7.7	A	7.8	A	7.7	A
Southbound Left	7.9	A	7.8	A	7.9	A	7.8	A

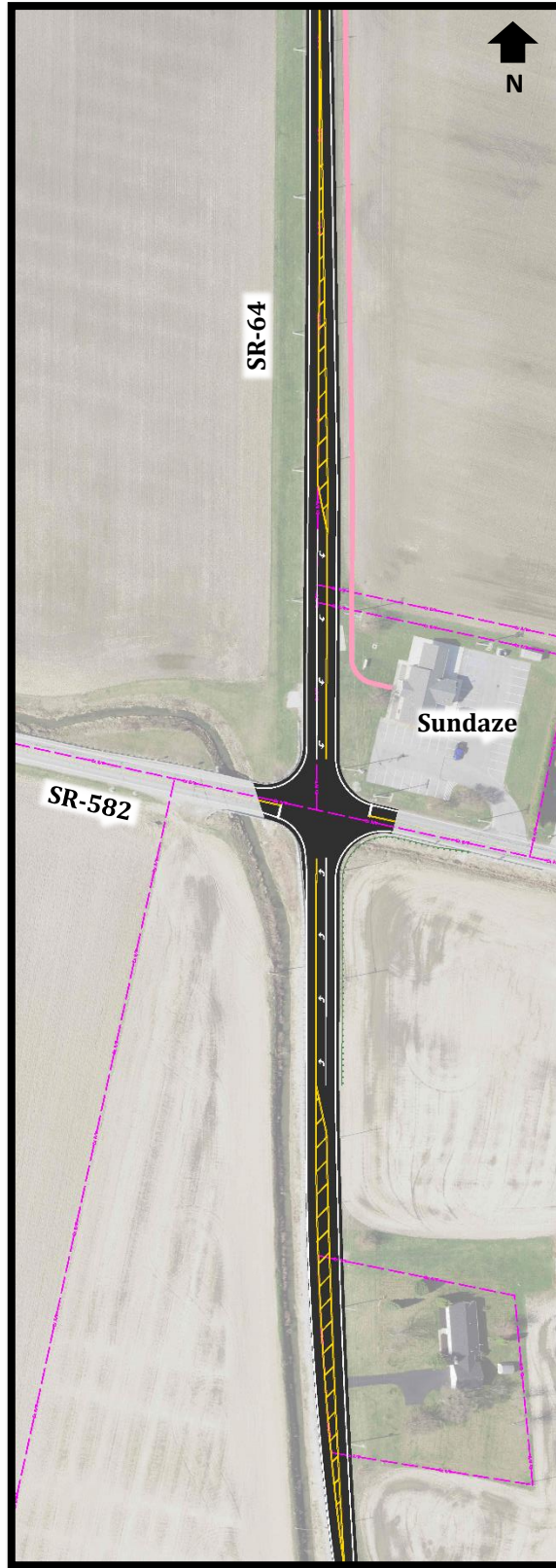
a – Average total delay in seconds per vehicle

Capacity analysis shows that turn lane installation at the intersection will slightly improve delays on the side street approaches. Overall, the turn lanes are recommended for safety reasons, not capacity reasons. However, this countermeasure is not expected or intended to be the “big fix” that mitigates all crashes shown in the crash history. The countermeasure is expected to improve general safety at the study intersection.

Additionally, it is recommended intersection lighting be implemented with the proposed turn lanes. While the lack of intersection lighting is not considered to be a contributing factor in the frequency of crashes, the implementation of intersection lighting is expected to improve the overall safety of the intersection.

A conceptual, planning-level layout of the proposed left turn lane installation is provided in **Figure 9**.

Figure 9 – Proposed Conceptual Planning-Level Left Turn Lane Installation
(proposed sidewalk shown in pink)



Add a sidewalk connection and enhanced crossing north of intersection

There is currently no sidewalk or pedestrian infrastructure near the study intersection. The Village representatives discussed how people are driving, walking, or desiring to walk, from the neighborhoods and Lusher Park south to Sundaze. There is existing sidewalk along the east side of SR-64 that starts near the Lusher Park baseball diamond and extends north to downtown Haskins. It is recommended that the existing sidewalk be extended from its existing terminus south to the study intersection.

Pedestrian crossing enhancement countermeasures were evaluated using Table 1 of the *FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*, the existing roadway configuration, ADT data, and posted speed limit. This is shown in **Figure 10** with the appropriate boxes outlined in red, depending on the posted speed limit.

Figure 10 – FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	① 2 4 5 6	① 5 6 7 9	① 5 6 7 9	① 4 5 6 7 9	① 5 6 7 9	① 5 6 7 9	① 4 5 6 7 9	① 5 6 7 9	① 5 6 9
3 lanes with raised median (1 lane in each direction)	① 2 3 4 5	① 3 5 7 9	① 3 5 7 9	① 3 4 5 7 9	① 3 5 7 9	① 3 5 7 9	① 3 4 5 7 9	① 3 5 7 9	① 3 5 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	① 2 3 4 5 6 7 9	① 3 5 6 7 9	① 3 5 6 9	① 3 4 5 6 7 9	① 3 5 6 7 9	① 3 5 6 9	① 3 4 5 6 7 9	① 3 5 6 9	① 3 5 6 9
4+ lanes with raised median (2 or more lanes in each direction)	① 3 5 7 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 7 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	① 3 5 6 7 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 7 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 8 9

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

- 1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
- 2 Raised crosswalk
- 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
- 4 In-Street Pedestrian Crossing sign
- 5 Curb extension
- 6 Pedestrian refuge island
- 7 Rectangular Rapid-Flashing Beacon (RRFB)**
- 8 Road Diet
- 9 Pedestrian Hybrid Beacon (PHB)**

Based on the table, countermeasure candidates are as follows:

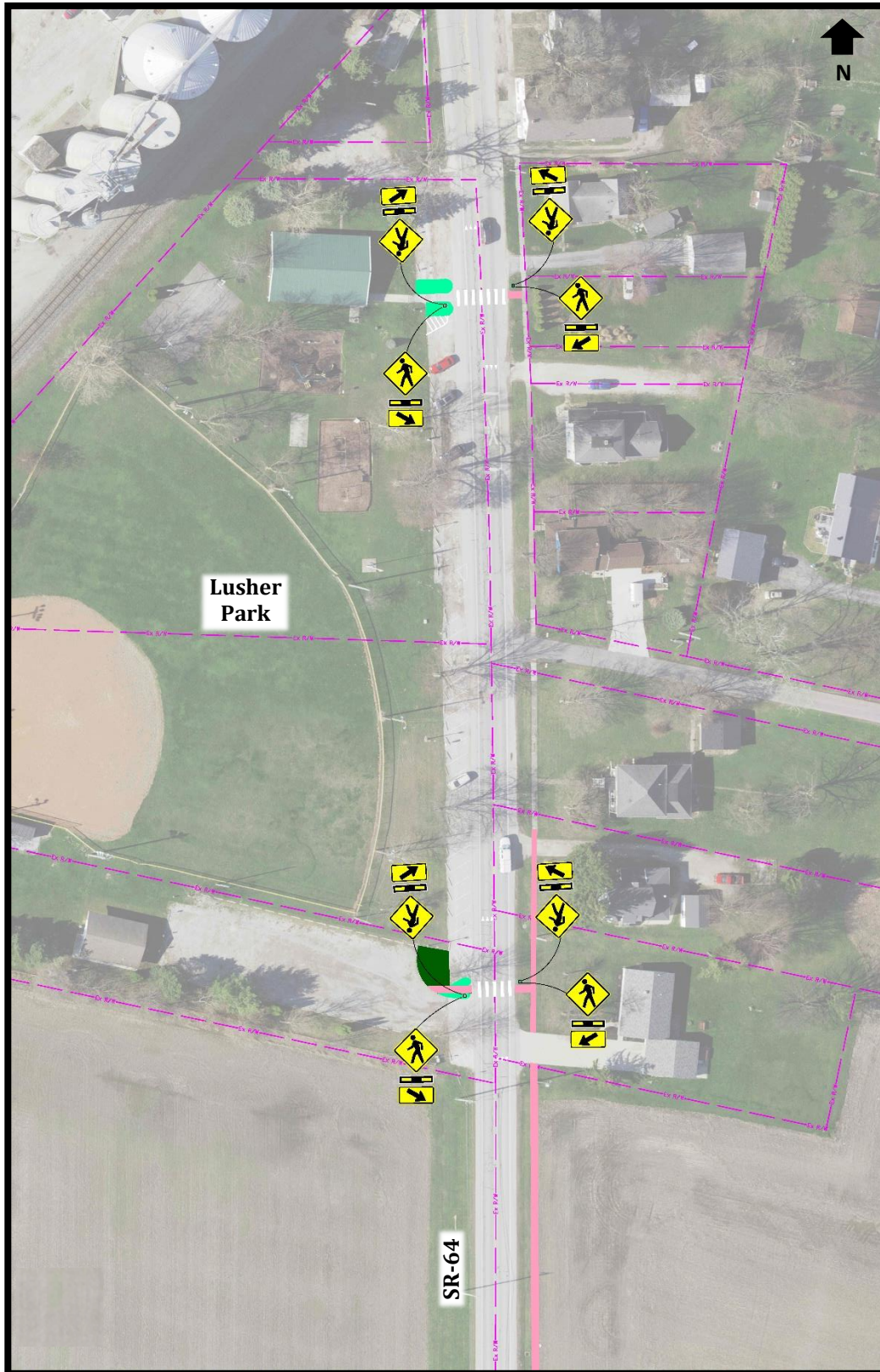
- High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs*
- Curb extension
- Pedestrian refuge island
- Rectangular Rapid-Flashing Beacon (RRFB)**
- Pedestrian Hybrid Beacon (PHB)**

*If posted speed limit is 35 MPH, this countermeasure should be considered. If posted speed limit is equal to or greater than 40 MPH, this countermeasure should always occur in conjunction with other identified countermeasures.

** If posted speed limit is 35 MPH, this countermeasure is a candidate. If posted speed limit is equal to or greater than 40 MPH, this countermeasure should always occur in conjunction with other identified countermeasures. Note, PHB and RRFB are not both installed at the same crossing location.

A conceptual, planning-level layout of the proposed sidewalk connection is provided in **Figure 11**. Included in the concept plan are enhanced crossings with continental type crosswalk pavement markings and RRFBs placed at the south end of the baseball diamond and at the south end of the pavilion. This will provide a safe crossing for pedestrians at Lusher Park walking to Sundaze, as well as pedestrians walking from the east neighborhood to Lusher Park. This countermeasure is recommended to be paired with both the medium and long-term countermeasure projects.

Figure 11 – Proposed Conceptual Planning-Level Sidewalk and Crossing Installation
(proposed sidewalk shown in pink)



C. Long-Term Countermeasures

Reconfigure intersection to be a roundabout

A roundabout should be considered for implementation at this intersection. The FHWA Office of Safety identified roundabouts as a Proven Safety Countermeasure because of their ability to greatly reduce the types of crashes that result in serious injury or fatality. By reducing the number and severity of conflict points at the intersection, and because of the lower speeds of vehicles moving through the intersection, roundabouts have been proven to be a safer intersection type. There is currently a roundabout on SR-64 less than three miles north of the study intersection, and roundabouts are generally becoming more common throughout Ohio. It is anticipated that traffic driving through the intersection will be familiar with roundabouts.

Capacity analysis was conducted using HCS with 2022 and 2044 traffic volumes to assess the capacity of the proposed roundabout installation. LOS and vehicle delay results are summarized in **Table 5**. Detailed capacity analysis results are provided in **Appendix J**.

Table 5 – Proposed Roundabout Capacity Analysis Results

Approach	2022 AM		2022 PM		2044 AM		2044 PM	
	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS	Delay ^a	LOS
Eastbound	5.1	A	4.0	A	5.2	A	4.1	A
Westbound	4.2	A	5.1	A	4.2	A	5.1	A
Northbound	5.3	A	4.7	A	5.4	A	4.7	A
Southbound	5.2	A	4.8	A	5.2	A	4.8	A
Total	5.1	A	4.7	A	5.2	A	4.8	A

a – Average total delay in seconds per vehicle

Capacity analysis shows that a single circulating lane roundabout with single lane approaches will operate with acceptable LOS through 2044. Note, LOS and delays are improved compared to the existing conditions capacity analysis.

Additionally, it is recommended intersection lighting be implemented with the proposed roundabout. While the lack of intersection lighting is not considered to be a contributing factor in the frequency of crashes, the implementation of intersection lighting is expected to improve the overall safety of the intersection. Especially with the implementation of a roundabout.

Two options of roundabout configurations are proposed:

- Modern roundabout, which impacts some Sundaze parking spots
- Peanut roundabout, which avoids impacts to Sundaze parking lot

Conceptual, planning-level layouts of all four proposed roundabout configuration options are provided in **Figure 12** and **13**.

Figure 12 – Proposed Conceptual Planning-Level Modern Roundabout Installation
(proposed sidewalk shown in pink, parking lot impacts shown in red hatching)

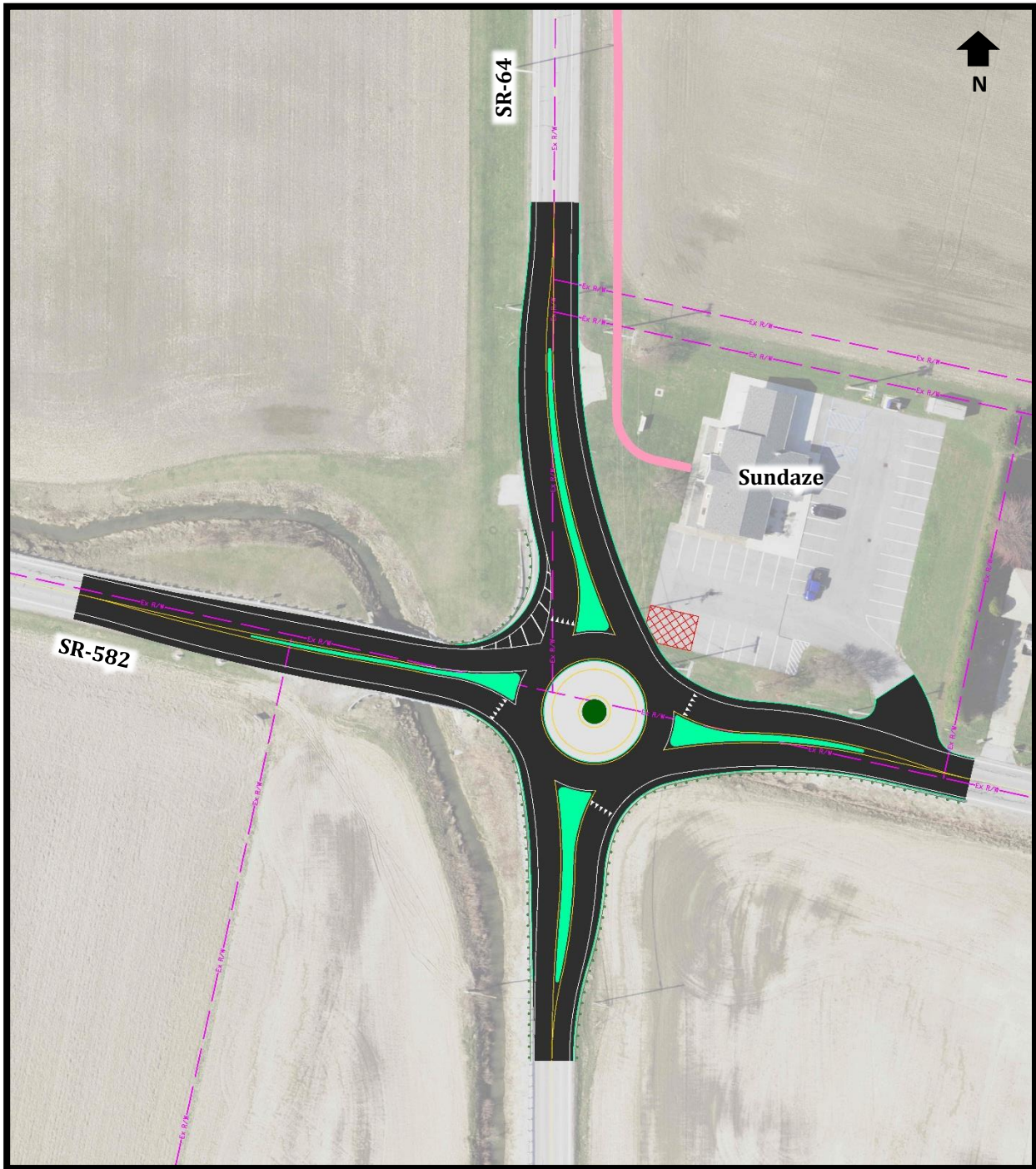
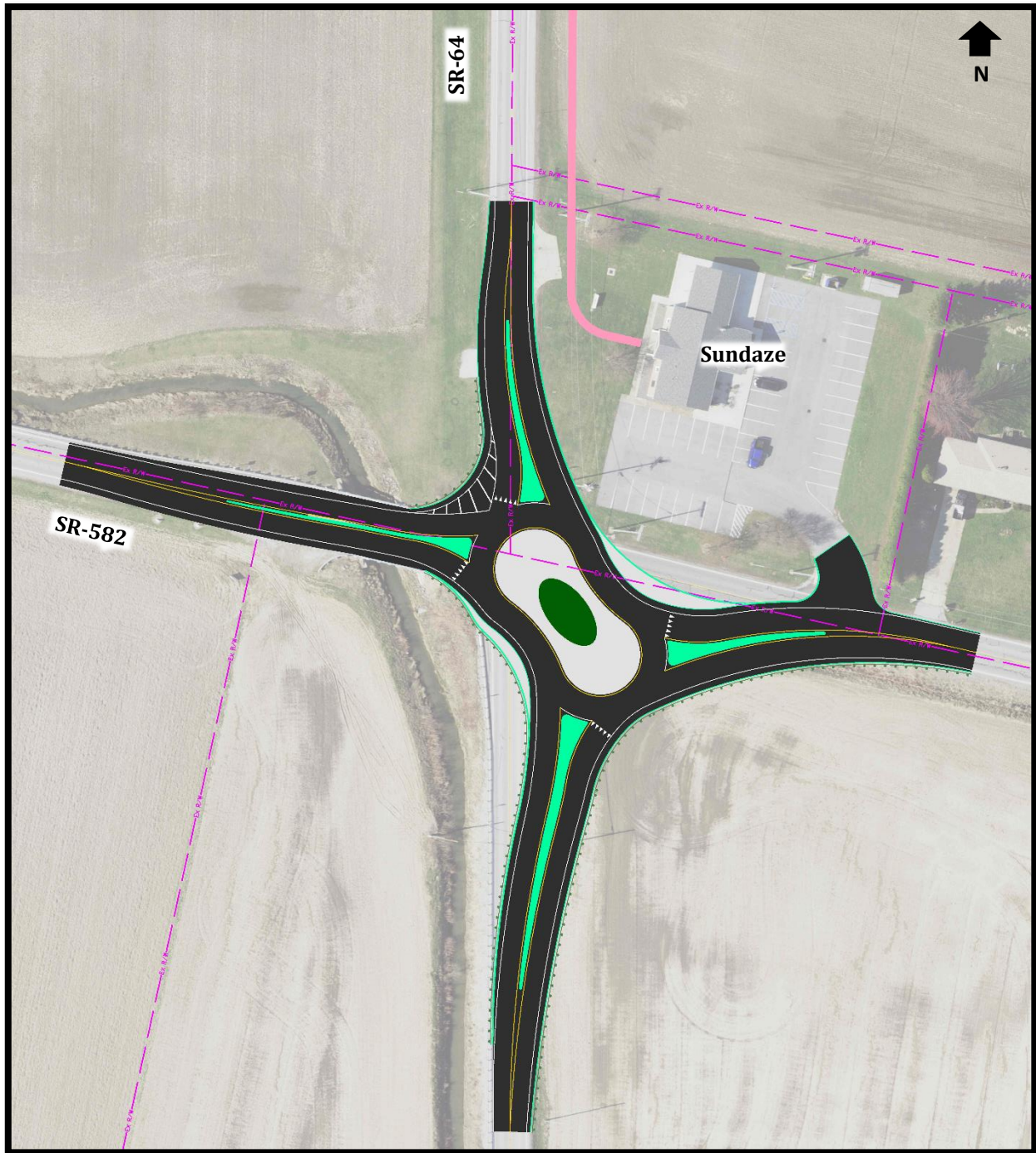


Figure 13 – Proposed Conceptual Planning-Level Peanut Roundabout Installation
(proposed sidewalk shown in pink)



D. Countermeasures for Future Consideration

Revise Lusher Park infrastructure

There is currently no sidewalk within the park to connect the different amenities of the park to each other or to the parking lot/spaces. Additionally, front-in angle parking is provided along the frontage of the park. This operates well for vehicles arriving. However, when vehicles are departing, their vision could be blocked by adjacent parked vehicles, and the drivers must blindly back up into traffic on SR-64. While this segment was not included in the crash analysis study area, it is expected that crashes are associated with this parking along the roadway.

It is recommended that the parking be revised to parallel parking. This enables drivers to see vehicles on SR-64 when departing. However, this would reduce the number of parking spaces on the frontage. If parking space availability is expected to be an issue, back angle parking could be considered instead. The pavement markings would be revised so that drivers are forced to back into the spaces from SR-64. This also enables drivers to see vehicles on SR-64 when departing, and the existing number of parking spaces can be maintained.

Additionally, it is recommended that sidewalk internal to the park be installed to connect the south parking lot, frontage parking, baseball diamond, and pavilion. This will help to funnel pedestrians to their destination, and to the proposed RRFB crossings, while also making the park more ADA compliant.

VII. Benefit-Cost Analysis

Benefit-cost analysis is a tool used to determine the financial benefits of a project by comparing the net present value (NPV) of a project to the NPV of the safety benefit provided by the project. Benefit-cost values greater than one indicate a positive return on the original investment. Preferred countermeasures are those having the highest NPV of safety benefits.

A benefit-cost analysis for the recommended long-term countermeasures was prepared using the ODOT ECAT. Crash modification factors (CMF) were applied for the proposed medium and long-term improvements. This analysis does not account for all recommended improvements and only includes countermeasures that have CMF values.

Cost estimates were prepared for the medium and long-term countermeasures. Note, the sidewalk connection and enhanced crossing north of intersection are included in all countermeasure projects. The construction cost estimates assume the following:

- 15% engineering design
- 30% contingency
- 10% environmental, geotechnical, federal requirements
- 11.7% inflation rate for an estimated 2025 construction year¹

¹ Note, inflation rates have been irregularly high recently. If the proposed project is not immediately moved forward, this cost estimate will likely need revised as time passes.

- Right-of-way impacts
- Utility relocation costs are not included

The estimated costs for the medium and long-term countermeasures are summarized in **Table 6**. Detailed cost estimates are included in **Appendix K**.

Table 6 – Cost Estimates

Countermeasures (including intersection lighting, sidewalk connection, and enhanced crossings)	Total
Install NB and SB left turn lanes	\$1,705,700
Install modern roundabout	\$2,867,800
Install peanut roundabout	\$3,096,500

Crash modification factors (CMF) were applied for the following countermeasures. This analysis does not account for all recommended improvements, rather only those countermeasures that have CMF values.

Install northbound and southbound left turn lanes

- **Install left turn lanes:** A CMF of 0.5200 was included in the project for the implementation of this proposed countermeasure. This is a standard Part C CMF offering in ECAT, which was used to calculate the Combined CMF.
- **Add intersection lighting:** A CMF of 0.9996 was included in the project for the implementation of this proposed countermeasure. This is a standard Part C CMF offering in ECAT, which was used to calculate the Combined CMF.

Roundabout (same for modern and peanut configurations)

- **Convert intersection with minor-road stop control to modern roundabout (rural):** A CMF of 0.13 was applied to all crashes except property damage only crashes in which a CMF of 0.29 was applied. This is a standard CMF offering in ECAT.
- **Add intersection lighting:** A CMF of 0.9996 was included in the project for the implementation of this proposed countermeasure. This is a standard Part C CMF offering in ECAT, which was used to calculate the Combined CMF.

Table 7 summarizes the benefit-cost analysis results. Detailed reports from ECAT are included in **Appendix L**.

Table 7 - Benefit-Cost Analysis

	Countermeasures		
	NB & SB left turn lanes	Modern roundabout	Peanut roundabout
Expected Annual Crash Adjustment	-1.211	-1.956	-1.956
NPV of Project	\$1,527,031.25	\$2,567,413.50	\$2,772,157.85
NPV of Safety Benefit	\$851,020.25	\$1,542,179.60	\$1,542,179.60
Benefit-Cost Ratio	0.56	0.60	0.56

The benefit-cost ratio for each countermeasure project is less than 1.0. The proposed roundabout configurations are expected to mitigate more crashes compared to the left turn lane installations. While the modern roundabout option has more right-of-way impacts, it is less expensive compared to the peanut roundabout option. Therefore, the modern roundabout option has the most favorable benefit-cost ratio when compared to the other countermeasure projects.

VIII. Recommendations

It is recommended the short-term countermeasure of revising the posted speed limits be implemented as soon as feasible. It is recommended that conversations be had with the landowners of the Sundaze property. If the removal of some parking spots, as proposed with the modern roundabout configuration, would be infeasible, then the peanut roundabout option could be further investigated. Regardless, the roundabout design would need to be further refined when survey data is available and through the detailed design process. It is recommended the sidewalk connection and enhanced crossing north of intersection be installed in conjunction with the proposed roundabout project.

While the cost of both proposed roundabout configuration options is relatively high, the crash history shows a high representation of angle crashes resulting in injury. The implementation of a roundabout is expected to mitigate this primary crash concern of angle crashes at the intersection. Therefore, the roundabout should be further considered regardless of the benefit-cost analysis results. If desired, formal safety funding could be pursued for this improvement.

Additionally, in the future, the Village of Haskins could further consider and investigate options to revise Lusher Park infrastructure, as described.

Appendix A

Count Data

Leg Direction	SR-582 Eastbound						SR-582 Westbound						SR-64 Northbound						SR-64 Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
5:30PM	4	4	2	0	10	0	4	15	23	0	42	0	1	53	4	0	58	0	8	47	6	0	61	0	171
5:45PM	8	9	2	0	19	0	5	7	21	0	33	0	0	39	2	0	41	0	8	45	5	0	58	0	151
Hourly Total	17	38	8	0	63	0	14	60	86	0	160	0	4	215	15	0	234	0	36	189	25	0	250	0	707
Total	169	367	41	0	577	0	89	371	475	0	935	0	29	1570	135	0	1734	0	449	1547	169	0	2165	0	5411
% Approach	29.3%	63.6%	7.1%	0%	-	-	9.5%	39.7%	50.8%	0%	-	-	1.7%	90.5%	7.8%	0%	-	-	20.7%	71.5%	7.8%	0%	-	-	-
% Total	3.1%	6.8%	0.8%	0%	10.7%	-	1.6%	6.9%	8.8%	0%	17.3%	-	0.5%	29.0%	2.5%	0%	32.0%	-	8.3%	28.6%	3.1%	0%	40.0%	-	-
Lights	164	349	39	0	552	-	78	354	435	0	867	-	28	1537	122	0	1687	-	419	1512	163	0	2094	-	5200
% Lights	97.0%	95.1%	95.1%	0%	95.7%	-	87.6%	95.4%	91.6%	0%	92.7%	-	96.6%	97.9%	90.4%	0%	97.3%	-	93.3%	97.7%	96.4%	0%	96.7%	-	96.1%
Articulated Trucks	1	3	0	0	4	-	8	5	16	0	29	-	0	5	6	0	11	-	7	8	1	0	16	-	60
% Articulated Trucks	0.6%	0.8%	0%	0%	0.7%	-	9.0%	1.3%	3.4%	0%	3.1%	-	0%	0.3%	4.4%	0%	0.6%	-	1.6%	0.5%	0.6%	0%	0.7%	-	1.1%
Buses and Single-Unit Trucks	4	15	2	0	21	-	3	12	23	0	38	-	1	26	7	0	34	-	23	26	5	0	54	-	147
% Buses and Single-Unit Trucks	2.4%	4.1%	4.9%	0%	3.6%	-	3.4%	3.2%	4.8%	0%	4.1%	-	3.4%	1.7%	5.2%	0%	2.0%	-	5.1%	1.7%	3.0%	0%	2.5%	-	2.7%
Bicycles on Road	0	0	0	0	0	-	0	0	1	0	1	-	0	2	0	0	2	-	0	1	0	0	1	-	4
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0.2%	0%	0.1%	-	0%	0.1%	0%	0%	0.1%	-	0%	0.1%	0%	0%	0%	-	0.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR-582 & SR-64 - TMC

Tue Jun 28, 2022

Full Length (6 AM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

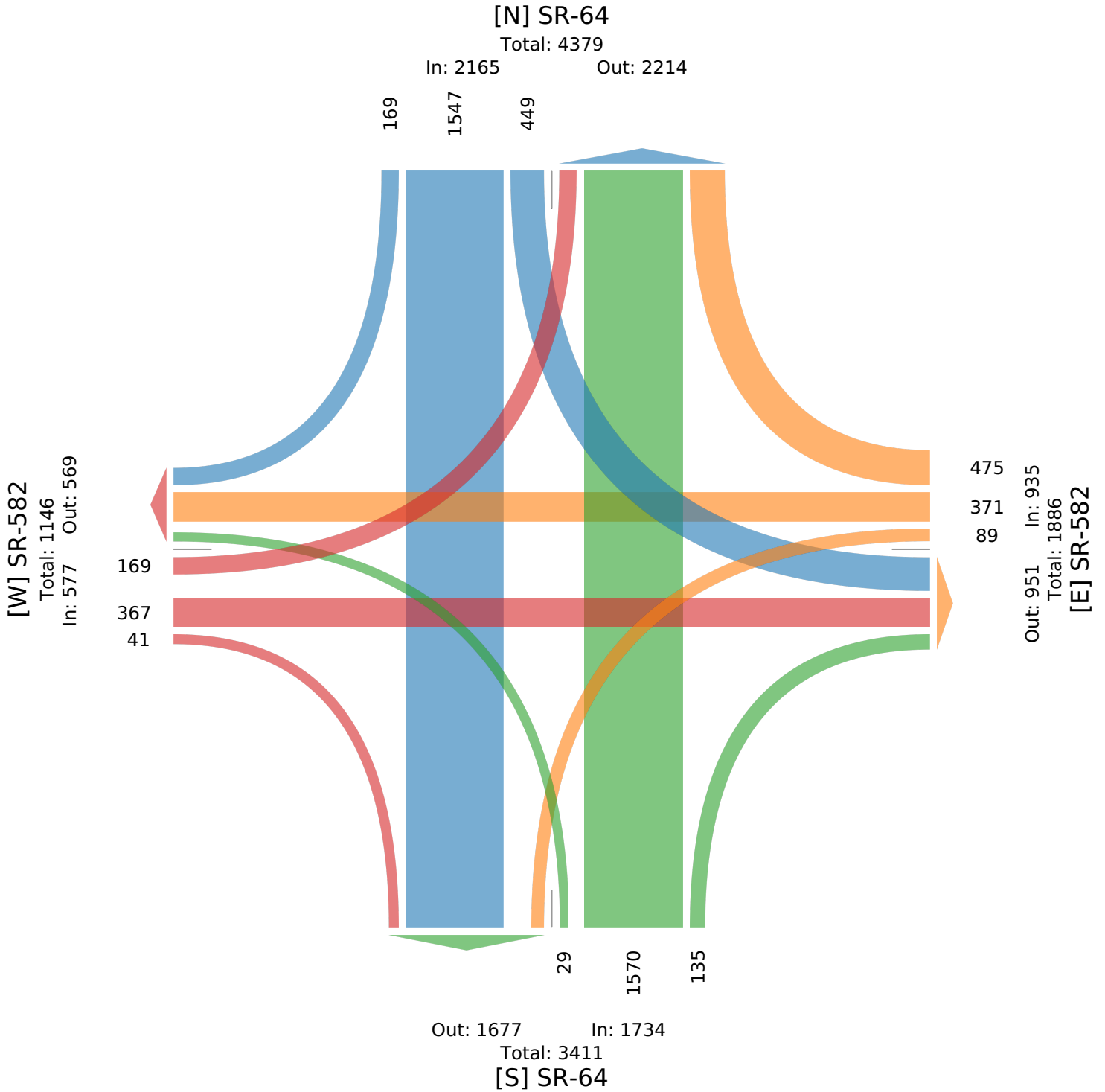
ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US



SR-582 & SR-64 - TMC

Tue Jun 28, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,
Columbus, OH, 43229, US

Leg Direction	SR-582 Eastbound						SR-582 Westbound						SR-64 Northbound						SR-64 Southbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2022-06-28 7:15AM	1	20	1	0	22	0	0	3	3	0	6	0	0	22	4	0	26	0	19	28	2	0	49	0	103
7:30AM	7	14	0	0	21	0	0	4	4	0	8	0	0	45	6	0	51	0	18	46	0	0	64	0	144
7:45AM	2	10	1	0	13	0	1	5	11	0	17	0	0	38	3	0	41	0	17	48	3	0	68	0	139
8:00AM	6	7	1	0	14	0	2	5	5	0	12	0	0	25	5	0	30	0	17	31	5	0	53	0	109
Total	16	51	3	0	70	0	3	17	23	0	43	0	0	130	18	0	148	0	71	153	10	0	234	0	495
% Approach	22.9%	72.9%	4.3%	0%	-	-	7.0%	39.5%	53.5%	0%	-	-	0%	87.8%	12.2%	0%	-	-	30.3%	65.4%	4.3%	0%	-	-	-
% Total	3.2%	10.3%	0.6%	0%	14.1%	-	0.6%	3.4%	4.6%	0%	8.7%	-	0%	26.3%	3.6%	0%	29.9%	-	14.3%	30.9%	2.0%	0%	47.3%	-	-
PHF	0.571	0.638	0.750	-	0.795	-	0.375	0.850	0.523	-	0.632	-	-	0.722	0.750	-	0.725	-	0.934	0.797	0.500	-	0.860	-	0.859
Lights	15	48	2	0	65	-	3	17	19	0	39	-	0	129	15	0	144	-	69	151	10	0	230	-	478
% Lights	93.8%	94.1%	66.7%	0%	92.9%	-	100%	100%	82.6%	0%	90.7%	-	0%	99.2%	83.3%	0%	97.3%	-	97.2%	98.7%	100%	0%	98.3%	-	96.6%
Articulated Trucks	0	0	0	0	0	-	0	0	3	0	3	-	0	0	1	0	1	-	0	0	0	0	0	-	4
% Articulated Trucks	0%	0%	0%	0%	0%	-	0%	0%	13.0%	0%	7.0%	-	0%	0%	5.6%	0%	0.7%	-	0%	0%	0%	0%	0%	-	0.8%
Buses and Single-Unit Trucks	1	3	1	0	5	-	0	0	1	0	1	-	0	1	2	0	3	-	2	2	0	0	4	-	13
% Buses and Single-Unit Trucks	6.3%	5.9%	33.3%	0%	7.1%	-	0%	0%	4.3%	0%	2.3%	-	0%	0.8%	11.1%	0%	2.0%	-	2.8%	1.3%	0%	0%	1.7%	-	2.6%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR-582 & SR-64 - TMC

Tue Jun 28, 2022

AM Peak (7:15 AM - 8:15 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

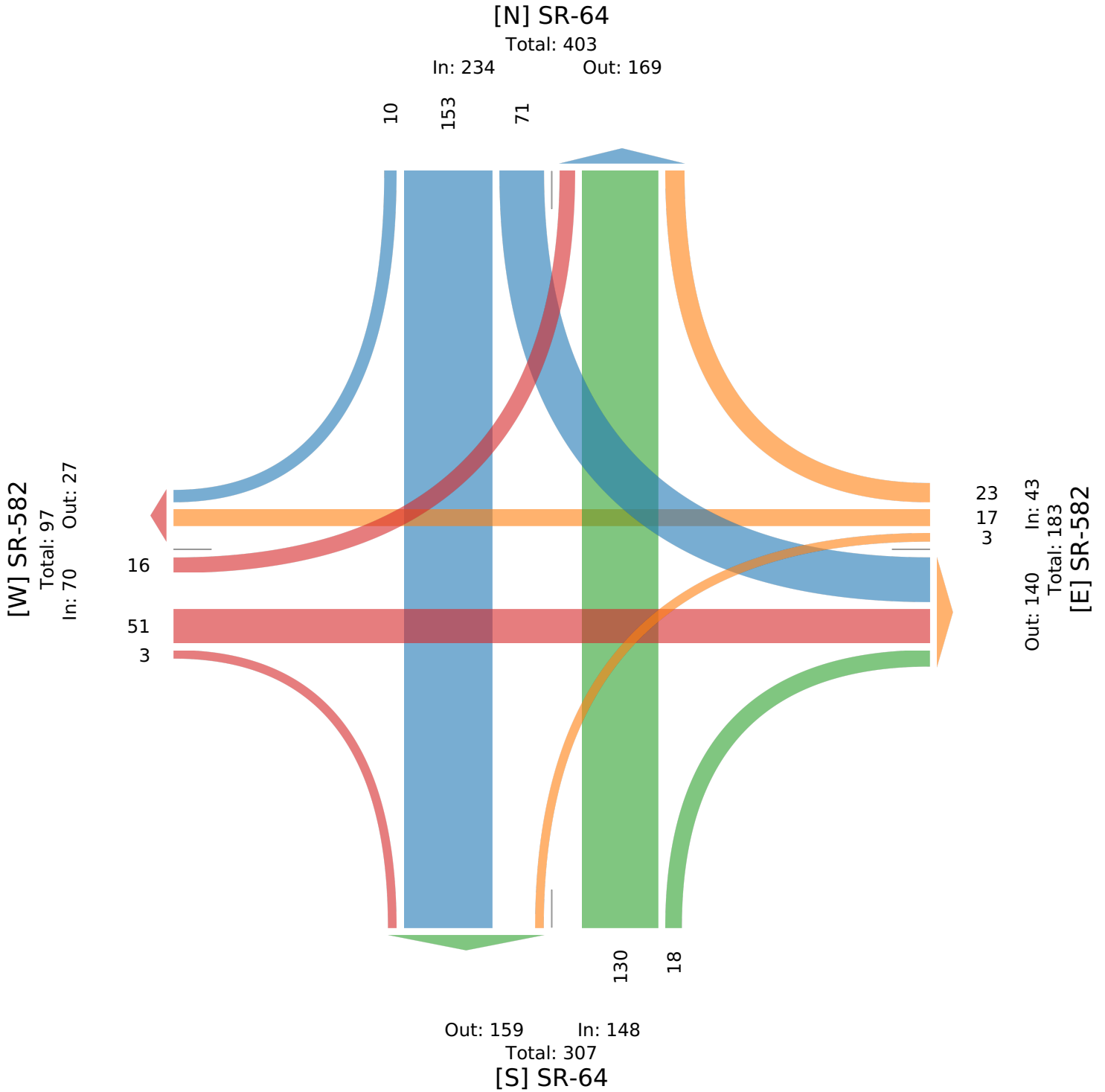
ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US



SR-582 & SR-64 - TMC

Tue Jun 28, 2022

Midday Peak (12:30 PM - 1:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US

Leg Direction	SR-582 Eastbound					SR-582 Westbound					SR-64 Northbound					SR-64 Southbound									
Time	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	Int				
2022-06-28 12:30PM	3	7	0	0	10	0	2	6	10	0	18	0	1	20	1	0	22	0	12	33	4	0	49	0	99
12:45PM	2	3	2	0	7	0	1	10	4	0	15	0	0	37	5	0	42	0	7	42	3	0	52	0	116
1:00PM	9	4	1	0	14	0	1	3	8	0	12	0	0	25	3	0	28	0	7	22	3	0	32	0	86
1:15PM	8	8	1	0	17	0	2	5	6	0	13	0	0	35	1	0	36	0	11	22	0	0	33	0	99
Total	22	22	4	0	48	0	6	24	28	0	58	0	1	117	10	0	128	0	37	119	10	0	166	0	400
% Approach	45.8%	45.8%	8.3%	0%	-	-	10.3%	41.4%	48.3%	0%	-	-	0.8%	91.4%	7.8%	0%	-	-	22.3%	71.7%	6.0%	0%	-	-	-
% Total	5.5%	5.5%	1.0%	0%	12.0%	-	1.5%	6.0%	7.0%	0%	14.5%	-	0.3%	29.3%	2.5%	0%	32.0%	-	9.3%	29.8%	2.5%	0%	41.5%	-	-
PHF	0.611	0.688	0.500	-	0.706	-	0.750	0.600	0.700	-	0.806	-	0.250	0.791	0.500	-	0.762	-	0.771	0.708	0.625	-	0.798	-	0.862
Lights	22	21	4	0	47	-	5	22	27	0	54	-	1	114	8	0	123	-	36	113	8	0	157	-	381
% Lights	100%	95.5%	100%	0%	97.9%	-	83.3%	91.7%	96.4%	0%	93.1%	-	100%	97.4%	80.0%	0%	96.1%	-	97.3%	95.0%	80.0%	0%	94.6%	-	95.3%
Articulated Trucks	0	0	0	0	0	-	1	1	0	0	2	-	0	1	1	0	2	-	0	2	1	0	3	-	7
% Articulated Trucks	0%	0%	0%	0%	0%	-	16.7%	4.2%	0%	0%	3.4%	-	0%	0.9%	10.0%	0%	1.6%	-	0%	1.7%	10.0%	0%	1.8%	-	1.8%
Buses and Single-Unit Trucks	0	1	0	0	1	-	0	1	1	0	2	-	0	2	1	0	3	-	1	4	1	0	6	-	12
% Buses and Single-Unit Trucks	0%	4.5%	0%	0%	2.1%	-	0%	4.2%	3.6%	0%	3.4%	-	0%	1.7%	10.0%	0%	2.3%	-	2.7%	3.4%	10.0%	0%	3.6%	-	3.0%
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR-582 & SR-64 - TMC

Tue Jun 28, 2022

Midday Peak (12:30 PM - 1:30 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

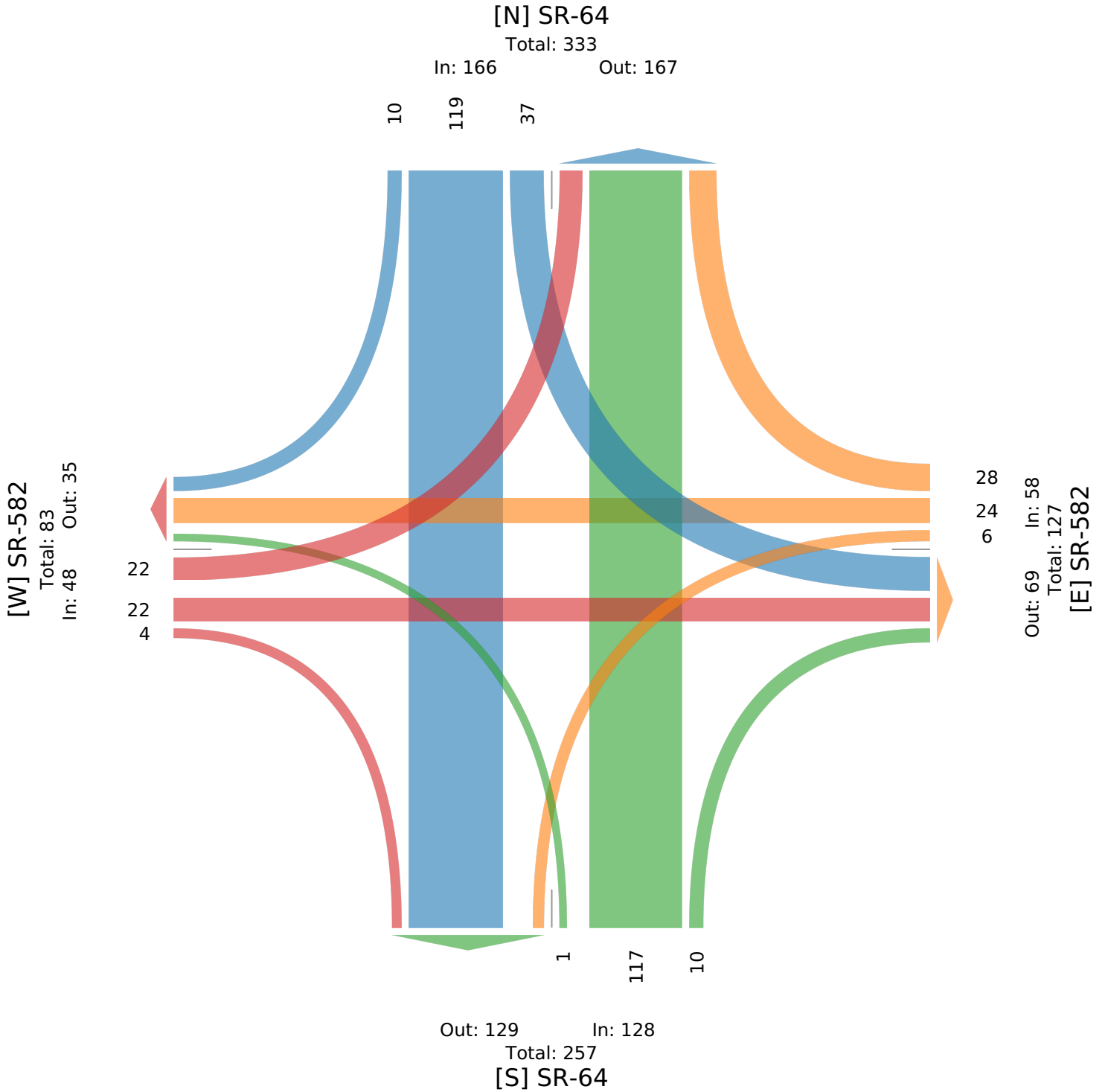
ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US



SR-582 & SR-64 - TMC

Tue Jun 28, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US

Leg Direction	SR-582 Eastbound					SR-582 Westbound					SR-64 Northbound					SR-64 Southbound									
Time	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	L	T	R	U	App Ped*	Int				
2022-06-28 4:30PM	5	7	0	0	12	0	3	15	18	0	36	0	1	48	5	0	54	0	14	52	8	0	74	0	176
4:45PM	1	6	0	0	7	0	4	16	22	0	42	0	1	60	5	0	66	0	8	46	8	0	62	0	177
5:00PM	2	10	1	0	13	0	2	27	18	0	47	0	2	54	5	0	61	0	7	47	10	0	64	0	185
5:15PM	3	15	3	0	21	0	3	11	24	0	38	0	1	69	4	0	74	0	13	50	4	0	67	0	200
Total	11	38	4	0	53	0	12	69	82	0	163	0	5	231	19	0	255	0	42	195	30	0	267	0	738
% Approach	20.8%	71.7%	7.5%	0%	-	-	7.4%	42.3%	50.3%	0%	-	-	2.0%	90.6%	7.5%	0%	-	-	15.7%	73.0%	11.2%	0%	-	-	-
% Total	1.5%	5.1%	0.5%	0%	7.2%	-	1.6%	9.3%	11.1%	0%	22.1%	-	0.7%	31.3%	2.6%	0%	34.6%	-	5.7%	26.4%	4.1%	0%	36.2%	-	-
PHF	0.550	0.633	0.333	-	0.631	-	0.750	0.639	0.844	-	0.862	-	0.625	0.837	0.950	-	0.861	-	0.750	0.938	0.750	-	0.902	-	0.921
Lights	11	35	4	0	50	-	11	67	80	0	158	-	5	231	18	0	254	-	40	193	30	0	263	-	725
% Lights	100%	92.1%	100%	0%	94.3%	-	91.7%	97.1%	97.6%	0%	96.9%	-	100%	100%	94.7%	0%	99.6%	-	95.2%	99.0%	100%	0%	98.5%	-	98.2%
Articulated Trucks	0	0	0	0	0	-	1	0	0	0	1	-	0	0	0	0	0	-	1	0	0	0	1	-	2
% Articulated Trucks	0%	0%	0%	0%	0%	-	8.3%	0%	0%	0%	0.6%	-	0%	0%	0%	0%	0%	-	2.4%	0%	0%	0%	0.4%	-	0.3%
Buses and Single-Unit Trucks	0	3	0	0	3	-	0	2	1	0	3	-	0	0	1	0	1	-	1	2	0	0	3	-	10
% Buses and Single-Unit Trucks	0%	7.9%	0%	0%	5.7%	-	0%	2.9%	1.2%	0%	1.8%	-	0%	0%	5.3%	0%	0.4%	-	2.4%	1.0%	0%	0%	1.1%	-	1.4%
Bicycles on Road	0	0	0	0	0	-	0	0	1	0	1	-	0	0	0	0	0	-	0	0	0	0	0	-	1
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0%	1.2%	0%	0.6%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	-	0
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

SR-582 & SR-64 - TMC

Tue Jun 28, 2022

PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

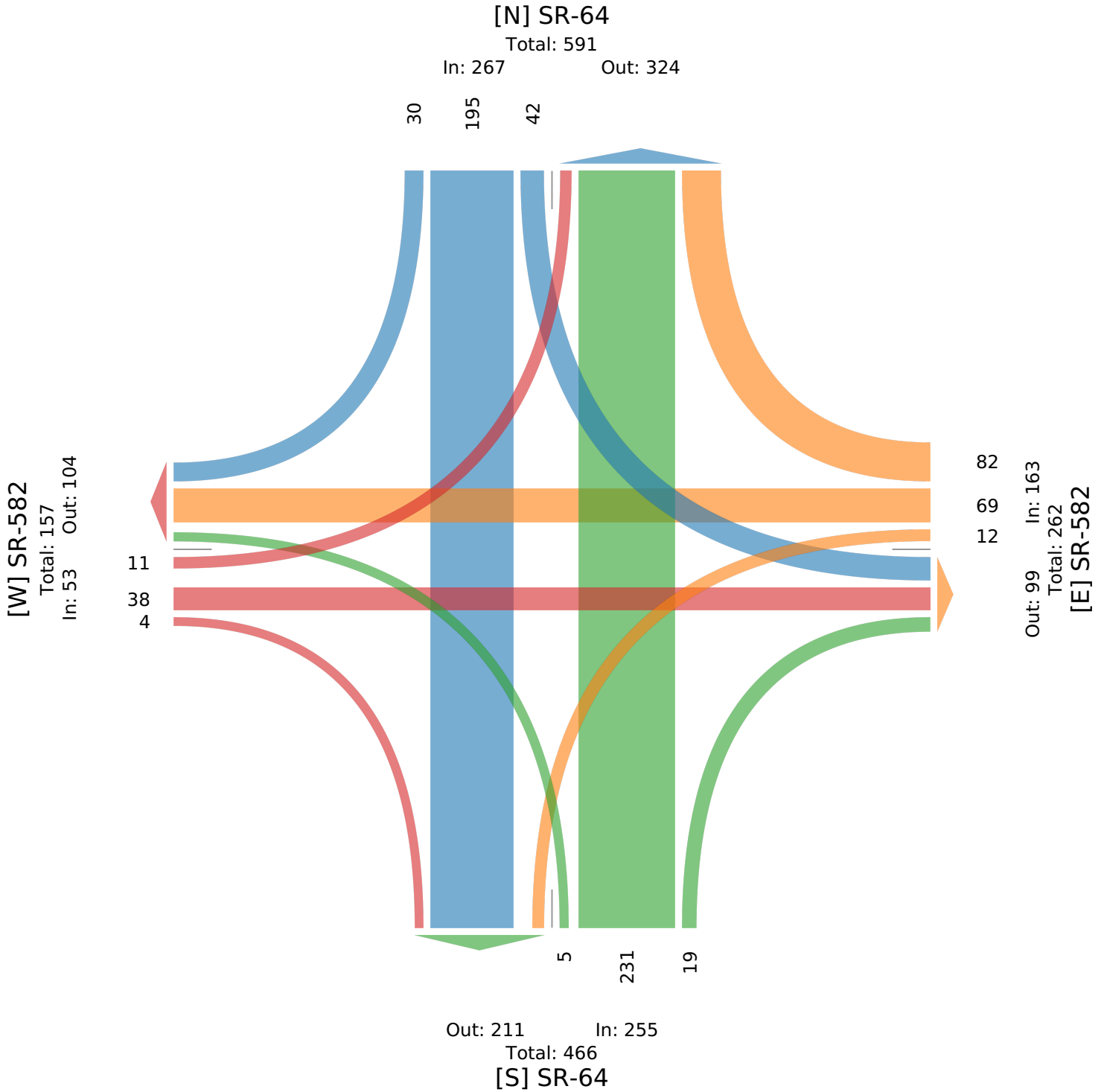
ID: 969775, Location: 41.459279, -83.703318

Provided by: Carpenter Marty (CM)

Transportation Inc.

6612 Singletree Drive,

Columbus, OH, 43229, US



Appendix B

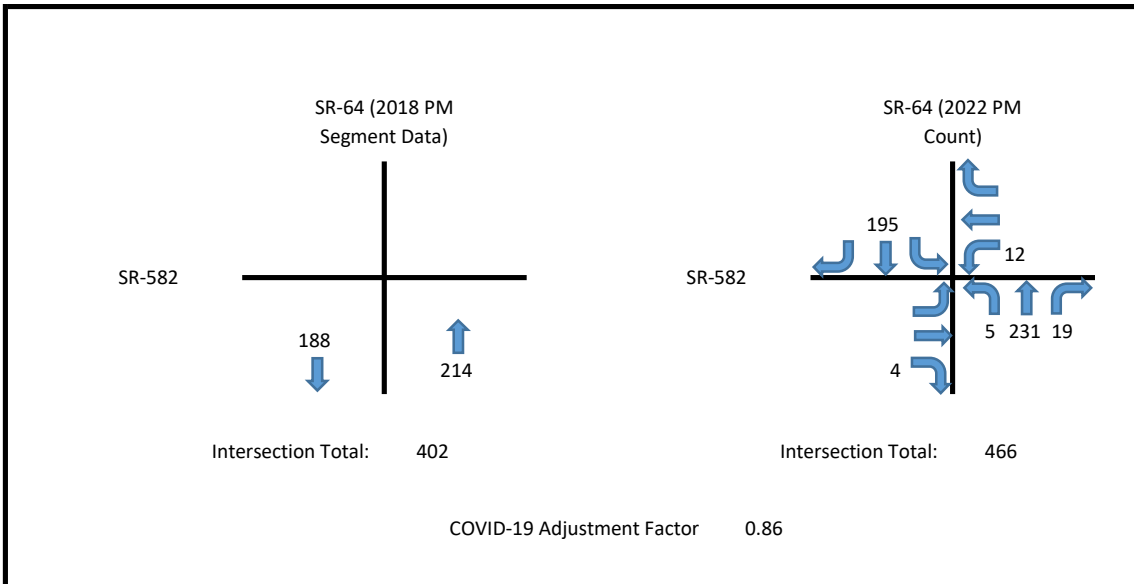
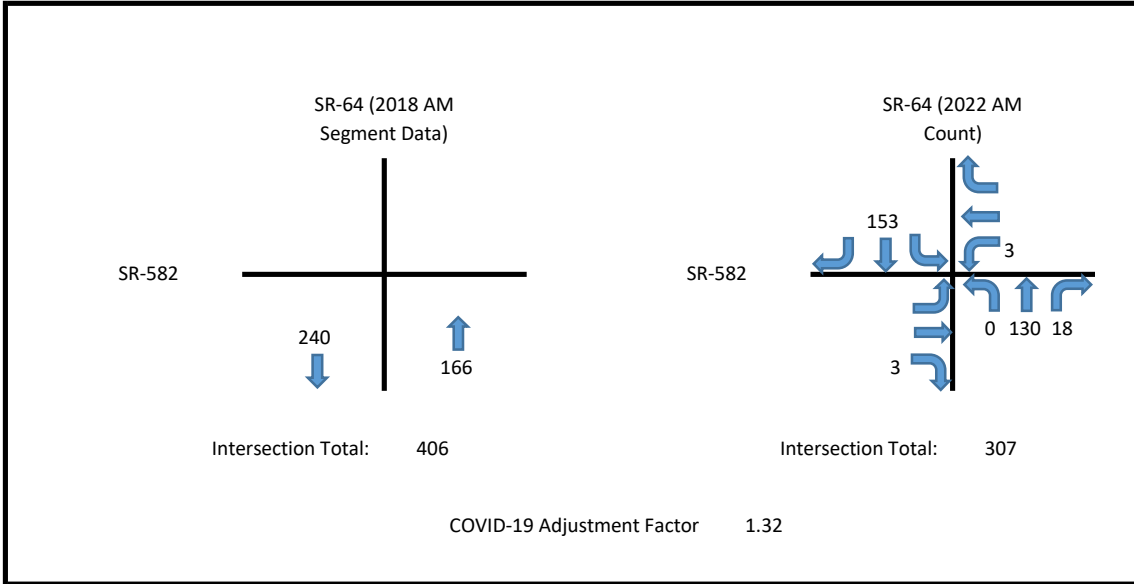
COVID Adjustment Factors, TMACOG Growth Rates, & Volume Calculations

WOO-582-2.61 Safety Study
Traffic Volume Calculations



Year	Period	Scenario	Plate

^
N



Conclusion: Since the AM Peak is over the 15% acceptable range, a COVID-19 adjustment factor of 1.32 will be applied to the AM Peak counts. The PM Peak is within the 15% acceptable range, and the 2022 counts are higher than the 2018 counts, so no COVID-19 adjustment factor will be applied to the PM Peak counts.

Gina Balsamo

From: Lisa Householder <householder@tmacog.org>
Sent: Friday, July 29, 2022 3:31 PM
To: Gina Balsamo
Cc: Christopher.Waterfield@dot.ohio.gov; Kimberly.Coutcher@dot.ohio.gov; Zachary.Porter@dot.ohio.gov; Chelsea Cousins; Leiana Yates; Marc VonDeylen; David Gedeon
Subject: RE: D2 Safety Studies; Growth Rates

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Hi Gina,

I wanted to respond with the one location I was able to look at this week – SR 582 at SR 64 in Haskins. I'll continue to review the locations in Toledo next week and get back to you with those additional growth rates.

So, I'm weighing this a little more heavily on the traffic count data at hand, and not as much on forecast results from the travel demand model. That model is currently updated through 2020 for highway network projects (coinciding with our 2045 long range plan update years). However, the demographic and employment data that feeds into the model is now several years old. I think the employment numbers we have dates back to 2015 and I have not incorporated any 2020 Census numbers to update the population and other demographic data inputs. I'm still waiting on all of that data to become available so I can update everything. The current model results show an overall decline in this area, but I don't want to rely on that too much since there is much information that needs to be updated.

In addition to the count data CMT gathered in 2022, I also reviewed the counts obtained by ODOT since 2015 (with physical counts being obtained in 2015, 2018, and 2021). The northern and western parts of the intersection have seen an increase in AADT since 2018, the eastern part has seen a bit of a decline, while the southern part has remained fairly consistent with very little gains in traffic. Maybe you are already aware, but there have been (and currently are) several road projects within the vicinity that will have impacted traffic over the years. We'll need to confirm the dates with ODOT, but some that come to mind are resurfacing on SR 582 within the last couple of years, as well as the Waterville bridge replacement that was under construction for a couple of years and I think opened in 2020 (that would have impacted N/S traffic through Haskins for those wanting to cross the Maumee River in Waterville).

Therefore, I suggest using a conservative annual growth rate around 0.05 to 0.08 percent overall for the intersection. At the current time I am not aware of any large housing developments or major employment opportunities in the immediate vicinity that will produce more traffic through this intersection. But I still want to be mindful that one of the few river crossings in the region is just a couple of miles to the north of the Village, so I don't envision any significant declines in traffic over the next 20-25 years either. The large question looming, however, is how will traffic patterns continue to evolve as we come out of the pandemic years.

Thank you,

Lisa Householder
Transportation Planner/Database Analyst
Toledo Metropolitan Area Council of Governments
300 Martin Luther King, Jr. Drive
Suite 300
Toledo, OH 43604

www.tmacog.org

TMACOG staff are working a combination of in-office and remotely. Email remains the best way to contact staff. Please visit www.tmacog.org for email addresses, meeting calendar, and log-in information.

From: Gina Balsamo <gbalsamo@cmtran.com>

Sent: Tuesday, July 26, 2022 10:20 AM

To: Lisa Householder <householder@tmacog.org>; Marc VonDeylen <vondeylen@tmacog.org>

Cc: Christopher.Waterfield@dot.ohio.gov; Kimberly.Coutcher@dot.ohio.gov; Zachary.Porter@dot.ohio.gov; Chelsea Cousins <ccousins@cmtran.com>; Leiana Yates <lyates@cmtran.com>

Subject: D2 Safety Studies; Growth Rates

Lisa/Marc,

We would like to request growth rates for the following locations:

- WOO-582-2.61 [SR-582 (Middleton Pike) & SR-64 (Haskins Road)]
- LUC-24-26.67 [US-24 (Detroit Avenue) & Phillips Avenue]
- LUC-2-15.44 [SR-2 (Airport Highway) intersections with South Avenue and S. Detroit Avenue]

For your reference, attached is the count data we have collected for each study location.

We plan to project the count data to a 2044 Design Year for each location.

Please let me know if you need anything else from us.

Thanks!

Gina Balsamo, PE, PTOE

Project Manager



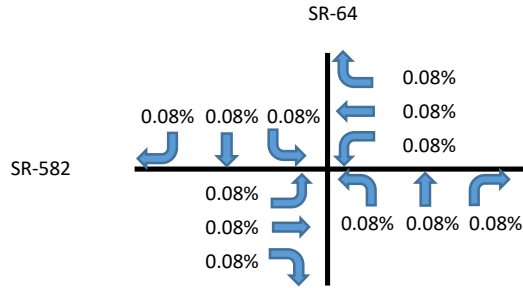
614.656.2429 | www.cmtran.com

WOO-582-2.61 Safety Study
 Traffic Volume Calculations



Year	Period	Scenario	Plate
		Growth Rates	

^
N

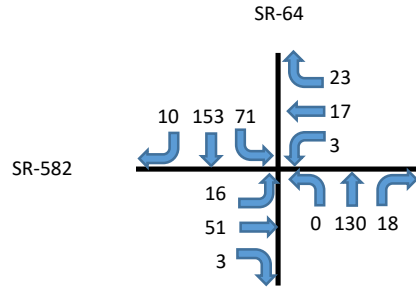


WOO-582-2.61 Safety Study
 Traffic Volume Calculations



Year	Period	Scenario	Plate
2022	AM	Count	

^
N



WOO-582-2.61 Safety Study
 Traffic Volume Calculations

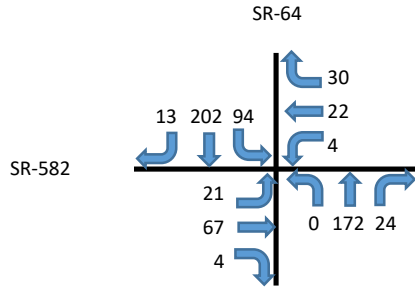


Year	Period	Scenario	Plate
2022	AM	Count Adjusted	A1

^

N

Adjustment Factor 1.32

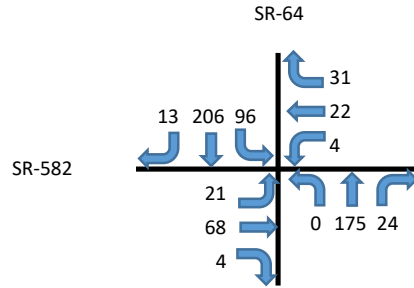


WOO-582-2.61 Safety Study
 Traffic Volume Calculations



Year	Period	Scenario	Plate
2044	AM	Count Grown	B1 = A1 Grown

^
N

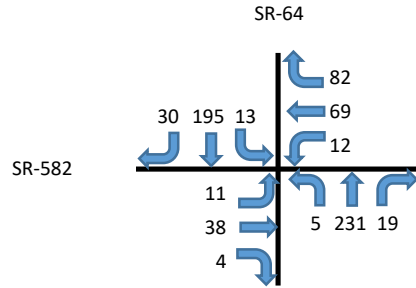


WOO-582-2.61 Safety Study
 Traffic Volume Calculations



Year	Period	Scenario	Plate
2022	PM	Count	A1

^
N

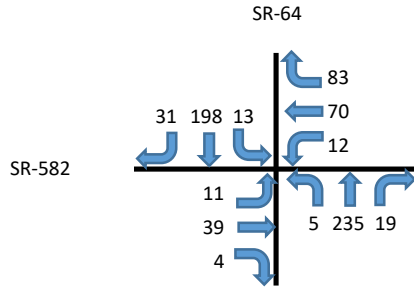


WOO-582-2.61 Safety Study
 Traffic Volume Calculations



Year	Period	Scenario	Plate
2044	PM	Count Grown	B1 = A1 Grown

^
N



Appendix C

Existing Conditions

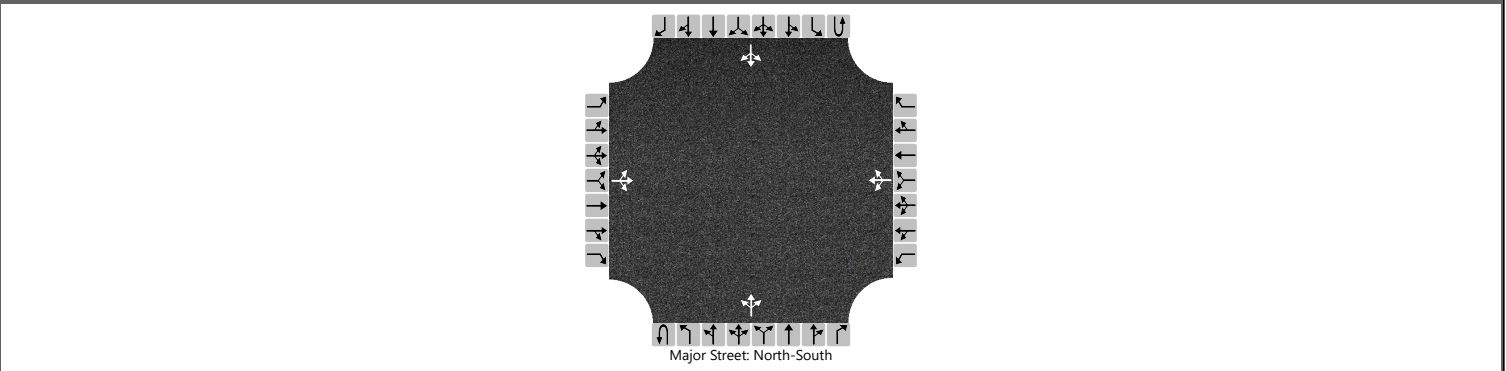
Capacity Analysis



HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LRY	Intersection	SR-64 & SR-582				
Agency/Co.	CMTran	Jurisdiction	Haskins				
Date Performed		East/West Street	SR-582				
Analysis Year	2022	North/South Street	SR-64				
Time Analyzed	AM Peak - Ex Conditions	Peak Hour Factor	0.86				
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25				
Project Description	WOO-582-2.61 Safety Study						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	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)		21	67	4		4	22	30		0	172	24		94	202	13	
Percent Heavy Vehicles (%)		7	7	7		9	9	9		3				2			
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)		7.17	6.57	6.27		7.19	6.59	6.29		4.13				4.12		
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)		3.56	4.06	3.36		3.58	4.08	3.38		2.23				2.22		

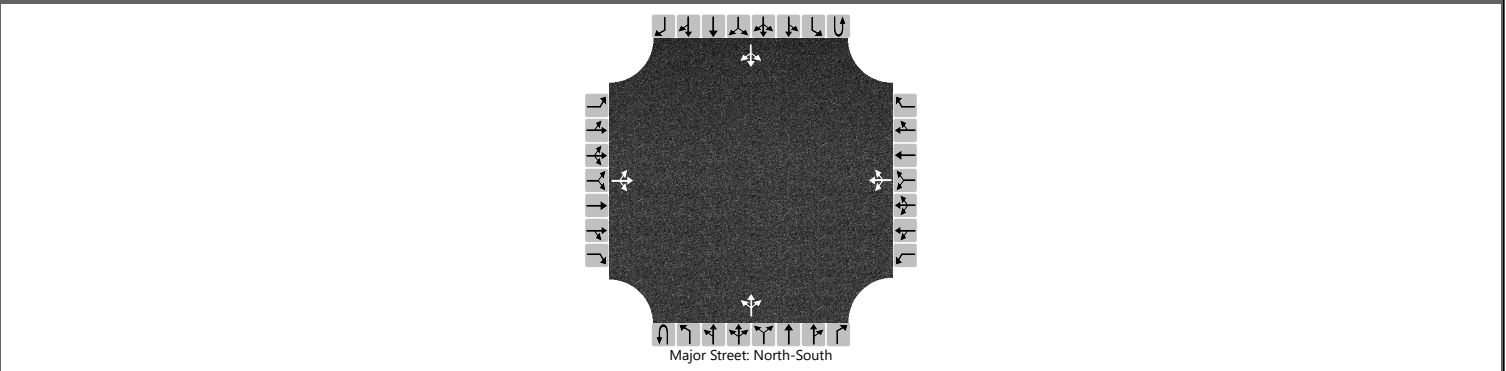
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			107				65			0				109			
Capacity, c (veh/h)			327				464			1310				1340			
v/c Ratio			0.33				0.14			0.00				0.08			
95% Queue Length, Q ₉₅ (veh)			1.4				0.5			0.0				0.3			
Control Delay (s/veh)			21.3				14.0			7.7	0.0	0.0		7.9	0.8	0.8	
Level of Service (LOS)			C				B			A	A	A		A	A	A	
Approach Delay (s/veh)		21.3				14.0				0.0				2.9			
Approach LOS		C				B				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LRY			Intersection	SR-64 & SR-582		
Agency/Co.	CMTran			Jurisdiction	Haskins		
Date Performed				East/West Street	SR-582		
Analysis Year	2022			North/South Street	SR-64		
Time Analyzed	PM Peak - Ex Conditions			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	WOO-582-2.61 Safety Study						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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)		11	38	4		12	69	82		5	231	19		13	195	30
Percent Heavy Vehicles (%)		6	6	6		2	2	2		0				2		
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)		7.16	6.56	6.26		7.12	6.52	6.22		4.10				4.12		
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)		3.55	4.05	3.35		3.52	4.02	3.32		2.20				2.22		

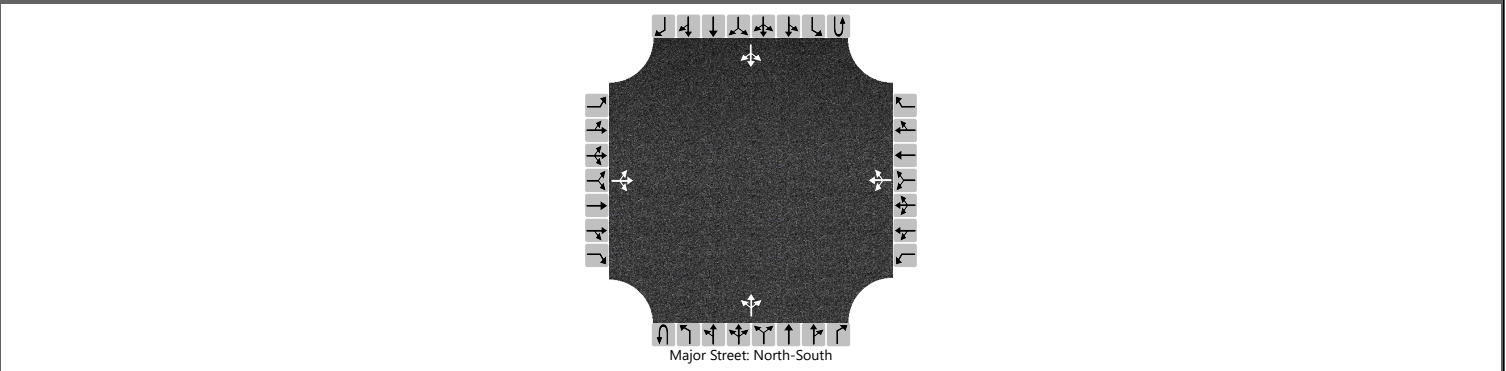
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			58				177			5				14			
Capacity, c (veh/h)			417				557			1333				1292			
v/c Ratio			0.14				0.32			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.5				1.4			0.0				0.0			
Control Delay (s/veh)			15.0				14.5			7.7	0.0	0.0		7.8	0.1	0.1	
Level of Service (LOS)			C				B			A	A	A		A	A	A	
Approach Delay (s/veh)		15.0				14.5				0.2				0.5			
Approach LOS		C				B				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LRY			Intersection	SR-64 & SR-582		
Agency/Co.	CMTran			Jurisdiction	Haskins		
Date Performed				East/West Street	SR-582		
Analysis Year	2044			North/South Street	SR-64		
Time Analyzed	AM Peak - Ex Conditions			Peak Hour Factor	0.86		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	WOO-582-2.61 Safety Study						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	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)		21	68	4		4	22	31		0	175	24		96	206	13	
Percent Heavy Vehicles (%)		7	7	7		9	9	9		3				2			
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)		7.17	6.57	6.27		7.19	6.59	6.29		4.13				4.12		
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)		3.56	4.06	3.36		3.58	4.08	3.38		2.23				2.22		

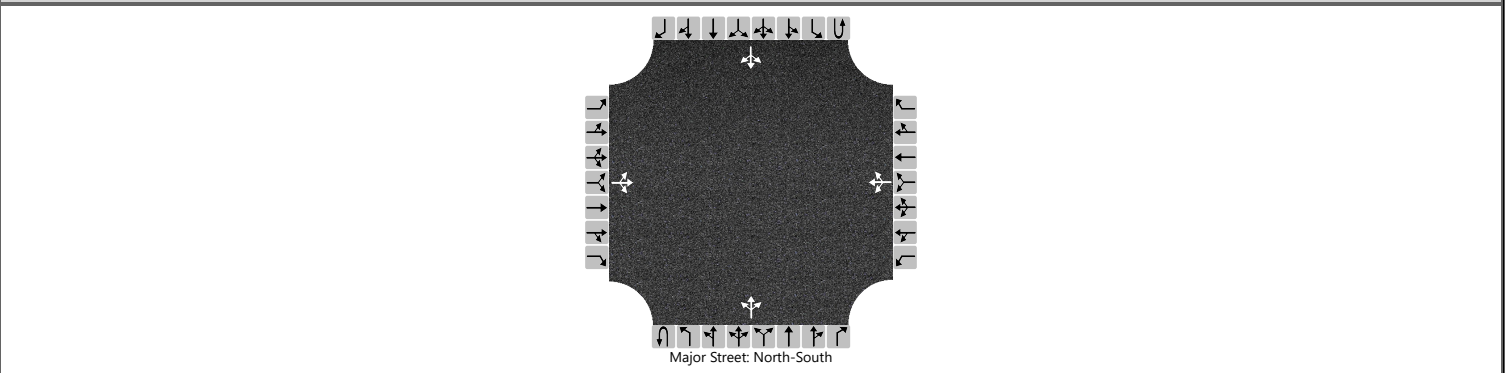
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			108				66			0				112			
Capacity, c (veh/h)			320				460			1305				1336			
v/c Ratio			0.34				0.14			0.00				0.08			
95% Queue Length, Q ₉₅ (veh)			1.5				0.5			0.0				0.3			
Control Delay (s/veh)			21.9				14.1			7.8	0.0	0.0		7.9	0.8	0.8	
Level of Service (LOS)			C				B			A	A	A		A	A	A	
Approach Delay (s/veh)		21.9				14.1				0.0				3.0			
Approach LOS		C				B				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LRY			Intersection	SR-64 & SR-582		
Agency/Co.	CMTran			Jurisdiction	Haskins		
Date Performed				East/West Street	SR-582		
Analysis Year	2044			North/South Street	SR-64		
Time Analyzed	PM Peak - Ex Conditions			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	WOO-582-2.61 Safety Study						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	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)		11	39	4		12	70	83		5	235	19		13	198	31	
Percent Heavy Vehicles (%)		6	6	6		2	2	2		0				2			
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)		7.16	6.56	6.26		7.12	6.52	6.22		4.10				4.12		
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)		3.55	4.05	3.35		3.52	4.02	3.32		2.20				2.22		

Delay, Queue Length, and Level of Service

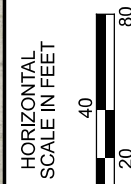
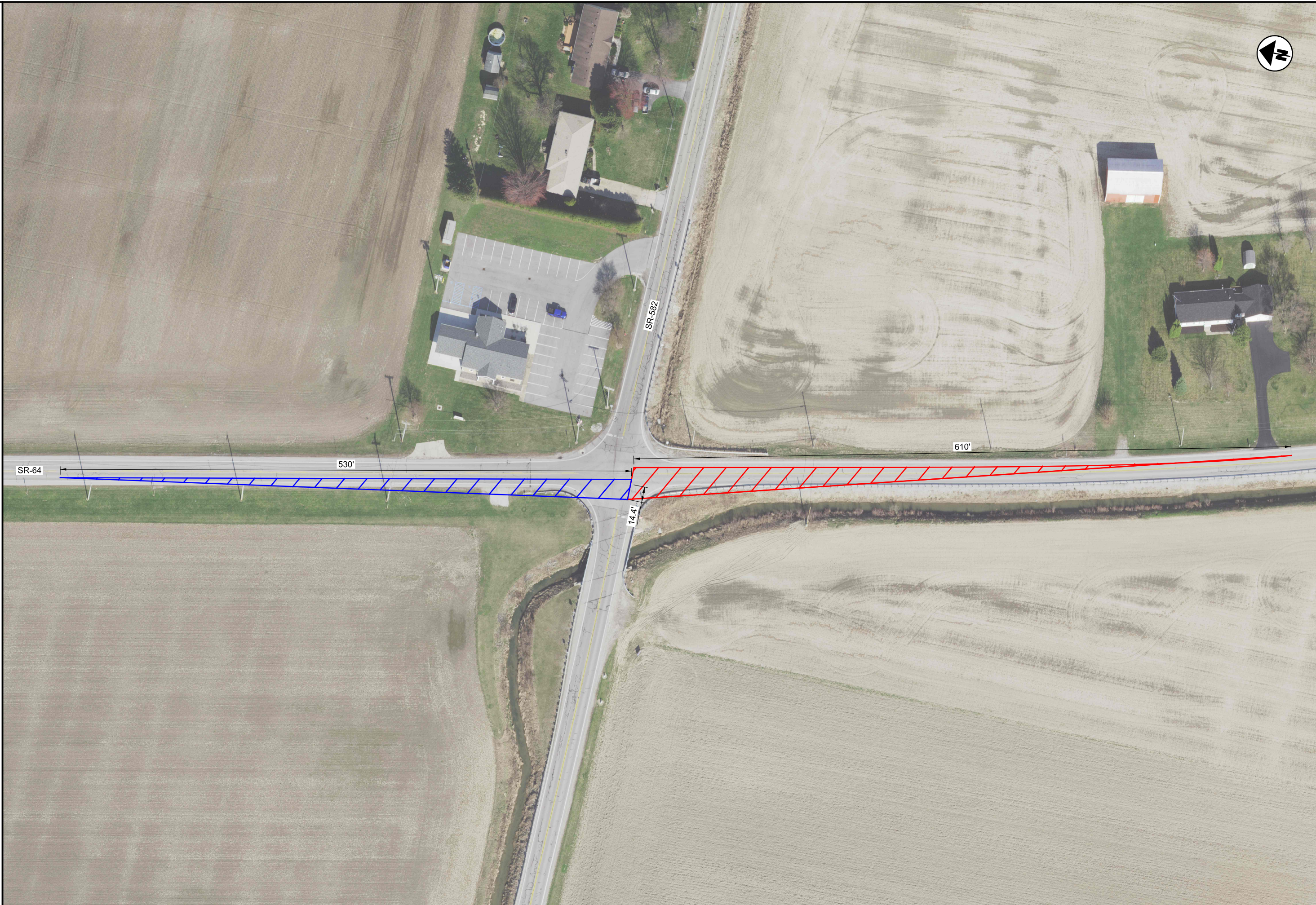
Flow Rate, v (veh/h)			59				179			5				14			
Capacity, c (veh/h)			412				551			1329				1287			
v/c Ratio			0.14				0.33			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.5				1.4			0.0				0.0			
Control Delay (s/veh)			15.2				14.6			7.7	0.0	0.0		7.8	0.1	0.1	
Level of Service (LOS)			C				B			A	A	A		A	A	A	
Approach Delay (s/veh)		15.2				14.6				0.2				0.5			
Approach LOS		C				B				A				A			

Appendix D

Sight Distance Exhibits

WOO-582-2.61 SAFETY STUDY

MODEL: Sheet | PAPER:SIZE: ITxII (in.) DATE: 8/9/2022 TIME: 9:44:05 AM USER: lyqtes
P:\00T\ST\0034_D2_Prior\ty_List & ICE_Pilot_Studies (Task_3)\WOO-582-2.61\Analysis\Sight_Distance\Sight_Distance.dgn



WOO-582-2.61 SAFETY STUDY
EASTBOUND APPROACH SIGHT DISTANCE

DESIGN AGENCY



DESIGNER

LRV

REVIEWER

XXX MM-DD-YY

PROJECT ID

0

SHEET

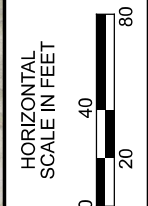
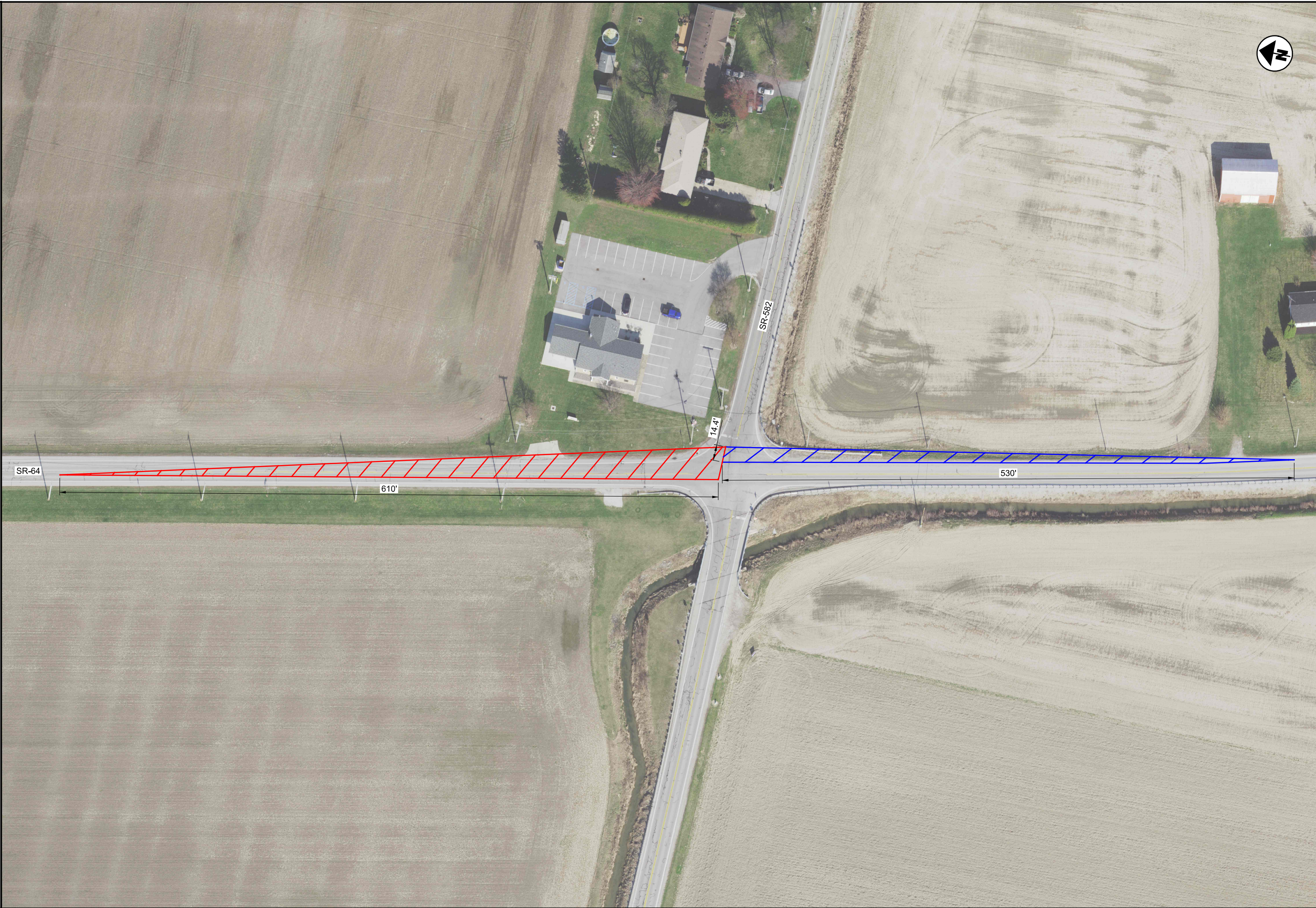
P.1

TOTAL

2

WOO-582-2.61 SAFETY STUDY

MODEL: Sheet 2 PAPER: SIZE: 11x17 (in.) DATE: 8/9/2022 TIME: 9:44:07 AM USER: lygates
P:\00T\STA\0034_D2_Prior\Ity_List & ICE Pilot_Studies (Task 3)\WOO-582-2.61\Analysis\Sight_Distance\Sight_Distance.dgn



WOO-582-2.61 SAFETY STUDY
WESTBOUND APPROACH SIGHT DISTANCE

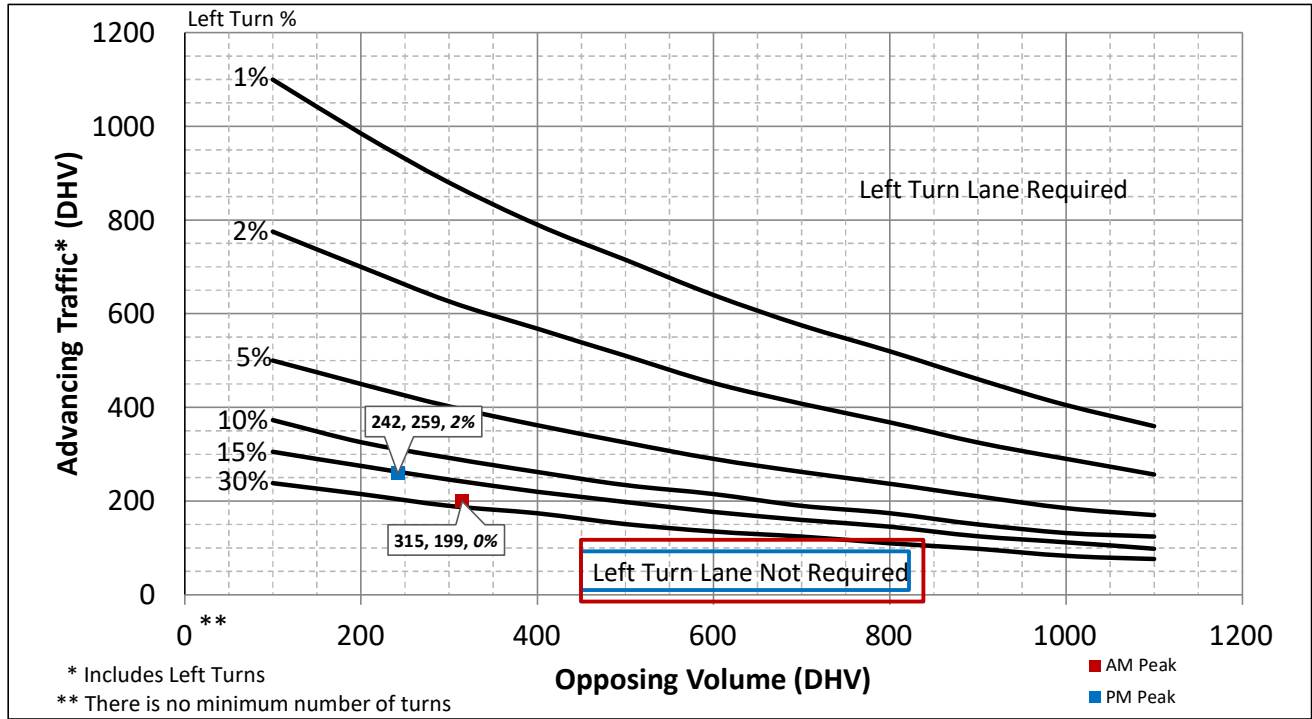


DESIGN AGENCY	
DESIGNER	LRV
REVIEWER	XXX MM-DD-YY
PROJECT ID	0
SHEET	TOTAL
P.2	2

Appendix E

Turn Lane Warrant Analysis

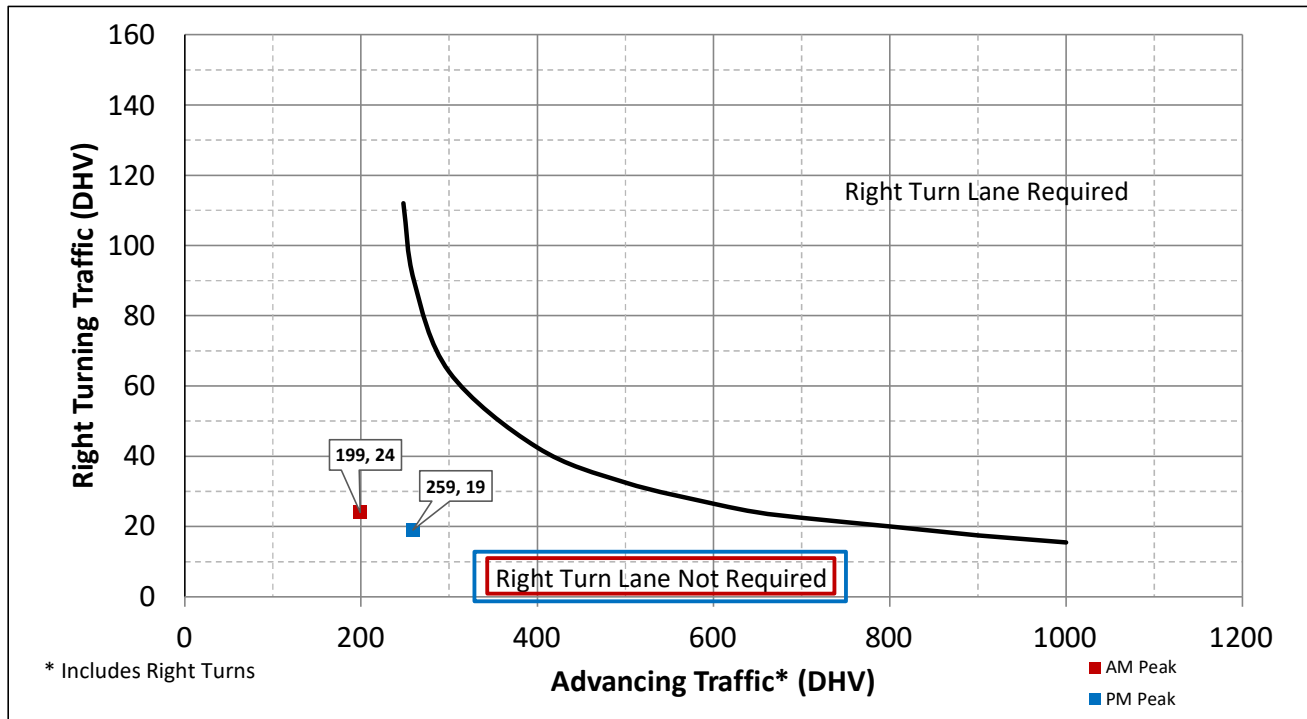
**2-Lane Highway Left Turn Lane Warrant
(> 40 mph or 70 kph Posted Speed)**



Turn Lane Length Calculations

AM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	0	VPH	
	Advancing Traffic	199	VPH	
	Opposing Volume	315	VPH	
	Left Turn Percentage	0%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12		
Approach Taper	660			
PM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	5	VPH	
	Advancing Traffic	259	VPH	
	Opposing Volume	242	VPH	
	Left Turn Percentage	2%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12		
Approach Taper	660			
Is Left Turn Warrant Met		No	No Left Turn Lane Required	

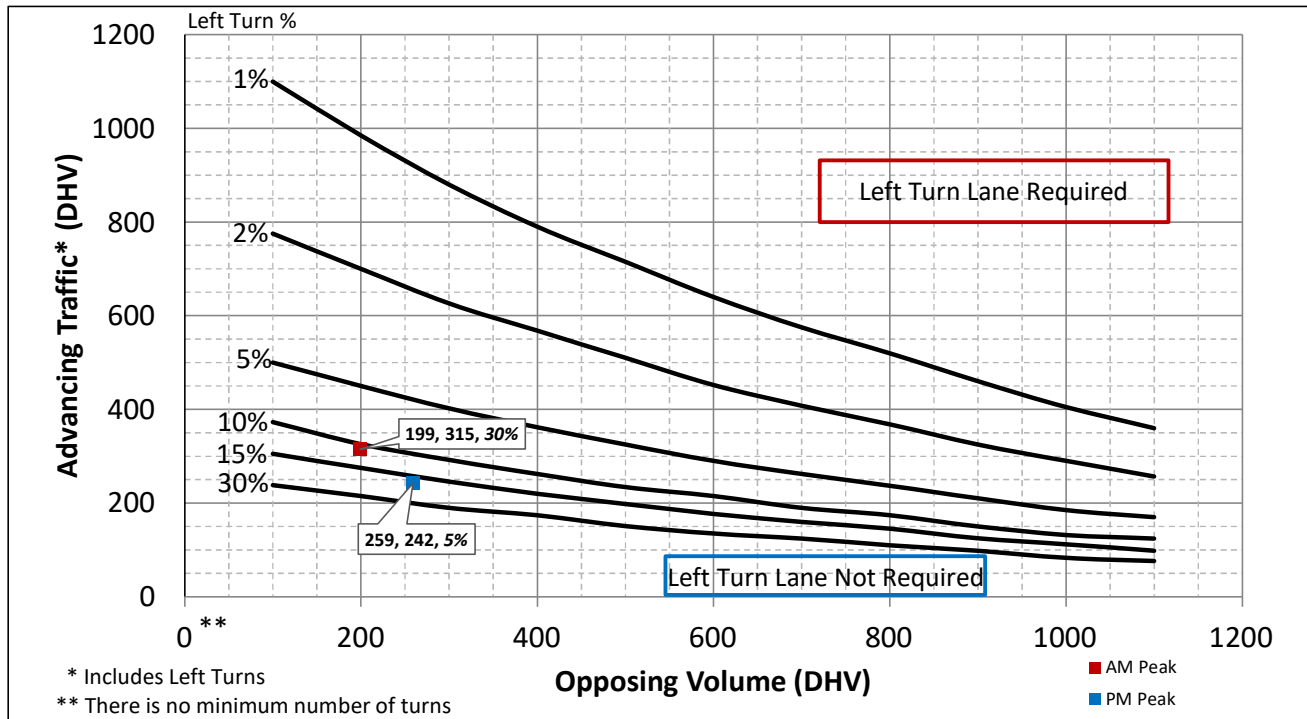
2-Lane Highway Right Turn Lane Warrant
(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

AM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	24	VPH	
	Advancing Traffic	199	VPH	
	Right Turn Percentage	12%		
	Location Type	Through Road		
	Condition	B or C		
	Vehicles/Cycle	1		
	Turn Lane Length	See Column to Right	285	* Turn Lane Length includes 50 ft diverging taper
PM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	19	VPH	
	Advancing Traffic	259	VPH	
	Right Turn Percentage	7%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
Is Right Turn Warrant Met	No	No Right Turn Lane Required		

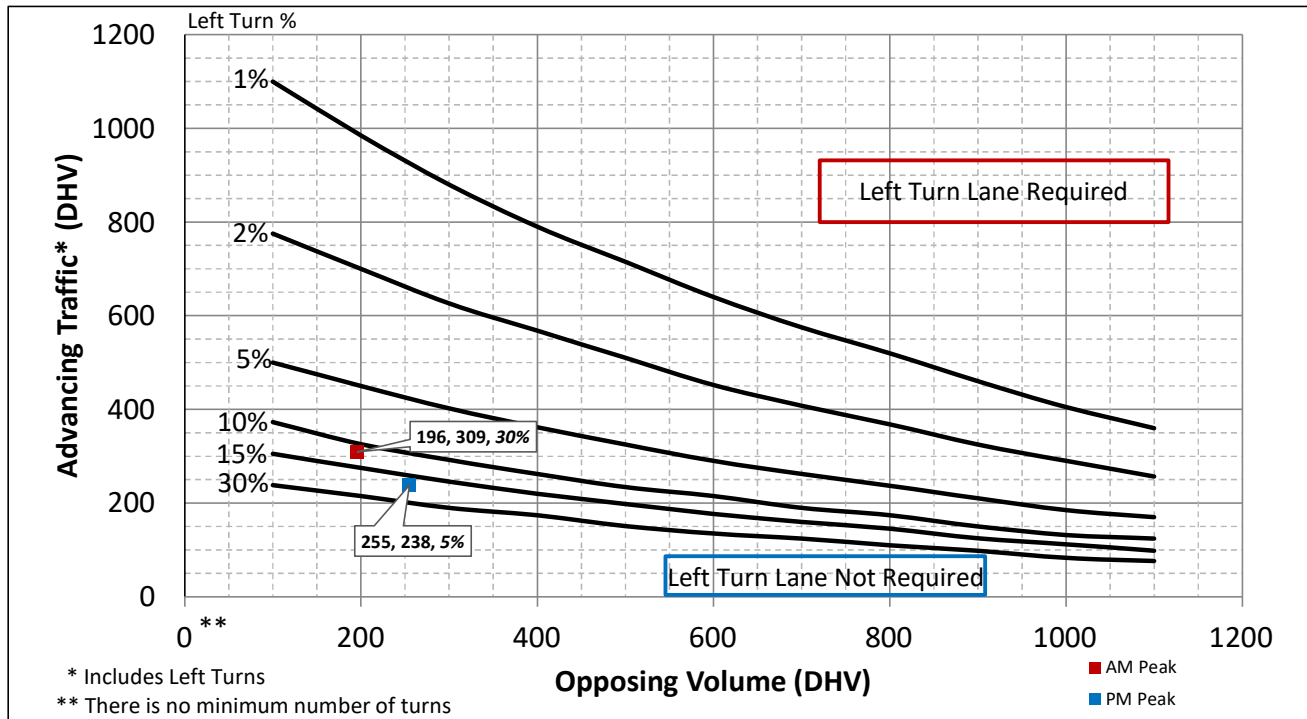
2-Lane Highway Left Turn Lane Warrant
(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

AM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	96	VPH	
	Advancing Traffic	315	VPH	
	Opposing Volume	199	VPH	
	Left Turn Percentage	30%		
	Location Type	Through Road		
	Condition	B or C		
	Vehicles/Cycle	2		
	Turn Lane Length	See Column to Right	285	* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12		
Approach Taper	660			
PM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	13	VPH	
	Advancing Traffic	242	VPH	
	Opposing Volume	259	VPH	
	Left Turn Percentage	5%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12		
Approach Taper	660			
Is Left Turn Warrant Met		Yes	See Above	

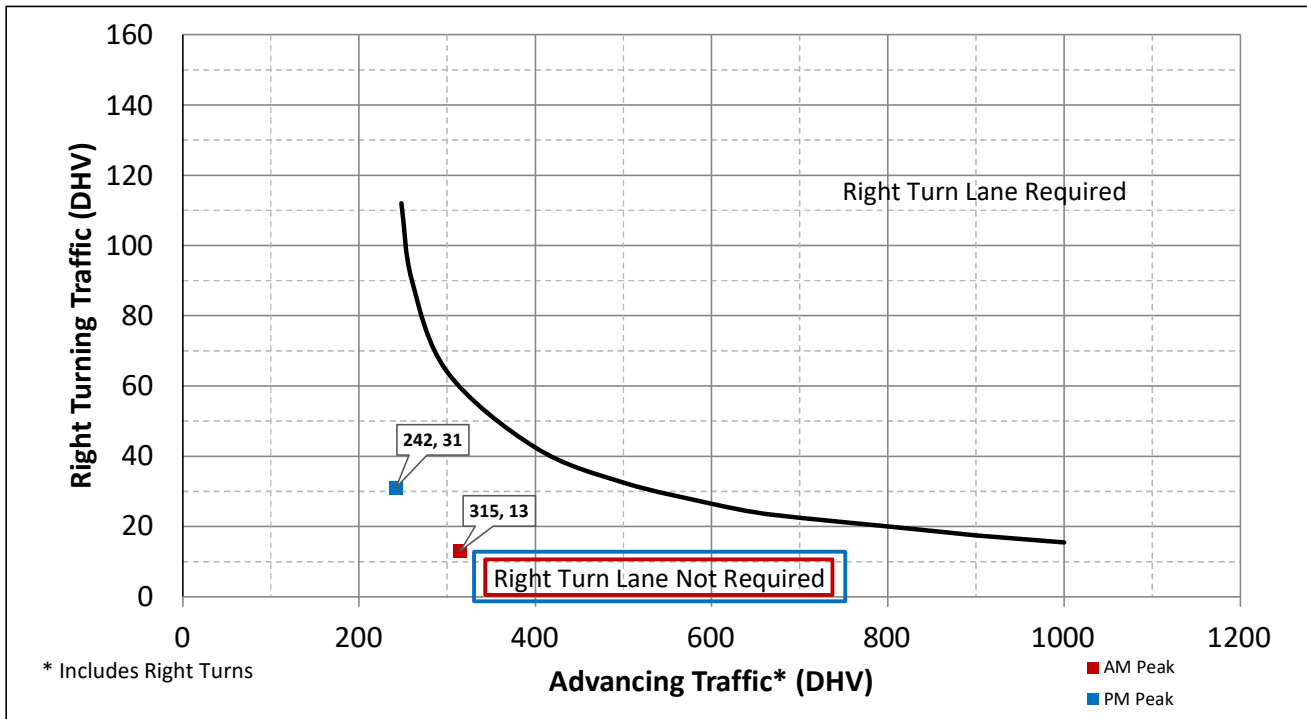
**2-Lane Highway Left Turn Lane Warrant
(> 40 mph or 70 kph Posted Speed)**



Turn Lane Length Calculations

AM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	94	VPH	
	Advancing Traffic	309	VPH	
	Opposing Volume	196	VPH	
	Left Turn Percentage	30%		
	Location Type	Through Road		
	Condition	B or C		
	Vehicles/Cycle	2		
	Turn Lane Length	See Column to Right	285	* Turn Lane Length includes 50 ft diverging taper
	Approach Taper	660		
PM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	13	VPH	
	Advancing Traffic	238	VPH	
	Opposing Volume	255	VPH	
	Left Turn Percentage	5%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
	Approach Taper	660		
Is Left Turn Warrant Met		Yes	See Above	

2-Lane Highway Right Turn Lane Warrant
(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

AM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	13	VPH	
	Advancing Traffic	315	VPH	
	Right Turn Percentage	4%		
	Location Type	Through Road		
	Condition	B		
	Vehicles/Cycle	1		
	Turn Lane Length	285		* Turn Lane Length includes 50 ft diverging taper
PM Peak	Design Speed	55	mph	
	Traffic Control	Unsignalized		
	Cycle Length	Unsignalized		
	Cycles Per Hour	60	Assume 60	
	Turn Lane Volume	31	VPH	
	Advancing Traffic	242	VPH	
	Right Turn Percentage	13%		
	Location Type	Through Road		
	Condition	B or C		
	Vehicles/Cycle	1		
	Turn Lane Length	See Column to Right	285	* Turn Lane Length includes 50 ft diverging taper
Is Right Turn Warrant Met	No	No Right Turn Lane Required		

Appendix F

All-Way Stop-Control Analysis

MULTI-WAY STOP MINIMUM VOLUMES

SR-64 & SR-582

WARRANT #1

Major street approach volumes average at least 300 vehicles/hour for any 8 hours of an average day

Top 8 Hours	
Start Time	NB/SB Volumes
7:00 AM	363
8:00 AM	314
12:00 PM	301
1:00 PM	266
2:00 PM	349
3:00 PM	389
4:00 PM	487
5:00 PM	484
Total	2953
Average	370

Average > 300 vehicles/hour?
(80%) Average > 240 vehicles/hour?

YES
YES

WARRANT #2

Combined (vehicle, pedestrian, bike) minor street approach volumes averages at least 200 units/hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the highest hour

Top 8 Major Street Hours			
Start Time	EB/WB Vehicle	Ped/Bike	Total
7:00 AM	113		113
8:00 AM	107		107
12:00 PM	96		96
1:00 PM	108		108
2:00 PM	130		130
3:00 PM	174		174
4:00 PM	198		198
5:00 PM	223		223
Total	1149		
Average	144		

Average > 200 units/hour?
(80%) Average > 160 units/hour?

NO
NO

Average delay/vehicle for minor approach = 14.75 sec/veh

Average delay > 30 sec/veh?
(80%) Average delay > 24 sec/veh?

NO
NO

DOES NOT MEET MULTI-WAY STOP WARRANT

Appendix G

Signal Warrant Analysis

STUDY AND ANALYSIS INFORMATION	TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS
--------------------------------	--

Municipality:	Haskins	Traffic Volumes Obtained By:	CMTran
County:	Wood	Analysis Date:	
ODOT Engineering District:	2	Agency/ Company Name Performing Warrant Analysis:	CMTran

Analysis Information

Data Collection Date:	6/28/2022
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-64
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*:	50 MPH
*Unknown assumes below 45 mph	

Minor Street Information

Minor Street Name and Route Number:	SR-582
Minor Street Approach Configuration:	1 E-Bound 1 W-Bound

Number of Thru Lanes on Each Minor Street Approach:	1 LANE(S)
Apply Right Turn Lane Reduction*:	No

*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.

	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. <table border="1" style="float: right; font-size: x-small;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">4:45 PM</td></tr> <tr><td style="text-align: center;">5:45 PM</td></tr> </table>	Peak Hour	4:45 PM	5:45 PM
Peak Hour						
4:45 PM						
5:45 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. <table border="1" style="float: right; font-size: x-small;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">4:30 PM</td></tr> <tr><td style="text-align: center;">5:30 PM</td></tr> </table>	Peak Hour	4:30 PM	5:30 PM
Peak Hour						
4:30 PM						
5:30 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	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	No		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: 2022 Data - No RTR

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1	X		500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
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5:00 AM	0	0																
5:15 AM	32	18																
5:30 AM	88	35																
5:45 AM	141	54																
6:00 AM	204	65																
6:15 AM	236	62																
6:30 AM	255	67																
6:45 AM	317	69												1				
7:00 AM	363	71			1													
7:15 AM	382	70																
7:30 AM	384	59																
7:45 AM	341	59												1				
8:00 AM	314	58																
8:15 AM	285	50																
8:30 AM	272	48																
8:45 AM	258	41																
9:00 AM	236	55																
9:15 AM	226	54																
9:30 AM	233	57																
9:45 AM	243	63																
10:00 AM	252	54																
10:15 AM	273	51																
10:30 AM	266	55																
10:45 AM	268	54																
11:00 AM	254	55																
11:15 AM	260	59																
11:30 AM	261	63																
11:45 AM	262	64																
12:00 PM	301	64												1				
12:15 PM	290	63																
12:30 PM	294	58																
12:45 PM	284	55																
1:00 PM	266	55																
1:15 PM	286	60												1				
1:30 PM	292	68																
1:45 PM	314	75																
2:00 PM	349	85																
2:15 PM	348	91												1	1			
2:30 PM	378	98			1													
2:45 PM	400	108								1								
3:00 PM	389	114																
3:15 PM	423	133												1	1	1	1	
3:30 PM	436	141			1	1												
3:45 PM	459	145								1	1							
4:00 PM	487	156																
4:15 PM	499	161												1	1	1	1	
4:30 PM	522	163	1	1	1	1												
4:45 PM	513	169								1	1							
5:00 PM	484	160																
5:15 PM	359	113												1	1			
5:30 PM	218	75																
5:45 PM	99	33																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
7:00 PM	0	0																
7:15 PM	0	0																
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8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			1	1	4	2	0	0	0	0	3	2	0	0	8	4	2	2
WARRANT SATISFIED?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Warrant Met: No

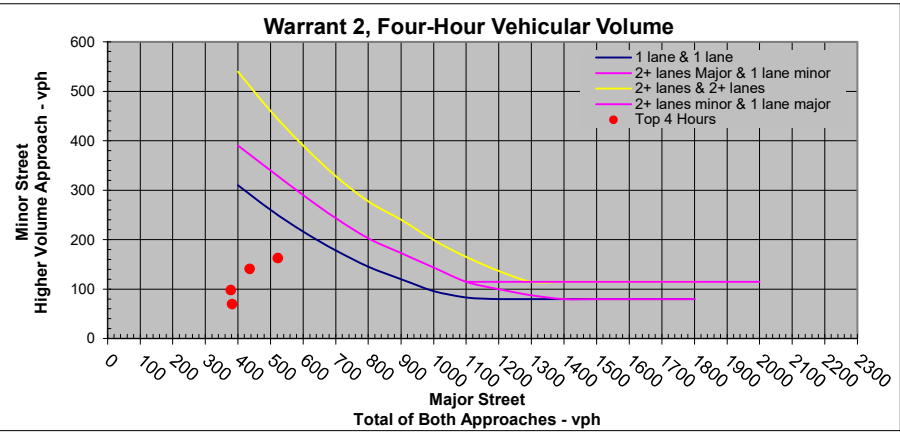
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	0
Major street: 1 Lane	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	2
Minor Street: 1 Lane		

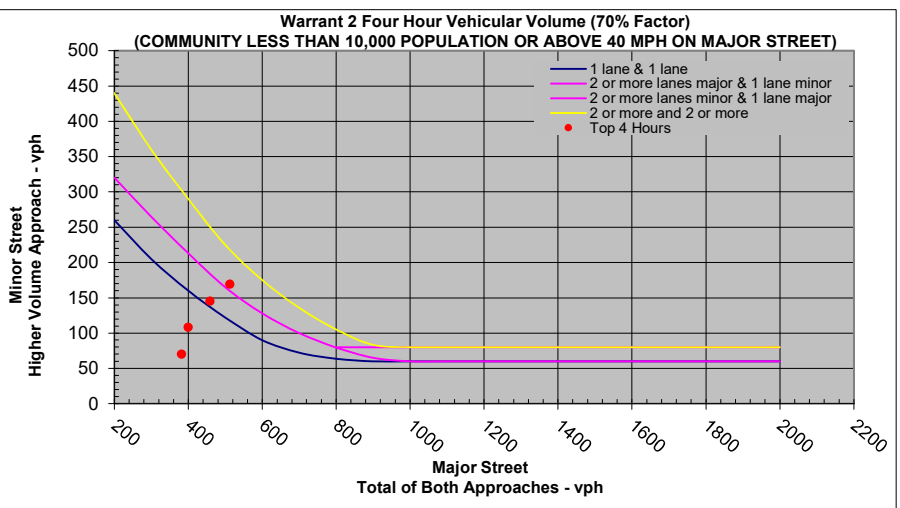
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Factor (70% Factor)
	Major - SR-64		Minor - SR-582					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	69	135	46	65	204	65		
6:15 AM	82	154	48	62	236	62		
6:30 AM	90	165	40	67	255	67		
6:45 AM	125	192	40	69	317	69		
7:00 AM	145	218	42	71	363	71		
7:15 AM	148	234	43	70	382	70		
7:30 AM	158	226	52	59	384	59		
7:45 AM	138	203	59	55	341	59		
8:00 AM	131	183	49	58	314	58		
8:15 AM	128	157	50	50	285	50		
8:30 AM	115	157	42	48	272	48		
8:45 AM	110	148	39	41	258	41		
9:00 AM	105	131	55	37	236	55		
9:15 AM	103	123	54	33	226	54		
9:30 AM	115	118	57	32	233	57		
9:45 AM	120	123	63	25	243	63		
10:00 AM	115	137	54	21	252	54		
10:15 AM	125	148	51	30	273	51		
10:30 AM	123	143	55	30	266	55		
10:45 AM	129	139	54	32	268	54		
11:00 AM	124	130	55	30	254	55		
11:15 AM	117	143	59	29	260	59		
11:30 AM	113	148	63	26	261	63		
11:45 AM	98	164	64	31	262	64		
12:00 PM	121	180	64	32	301	64		
12:15 PM	121	169	63	36	290	63		
12:30 PM	128	166	58	48	294	58		
12:45 PM	135	149	55	51	284	55		
1:00 PM	124	142	55	53	266	55		
1:15 PM	133	153	60	51	286	60		
1:30 PM	132	160	68	40	292	68		
1:45 PM	137	177	75	37	314	75		
2:00 PM	161	188	85	45	349	85		
2:15 PM	167	181	91	43	348	91		
2:30 PM	179	199	98	51	378	98		
2:45 PM	191	209	108	61	400	108		
3:00 PM	182	207	114	60	389	114		
3:15 PM	190	233	133	55	423	133		
3:30 PM	195	241	141	59	436	141	Met	
3:45 PM	203	256	145	51	459	145		
4:00 PM	223	264	156	42	487	156		
4:15 PM	233	266	161	50	499	161		
4:30 PM	255	267	163	53	522	163	Met	
4:45 PM	259	254	169	51	513	169		
5:00 PM	234	250	160	63	484	160		
5:15 PM	173	186	113	50	359	113		
5:30 PM	99	119	75	29	218	75		
5:45 PM	41	58	33	19	99	33		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		



Top Hours for Figure 4C-1					
Start Time	End Time	Major Street	Minor Street	Major Street	Minor Street
Top Hour	4:30 PM	5:30 PM	522	163	
2nd Highest Hour	3:30 PM	4:30 PM	436	141	
3rd Highest Hour	2:30 PM	3:30 PM	378	98	
4th Highest Hour	7:15 AM	8:15 AM	382	70	

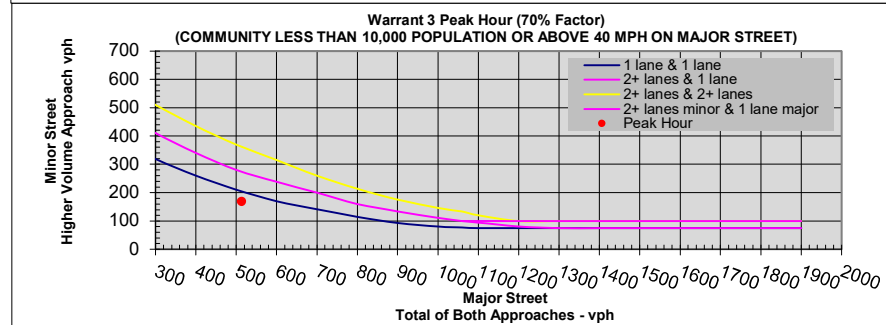
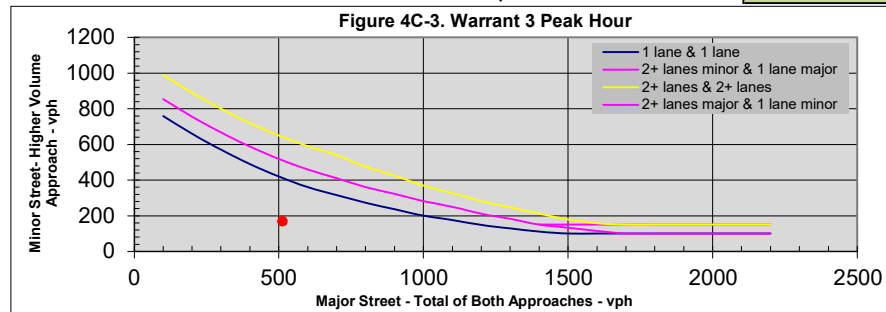
Top Hours for Figure 4C-2					
Start Time	End Time	Major Street	Minor Street	Major Street	Minor Street
Top Hour	4:45 PM	5:45 PM	513	169	
2nd Highest Hour	3:45 PM	4:45 PM	459	145	
3rd Highest Hour	2:45 PM	3:45 PM	400	108	
4th Highest Hour	7:15 AM	8:15 AM	382	70	



Are the requirements for Warrant 2 met?: No

OMUTCD WARRANT 3, PEAK HOUR				Hour Vehicular Volume				
Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	4:45 PM	Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
Major Street:	1 Lane	Peak Hour End Time	5:45 PM	6:00 AM	204	65	269	315
Minor Street:	1 Lane			6:15 AM	236	62	298	346
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?				6:30 AM	255	67	322	362
Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?				6:45 AM	317	69	386	426
Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*				7:00 AM	363	71	434	476
				7:15 AM	382	70	452	495
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?				7:30 AM	384	59	443	495
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?				7:45 AM	341	59	400	455
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?				8:00 AM	314	58	372	421
*If applicable, attach all supporting calculations and documentation.				8:15 AM	285	50	335	385
Are the requirements for Warrant 3 met?:				8:30 AM	272	48	320	362
				8:45 AM	258	41	299	338
				9:00 AM	236	55	291	328
				9:15 AM	226	54	280	313
				9:30 AM	233	57	290	322
				9:45 AM	243	63	306	331
				10:00 AM	252	54	306	327
				10:15 AM	273	51	324	354
				10:30 AM	266	55	321	351
				10:45 AM	268	54	322	354
				11:00 AM	254	55	309	339
				11:15 AM	260	59	319	348
				11:30 AM	261	63	324	350
				11:45 AM	262	64	326	357
				12:00 PM	301	64	365	397
				12:15 PM	290	63	353	389
				12:30 PM	294	58	352	400
				12:45 PM	284	55	339	390
				1:00 PM	266	55	321	374
				1:15 PM	286	60	346	397
				1:30 PM	292	68	360	400
				1:45 PM	314	75	389	426
				2:00 PM	349	85	434	479
				2:15 PM	348	91	439	482
				2:30 PM	378	98	476	527
				2:45 PM	400	108	508	569
				3:00 PM	389	114	503	563
				3:15 PM	423	133	556	611
				3:30 PM	436	141	577	636
				3:45 PM	459	145	604	655
				4:00 PM	487	156	643	685
				4:15 PM	499	161	660	710
				4:30 PM	522	163	685	738
				4:45 PM	513	169	682	733
				5:00 PM	484	160	644	707
				5:15 PM	359	113	472	522
				5:30 PM	218	75	293	322
				5:45 PM	99	33	132	151
				6:00 PM	0	0	0	0
				6:15 PM	0	0	0	0
				6:30 PM	0	0	0	0
				6:45 PM	0	0	0	0
				7:00 PM	0	0	0	0
				7:15 PM	0	0	0	0
				7:30 PM	0	0	0	0
				7:45 PM	0	0	0	0
				8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
513	169	405.88643	204.25353



Start Time	Southbound Approach					Westbound Approach					Northbound Approach					Eastbound Approach					NOTES:				
	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru		Left	U-Turn	Peds	App Total
12:00 AM						0						0							0						0
12:15 AM						0						0							0						0
12:30 AM						0						0							0						0
12:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 AM						0						0							0						0
1:15 AM						0						0							0						0
1:30 AM						0						0							0						0
1:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM						0						0							0						0
2:15 AM						0						0							0						0
2:30 AM						0						0							0						0
2:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM						0						0							0						0
3:15 AM						0						0							0						0
3:30 AM						0						0							0						0
3:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM						0						0							0						0
4:15 AM						0						0							0						0
4:30 AM						0						0							0						0
4:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM						0						0							0						0
5:15 AM						0						0							0						0
5:30 AM						0						0							0						0
5:45 AM						0						0							0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	2	7	9			18	3	5	1			9	0	14	0			14	0	14	4			18	
6:15 AM	2	19	17			38	9	4	1			14	0	18	0			18	0	13	4			17	
6:30 AM	1	19	17			37	4	4	0			8	0	16	0			16	1	13	5			19	
6:45 AM	4	26	12			42	6	7	2			15	2	19	0			21	0	10	1			11	
Hourly Total	9	71	55	0	0	135	22	20	4	0	0	46	2	67	0	0	0	69	1	50	14	0	0	65	
7:00 AM	0	24	13			37	7	3	1			11	1	26	0			27	0	10	5			15	
7:15 AM	2	28	19			49	3	3	0			6	4	22	0			26	1	20	1			22	
7:30 AM	0	46	18			64	4	4	0			8	6	45	0			51	0	14	7			21	
7:45 AM	3	48	17			68	11	5	1			17	3	38	0			41	1	10	2			13	
Hourly Total	5	146	67	0	0	218	25	15	2	0	0	42	14	131	0	0	0	145	2	54	15	0	0	71	
8:00 AM	5	31	17			53	5	5	2			12	5	25	0			30	1	7	6			14	
8:15 AM	4	22	15			41	7	6	2			15	2	34	0			36	0	7	4			11	
8:30 AM	4	32	5			41	4	2	9			15	1	30	0			31	3	8	6			17	
8:45 AM	4	35	9			48	1	6	0			7	2	32	0			34	1	14	1			16	
Hourly Total	17	120	46	0	0	183	17	19	13	0	0	49	10	121	0	0	0	131	5	36	17	0	0	58	
9:00 AM	1	20	6			27	4	6	3			13	3	24	0			27	0	3	3			6	
9:15 AM	2	33	6			41	4	2	1			7	3	19	1			23	2	5	2			9	
9:30 AM	0	27	5			32	3	7	2			12	1	25	0			26	0	7	3			10	
9:45 AM	3	22	6			31	15	7	1			23	4	24	1			29	0	5	7			12	
Hourly Total	6	102	23	0	0	131	26	22	7	0	0	55	11	92	2	0	0	105	2	20	15	0	0	37	
10:00 AM	1	15	3			19	9	2	1			12	2	22	1			25	0	1	1			2	
10:15 AM	2	27	7			36	4	2	4			10	1	34	0			35	0	6	2			8	
10:30 AM	9	22	6			37	12	5	1			18	2	28	1			31	0	2	1			3	
10:45 AM	2	35	8			45	9	4	1			14	2	21	1			24	2	4	2			8	
Hourly Total	14	99	24	0	0	137	34	13	7	0	0	54	7	105	3	0	0	115	2	13	6	0	0	21	
11:00 AM	5	18	7			30	6	2	1			9	2	32	1			35	0	7	4			11	
11:15 AM	1	26	4			31	8	5	1			14	2	30	1			33	1	5	2			8	
11:30 AM	1	26	6			33	9	7	1			17	5	31	1			37	2	3	0			5	
11:45 AM	4	26	6			36	9	2	4			15	1	18	0			19	1	1	4			6	
Hourly Total	11	96	23	0	0	130	32	16	7	0	0	55	10	111	3	0	0	124	4	16	10	0	0	30	
12:00 PM	5	29	9			43	9	4	0			13	1	26	1			28	2	4	4			10	
12:15 PM	3	27	6			36	13	3	2			18	4	25	0			29	1	2	2			5	
12:30 PM	4	33	12			49	10	6	2			18	1	20	1			22	0	7	3			10	
12:45 PM	3	42	7			52	4	10	1			15	5	37	0			42	2	3	2			7	
Hourly Total	15	131	34	0	0	180	36	23	5	0	0	64	11	108	2	0	0	121	5	16	11	0	0	32	
1:00 PM	3	22	7			32	8	3	1			12	3	25	0			28	1	4	9			14	
1:15 PM	0	22	11			33	6	5	2			13	1	35	0			36	1	8	8			17	
1:30 PM	5	21	6			32	11	4	0			15	2	26	1			29	1	10	2			13	
1:45 PM	4	37	4			45	3	10	2			15	1	30	0			31	0	6	3			9	
Hourly Total	12	102	28	0	0	142	28	22	5	0	0	55	7	116	1	0	0	124	3	28	22	0	0	53	
2:00 PM	1	33	9			43	10	5	2			17	3	33	1			37	0	10	2			12	
2:15 PM	1	31	8			40	11	6	4			21	5	30	0			35	0	6	0			6	
2:30 PM	5	32	12			49	9	13	0			22	0	32	2			34	0	5	5			10	
2:45 PM	7	43	6			56	12	12	1			25	1	50	4			55	2	9	6			17	
Hourly Total	14	139	35	0	0	188	42	36	7	0	0	85	9	145	7	0	0	161	2	30	13	0	0	45	
3:00 PM	3	27	6			36	8	13	2			23	5	38	0			43	3	5	2			10	
3:15 PM	2	45	11			58	16	10	2			29	8	37	2			47	0	9	5			14	
3:30 PM	4	49	6			59	13	18	1			32	1	44	1			46	3	12	5			20	
3:45 PM	6	33	15			54	13	16	2			31	6	39	1			46	0	12	4			16	
Hourly Total	15	154	38	0	0	207	50	57	7	0	0	114	20	158	4	0	0	182	6	38	16	0	0	60	
4:00 PM	3	51	8			62	25	16	1			42	5	46	0			51	0	3	2			5	
4:15 PM	7	49	10			66	12	21	3			36	4	47	1			52	1	12	5			18	
4:30 PM	8	52	14			74	18	15	3			36	5	48	1										

Leg Direction Start Time	Count Data											
	SR-64 Southbound			SR-582 Westbound			SR-64 Northbound			SR-582 Eastbound		
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
2021-09-14 06:00:00	2	7	9	3	5	1	0	14	0	0	14	4
2021-09-14 06:15:00	2	19	17	9	4	1	0	18	0	0	13	4
2021-09-14 06:30:00	1	19	17	4	4	0	0	16	0	1	13	5
2021-09-14 06:45:00	4	26	12	6	7	2	2	19	0	0	10	1
2021-09-14 07:00:00	0	24	13	7	3	1	1	26	0	0	10	5
2021-09-14 07:15:00	2	28	19	3	3	0	4	22	0	1	20	1
2021-09-14 07:30:00	0	46	18	4	4	0	6	45	0	0	14	7
2021-09-14 07:45:00	3	48	17	11	5	1	3	38	0	1	10	2
2021-09-14 08:00:00	5	31	17	5	5	2	5	25	0	1	7	6
2021-09-14 08:15:00	4	22	15	7	6	2	2	34	0	0	7	4
2021-09-14 08:30:00	4	32	5	4	2	9	1	30	0	3	8	6
2021-09-14 08:45:00	4	35	9	1	6	0	2	32	0	1	14	1
2021-09-14 09:00:00	1	20	6	4	6	3	3	24	0	0	3	3
2021-09-14 09:15:00	2	33	6	4	2	1	3	19	1	2	5	2
2021-09-14 09:30:00	0	27	5	3	7	2	1	25	0	0	7	3
2021-09-14 09:45:00	3	22	6	15	7	1	4	24	1	0	5	7
2021-09-14 10:00:00	1	15	3	9	2	1	2	22	1	0	1	1
2021-09-14 10:15:00	2	27	7	4	2	4	1	34	0	0	6	2
2021-09-14 10:30:00	9	22	6	12	5	1	2	28	1	0	2	1
2021-09-14 10:45:00	2	35	8	9	4	1	2	21	1	2	4	2
2021-09-14 11:00:00	5	18	7	6	2	1	2	32	1	0	7	4
2021-09-14 11:15:00	1	26	4	8	5	1	2	30	1	1	5	2
2021-09-14 11:30:00	1	26	6	9	7	1	5	31	1	2	3	0
2021-09-14 11:45:00	4	26	6	9	2	4	1	18	0	1	1	4
2021-09-14 12:00:00	5	29	9	9	4	0	1	26	1	2	4	4
2021-09-14 12:15:00	3	27	6	13	3	2	4	25	0	1	2	2
2021-09-14 12:30:00	4	33	12	10	6	2	1	20	1	0	7	3
2021-09-14 12:45:00	3	42	7	4	10	1	5	37	0	2	3	2
2021-09-14 13:00:00	3	22	7	8	3	1	3	25	0	1	4	9
2021-09-14 13:15:00	0	22	11	6	5	2	1	35	0	1	8	8
2021-09-14 13:30:00	5	21	6	11	4	0	2	26	1	1	10	2
2021-09-14 13:45:00	4	37	4	3	10	2	1	30	0	0	6	3
2021-09-14 14:00:00	1	33	9	10	5	2	3	33	1	0	10	2
2021-09-14 14:15:00	1	31	8	11	6	4	5	30	0	0	6	0
2021-09-14 14:30:00	5	32	12	9	13	0	0	32	2	0	5	5
2021-09-14 14:45:00	7	43	6	12	12	1	1	50	4	2	9	6
2021-09-14 15:00:00	3	27	6	8	13	2	5	38	0	3	5	2
2021-09-14 15:15:00	2	45	11	16	10	2	8	37	2	0	9	5
2021-09-14 15:30:00	4	49	6	13	18	1	1	44	1	3	12	5
2021-09-14 15:45:00	6	33	15	13	16	2	6	39	1	0	12	4
2021-09-14 16:00:00	3	51	8	25	16	1	5	46	0	0	3	2
2021-09-14 16:15:00	7	49	10	12	21	3	4	47	1	1	12	5
2021-09-14 16:30:00	8	52	14	18	15	3	5	48	1	0	7	5
2021-09-14 16:45:00	8	46	8	22	16	4	5	60	1	0	6	1
2021-09-14 17:00:00	10	47	7	18	27	2	5	54	2	1	10	2
2021-09-14 17:15:00	4	50	13	24	11	3	4	69	1	3	15	3
2021-09-14 17:30:00	6	47	8	23	15	4	4	53	1	2	4	4
2021-09-14 17:45:00	5	45	8	21	7	5	2	39	0	2	9	8

STUDY AND ANALYSIS INFORMATION	TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS
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Municipality:	Haskins	Traffic Volumes Obtained By:	CMTran
County:	Wood	Analysis Date:	
ODOT Engineering District:	2	Agency/ Company Name Performing Warrant Analysis:	CMTran

Analysis Information

Data Collection Date:	6/28/2022
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-64
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*:	50 MPH
*Unknown assumes below 45 mph	

Minor Street Information

Minor Street Name and Route Number:	SR-582
Minor Street Approach Configuration:	1 E-Bound 1 W-Bound

Number of Thru Lanes on Each Minor Street Approach:	1 LANE(S)
Apply Right Turn Lane Reduction*:	No

*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.

	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. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">4:45 PM</td></tr> <tr><td style="text-align: center;">5:45 PM</td></tr> </table>	Peak Hour	4:45 PM	5:45 PM
Peak Hour						
4:45 PM						
5:45 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. <table border="1" style="float: right; margin-top: 5px;"> <tr><td style="text-align: center;">Peak Hour</td></tr> <tr><td style="text-align: center;">4:30 PM</td></tr> <tr><td style="text-align: center;">5:30 PM</td></tr> </table>	Peak Hour	4:30 PM	5:30 PM
Peak Hour						
4:30 PM						
5:30 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	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	No		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: 2044 Data - No RTR

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1	X		500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
2:15 AM	0	0																
2:30 AM	0	0																
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4:15 AM	0	0																
4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	32	18																
5:30 AM	88	35																
5:45 AM	141	54																
6:00 AM	204	65																
6:15 AM	236	62																
6:30 AM	255	67																
6:45 AM	319	69												1				
7:00 AM	367	71			1													
7:15 AM	387	70																
7:30 AM	390	59																
7:45 AM	347	59												1				
8:00 AM	320	58																
8:15 AM	290	50																
8:30 AM	277	48																
8:45 AM	261	41																
9:00 AM	237	55																
9:15 AM	227	54																
9:30 AM	234	57																
9:45 AM	244	63																
10:00 AM	254	54																
10:15 AM	276	51																
10:30 AM	269	55																
10:45 AM	272	54																
11:00 AM	257	55																
11:15 AM	263	59																
11:30 AM	263	63																
11:45 AM	264	64																
12:00 PM	305	64												1				
12:15 PM	293	63																
12:30 PM	298	58																
12:45 PM	287	55																
1:00 PM	269	55																
1:15 PM	291	60												1				
1:30 PM	298	68																
1:45 PM	322	75																
2:00 PM	357	85			1													
2:15 PM	355	91												1	1			
2:30 PM	385	98																
2:45 PM	407	108								1								
3:00 PM	396	114			1	1												
3:15 PM	431	133												1	1	1	1	
3:30 PM	444	141																
3:45 PM	467	145								1	1							
4:00 PM	495	156			1	1												
4:15 PM	507	161	1	1										1	1	1	1	
4:30 PM	530	163							1	1								
4:45 PM	521	169								1	1							
5:00 PM	492	160			1	1												
5:15 PM	365	113												1	1			
5:30 PM	222	75																
5:45 PM	101	33																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
7:00 PM	0	0																
7:15 PM	0	0																
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7:45 PM	0	0																
8:00 PM	0	0																
8:15 PM	0	0																
8:30 PM	0	0																
8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			1	1	5	3	0	0	1	1	3	2	0	0	8	4	2	2
WARRANT SATISFIED?			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Warrant Met: No

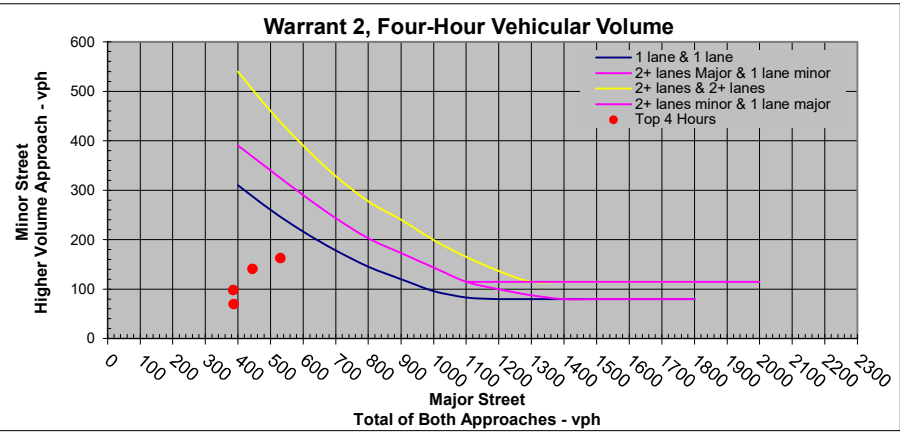
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	0
Major street: 1 Lane	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	2
Minor Street: 1 Lane		

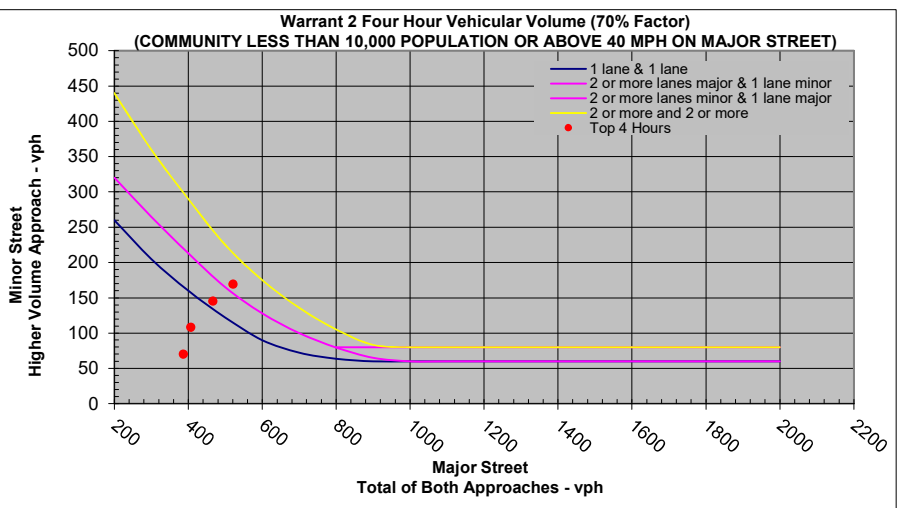
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Factor (70% Factor)
	Major - SR-64		Minor - SR-582					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	69	135	46	65	204	65		
6:15 AM	82	154	48	62	236	62		
6:30 AM	90	165	40	67	255	67		
6:45 AM	126	193	40	69	319	69		
7:00 AM	147	220	42	71	367	71		
7:15 AM	150	237	43	70	387	70		
7:30 AM	161	229	52	59	390	59		
7:45 AM	141	206	59	55	347	59		
8:00 AM	134	186	49	58	320	58		
8:15 AM	131	159	50	50	290	50		
8:30 AM	117	160	42	48	277	48		
8:45 AM	111	150	39	41	261	41		
9:00 AM	105	132	55	37	237	55		
9:15 AM	103	124	54	33	227	54		
9:30 AM	116	118	57	32	234	57		
9:45 AM	121	123	63	25	244	63		
10:00 AM	116	138	54	21	254	54		
10:15 AM	127	149	51	30	276	51		
10:30 AM	125	144	55	30	269	55		
10:45 AM	132	140	54	32	272	54		
11:00 AM	127	130	55	30	257	55		
11:15 AM	119	144	59	29	263	59		
11:30 AM	114	149	63	26	263	63		
11:45 AM	98	166	64	31	264	64		
12:00 PM	122	183	64	32	305	64		
12:15 PM	122	171	63	36	293	63		
12:30 PM	130	168	58	48	298	58		
12:45 PM	137	150	55	51	287	55		
1:00 PM	126	143	55	53	269	55		
1:15 PM	136	155	60	51	291	60		
1:30 PM	135	163	68	40	298	68		
1:45 PM	141	181	75	37	322	75		
2:00 PM	165	192	85	45	357	85		
2:15 PM	171	184	91	43	355	91		
2:30 PM	183	202	98	51	385	98		
2:45 PM	195	212	108	61	407	108		
3:00 PM	186	210	114	60	396	114		
3:15 PM	194	237	133	55	431	133		
3:30 PM	199	245	141	59	444	141	Met	
3:45 PM	207	260	145	51	467	145		
4:00 PM	227	268	156	42	495	156		
4:15 PM	237	270	161	50	507	161		
4:30 PM	259	271	163	53	530	163	Met	
4:45 PM	263	258	169	51	521	169		
5:00 PM	238	254	160	63	492	160		
5:15 PM	176	189	113	50	365	113		
5:30 PM	101	121	75	29	222	75		
5:45 PM	42	59	33	19	101	33		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		



Top Hours for Figure 4C-1					
Start Time	End Time	Major Street	Minor Street		
Top Hour	4:30 PM	5:30 PM	530	163	
2nd Highest Hour	3:30 PM	4:30 PM	444	141	
3rd Highest Hour	2:30 PM	3:30 PM	385	98	
4th Highest Hour	7:15 AM	8:15 AM	387	70	

Top Hours for Figure 4C-2					
Start Time	End Time	Major Street	Minor Street		
Top Hour	4:45 PM	5:45 PM	521	169	
2nd Highest Hour	3:45 PM	4:45 PM	467	145	
3rd Highest Hour	2:45 PM	3:45 PM	407	108	
4th Highest Hour	7:15 AM	8:15 AM	387	70	



Are the requirements for Warrant 2 met?: No

OMUTCD WARRANT 3, PEAK HOUR				Hour Vehicular Volume				
Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	4:45 PM	Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
Major Street:	1 Lane	Peak Hour End Time	5:45 PM	6:00 AM	204	65	269	315
Minor Street:	1 Lane			6:15 AM	236	62	298	346
				6:30 AM	255	67	322	362
				6:45 AM	319	69	388	428
				7:00 AM	367	71	438	480
				7:15 AM	387	70	457	500
				7:30 AM	390	59	449	501
				7:45 AM	347	59	406	461
				8:00 AM	320	58	378	427
				8:15 AM	290	50	340	390
				8:30 AM	277	48	325	367
				8:45 AM	261	41	302	341
				9:00 AM	237	55	292	329
				9:15 AM	227	54	281	314
				9:30 AM	234	57	291	323
				9:45 AM	244	63	307	332
				10:00 AM	254	54	308	329
				10:15 AM	276	51	327	357
				10:30 AM	269	55	324	354
				10:45 AM	272	54	326	358
				11:00 AM	257	55	312	342
				11:15 AM	263	59	322	351
				11:30 AM	263	63	326	352
				11:45 AM	264	64	328	359
				12:00 PM	305	64	369	401
				12:15 PM	293	63	356	392
				12:30 PM	298	58	356	404
				12:45 PM	287	55	342	393
				1:00 PM	269	55	324	377
				1:15 PM	291	60	351	402
				1:30 PM	298	68	366	406
				1:45 PM	322	75	397	434
				2:00 PM	357	85	442	487
				2:15 PM	355	91	446	489
				2:30 PM	385	98	483	534
				2:45 PM	407	108	515	576
				3:00 PM	396	114	510	570
				3:15 PM	431	133	564	619
				3:30 PM	444	141	585	644
				3:45 PM	467	145	612	663
				4:00 PM	495	156	651	693
				4:15 PM	507	161	668	718
				4:30 PM	530	163	693	746
				4:45 PM	521	169	690	741
				5:00 PM	492	160	652	715
				5:15 PM	365	113	478	528
				5:30 PM	222	75	297	326
				5:45 PM	101	33	134	153
				6:00 PM	0	0	0	0
				6:15 PM	0	0	0	0
				6:30 PM	0	0	0	0
				6:45 PM	0	0	0	0
				7:00 PM	0	0	0	0
				7:15 PM	0	0	0	0
				7:30 PM	0	0	0	0
				7:45 PM	0	0	0	0
				8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
521	169	400.84092	200.79842

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time? **Yes**

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

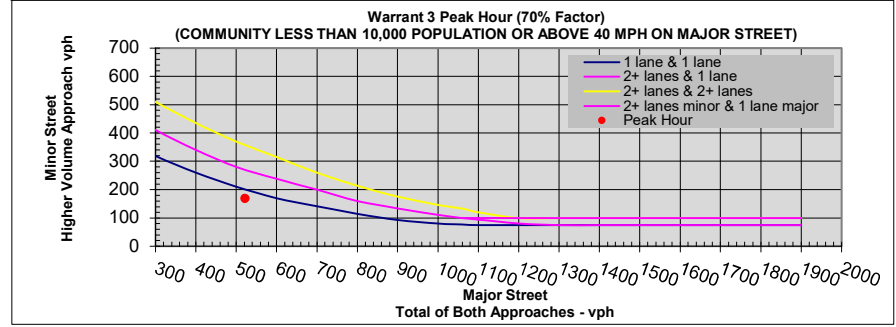
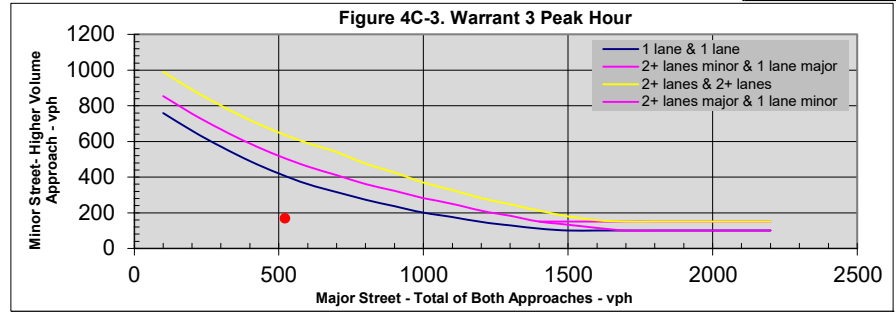
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach? **Yes**

Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes? **Yes**

Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches? **No**

**If applicable, attach all supporting calculations and documentation.*

Are the requirements for Warrant 3 met?: **No**



Start Time	Southbound Approach					Westbound Approach					Northbound Approach					Eastbound Approach					NOTES:			
	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru	Left	U-Turn	Peds	App Total	Right	Thru		Left	U-Turn	Peds
12:00 AM						0						0						0						0
12:15 AM						0						0						0						0
12:30 AM						0						0						0						0
12:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 AM						0						0						0						0
1:15 AM						0						0						0						0
1:30 AM						0						0						0						0
1:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 AM						0						0						0						0
2:15 AM						0						0						0						0
2:30 AM						0						0						0						0
2:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 AM						0						0						0						0
3:15 AM						0						0						0						0
3:30 AM						0						0						0						0
3:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 AM						0						0						0						0
4:15 AM						0						0						0						0
4:30 AM						0						0						0						0
4:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 AM						0						0						0						0
5:15 AM						0						0						0						0
5:30 AM						0						0						0						0
5:45 AM						0						0						0						0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 AM	2	7	9			18	3	5	1			9	0	14	0		14	0	14	4			18	
6:15 AM	2	19	17			38	9	4	1			14	0	18	0		18	0	13	4			17	
6:30 AM	1	19	17			37	4	4	0			8	0	16	0		16	1	13	5			19	
6:45 AM	4	26	12			42	6	7	2			15	2	19	0		21	0	10	1			11	
Hourly Total	9	71	55	0	0	135	22	20	4	0	0	46	2	67	0	0	69	1	50	14	0	0	65	
7:00 AM	0	24	13			37	7	3	1			11	1	26	0		27	0	10	5			15	
7:15 AM	2	28	19			49	3	3	0			6	4	22	0		26	1	20	1			22	
7:30 AM	0	47	18			65	4	4	0			8	6	46	0		52	0	14	7			21	
7:45 AM	3	49	17			69	11	5	1			17	3	39	0		42	1	10	2			13	
Hourly Total	5	148	67	0	0	220	25	15	2	0	0	42	14	133	0	0	147	2	54	15	0	0	71	
8:00 AM	5	32	17			54	5	5	2			12	5	25	0		30	1	7	6			14	
8:15 AM	4	22	15			41	7	6	2			15	2	35	0		37	0	7	4			11	
8:30 AM	4	33	5			42	4	2	9			15	1	31	0		32	3	8	6			17	
8:45 AM	4	36	9			49	1	6	0			7	2	33	0		35	1	14	1			16	
Hourly Total	17	123	46	0	0	186	17	19	13	0	0	49	10	124	0	0	134	5	36	17	0	0	58	
9:00 AM	1	20	6			27	4	6	3			13	3	24	0		27	0	3	3			6	
9:15 AM	2	34	6			42	4	2	1			7	3	19	1		23	2	5	2			9	
9:30 AM	0	27	5			32	3	7	2			12	1	25	0		26	0	7	3			10	
9:45 AM	3	22	6			31	15	7	1			23	4	24	1		29	0	5	7			12	
Hourly Total	6	103	23	0	0	132	26	22	7	0	0	55	11	92	2	0	105	2	20	15	0	0	37	
10:00 AM	1	15	3			19	9	2	1			12	2	22	1		25	0	1	1			2	
10:15 AM	2	27	7			36	4	2	4			10	1	35	0		36	0	6	2			8	
10:30 AM	9	22	6			37	12	5	1			18	2	28	1		31	0	2	1			3	
10:45 AM	2	36	8			46	9	4	1			14	2	21	1		24	2	4	2			8	
Hourly Total	14	100	24	0	0	138	34	13	7	0	0	54	7	106	3	0	116	2	13	6	0	0	21	
11:00 AM	5	18	7			30	6	2	1			9	2	33	1		36	0	7	4			11	
11:15 AM	1	26	4			31	8	5	1			14	2	31	1		34	1	5	2			8	
11:30 AM	1	26	6			33	9	7	1			17	5	32	1		38	2	3	0			5	
11:45 AM	4	26	6			36	9	2	4			15	1	18	0		19	1	1	4			6	
Hourly Total	11	96	23	0	0	130	32	16	7	0	0	55	10	114	3	0	127	4	16	10	0	0	30	
12:00 PM	5	30	9			44	9	4	0			13	1	26	1		28	2	4	4			10	
12:15 PM	3	27	6			36	13	3	2			18	4	25	0		29	1	2	2			5	
12:30 PM	4	34	12			50	10	6	2			18	1	20	1		22	0	7	3			10	
12:45 PM	3	43	7			53	4	10	1			15	5	38	0		43	2	3	2			7	
Hourly Total	15	134	34	0	0	183	36	23	5	0	0	64	11	109	2	0	122	5	16	11	0	0	32	
1:00 PM	3	22	7			32	8	3	1			12	3	25	0		28	1	4	9			14	
1:15 PM	0	22	11			33	6	5	2			13	1	36	0		37	1	8	8			17	
1:30 PM	5	21	6			32	11	4	0			15	2	26	1		29	1	10	2			13	
1:45 PM	4	38	4			46	3	10	2			15	1	31	0		32	0	6	3			9	
Hourly Total	12	103	28	0	0	143	28	22	5	0	0	55	7	118	1	0	126	3	28	22	0	0	53	
2:00 PM	1	34	9			44	10	5	2			17	3	34	1		38	0	10	2			12	
2:15 PM	1	32	8			41	11	6	4			21	5	31	0		36	0	6	0			6	
2:30 PM	5	33	12			50	9	13	0			22	0	33	2		35	0	5	5			10	
2:45 PM	7	44	6			57	12	12	1			25	1	51	4		56	2	9	6			17	
Hourly Total	14	143	35	0	0	192	42	36	7	0	0	85	9	149	7	0	165	2	30	13	0	0	45	
3:00 PM	3	27	6			36	8	13	2			23	5	39	0		44	3	5	2			10	
3:15 PM	2	46	11			59	16	10	2			29	8	38	2		48	0	9	5			14	
3:30 PM	4	50	6			60	13	18	1			32	1	45	1		47	3	12	5			20	
3:45 PM	6	34	15			55	13	16	2			31	6	40	1		47	0	12	4			16	
Hourly Total	15	157	38	0	0	210	50	57	7	0	0	114	20	162	4	0	186	6	38	16	0	0	60	
4:00 PM	3	52	8			63	25	16	1			42	5	47	0		52	0	3	2			5	
4:15 PM	7	50	10			67	12	21	3			36	4	48	1		53	1	12	5			18	
4:30 PM	8	53	14			75	18	15	3			36	5	49	1		55	0	7	5			12	
4:45 PM	8	47	8			63	22	16	4			42	5	61	1		67	0	6	1			7	
Hourly Total	26	202	40	0	0	268	77	68	11	0	0	156	19	205	3	0	227	1	28	13	0	0	42	

Leg Direction Start Time	Count Data											
	SR-64 Southbound			SR-582 Westbound			SR-64 Northbound			SR-582 Eastbound		
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
2021-09-14 06:00:00	2	7	9	3	5	1	0	14	0	0	14	4
2021-09-14 06:15:00	2	19	17	9	4	1	0	18	0	0	13	4
2021-09-14 06:30:00	1	19	17	4	4	0	0	16	0	1	13	5
2021-09-14 06:45:00	4	26	12	6	7	2	2	19	0	0	10	1
2021-09-14 07:00:00	0	24	13	7	3	1	1	26	0	0	10	5
2021-09-14 07:15:00	2	28	19	3	3	0	4	22	0	1	20	1
2021-09-14 07:30:00	0	46	18	4	4	0	6	45	0	0	14	7
2021-09-14 07:45:00	3	48	17	11	5	1	3	38	0	1	10	2
2021-09-14 08:00:00	5	31	17	5	5	2	5	25	0	1	7	6
2021-09-14 08:15:00	4	22	15	7	6	2	2	34	0	0	7	4
2021-09-14 08:30:00	4	32	5	4	2	9	1	30	0	3	8	6
2021-09-14 08:45:00	4	35	9	1	6	0	2	32	0	1	14	1
2021-09-14 09:00:00	1	20	6	4	6	3	3	24	0	0	3	3
2021-09-14 09:15:00	2	33	6	4	2	1	3	19	1	2	5	2
2021-09-14 09:30:00	0	27	5	3	7	2	1	25	0	0	7	3
2021-09-14 09:45:00	3	22	6	15	7	1	4	24	1	0	5	7
2021-09-14 10:00:00	1	15	3	9	2	1	2	22	1	0	1	1
2021-09-14 10:15:00	2	27	7	4	2	4	1	34	0	0	6	2
2021-09-14 10:30:00	9	22	6	12	5	1	2	28	1	0	2	1
2021-09-14 10:45:00	2	35	8	9	4	1	2	21	1	2	4	2
2021-09-14 11:00:00	5	18	7	6	2	1	2	32	1	0	7	4
2021-09-14 11:15:00	1	26	4	8	5	1	2	30	1	1	5	2
2021-09-14 11:30:00	1	26	6	9	7	1	5	31	1	2	3	0
2021-09-14 11:45:00	4	26	6	9	2	4	1	18	0	1	1	4
2021-09-14 12:00:00	5	29	9	9	4	0	1	26	1	2	4	4
2021-09-14 12:15:00	3	27	6	13	3	2	4	25	0	1	2	2
2021-09-14 12:30:00	4	33	12	10	6	2	1	20	1	0	7	3
2021-09-14 12:45:00	3	42	7	4	10	1	5	37	0	2	3	2
2021-09-14 13:00:00	3	22	7	8	3	1	3	25	0	1	4	9
2021-09-14 13:15:00	0	22	11	6	5	2	1	35	0	1	8	8
2021-09-14 13:30:00	5	21	6	11	4	0	2	26	1	1	10	2
2021-09-14 13:45:00	4	37	4	3	10	2	1	30	0	0	6	3
2021-09-14 14:00:00	1	33	9	10	5	2	3	33	1	0	10	2
2021-09-14 14:15:00	1	31	8	11	6	4	5	30	0	0	6	0
2021-09-14 14:30:00	5	32	12	9	13	0	0	32	2	0	5	5
2021-09-14 14:45:00	7	43	6	12	12	1	1	50	4	2	9	6
2021-09-14 15:00:00	3	27	6	8	13	2	5	38	0	3	5	2
2021-09-14 15:15:00	2	45	11	16	10	2	8	37	2	0	9	5
2021-09-14 15:30:00	4	49	6	13	18	1	1	44	1	3	12	5
2021-09-14 15:45:00	6	33	15	13	16	2	6	39	1	0	12	4
2021-09-14 16:00:00	3	51	8	25	16	1	5	46	0	0	3	2
2021-09-14 16:15:00	7	49	10	12	21	3	4	47	1	1	12	5
2021-09-14 16:30:00	8	52	14	18	15	3	5	48	1	0	7	5
2021-09-14 16:45:00	8	46	8	22	16	4	5	60	1	0	6	1
2021-09-14 17:00:00	10	47	7	18	27	2	5	54	2	1	10	2
2021-09-14 17:15:00	4	50	13	24	11	3	4	69	1	3	15	3
2021-09-14 17:30:00	6	47	8	23	15	4	4	53	1	2	4	4
2021-09-14 17:45:00	5	45	8	21	7	5	2	39	0	2	9	8

Leg Direction Start Time	Count Data												Growth Rates	
	SR-64 Southbound			SR-582 Westbound			SR-64 Northbound			SR-582 Eastbound			Southbound	0.08%
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Westbound	0.08%
2021-09-14 06:00:00	2	7	9	3	5	1	0	14	0	0	14	4	Northbound	0.08%
2021-09-14 06:15:00	2	19	17	9	4	1	0	18	0	0	13	4	Eastbound	0.08%
2021-09-14 06:30:00	1	19	17	4	4	0	0	16	0	1	13	5		
2021-09-14 06:45:00	4	26	12	6	7	2	2	19	0	0	10	1		
2021-09-14 07:00:00	0	24	13	7	3	1	1	26	0	0	10	5	Collection Year	2022
2021-09-14 07:15:00	2	28	19	3	3	0	4	22	0	1	20	1	Horizon Year	2044
2021-09-14 07:30:00	0	47	18	4	4	0	6	46	0	0	14	7		
2021-09-14 07:45:00	3	49	17	11	5	1	3	39	0	1	10	2		
2021-09-14 08:00:00	5	32	17	5	5	2	5	25	0	1	7	6		
2021-09-14 08:15:00	4	22	15	7	6	2	2	35	0	0	7	4		
2021-09-14 08:30:00	4	33	5	4	2	9	1	31	0	3	8	6		
2021-09-14 08:45:00	4	36	9	1	6	0	2	33	0	1	14	1		
2021-09-14 09:00:00	1	20	6	4	6	3	3	24	0	0	3	3		
2021-09-14 09:15:00	2	34	6	4	2	1	3	19	1	2	5	2		
2021-09-14 09:30:00	0	27	5	3	7	2	1	25	0	0	7	3		
2021-09-14 09:45:00	3	22	6	15	7	1	4	24	1	0	5	7		
2021-09-14 10:00:00	1	15	3	9	2	1	2	22	1	0	1	1		
2021-09-14 10:15:00	2	27	7	4	2	4	1	35	0	0	6	2		
2021-09-14 10:30:00	9	22	6	12	5	1	2	28	1	0	2	1		
2021-09-14 10:45:00	2	36	8	9	4	1	2	21	1	2	4	2		
2021-09-14 11:00:00	5	18	7	6	2	1	2	33	1	0	7	4		
2021-09-14 11:15:00	1	26	4	8	5	1	2	31	1	1	5	2		
2021-09-14 11:30:00	1	26	6	9	7	1	5	32	1	2	3	0		
2021-09-14 11:45:00	4	26	6	9	2	4	1	18	0	1	1	4		
2021-09-14 12:00:00	5	30	9	9	4	0	1	26	1	2	4	4		
2021-09-14 12:15:00	3	27	6	13	3	2	4	25	0	1	2	2		
2021-09-14 12:30:00	4	34	12	10	6	2	1	20	1	0	7	3		
2021-09-14 12:45:00	3	43	7	4	10	1	5	38	0	2	3	2		
2021-09-14 13:00:00	3	22	7	8	3	1	3	25	0	1	4	9		
2021-09-14 13:15:00	0	22	11	6	5	2	1	36	0	1	8	8		
2021-09-14 13:30:00	5	21	6	11	4	0	2	26	1	1	10	2		
2021-09-14 13:45:00	4	38	4	3	10	2	1	31	0	0	6	3		
2021-09-14 14:00:00	1	34	9	10	5	2	3	34	1	0	10	2		
2021-09-14 14:15:00	1	32	8	11	6	4	5	31	0	0	6	0		
2021-09-14 14:30:00	5	33	12	9	13	0	0	33	2	0	5	5		
2021-09-14 14:45:00	7	44	6	12	12	1	1	51	4	2	9	6		
2021-09-14 15:00:00	3	27	6	8	13	2	5	39	0	3	5	2		
2021-09-14 15:15:00	2	46	11	16	10	2	8	38	2	0	9	5		
2021-09-14 15:30:00	4	50	6	13	18	1	1	45	1	3	12	5		
2021-09-14 15:45:00	6	34	15	13	16	2	6	40	1	0	12	4		
2021-09-14 16:00:00	3	52	8	25	16	1	5	47	0	0	3	2		
2021-09-14 16:15:00	7	50	10	12	21	3	4	48	1	1	12	5		
2021-09-14 16:30:00	8	53	14	18	15	3	5	49	1	0	7	5		
2021-09-14 16:45:00	8	47	8	22	16	4	5	61	1	0	6	1		
2021-09-14 17:00:00	10	48	7	18	27	2	5	55	2	1	10	2		
2021-09-14 17:15:00	4	51	13	24	11	3	4	70	1	3	15	3		
2021-09-14 17:30:00	6	48	8	23	15	4	4	54	1	2	4	4		
2021-09-14 17:45:00	5	46	8	21	7	5	2	40	0	2	9	8		

Appendix H

Speed Zone Analysis

Speed Check Form

Location: SR-64, Between High Street and Perry Street @ ~209 N Findlay Road
 Date: 6/29/2022 Day: Wednesday County: Wood
 Observer: LRY & CMC
 Pavement Type: Asphalt Dry: X Wet: Condition: Fair Width: 26'
 Weather: Sunny Temperature: 81°F

Southbound, Time: 1:00-2:00 PM					MPH	Northbound, Time: 2:00-3:00 PM				
Com. %	Cum. Total	No.	Vehicles			Vehicles		No.	Cum. Total	Com. %
			Passenger Cars	Commercial		Passenger Cars	Commercial			
100.00%	101	0			Over			0	101	100.00%
100.00%	101	0			90			0	101	100.00%
100.00%	101	0			88			0	101	100.00%
100.00%	101	0			86			0	101	100.00%
100.00%	101	0			84			0	101	100.00%
100.00%	101	0			82			0	101	100.00%
100.00%	101	0			80			0	101	100.00%
100.00%	101	0			78			0	101	100.00%
100.00%	101	0			76			0	101	100.00%
100.00%	101	0			74			0	101	100.00%
100.00%	101	0			72			0	101	100.00%
100.00%	101	0			70			0	101	100.00%
100.00%	101	0			68			0	101	100.00%
100.00%	101	0			66			0	101	100.00%
100.00%	101	0			64			0	101	100.00%
100.00%	101	0			62			0	101	100.00%
100.00%	101	0			60			0	101	100.00%
100.00%	101	0			58			0	101	100.00%
100.00%	101	0			56			0	101	100.00%
100.00%	101	0			54			0	101	100.00%
100.00%	101	0			52			0	101	100.00%
100.00%	101	0			50			0	101	100.00%
100.00%	101	0			48			0	101	100.00%
100.00%	101	0			46			0	101	100.00%
100.00%	101	1			44			1	101	100.00%
99.01%	100	0			42			1	100	99.01%
99.01%	100	2			40			0	99	98.02%
97.03%	98	3			38			2	99	98.02%
94.06%	95	16	- -		36			3	97	96.04%
78.22%	79	17	- - -		34	- - -		15	94	93.07%
61.39%	62	19	- - -		32	- - -		15	79	78.22%
42.57%	43	31	- - - - -		30	- - - -		24	64	63.37%
11.88%	12	9	-		28	- - -		16	40	39.60%
2.97%	3	2			26	- - -		16	24	23.76%
0.99%	1	1			24			3	8	7.92%
0.00%	0	0			22			5	5	4.95%
0.00%	0	0			20			0	0	0.00%
0.00%	0	0			18			0	0	0.00%
0.00%	0	0			16			0	0	0.00%
0.00%	0	0			14			0	0	0.00%
0.00%	0	0			Below			0	0	0.00%
		101	99	2	Totals	97	4	101		

SB		NB	
Percentile	Speed	Percentile	Speed
50th	32	50th	30
85th	36	85th	34

Combined	
Percentile	Speed
50th	30
85th	34

Speed Check Form

Location: SR-64, South of Church Street @ Park Parking Lot Access
 Date: 6/30/2022 Day: Thursday County: Wood
 Observer: LRY & CMC
 Pavement Type: Asphalt Dry: X Wet: Condition: Fair Width: 27' (Not inc
 Weather: Sunny Temperature: 88°F

Southbound, Time: 1:00-1:50 PM					MPH	Northbound, Time: 2:00-2:45 PM					
Com. %	Cum. Total	No.	Vehicles			Vehicles		No.	Cum. Total	Com. %	
			Passenger Cars	Commercial		Passenger Cars	Commercial				
100.00%	100	0			Over			0	100	100.00%	
100.00%	100	0			90			0	100	100.00%	
100.00%	100	0			88			0	100	100.00%	
100.00%	100	0			86			0	100	100.00%	
100.00%	100	0			84			0	100	100.00%	
100.00%	100	0			82			0	100	100.00%	
100.00%	100	0			80			0	100	100.00%	
100.00%	100	0			78			0	100	100.00%	
100.00%	100	0			76			0	100	100.00%	
100.00%	100	0			74			0	100	100.00%	
100.00%	100	0			72			0	100	100.00%	
100.00%	100	0			70			0	100	100.00%	
100.00%	100	0			68			0	100	100.00%	
100.00%	100	0			66			0	100	100.00%	
100.00%	100	0			64			0	100	100.00%	
100.00%	100	0			62			0	100	100.00%	
100.00%	100	0			60			0	100	100.00%	
100.00%	100	0			58			0	100	100.00%	
100.00%	100	0			56			0	100	100.00%	
100.00%	100	0			54			0	100	100.00%	
100.00%	100	0			52			0	100	100.00%	
100.00%	100	0			50			0	100	100.00%	
100.00%	100	0			48	I		1	100	100.00%	
100.00%	100	0			46	IIII-I		6	99	99.00%	
100.00%	100	0			44	IIII-I		6	93	93.00%	
100.00%	100	2	II		44	IIII-IIII-I		16	87	87.00%	
98.00%	98	5	IIII-		42	IIII-IIII-IIII-		15	71	71.00%	
93.00%	93	9	IIII-IIII		40	IIII-IIII-IIII-IIII-		20	56	56.00%	
84.00%	84	14	IIII-IIII-IIII		38	IIII-IIII-IIII		13	36	36.00%	
70.00%	70	14	IIII-IIII-IIII	I	36	IIII-IIII		9	23	23.00%	
56.00%	56	20	IIII-IIII-IIII-IIII	II	34	IIII-		5	14	14.00%	
36.00%	36	20	IIII-IIII-IIII-IIII	I	32	IIII		4	9	9.00%	
16.00%	16	7	IIII-II		30	II		2	5	5.00%	
9.00%	9	5	IIII-		28	III		3	3	3.00%	
4.00%	4	3	II	I	26			0	0	0.00%	
1.00%	1	1	I		24			0	0	0.00%	
0.00%	0	0			22			0	0	0.00%	
0.00%	0	0			20			0	0	0.00%	
0.00%	0	0			18			0	0	0.00%	
0.00%	0	0			16			0	0	0.00%	
0.00%	0	0			14			0	0	0.00%	
0.00%	0	0			Below			0	0	0.00%	
		100	95	5	Totals			100	0	100	

SB

Percentile	Speed
50th	34
85th	40

NB

Percentile	Speed
50th	40
85th	44

Combined

Percentile	Speed
50th	38
85th	44

Speed Check Form

Location: SR-64, South of Kingsbury Avenue
 Date: 6/29/2022 Day: Wednesday County: Wood
 Observer: LRY & CMC
 Pavement Type: Asphalt Dry: X Wet: Condition: Fair Width: 24'
 Weather: Partly Cloudy Temperature: 72°F

Southbound, Time: 10:00-11:00 AM					MPH	Northbound, Time: 10:00-10:50 AM				
Com. %	Cum. Total	No.	Vehicles			Vehicles		No.	Cum. Total	Com. %
			Passenger Cars	Commercial		Passenger Cars	Commercial			
100.00%	87	0			Over			0	100	100.00%
100.00%	87	0			90			0	100	100.00%
100.00%	87	0			88			0	100	100.00%
100.00%	87	0			86			0	100	100.00%
100.00%	87	0			84			0	100	100.00%
100.00%	87	0			82			0	100	100.00%
100.00%	87	0			80			0	100	100.00%
100.00%	87	0			78			0	100	100.00%
100.00%	87	0			76			0	100	100.00%
100.00%	87	0			74			0	100	100.00%
100.00%	87	0			72			0	100	100.00%
100.00%	87	0			70			0	100	100.00%
100.00%	87	0			68			0	100	100.00%
100.00%	87	0			66			0	100	100.00%
100.00%	87	0			64			0	100	100.00%
100.00%	87	0			62			0	100	100.00%
100.00%	87	1	I		60			0	100	100.00%
98.85%	86	0			58			0	100	100.00%
98.85%	86	0			56			0	100	100.00%
98.85%	86	3	III		54			0	100	100.00%
95.40%	83	2	II		52	II		2	100	100.00%
93.10%	81	7	IIII-II		50	II		2	98	98.00%
85.06%	74	4	III	I	48	II		2	96	96.00%
80.46%	70	7	IIII-II		46	III		4	94	94.00%
72.41%	63	11	IIII-III-I		44	IIII-III-III	I	14	90	90.00%
59.77%	52	17	IIII-III-III-II		42	IIII-III-III-I	I	17	76	76.00%
40.23%	35	14	IIII-III-III		40	IIII-III-III	II	15	59	59.00%
24.14%	21	7	IIII-II		38	IIII-III-III-	II	17	44	44.00%
16.09%	14	5	IIII-		36	IIII-III-III	II	15	27	27.00%
10.34%	9	7	IIII-II		34	IIII-		5	12	12.00%
2.30%	2	2	II		32	III		4	7	7.00%
0.00%	0	0			30	III		3	3	3.00%
0.00%	0	0			28			0	0	0.00%
0.00%	0	0			26			0	0	0.00%
0.00%	0	0			24			0	0	0.00%
0.00%	0	0			22			0	0	0.00%
0.00%	0	0			20			0	0	0.00%
0.00%	0	0			18			0	0	0.00%
0.00%	0	0			16			0	0	0.00%
0.00%	0	0			14			0	0	0.00%
0.00%	0	0			Below			0	0	0.00%
		87	86	1	Totals	92	8	100		

SB

Percentile	Speed
50th	42
85th	50

NB

Percentile	Speed
50th	40
85th	44

Combined

Percentile	Speed
50th	40
85th	46

Speed Check Form

Location: SR-64, South of Middleton Pike @ ~20760 Haskins Road
 Date: 6/30/2022 Day: Thursday County: Wood
 Observer: LRY & CMC
 Pavement Type: Asphalt Dry: X Wet: Condition: Fair Width: 22'
 Weather: Sunny Temperature: 81°F

Southbound, Time: 9:30-10:30 AM					MPH	Northbound, Time: 10:30-11:30 AM				
Com. %	Cum. Total	No.	Vehicles			Vehicles		No.	Cum. Total	Com. %
			Passenger Cars	Commercial		Passenger Cars	Commercial			
100.00%	92	0			Over			0	80	100.00%
100.00%	92	0			90			0	80	100.00%
100.00%	92	0			88			0	80	100.00%
100.00%	92	0			86			0	80	100.00%
100.00%	92	0			84			0	80	100.00%
100.00%	92	0			82			0	80	100.00%
100.00%	92	0			80			0	80	100.00%
100.00%	92	0			78			0	80	100.00%
100.00%	92	0			76			0	80	100.00%
100.00%	92	0			74			0	80	100.00%
100.00%	92	0			72			0	80	100.00%
100.00%	92	0			70			0	80	100.00%
100.00%	92	1	I		68			0	80	100.00%
98.91%	91	0			66	I		1	80	100.00%
98.91%	91	0			64			0	79	98.75%
98.91%	91	1	I		62			0	79	98.75%
97.83%	90	1	I		60	II		2	79	98.75%
96.74%	89	4	IIII		58	III		3	77	96.25%
92.39%	85	8	IIII-III		56	IIII-III-II		12	74	92.50%
83.70%	77	14	IIII-III-III	I	54	IIII-III		9	62	77.50%
68.48%	63	14	IIII-III-III	I	52	IIII-III-III-II	II	19	53	66.25%
53.26%	49	21	IIII-III-III-III	II	50	IIII-III-II		12	34	42.50%
30.43%	28	10	IIII-III-		48	IIII-II	I	8	22	27.50%
19.57%	18	7	IIII-II		46	IIII-I	I	7	14	17.50%
11.96%	11	5	IIII	I	44	IIII-		5	7	8.75%
6.52%	6	2	II		42	II		2	2	2.50%
4.35%	4	2	II		40			0	0	0.00%
2.17%	2	1	I		38			0	0	0.00%
1.09%	1	1	I		36			0	0	0.00%
0.00%	0	0			34			0	0	0.00%
0.00%	0	0			32			0	0	0.00%
0.00%	0	0			30			0	0	0.00%
0.00%	0	0			28			0	0	0.00%
0.00%	0	0			26			0	0	0.00%
0.00%	0	0			24			0	0	0.00%
0.00%	0	0			22			0	0	0.00%
0.00%	0	0			20			0	0	0.00%
0.00%	0	0			18			0	0	0.00%
0.00%	0	0			16			0	0	0.00%
0.00%	0	0			14			0	0	0.00%
0.00%	0	0			Below			0	0	0.00%
		92	87	5	Totals	76	4	80		

SB

Percentile	Speed
50th	50
85th	56

NB

Percentile	Speed
50th	52
85th	56

Combined

Percentile	Speed
50th	52
85th	56

Village of Haskins

SR-64 Speed Zone Proposals

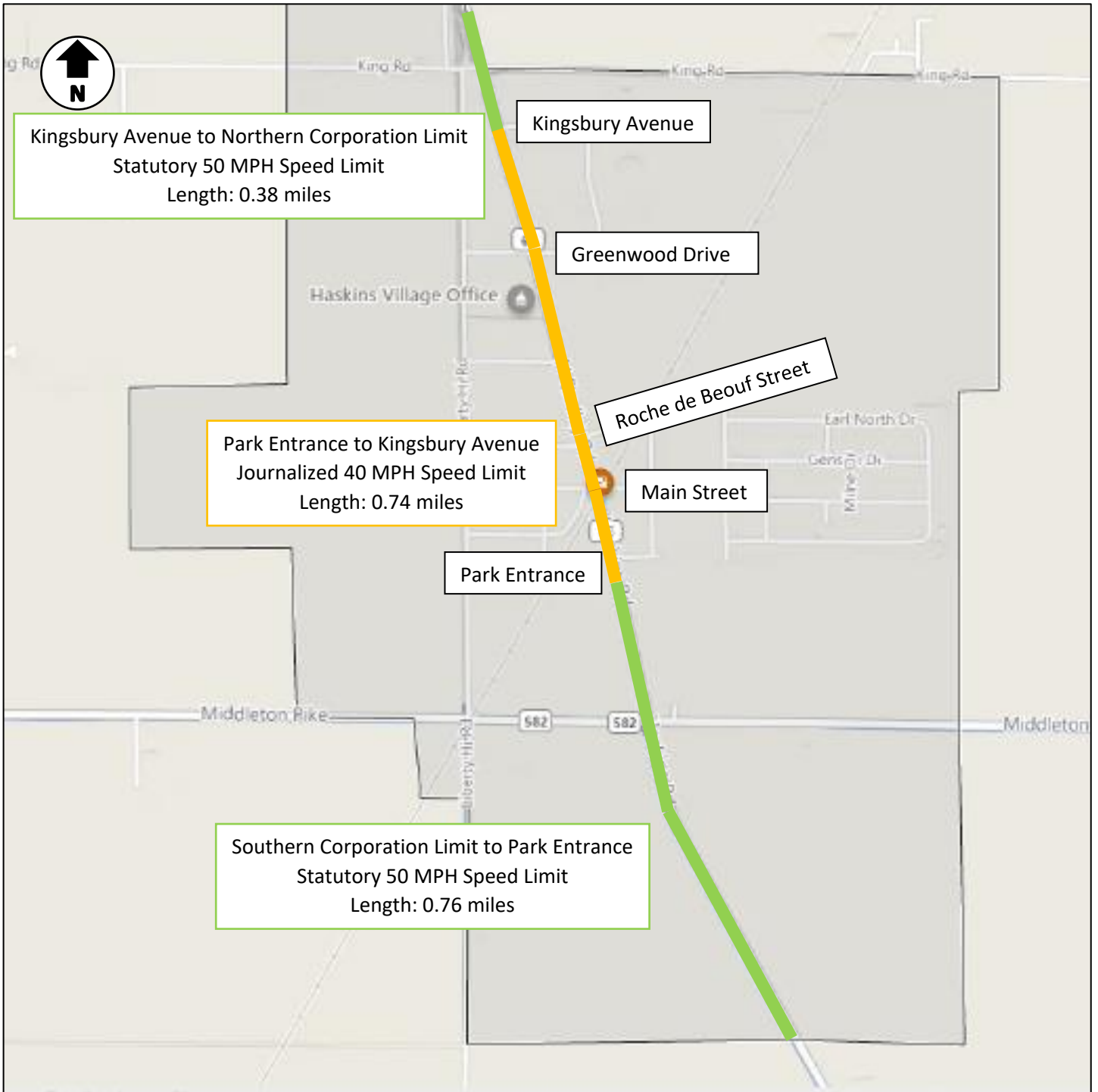
Option 1: Existing Statutory Speed Limits



Village of Haskins

SR-64 Speed Zone Proposals

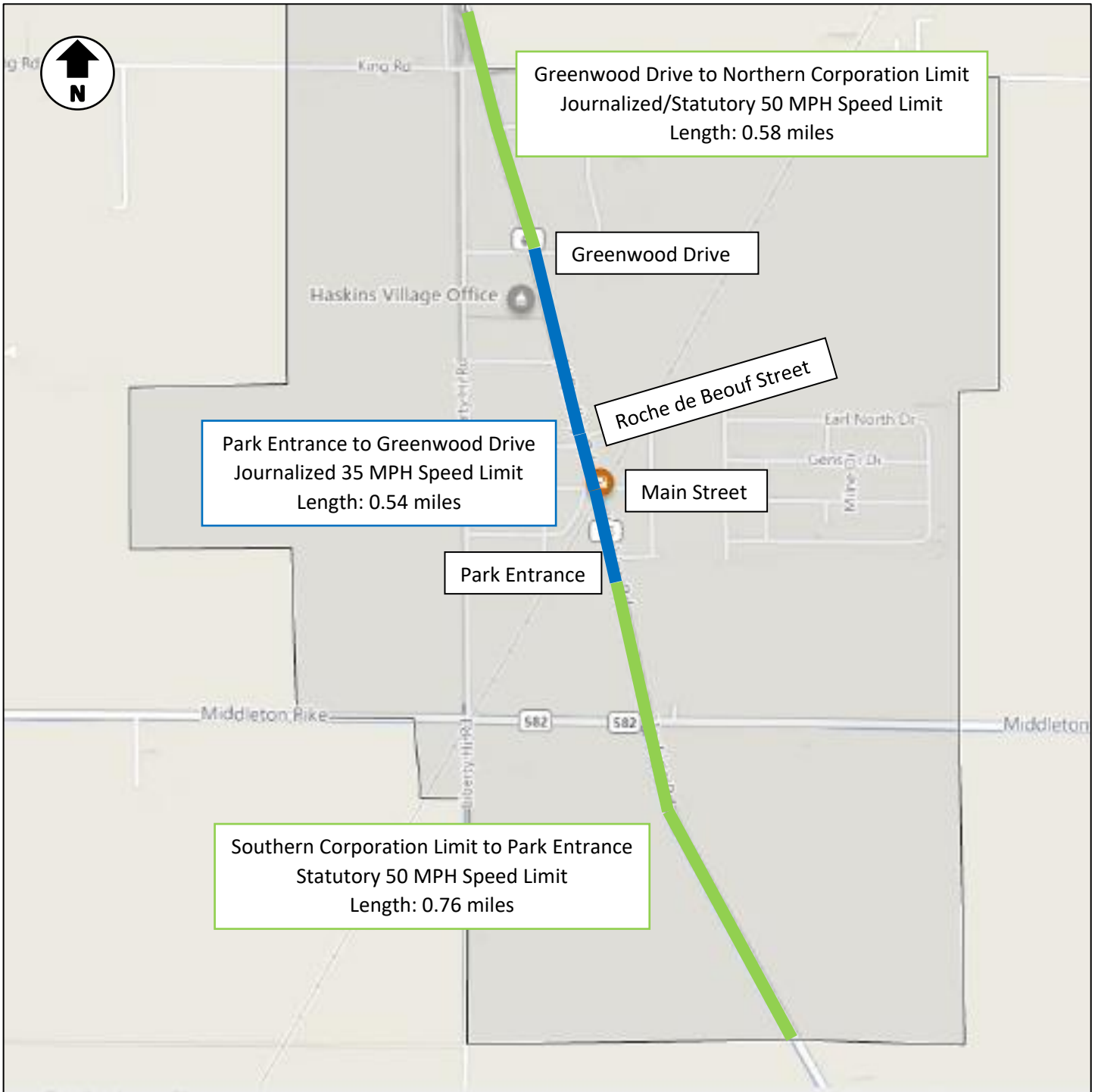
Option 2



Village of Haskins

SR-64 Speed Zone Proposals

Option 3





Ohio Department of Transportation

SPEED ZONE EVALUATION SHEET

For Highways with less than 50% of all crossroads grade separated



TEM FORM 1296-2

COMPLETE ALL GREEN SHADED AREAS

ROUTE NAME:	N Findlay St	ROUTE NUMBER:	SR-64
BEGIN STUDY AT:	Greenwood Dr	COUNTY:	Wood
BEGIN LOGPOINT:	9.89	TOWNSHIP / MUNICIPALITY:	Village of Haskins
END STUDY AT:	North Corporation Limit	JURISDICTION:	Village of Haskins
END LOGPOINT:	10.47	EXISTING SPEED LIMIT (MPH):	50
LENGTH (MILE):	0.58	AVERAGE DAILY TRAFFIC (ADT):	3968

[REFER TO SECTION 1203 OF THE TRAFFIC ENGINEERING MANUAL FOR ADDITIONAL GUIDANCE](#)

No. of Houses or Farms	23	Must have direct access to the roadway being studied.	
No. of Small Businesses, Apts./Condos	0		
No. of Medium Businesses, Apts./Condos	0		
No. of Major Businesses, Apts./Condos	0		
No. of Minor Street Intersections	1	Subdivision, Residential, or Other streets serving the residents of that street.	
No. of Major Street Intersections	1	Streets which serve both the residents and commuters of the area.	
No. of Signalized/Roundabout Intersections	0	Do not include intersections at the beginning or end of the section.	
No. of Interchange Ramps	0	Do not include Loop ramps at the beginning or end of the section.	
Lane Width (Round down to nearest foot)	12	General width of through lanes throughout the section.	
Shoulder Width (Round down to nearest foot)	5	General shoulder width throughout the section.	
No. of Property Damage Only Crashes	4	Latest three years of data	
No. of Injury Crashes	0	Weighted value is 2x that of a Property Damage Only Crash	
No. of Fatal Crashes	0	Weighted value is 4x that of a Property Damage Only Crash	
Presence of Vulnerable Road Users	Not High	Pedestrians / Bicyclists / Amish Buggies / etc..	
Urban Features	No	Sidewalks / Crosswalks / Curb & Gutter / On-Street Parking / Street Lighting / etc..	
50 th Percentile Speed	46	Average of all speed samples that were taken.	
85 th Percentile Speed	51	Average of all speed samples that were taken.	
10-mph Pace Speed	42	to 51	Average of all speed samples that were taken.
Roadway Characteristics	A1	CATEGORIES: C B3 B2 B1 A3 A2 A1 DIV	

To View Calculation Sheet or Examples of Roadway Characteristics and Crashes to Include, use Buttons Below.

CALCULATION SHEET

ROADWAY CHARACTERISTICS

CRASHES TO INCLUDE

CALCULATED SPEED: **51** MPH

USLIMITS2 SPEED: **50** MPH

REQUESTED SPEED: MPH

ADDITIONAL CONSIDERATIONS AND COMMENTS

STUDY BY: **CMC**

DATE: **August 8, 2022**

INCLUDE THE RELATED RESOLUTION(S) WHEN SUBMITTING THIS FORM

BELOW FOR ODOT USE ONLY

CHECKED BY: **Waterfield**

TEST RUN: **53** MPH

APPROVED SPEED: **50** MPH

USLIMITS2 Speed Zoning Report

Project Overview

Project Name: Haskins

Analyst: Waterfield

Date: 2022-12-02

Basic Project Information

Project Number: 3

Route Name: SR-64

From: 9.89

To: 10.47

State: Ohio

County: Wood County

City: Haskins village

Route Type: Road Section in Developed Area

Route Status: Existing

Roadway Information

Section Length: 0.58 mile(s)

Statutory Speed Limit: 50 mph

Existing Speed Limit: 50 mph

Adverse Alignment: No

One-Way Street: No

Divided/Undivided: Undivided

Number of Through Lanes: 2

Area Type: Residential-Collector/Arterial

Number of Driveways: 25

Number of Signals: 0

Crash Data Information

Crash Data Years: 0

Crash AADT: N/A

Total Number of Crashes: N/A

Total Number of Injury Crashes: N/A

Traffic Information

85th Percentile Speed: 51 mph

50th Percentile Speed: 46 mph

AADT: 3968 veh/day

On Street Parking and Usage: Not High

Pedestrian / Bicyclist Activity: Not High

Project Description: Greenwood to North Corp Limit

Recommended Speed Limit:



Note: Crash data were not entered for this project. A comprehensive crash study is a critical component of any traffic engineering study. We suggest that you repeat this process when crash data become available.

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Ohio Department of Transportation

SPEED ZONE EVALUATION SHEET

For Highways with less than 50% of all crossroads grade separated



TEM FORM 1296-2

COMPLETE ALL GREEN SHADED AREAS

ROUTE NAME:	N Findlay St	ROUTE NUMBER:	SR-64
BEGIN STUDY AT:	Park Entrance	COUNTY:	Wood
BEGIN LOGPOINT:	9.35	TOWNSHIP / MUNICIPALITY:	Village of Haskins
END STUDY AT:	Kingsbury Ave	JURISDICTION:	Village of Haskins
END LOGPOINT:	10.09	EXISTING SPEED LIMIT (MPH):	35
LENGTH (MILE):	0.74	AVERAGE DAILY TRAFFIC (ADT):	5037

[REFER TO SECTION 1203 OF THE TRAFFIC ENGINEERING MANUAL FOR ADDITIONAL GUIDANCE](#)

No. of Houses or Farms	44	Must have direct access to the roadway being studied.								
No. of Small Businesses, Apts./Condos	12									
No. of Medium Businesses, Apts./Condos	0									
No. of Major Businesses, Apts./Condos	0									
No. of Minor Street Intersections	6	Subdivision, Residential, or Other streets serving the residents of that street.								
No. of Major Street Intersections	0	Streets which serve both the residents and commuters of the area.								
No. of Signalized/Roundabout Intersections	0	Do not include intersections at the beginning or end of the section.								
No. of Interchange Ramps	0	Do not include Loop ramps at the beginning or end of the section.								
Lane Width (Round down to nearest foot)	13	General width of through lanes throughout the section.								
Shoulder Width (Round down to nearest foot)	4	General shoulder width throughout the section.								
No. of Property Damage Only Crashes	0	Latest three years of data								
No. of Injury Crashes	0	Weighted value is 2x that of a Property Damage Only Crash								
No. of Fatal Crashes	0	Weighted value is 4x that of a Property Damage Only Crash								
Presence of Vulnerable Road Users	High	Pedestrians / Bicyclists / Amish Buggies / etc..								
Urban Features	Yes	Sidewalks / Crosswalks / Curb & Gutter / On-Street Parking / Street Lighting / etc..								
50 th Percentile Speed	37	Average of all speed samples that were taken.								
85 th Percentile Speed	43	Average of all speed samples that were taken.								
10-mph Pace Speed	36	to	45	Average of all speed samples that were taken.						
Roadway Characteristics	A1	CATEGORIES:	C	B3	B2	B1	A3	A2	A1	DIV

To View Calculation Sheet or Examples of Roadway Characteristics and Crashes to Include, use Buttons Below.

CALCULATION SHEET

ROADWAY CHARACTERISTICS

CRASHES TO INCLUDE

CALCULATED SPEED: **41** MPH

USLIMITS2 SPEED: **35** MPH

REQUESTED SPEED: MPH

ADDITIONAL CONSIDERATIONS AND COMMENTS

STUDY BY: **CMC**

DATE: **August 8, 2022**

INCLUDE THE RELATED RESOLUTION(S) WHEN SUBMITTING THIS FORM

BELOW FOR ODOT USE ONLY

CHECKED BY: **Waterfield**

TEST RUN: **39** MPH

APPROVED SPEED: **40** MPH

USLIMITS2 Speed Zoning Report

Project Overview

Project Name: Haskins

Analyst: Waterfield

Date: 2022-11-01

Basic Project Information

Project Number: 2

Route Name: SR-64

From: 9.35

To: 10.09

State: Ohio

County: Wood County

City: Haskins village

Route Type: Road Section in Developed Area

Route Status: Existing

Roadway Information

Section Length: .74 mile(s)

Statutory Speed Limit: 50 mph

Existing Speed Limit: 35 mph

Adverse Alignment: No

One-Way Street: No

Divided/Undivided: Undivided

Number of Through Lanes: 2

Area Type: Residential-Collector/Arterial

Number of Driveways: 56

Number of Signals: 0

Crash Data Information

Crash Data Years: 0

Crash AADT: N/A

Total Number of Crashes: N/A

Total Number of Injury Crashes: N/A

Traffic Information

85th Percentile Speed: 43 mph

50th Percentile Speed: 37 mph

AADT: 5037 veh/day

On Street Parking and Usage: Not High

Pedestrian / Bicyclist Activity: High

Project Description: Park to Kingsbury

Recommended Speed Limit:



Note: Crash data were not entered for this project. A comprehensive crash study is a critical component of any traffic engineering study. We suggest that you repeat this process when crash data become available.

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.

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Ohio Department of Transportation

SPEED ZONE EVALUATION SHEET

For Highways with less than 50% of all crossroads grade separated



TEM FORM 1296-2

COMPLETE ALL GREEN SHADED AREAS

ROUTE NAME:	N Findlay St	ROUTE NUMBER:	SR-64
BEGIN STUDY AT:	Park Entrance	COUNTY:	Wood
BEGIN LOGPOINT:	9.35	TOWNSHIP / MUNICIPALITY:	Village of Haskins
END STUDY AT:	Greenwood Dr	JURISDICTION:	Village of Haskins
END LOGPOINT:	9.89	EXISTING SPEED LIMIT (MPH):	35
LENGTH (MILE):	0.54	AVERAGE DAILY TRAFFIC (ADT):	5037

[REFER TO SECTION 1203 OF THE TRAFFIC ENGINEERING MANUAL FOR ADDITIONAL GUIDANCE](#)

No. of Houses or Farms	32	Must have direct access to the roadway being studied.	
No. of Small Businesses, Apts./Condos	12		
No. of Medium Businesses, Apts./Condos	0		
No. of Major Businesses, Apts./Condos	0		
No. of Minor Street Intersections	5	Subdivision, Residential, or Other streets serving the residents of that street.	
No. of Major Street Intersections	0	Streets which serve both the residents and commuters of the area.	
No. of Signalized/Roundabout Intersections	0	Do not include intersections at the beginning or end of the section.	
No. of Interchange Ramps	0	Do not include Loop ramps at the beginning or end of the section.	
Lane Width (Round down to nearest foot)	13	General width of through lanes throughout the section.	
Shoulder Width (Round down to nearest foot)	4	General shoulder width throughout the section.	
No. of Property Damage Only Crashes	0	Latest three years of data	
No. of Injury Crashes	0	Weighted value is 2x that of a Property Damage Only Crash	
No. of Fatal Crashes	0	Weighted value is 4x that of a Property Damage Only Crash	
Presence of Vulnerable Road Users	High	Pedestrians / Bicyclists / Amish Buggies / etc..	
Urban Features	Yes	Sidewalks / Crosswalks / Curb & Gutter / On-Street Parking / Street Lighting / etc..	
50 th Percentile Speed	34	Average of all speed samples that were taken.	
85 th Percentile Speed	40	Average of all speed samples that were taken.	
10-mph Pace Speed	30	to 39	Average of all speed samples that were taken.
Roadway Characteristics	A1	CATEGORIES: C B3 B2 B1 A3 A2 A1 DIV	

To View Calculation Sheet or Examples of Roadway Characteristics and Crashes to Include, use Buttons Below.

CALCULATION SHEET

ROADWAY CHARACTERISTICS

CRASHES TO INCLUDE

CALCULATED SPEED: 40 MPH

USLIMITS2 SPEED: 35 MPH

REQUESTED SPEED: MPH

ADDITIONAL CONSIDERATIONS AND COMMENTS

STUDY BY: CMC

DATE: August 8, 2022

INCLUDE THE RELATED RESOLUTION(S) WHEN SUBMITTING THIS FORM

BELOW FOR ODOT USE ONLY

CHECKED BY: Waterfield

TEST RUN: 37 MPH

APPROVED SPEED: 35 MPH

USLIMITS2 Speed Zoning Report

Project Overview

Project Name: Haskins

Analyst: Waterfield

Date: 2022-11-01

Basic Project Information

Project Number: 1

Route Name: SR-64

From: 9.35

To: 9.89

State: Ohio

County: Wood County

City: Haskins village

Route Type: Road Section in Developed Area

Route Status: Existing

Roadway Information

Section Length: .54 mile(s)

Statutory Speed Limit: 50 mph

Existing Speed Limit: 35 mph

Adverse Alignment: No

One-Way Street: No

Divided/Undivided: Undivided

Number of Through Lanes: 2

Area Type: Residential-Collector/Arterial

Number of Driveways: 44

Number of Signals: 0

Crash Data Information

Crash Data Years: 0

Crash AADT: N/A

Total Number of Crashes: N/A

Total Number of Injury Crashes: N/A

Traffic Information

85th Percentile Speed: 40 mph

50th Percentile Speed: 34 mph

AADT: 5037 veh/day

On Street Parking and Usage: Not High

Pedestrian / Bicyclist Activity: High

Project Description: Park to Greenwood

Recommended Speed Limit:



Note: Crash data were not entered for this project. A comprehensive crash study is a critical component of any traffic engineering study. We suggest that you repeat this process when crash data become available.

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.

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Appendix I

HSM Outputs and CMFs



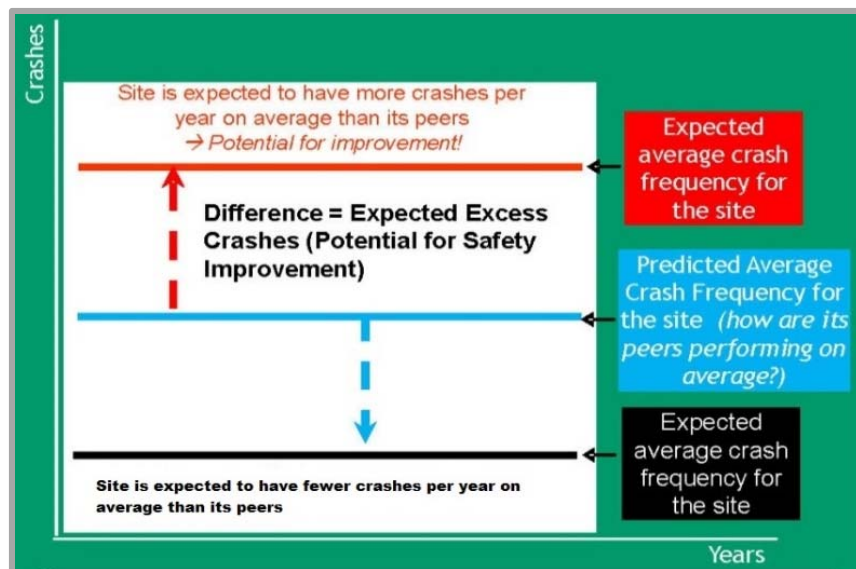
Highway Safety Manual

The predictive method described in Part C of the Highway Safety Manual provides steps to estimate the expected average crash frequency of a site for a given time period, geometric design, traffic control features, and traffic volumes. The expected average crash frequency (N_{expected}) is estimated using a predictive model estimate of crash frequency for a specific site type ($N_{\text{predicted}}$) together with observed crash frequency (where available).

Predicted average crash frequency: This step involves determination of the predicted crash frequency, which reflects how a site would be expected to perform relative to 1,000 similar sites. Calculation of predicted crash frequency utilizes Safety Performance Functions (SPF) for a base condition. Crash Modification Factors (CMF) are applied to account for specific site characteristics that differ from the base condition. A state-level calibration factor is then applied to normalize the base condition to localized conditions. The resulting value is the Predicted Crash Frequency ($N_{\text{predicted}}$).

Expected average crash frequency: The next step involves calculation of the expected average crash frequency, which reflects average performance of the site over an extended period of time based on actual crash history. This step incorporates the Empirical Bayes (EB) method, which combines actual (observed) crash history of the study site with predicted average crash frequency. These values are weighted based on an over-dispersion parameter (k) that is the measure of the strength of the model (safety performance factors). The resulting value is the expected average crash frequency (N_{expected}).

The difference between the predicted and expected average crash frequencies is termed the “Expected Excess Crashes” for the site, as shown in the figure below. If the expected average crash frequency is greater than the predicted average crash frequency, then the site has potential for safety improvement. If expected frequency is less than predicted frequency, then the site is expected to experience fewer crashes per year on average than its peers.





Project Information

General Information

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		
Perform Benefit Cost Analysis?	Yes		

Do the proposed improvements fundamentally change the conditions of the base safety performance function (SPF), Or is crash data unavailable for the analysis condition, Or is only predicted (and not expected) analysis needed for the existing or proposed condition? **No**

(Examples: unsignalized to signalized, undivided to divided, increase or decrease in the number of lanes, change the number of approaches to an intersection, significant realignment of the roadway)

Project Elements Description Table

Project Element ID (Must be Unique)	Site Type	Intersection Control Type	Location Information					
			NLFID	Begin Logpoint/ Intersection Midpoint	End Logpoint (Leave blank for Intersection)	Length (mi) OR Intersection Radius Buffer (mi)	Cross Route NLFID(s)	Common Name
SR64: 9.16	Rural Two-Lane Two Way Intersection	Unsignalized	SWOOSR00064**C	9.16		0.05	SWOOSR005	SR-64 & SR-582

Traffic Volume Growth Rate Calculation For Benefit Cost Analysis			
	Year	AADT	
Present ADT (PADT)			veh / day
Future ADT (FADT)			veh / day
Annual Linear Growth Rate		0.0008	

Select Other Non-Site Characteristic Based Countermeasures For Entire Project

CMF Nbr	Countermeasure	CMF KA Value	CMF B Value	CMF C Value	CMF O Value	CMF Valid for the Following Site Types
CMF 1	Convert intersection with minor-road stop control to modern roundabout (Rural)	0.13	0.13	0.13	0.29	2 / 10

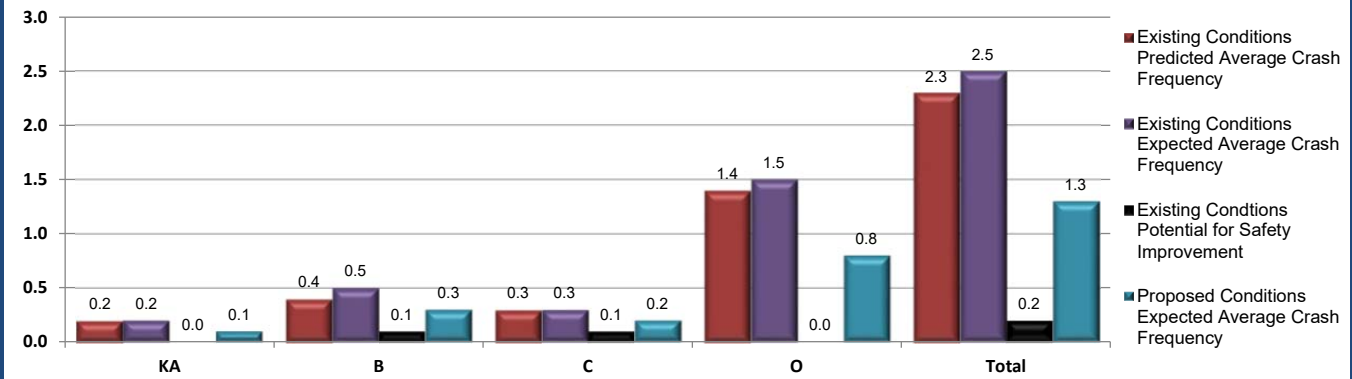


Project Safety Performance Report

General Information

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

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	0.1669	0.4042	0.2691	1.4466	2.2868
N_{expected} - Existing Conditions	0.2054	0.4979	0.3315	1.4861	2.5209
N_{potential for improvement} - Existing Conditions	0.0385	0.0937	0.0624	0.0395	0.2341
N_{expected} - Proposed Conditions	0.1068	0.2588	0.1723	0.7724	1.3103

Existing Conditions Project Element Predicted Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				Total
		KA	B	C	O	
SR64: 9.16	SR-64 & SR-582	0.1669	0.4042	0.2691	1.4466	2.2868

Existing Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				Total
		KA	B	C	O	
SR64: 9.16	SR-64 & SR-582	0.2054	0.4979	0.3315	1.4861	2.5209

Existing Conditions Project Element Potential for Safety Improvement Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				Total
		KA	B	C	O	
SR64: 9.16	SR-64 & SR-582	0.0385	0.0937	0.0624	0.0395	0.2341

Proposed Conditions Project Element Expected Crash Summary (Without Animal Crashes)

Project Element ID	Common Name	Crash Severity Level				Total
		KA	B	C	O	
SR64: 9.16	SR-64 & SR-582	0.1068	0.2588	0.1723	0.7724	1.3103



Project Safety Performance Report

General Information

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Summary by Crash Type

Crash Type	Existing		PSI	Proposed
	Predicted Crash Frequency	Expected Crash Frequency		Expected Crash Frequency
Unknown	0.0086	0.0094	0.0008	0.0022
Head On	0.0184	0.0217	0.0033	0.0039
Rear End	0.4581	0.5070	0.0489	0.1186
Backing	0.0862	0.0909	0.0047	0.0255
Sideswipe - Meeting	0.0623	0.0700	0.0077	0.0153
Sideswipe - Passing	0.0969	0.1057	0.0088	0.0262
Angle	0.8178	0.9335	0.1157	0.1917
Parked Vehicle	0.0763	0.0813	0.0050	0.0219
Pedestrian	0.0104	0.0127	0.0023	0.0019
Animal	0.0000	0.0000	0.0000	0.0000
Train	0.0003	0.0004	0.0001	0.0001
Pedalcycles	0.0078	0.0094	0.0016	0.0016
Other Non-Vehicle	0.0002	0.0002	0.0000	0.0000
Fixed Object	0.3596	0.3960	0.0364	0.0944
Other Object	0.0125	0.0134	0.0009	0.0036
Overtuning	0.0216	0.0253	0.0037	0.0046
Other Non-Collision	0.0285	0.0307	0.0022	0.0080
Left Turn	0.0779	0.0887	0.0108	0.0184
Right Turn	0.0000	0.0000	0.0000	0.0000

Existing Conditions: General Information and Data for Rural Two-Lane Two-Way Intersection

General Information		Location Information			
Analyst	Gina Balsamo	Route	SR64		
Agency or Company	Carpenter Marty Transportation	Logpoint	9.16		
Date Performed	08/11/22	Common Name	SR-64 & SR-582		
Intersection	SR64; 9.16	Analysis Year	2021		
Signalized/Unsignalized	Unsignalized				
Input Data		Existing Conditions		HSM Base Conditions	
Intersection type (3ST, 4ST, 4SG)		4ST		--	
AADT _{major} (veh/day)	AADT _{MAX} = 14,700 (veh/day)	3,846		--	
AADT _{minor} (veh/day)	AADT _{MAX} = 3,500 (veh/day)	1,270		--	
Intersection skew angle (degrees)	Does skew differ for minor legs? Else, No. No	Skew for Leg 1 (All):	12	Skew for Leg 2 (4ST only):	0
Skew Angle Help					
Number of uncontrolled approaches with a left-turn lane (0, 1, 2, 3, 4)		0		0	
Number of uncontrolled approaches with a right-turn lane (0, 1, 2, 3, 4)		0		0	
Intersection lighting (present/not present)		Not Present		Not Present	
Calibration Factor, C _i		1.01		1.00	
Locality:		State System			

Proposed Conditions: Data for Rural Two-Lane Two-Way Intersection

Input Data		Proposed Conditions			Existing Conditions	
Intersection type (3ST, 4ST, 4SG)		4ST			4ST	
AAADT _{major} (veh/day)	AAADT _{MAX} = 14,700 (veh/day)	3,846			3,846	
AAADT _{minor} (veh/day)	AAADT _{MAX} = 3,500 (veh/day)	1,270			1,270	
Intersection skew angle (degrees)	Does skew differ for minor legs? Else, No.	No	Skew for Leg 1 (All): 12	Skew for Leg 2 (4ST only): 0	12	
Number of uncontrolled approaches with a left-turn lane (0, 1, 2, 3, 4)		2			0	
Number of uncontrolled approaches with a right-turn lane (0, 1, 2, 3, 4)		0			0	
Intersection lighting (present/not present)		Present			Not Present	
Calibration Factor, C _i		1.01			1.01	
Locality:		State System			State System	

Proposed Conditions: CMFs for Rural Two-Lane Two-Way Intersection

(1) CMF for Intersection Skew Angle CMF ₁₁ from Equations 10-22 or 10-23	(2) CMF for Left-Turn Lanes CMF ₂₁ from Table 10-13	(3) CMF for Right-Turn Lanes CMF ₃₁ from Table 10-14	(4) CMF for Lighting CMF ₄₁ from Equation 10-24	(5) Combined CMF CMF _{COMB} (1)*(2)*(3)*(4)
1.0669	0.5200	1.0000	0.9996	0.5546
Indicate Below the Proposed CMFs to be Included in the Project				
1.0000	0.5200	1.0000	0.9996	0.5198
	X		X	

Proposed Intersection: Summary Results (Without Animal Crashes) (Crashes/Year)					
	KA	B	C	O	Total
N_{predicted}	0.1669	0.4042	0.2691	1.4466	2.2868
N_{expected} - Existing Conditions	0.2054	0.4979	0.3315	1.4861	2.5209
N_{potential for improvement} - Existing Conditions	0.0385	0.0937	0.0624	0.0395	0.2341
N_{expected} - Proposed Conditions Site CMFs	0.1068	0.2588	0.1723	0.7724	1.3103
N_{expected} - Proposed Conditions All CMFs	0.1068	0.2588	0.1723	0.7724	1.3103

Roundabout Options

Proposed Conditions: Data for Rural Two-Lane Two-Way Intersection													
Input Data				Proposed Conditions				Existing Conditions					
Intersection type (3ST, 4ST, 4SG)				4ST				4ST					
AADT _{major} (veh/day)		AADT _{MAX} = 14,700 (veh/day)		3,846				3,846					
AADT _{minor} (veh/day)		AADT _{MAX} = 3,500 (veh/day)		1,270				1,270					
Intersection skew angle (degrees) Does skew differ for minor legs? Else, No.				No		Skew for Leg 1 (All):		12		Skew for Leg 2 (4ST only):		0	
Number of uncontrolled approaches with a left-turn lane (0, 1, 2, 3, 4)				0				0					
Number of uncontrolled approaches with a right-turn lane (0, 1, 2, 3, 4)				0				0					
Intersection lighting (present/not present)				Present				Not Present					
Calibration Factor, C _i				1.01				1.01					
Locality:				State System				State System					

Proposed Conditions: CMFs for Rural Two-Lane Two-Way Intersection				
(1) CMF for Intersection Skew Angle CMF _{s1} from Equations 10-22 or 10-23	(2) CMF for Left-Turn Lanes CMF ₂₁ from Table 10-13	(3) CMF for Right-Turn Lanes CMF ₃₁ from Table 10-14	(4) CMF for Lighting CMF ₄₁ from Equation 10-24	(5) Combined CMF CMF _{comb} (1)*(2)*(3)*(4)
1.0669	1.0000	1.0000	0.9996	1.0665
Indicate Below the Proposed CMFs to be Included in the Project				
1.0000	1.0000	1.0000	0.9996	0.9996
			X	

Roundabout Options

Proposed Conditions: Summary of Other CMFs (Without Animal Crashes)						
CMF Nbr	Countermeasure	KA Value	B Value	C Value	O Value	Total
CMF 1	Convert intersection with minor-road stop control to modern roundabout (Rural)	-0.1786	-0.4330	-0.2883	-1.0547	-1.9546
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000
Total		-0.1786	-0.433	-0.2883	-1.0547	-1.9546

Proposed Intersection: Summary Results (Without Animal Crashes) (Crashes/Year)					
	KA	B	C	O	Total
N_{predicted}	0.1669	0.4042	0.2691	1.4466	2.2868
N_{expected} - Existing Conditions	0.2054	0.4979	0.3315	1.4861	2.5209
N_{potential for improvement} - Existing Conditions	0.0385	0.0937	0.0624	0.0395	0.2341
N_{expected} - Proposed Conditions Site CMFs	0.2053	0.4977	0.3314	1.4855	2.5199
N_{expected} - Proposed Conditions All CMFs	0.0267	0.0647	0.0431	0.4308	0.5653

Appendix J

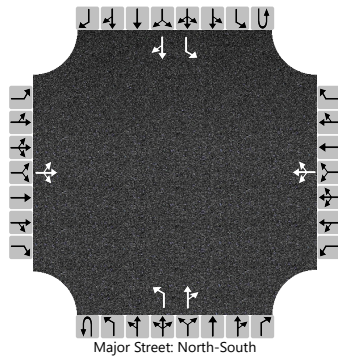
Proposed Conditions Capacity Analysis



HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	LRY	Intersection	SR-64 & SR-582
Agency/Co.	CMTran	Jurisdiction	Haskins
Date Performed		East/West Street	SR-582
Analysis Year	2022	North/South Street	SR-64
Time Analyzed	AM Peak - Add Turn Lanes	Peak Hour Factor	0.86
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	WOO-582-2.61 Safety Study		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	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	1	1	0	0	1	1	0	
Configuration			LTR				LTR			L		TR		L		TR	
Volume (veh/h)		21	67	4		4	22	30		0	172	24		94	202	13	
Percent Heavy Vehicles (%)		7	7	7		9	9	9		3				2			
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)		7.17	6.57	6.27		7.19	6.59	6.29		4.13				4.12		
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)		3.56	4.06	3.36		3.58	4.08	3.38		2.23				2.22		

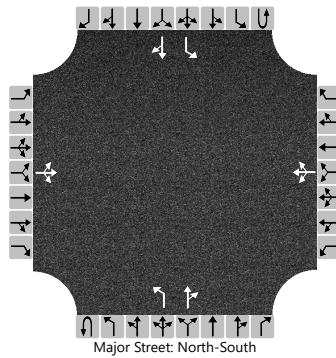
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			107				65			0				109			
Capacity, c (veh/h)			332				469			1310				1340			
v/c Ratio			0.32				0.14			0.00				0.08			
95% Queue Length, Q ₉₅ (veh)			1.4				0.5			0.0				0.3			
Control Delay (s/veh)			20.9				13.9			7.7				7.9			
Level of Service (LOS)			C				B			A				A			
Approach Delay (s/veh)		20.9				13.9				0.0				2.4			
Approach LOS		C				B				A				A			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	LRY	Intersection	SR-64 & SR-582
Agency/Co.	CMTran	Jurisdiction	Haskins
Date Performed		East/West Street	SR-582
Analysis Year	2022	North/South Street	SR-64
Time Analyzed	PM Peak - Add Turn Lanes	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	WOO-582-2.61 Safety Study		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		11	38	4		12	69	82		5	231	19		13	195	30
Percent Heavy Vehicles (%)		6	6	6		2	2	2		0				2		
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)		7.16	6.56	6.26		7.12	6.52	6.22		4.10				4.12		
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)		3.55	4.05	3.35		3.52	4.02	3.32		2.20				2.22		

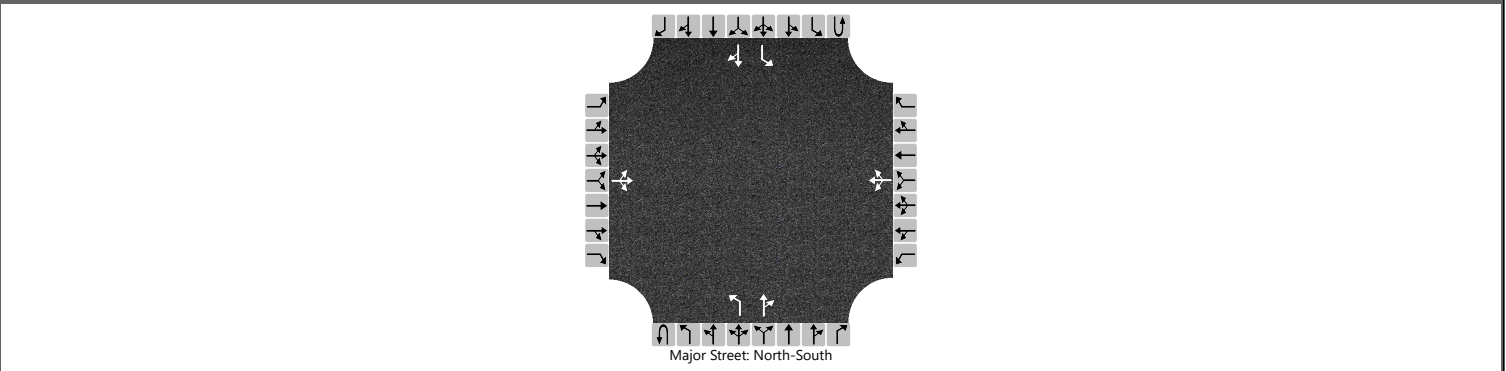
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			58				177			5				14			
Capacity, c (veh/h)			418				558			1333				1292			
v/c Ratio			0.14				0.32			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.5				1.4			0.0				0.0			
Control Delay (s/veh)			15.0				14.4			7.7				7.8			
Level of Service (LOS)			B				B			A				A			
Approach Delay (s/veh)		15.0				14.4				0.2				0.4			
Approach LOS		B				B				A				A			

HCS Two-Way Stop-Control Report

General Information				Site Information			
Analyst	LRY			Intersection	SR-64 & SR-582		
Agency/Co.	CMTran			Jurisdiction	Haskins		
Date Performed				East/West Street	SR-582		
Analysis Year	2044			North/South Street	SR-64		
Time Analyzed	AM Peak - Add Turn Lanes			Peak Hour Factor	0.86		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	WOO-582-2.61 Safety Study						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound				
	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	1	1	0	0	1	1	0	
Configuration			LTR				LTR			L		TR		L		TR	
Volume (veh/h)		21	68	4		4	22	31		0	175	24		96	206	13	
Percent Heavy Vehicles (%)		7	7	7		9	9	9		3				2			
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)		7.17	6.57	6.27		7.19	6.59	6.29		4.13				4.12		
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)		3.56	4.06	3.36		3.58	4.08	3.38		2.23				2.22		

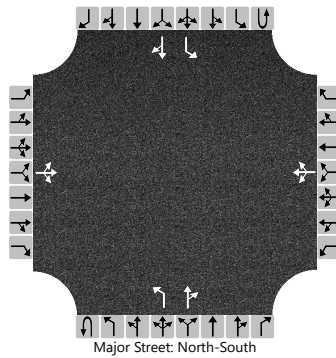
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			108				66			0				112			
Capacity, c (veh/h)			325				464			1305				1336			
v/c Ratio			0.33				0.14			0.00				0.08			
95% Queue Length, Q ₉₅ (veh)			1.4				0.5			0.0				0.3			
Control Delay (s/veh)			21.5				14.0			7.8				7.9			
Level of Service (LOS)			C				B			A				A			
Approach Delay (s/veh)		21.5				14.0				0.0				2.4			
Approach LOS		C				B				A				A			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	LRY	Intersection	SR-64 & SR-582
Agency/Co.	CMTran	Jurisdiction	Haskins
Date Performed		East/West Street	SR-582
Analysis Year	2044	North/South Street	SR-64
Time Analyzed	PM Peak - Add Turn Lanes	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	WOO-582-2.61 Safety Study		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	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	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume (veh/h)		11	39	4		12	70	83		5	235	19		13	198	31
Percent Heavy Vehicles (%)		6	6	6		2	2	2		0				2		
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)		7.16	6.56	6.26		7.12	6.52	6.22		4.10				4.12		
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)		3.55	4.05	3.35		3.52	4.02	3.32		2.20				2.22		

Delay, Queue Length, and Level of Service

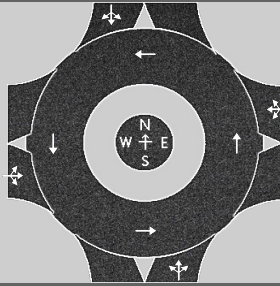
Flow Rate, v (veh/h)			59				179			5				14			
Capacity, c (veh/h)			413				552			1329				1287			
v/c Ratio			0.14				0.32			0.00				0.01			
95% Queue Length, Q ₉₅ (veh)			0.5				1.4			0.0				0.0			
Control Delay (s/veh)			15.2				14.6			7.7				7.8			
Level of Service (LOS)			C				B			A				A			
Approach Delay (s/veh)		15.2				14.6				0.1				0.4			
Approach LOS		C				B				A				A			

HCS Roundabouts Report

General Information

Site Information

Analyst	LRV
Agency or Co.	CMTran
Date Performed	
Analysis Year	2022
Time Analyzed	AM Peak
Project Description	WOO-582-2.61



Intersection	SR-64 & SR-582
E/W Street Name	SR-582
N/S Street Name	SR-64
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.86
Jurisdiction	Haskins

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	21	67	4	0	4	22	30	0	0	172	24	0	94	202	13
Percent Heavy Vehicles, %	7	7	7	7	9	9	9	9	3	3	3	3	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	26	83	5	0	5	28	38	0	0	206	29	0	111	240	15
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		
	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		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h		114			71			235			366	
Entry Volume, veh/h		107			65			228			359	
Circulating Flow (v _c), pc/h	356			232			220			33		
Exiting Flow (v _{ex}), pc/h	223			43			270			250		
Capacity (c _{pce}), pc/h		960			1089			1103			1334	
Capacity (c), veh/h		897			999			1071			1308	
v/c Ratio (x)		0.12			0.07			0.21			0.27	

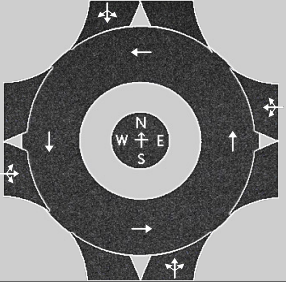
Delay and Level of Service

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.1			4.2			5.3			5.2	
Lane LOS		A			A			A			A	
95% Queue, veh		0.4			0.2			0.8			1.1	
Approach Delay, s/veh	5.1			4.2			5.3			5.2		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.1						A					

HCS Roundabouts Report

General Information

Site Information

Analyst	LRY		Intersection	SR-64 & SR-582
Agency or Co.	CMTran		E/W Street Name	SR-582
Date Performed			N/S Street Name	SR-64
Analysis Year	2022		Analysis Time Period, hrs	0.25
Time Analyzed	PM Peak		Peak Hour Factor	0.92
Project Description	WOO-582-2.61		Jurisdiction	Haskins

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	11	38	4	0	12	69	82	0	5	231	19	0	13	195	30
Percent Heavy Vehicles, %	6	6	6	6	2	2	2	2	0	0	0	0	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	13	44	5	0	13	76	91	0	5	251	21	0	14	216	33
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		
	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		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h		62			180			277			263	
Entry Volume, veh/h		58			176			277			258	
Circulating Flow (v _c), pc/h	243			269			71			94		
Exiting Flow (v _{ex}), pc/h	79			114			355			234		
Capacity (c _{PCE}), pc/h		1077			1049			1284			1254	
Capacity (c), veh/h		1016			1028			1284			1229	
v/c Ratio (x)		0.06			0.17			0.22			0.21	

Delay and Level of Service

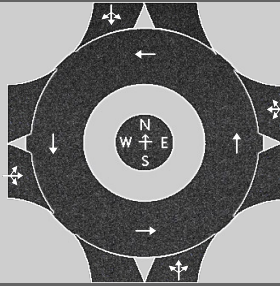
Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.0			5.1			4.7			4.8	
Lane LOS		A			A			A			A	
95% Queue, veh		0.2			0.6			0.8			0.8	
Approach Delay, s/veh	4.0			5.1			4.7			4.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.7						A					

HCS Roundabouts Report

General Information

Site Information

Analyst	LRV
Agency or Co.	CMTran
Date Performed	
Analysis Year	2044
Time Analyzed	AM Peak
Project Description	WOO-582-2.61



Intersection	SR-64 & SR-582
E/W Street Name	SR-582
N/S Street Name	SR-64
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.86
Jurisdiction	Haskins

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	21	68	4	0	4	22	31	0	0	175	24	0	96	206	13
Percent Heavy Vehicles, %	7	7	7	7	9	9	9	9	3	3	3	3	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	26	85	5	0	5	28	39	0	0	210	29	0	114	244	15
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		
	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		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h		116			72			239			373	
Entry Volume, veh/h		108			66			232			366	
Circulating Flow (v _c), pc/h	363			236			225			33		
Exiting Flow (v _{ex}), pc/h	228			43			275			254		
Capacity (c _{pce}), pc/h		953			1085			1097			1334	
Capacity (c), veh/h		891			995			1065			1308	
v/c Ratio (x)		0.12			0.07			0.22			0.28	

Delay and Level of Service

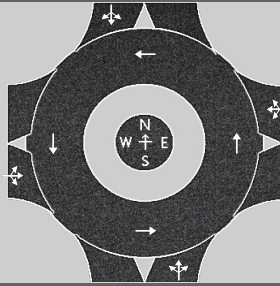
Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.2			4.2			5.4			5.2	
Lane LOS		A			A			A			A	
95% Queue, veh		0.4			0.2			0.8			1.2	
Approach Delay, s/veh	5.2			4.2			5.4			5.2		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	5.2						A					

HCS Roundabouts Report

General Information

Site Information

Analyst	LRV
Agency or Co.	CMTran
Date Performed	
Analysis Year	2044
Time Analyzed	PM Peak
Project Description	WOO-582-2.61



Intersection	SR-64 & SR-582
E/W Street Name	SR-582
N/S Street Name	SR-64
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.92
Jurisdiction	Haskins

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
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	11	39	4	0	12	70	83	0	5	235	19	0	13	198	31
Percent Heavy Vehicles, %	6	6	6	6	2	2	2	2	0	0	0	0	2	2	2	2
Flow Rate (v _{PCE}), pc/h	0	13	45	5	0	13	78	92	0	5	255	21	0	14	220	34
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		
	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		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v _e), pc/h		63			183			281			268	
Entry Volume, veh/h		59			179			281			263	
Circulating Flow (v _c), pc/h	247			273			72			96		
Exiting Flow (v _{ex}), pc/h	80			117			360			238		
Capacity (c _{PCE}), pc/h		1073			1045			1282			1251	
Capacity (c), veh/h		1012			1024			1282			1227	
v/c Ratio (x)		0.06			0.18			0.22			0.21	

Delay and Level of Service

Approach	EB			WB			NB			SB		
	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.1			5.1			4.7			4.8	
Lane LOS		A			A			A			A	
95% Queue, veh		0.2			0.6			0.8			0.8	
Approach Delay, s/veh	4.1			5.1			4.7			4.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh LOS	4.8 A											

Appendix K

Cost Estimates



Roadway Improvements - Left Turn Lanes

Item	Description	Quantity	Units	Unit Cost	Total Cost
202	Pavement Removed	425	SY	\$ 25.00	\$ 10,625.00
202	Guardrail Removed	200	FT	\$ 5.00	\$ 1,000.00
203	Earthwork	1	LUMP	\$ 100,000.00	\$ 100,000.00
448	Asphalt Overlay	4280	SY	\$ 20.00	\$ 85,600.00
448	Full Depth Pavement (Asphalt)	2500	SY	\$ 100.00	\$ 250,000.00
606	Guardrail , Type MGS	200	FT	\$ 35.00	\$ 7,000.00
608	4" Concrete Walk	1940	SF	\$ 25.00	\$ 48,500.00
609	Concrete Traffic Island	55	SY	\$ 125.00	\$ 6,875.00
611	Drainage	1	LUMP	\$ 30,000.00	\$ 30,000.00
630	Rectangular Rapid Flashing Beacon	4	EACH	\$ 10,000.00	\$ 40,000.00
630	Signage	1	LUMP	\$ 10,000.00	\$ 10,000.00
644	Yield Line	40	FT	\$ 25.00	\$ 1,000.00
644	Crosswalk Line	130	FT	\$ 20.00	\$ 2,600.00
644	Transverse Line	359	FT	\$ 8.00	\$ 2,870.00
644	Center Line	0.51	MILE	\$ 10,000.00	\$ 5,100.00
644	Lane Arrows	6	EACH	\$ 200.00	\$ 1,200.00
644	Edge Line	0.62	MILE	\$ 6,000.00	\$ 3,720.00
659	Seeding and Mulching	1	LUMP	\$ 25,000.00	\$ 25,000.00
832	Erosion Control	1	LUMP	\$ 35,000.00	\$ 35,000.00

Itemized Subtotal	\$ 666,090.00
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Incidentals					
614	Maintenance of Traffic	1	LUMP	\$ 50,000.00	\$ 50,000.00
623	Construction Layout Stakes	1	LUMP	\$ 5,000.00	\$ 5,000.00
624	Mobilization	1	LUMP	\$ 40,000.00	\$ 40,000.00

Incidentals Subtotal	\$ 95,000.00
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Contingency (30%) \$ 228,400.00

Construction Subtotal	\$ 989,490.00
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Engineering Design (15%) \$ 148,500.00
Environmental, Geotechnical, Miscellaneous Federal Requirements (10%) \$ 99,000.00
Right-of-Way* (Includes 30% Contingency) \$ 290,000.00

Subtotal	\$ 1,527,000.00
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Inflation (11.7%) \$ 178,700.00**

Total	\$ 1,705,700.00
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Note: Cost estimate does not include utility relocation costs.
 *Assumes the Villiage of Haskins will donate right-of-way at the park for RRFB updates.
 **Inflation based on 2025 Construction

Acquisition	Parcel	Unit (Acreage)	Cost/Unit (\$/Acre)	Subtotal Land Value	Structure Value (If Taken)	Damages (Loss in Value to the Residue)	Subtotal Structures & Damages	Total Non-Labor Acquisition Costs	Parcel Count	Total Takes	Partial Takes	No. of Structures Impacted	
Residential	610220312002000	0.050	\$258,108	\$12,905	\$0	\$0	\$0	\$12,905	3	0	3	0	
	610220312003000	0.080	\$242,453	\$19,396	\$0	\$0	\$0	\$19,396					
	61027000009001	0.150	\$144,800	\$21,720	\$0	\$0	\$0	\$21,720					
Commercial	610220312006000	0.200	\$97,273	\$19,455	\$0	\$0	\$0	\$19,455	1	0	1	0	
Industrial		0.000	\$0	\$0	\$0	\$0	\$0	\$0	0	0	0	0	
Agricultural	610220312004000	0.900	\$7,019	\$6,317	\$0	\$0	\$0	\$6,317	3	0	3	0	
	610220309022000	0.700	\$6,539	\$4,577	\$0	\$0	\$0	\$4,577					
	61027000009000	1.000	\$7,919	\$7,919	\$0	\$0	\$0	\$7,919					
Relocation	Unit (Displacement)		RHP/RSP		Move Cost	Re-establishment		Total Non-Labor RAP Costs	Estimate amount of time necessary to relocate all RAP				
Residential									Estimated number of years until project wide R/W acquisition begins =3				
Owner Occupant	0		\$34,000		\$6,000			\$0					
Tenant	0		\$10,000		\$1750			\$0					
Commercial/Farm/NPO													
Owner	0				\$15,000	\$10,000		\$0					
Tenant	0				\$15,000	\$10,000		\$0					
Personal Property	0				\$1,000			\$0					
$(((\text{total of acquisition cost}) \times 0.09) \times 0.025) + (((\text{total of acquisition cost}) \times 0.15) \times 1.20) + (((\text{total of acquisition cost}) \times 0.10) \times 1.50) =$							Contingency <small>(Incidentals, Admin. Review, & Appropriator)</small>	\$30,663	RHP - Replacement Housing Payment RSP - Rent Supplemental Payment NPO - Non-Profit Organization				
							Total Non-Labor R/W Costs	\$122,952					
Labor (External)	Unit (Parcels)		Unit Price	Total Cost									
Titles	7		\$1,000	\$7,000									
Appraisals													
Simple	0		\$750	\$0									
Detailed	7		\$4,500	\$31,500									
Appraisal Review													
Simple	0		\$500	\$0									
Detailed	7		\$2,000	\$14,000									
Negotiations	7		\$1,800	\$12,600									
Relocations													
Personal Property	0		\$2,000	\$0									
Residential	0		\$8,000	\$0									
Commercial/Farm/NPO	0		\$6,000	\$0									
Closings	7		\$500	\$3,500									
Package Billing & Review	7		\$500	\$3,500									
Project Management	7		\$4,000	\$28,000									
Asbestos Testing & Abatement	0		\$5,000	\$0									
Total Labor Costs				\$100,100									
								Total Labor Costs					\$100,100
								Total Non-Labor R/W Costs					\$122,952
								Contingency					30%
								TOTAL R/W COSTS					\$290,000

This R/W Cost Estimate Prepared by	Date
Carpenter Marty Transportation	1/26/2022

Total Labor Costs	\$100,100
Total Non-Labor R/W Costs	\$122,952
Contingency	30%
TOTAL R/W COSTS	\$290,000

Roadway Improvements - Single Lane Roundabout - West Leg Update

Item	Description	Quantity	Units	Unit Cost	Total Cost
202	Pavement Removed	2475	SY	\$ 25.00	\$ 61,875.00
202	Guardrail Removed	615	FT	\$ 5.00	\$ 3,075.00
203	Earthwork	1	LUMP	\$ 75,000.00	\$ 75,000.00
448	Asphalt Overlay	750	SY	\$ 20.00	\$ 15,000.00
448	Full Depth Pavement (Asphalt)	2975	SY	\$ 100.00	\$ 297,500.00
452	Full Depth Pavement (Concrete)	290	SY	\$ 115.00	\$ 33,350.00
606	Guardrail , Type MGS	650	FT	\$ 35.00	\$ 22,750.00
608	4" Concrete Walk	1940	SF	\$ 25.00	\$ 48,500.00
609	Concrete Curb	1200	FT	\$ 35.00	\$ 42,000.00
609	Concrete Traffic Island	355	SY	\$ 125.00	\$ 44,375.00
611	Drainage	1	LUMP	\$ 175,000.00	\$ 175,000.00
625	Lighting	1	LUMP	\$ 96,000.00	\$ 96,000.00
630	Rectangular Rapid Flashing Beacon	4	EACH	\$ 10,000.00	\$ 40,000.00
630	Signage	1	LUMP	\$ 15,000.00	\$ 15,000.00
644	Yield Line	105	FT	\$ 25.00	\$ 2,630.00
644	Crosswalk Line	130	FT	\$ 20.00	\$ 2,600.00
644	Transverse Line	60	FT	\$ 8.00	\$ 480.00
644	Edge Line	0.60	MILE	\$ 6,000.00	\$ 3,600.00
659	Seeding and Mulching	1	LUMP	\$ 50,000.00	\$ 50,000.00
832	Erosion Control	1	LUMP	\$ 50,000.00	\$ 50,000.00

Itemized Subtotal	\$ 1,078,740.00
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Incidentals					
614	Maintenance of Traffic	1	LUMP	\$ 150,000.00	\$ 150,000.00
619	Field Office	1	LUMP	\$ 10,000.00	\$ 10,000.00
623	Construction Layout Stakes	1	LUMP	\$ 15,000.00	\$ 15,000.00
624	Mobilization	1	LUMP	\$ 100,000.00	\$ 100,000.00

Incidentals Subtotal	\$ 275,000.00
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Contingency (30%) \$ 406,200.00

Construction Subtotal	\$ 1,759,940.00
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Engineering Design (15%) \$ 264,000.00
Environmental, Geotechnical, Miscellaneous Federal Requirements (10%) \$ 176,000.00
Right-of-Way* (Includes 30% Contingency) \$ 367,400.00

Subtotal	\$ 2,567,400.00
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Inflation (11.7%) \$ 300,400.00**

Total	\$ 2,867,800.00
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Note: Cost estimate does not include utility relocation costs.

*Assumes the Villiage of Haskins will donate right-of-way at the park for RRFB updates.

**Inflation based on 2025 Construction

Acquisition	Parcel	Unit (Acreage)	Cost/Unit (\$/Acre)	Subtotal Land Value	Structure Value (If Taken)	Damages (Loss in Value to the Residue)	Subtotal Structures & Damages	Total Non-Labor Acquisition Costs	Parcel Count	Total Takes	Partial Takes	No. of Structures Impacted
Residential	610220312002000	0.050	\$258,108	\$12,905	\$0	\$0	\$0	\$12,905	2	0	2	0
	610220312003000	0.080	\$242,453	\$19,396	\$0	\$0	\$0	\$19,396				
Commercial	610220312006000	0.360	\$97,273	\$35,018	\$0	\$50,000	\$50,000	\$85,018	1	0	1	0
Industrial		0.000	\$0	\$0	\$0	\$0	\$0	\$0	0	0	0	0
	610220312004000	0.900	\$7,019	\$6,317	\$0	\$0	\$0	\$6,317				
Agricultural	610220309022000	0.470	\$6,539	\$3,073	\$0	\$0	\$0	\$3,073	4	0	4	0
	610270000009000	0.550	\$7,919	\$4,355	\$0	\$0	\$0	\$4,355				
	610270000021503	0.500	\$6,826	\$3,413	\$0	\$0	\$0	\$3,413				
Relocation	Unit (Displacement)	RHP/RSP	Move Cost	Re-establishment	Total Non-Labor RAP Costs	Estimate amount of time necessary to relocate all RAP						
Residential						Estimated number of years until project wide R/W acquisition begins =3						
Owner Occupant	0	\$34,000	\$6,000		\$0							
Tenant	0	\$10,000	\$1750		\$0							
Commercial/Farm/NPO												
Owner	0		\$15,000	\$10,000	\$0							
Tenant	0		\$15,000	\$10,000	\$0							
Personal Property	1		\$1,000		\$1,000							
$[[[(\text{total of acquisition cost}) \times 0.09] \times 0.025] + [[[(\text{total of acquisition cost}) \times 0.15] \times 1.20] + [[[(\text{total of acquisition cost}) \times 0.10] \times 1.50]] =$							Contingency <small>(Incidentals, Admin, Review, & Appropriation)</small>	\$45,012	RHP - Replacement Housing Payment			
							Total Non-Labor R/W Costs	\$180,489	RSP - Rent Supplemental Payment			
									NPO - Non-Profit Organization			
Labor (External)	Unit (Parcels)	Unit Price	Total Cost									
Titles	7	\$1,000	\$7,000									
Appraisals												
Simple	0	\$750	\$0									
Detailed	7	\$4,500	\$31,500									
Appraisal Review												
Simple	0	\$500	\$0									
Detailed	7	\$2,000	\$14,000									
Negotiations	7	\$1,800	\$12,600									
Relocations												
Personal Property	1	\$2,000	\$2,000									
Residential	0	\$8,000	\$0									
Commercial/Farm/NPO	0	\$6,000	\$0									
Closings	7	\$500	\$3,500									
Package Billing & Review	7	\$500	\$3,500									
Project Management	7	\$4,000	\$28,000									
Asbestos Testing & Abatement	0	\$5,000	\$0									
Total Labor Costs			\$102,100									
				Total Labor Costs	\$102,100							
				Total Non-Labor R/W Costs	\$180,489							
				Contingency	30%							
				TOTAL R/W COSTS	\$367,400							

This R/W Cost Estimate Prepared by	Date
Carpenter Marty Transportation	1/26/2022

Roadway Improvements -Peanut Roundabout - West Leg Update

Item	Description	Quantity	Units	Unit Cost	Total Cost
202	Pavement Removed	2875	SY	\$ 25.00	\$ 71,875.00
202	Guardrail Removed	725	FT	\$ 5.00	\$ 3,625.00
203	Earthwork	1	LUMP	\$ 100,000.00	\$ 100,000.00
448	Asphalt Overlay	750	SY	\$ 20.00	\$ 15,000.00
448	Full Depth Pavement (Asphalt)	3425	SY	\$ 100.00	\$ 342,500.00
452	Full Depth Pavement (Concrete)	535	SY	\$ 115.00	\$ 61,525.00
606	Guardrail , Type MGS	875	FT	\$ 35.00	\$ 30,625.00
608	4" Concrete Walk	1940	SF	\$ 25.00	\$ 48,500.00
609	Concrete Curb	1650	FT	\$ 35.00	\$ 57,750.00
609	Concrete Traffic Island	335	SY	\$ 125.00	\$ 41,875.00
611	Drainage	1	LUMP	\$ 200,000.00	\$ 200,000.00
625	Lighting	1	LUMP	\$ 120,000.00	\$ 120,000.00
630	Rectangular Rapid Flashing Beacon	4	EACH	\$ 10,000.00	\$ 40,000.00
630	Signage	1	LUMP	\$ 15,000.00	\$ 15,000.00
644	Yield Line	100	FT	\$ 25.00	\$ 2,500.00
644	Crosswalk Line	130	FT	\$ 20.00	\$ 2,600.00
644	Transverse Line	60	FT	\$ 8.00	\$ 480.00
644	Edge Line	0.68	MILE	\$ 6,000.00	\$ 4,100.00
659	Seeding and Mulching	1	LUMP	\$ 50,000.00	\$ 50,000.00
832	Erosion Control	1	LUMP	\$ 50,000.00	\$ 50,000.00

Itemized Subtotal	\$ 1,257,960.00
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Incidentals					
614	Maintenance of Traffic	1	LUMP	\$ 150,000.00	\$ 150,000.00
619	Field Office	1	LUMP	\$ 10,000.00	\$ 10,000.00
623	Construction Layout Stakes	1	LUMP	\$ 20,000.00	\$ 20,000.00
624	Mobilization	1	LUMP	\$ 100,000.00	\$ 100,000.00

Incidentals Subtotal	\$ 280,000.00
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Contingency (30%) \$ 461,400.00

Construction Subtotal	\$ 1,999,360.00
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Engineering Design (15%) \$ 300,000.00
Environmental, Geotechnical, Miscellaneous Federal Requirements (10%) \$ 200,000.00
Right-of-Way* (Includes 30% Contingency) \$ 272,700.00

Subtotal	\$ 2,772,100.00
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Inflation (11.7%) \$ 324,400.00**

Total	\$ 3,096,500.00
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Note: Cost estimate does not include utility relocation costs.

*Assumes the Villiage of Haskins will donate right-of-way at the park for RRFB updates.

**Inflation based on 2025 Construction

Acquisition	Parcel	Unit (Acreage)	Cost/Unit (\$/Acre)	Subtotal Land Value	Structure Value (If Taken)	Damages (Loss in Value to the Residue)	Subtotal Structures & Damages	Total Non-Labor Acquisition Costs	Parcel Count	Total Takes	Partial Takes	No. of Structures Impacted
Residential	610220312002000	0.050	\$258,108	\$12,905	\$0	\$0	\$0	\$12,905	2	0	2	0
	610220312003000	0.080	\$242,453	\$19,396	\$0	\$0	\$0	\$19,396				
Commercial	610220312006000	0.310	\$97,273	\$30,155	\$0	\$0	\$0	\$30,155	1	0	1	0
Industrial		0.000	\$0	\$0	\$0	\$0	\$0	\$0	0	0	0	0
Agricultural	610220312004000	0.900	\$7,019	\$6,317	\$0	\$0	\$0	\$6,317	4	0	4	0
	610220309022000	0.400	\$6,539	\$2,616	\$0	\$0	\$0	\$2,616				
	610270000009000	0.950	\$7,919	\$7,523	\$0	\$0	\$0	\$7,523				
	610270000021503	0.500	\$6,826	\$3,413	\$0	\$0	\$0	\$3,413				
Relocation	Unit (Displacement)	RHP/RSP	Move Cost	Re-establishment	Total Non-Labor RAP Costs	Estimate amount of time necessary to relocate all RAP						
Residential						Estimated number of years until project wide R/W acquisition begins =3						
Owner Occupant	0	\$34,000	\$6,000		\$0							
Tenant	0	\$10,000	\$1750		\$0							
Commercial/Farm/NPO												
Owner	0		\$15,000	\$10,000	\$0							
Tenant	0		\$15,000	\$10,000	\$0							
Personal Property	0		\$1,000		\$0							
[[[(total of acquisition cost) x 0.09]x0.025] + [[[(total of acquisition cost) x 0.15] x 1.20] + [[[(total of acquisition cost) x 0.10] x 1.50] =					Contingency <small>(Incidentals, Admin, Review, & Appropriation)</small>	\$27,352	RHP - Replacement Housing Payment					
					Total Non-Labor R/W Costs	\$109,677	RSP - Rent Supplemental Payment					
							NPO - Non-Profit Organization					
Labor (External)	Unit (Parcels)	Unit Price	Total Cost									
Titles	7	\$1,000	\$7,000									
Appraisals												
Simple	0	\$750	\$0									
Detailed	7	\$4,500	\$31,500									
Appraisal Review												
Simple	0	\$500	\$0									
Detailed	7	\$2,000	\$14,000									
Negotiations	7	\$1,800	\$12,600									
Relocations												
Personal Property	0	\$2,000	\$0									
Residential	0	\$8,000	\$0									
Commercial/Farm/NPO	0	\$6,000	\$0									
Closings	7	\$500	\$3,500									
Package Billing & Review	7	\$500	\$3,500									
Project Management	7	\$4,000	\$28,000									
Asbestos Testing & Abatement	0	\$5,000	\$0									
Total Labor Costs			\$100,100									
				Total Labor Costs	\$100,100							
				Total Non-Labor R/W Costs	\$109,677							
				Contingency	30%							
				TOTAL R/W COSTS	\$272,700							

This R/W Cost Estimate Prepared by	Date
Carpenter Marty Transportation	1/26/2022

Total Labor Costs	\$100,100
Total Non-Labor R/W Costs	\$109,677
Contingency	30%
TOTAL R/W COSTS	\$272,700

Appendix L

Benefit-Cost Analysis



Project Cost Estimate

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Engineering Design %	15%
Contingency %	30%

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
Install left turn lanes, intersection lighting, sidewalk connection, and RRFBs	\$763,125.00	\$290,000.00	\$157,968.75	\$315,937.50	\$1,527,031.25		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
Totals	\$763,125.00	\$290,000.00	\$157,968.75	\$315,937.50	\$1,527,031.25	\$0.00	\$0.00

Inflation %	12%
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Final Construction Cost:	\$1,705,693.91
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*Final construction cost should match the Project Cost Estimate



Safety Benefit - Cost Analysis

General Information

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Select Site Types to be used in Benefit-Cost Analysis: All Sites	Comments:
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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
Install left turn lanes, intersection lighting, sidewalk connection, and RRFBs	20	\$1,527,031.25			\$1,527,031.25	\$1,527,031.25	-1.211	\$851,020
		\$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
Totals		\$1,527,031.25	\$0.00	\$0.00	\$1,527,031.25	\$1,527,031.25	-1.211	\$851,020

Benefit - Cost Calculator	
Net Present Value of Project	\$1,527,031.25
Net Present Value of Safety Benefits	\$851,020.25
Net Benefit	(\$676,011.00)
Benefit / Cost Ratio	0.56

Expected Annual Crash Adjustment	
Number of Fatal & Incapacitating Injury Crashes	-0.099
Number of Injury Crashes	-0.497
Number of Total Crashes	-1.211

Comments:

Project Cost Estimate

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Engineering Design %	15%
Contingency %	30%

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
CMF 1 - Convert intersection with minor-road stop control to modern roundabout (Rural)	\$1,403,230.00	\$367,400.00	\$265,594.50	\$531,189.00	\$2,567,413.50		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
Totals	\$1,403,230.00	\$367,400.00	\$265,594.50	\$531,189.00	\$2,567,413.50	\$0.00	\$0.00

Inflation %	12%
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Final Construction Cost:	\$2,867,800.88
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*Final construction cost should match the Project Cost Estimate



Safety Benefit - Cost Analysis

General Information

Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Select Site Types to be used in Benefit-Cost Analysis: All Sites	Comments:
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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
		\$0.00			\$0.00	\$0.00	-0.001	\$792
		\$0.00			\$0.00	\$0.00		
		\$0.00			\$0.00	\$0.00		
		\$0.00			\$0.00	\$0.00		
CMF 1 - Convert intersection with minor-road stop control to modern roundabout (Rural)	20	\$2,567,413.50			\$2,567,413.50	\$2,567,413.50	-1.955	\$1,541,388
		\$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		\$2,567,413.50	\$0.00	\$0.00	\$2,567,413.50	\$2,567,413.50	-1.956	\$1,542,180

Benefit - Cost Calculator	
Net Present Value of Project	\$2,567,413.50
Net Present Value of Safety Benefits	\$1,542,179.60
Net Benefit	(\$1,025,233.90)
Benefit / Cost Ratio	0.60

Expected Annual Crash Adjustment	
Number of Fatal & Incapacitating Injury Crashes	-0.179
Number of Injury Crashes	-0.900
Number of Total Crashes	-1.956

Comments:

Project Cost Estimate			
Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

Engineering Design %	15%
Contingency %	30%

Countermeasures	Construction Costs	Right of Way Costs	Engineering Design Costs	Contingency Amount	Total Cost of Countermeasure	Annual Maintenance & Energy Costs	Salvage Value
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
CMF 1 - Convert intersection with minor-road stop control to modern roundabout (Rural)	\$1,639,133.00	\$272,700.00	\$286,774.95	\$573,549.90	\$2,772,157.85		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
			\$0.00	\$0.00	\$0.00		
Totals	\$1,639,133.00	\$272,700.00	\$286,774.95	\$573,549.90	\$2,772,157.85	\$0.00	\$0.00

Inflation %	12%
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Final Construction Cost:	\$3,096,500.32
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*Final construction cost should match the Project Cost Estimate

Safety Benefit - Cost Analysis			
General Information			
Project Name	WOO-582-2.61	Contact Email	gbalsamo@cmtran.com
Project Description	Safety Study	Contact Phone	614-656-2429
Reference Number	117091	Date Performed	8/11/2022
Analyst	Gina Balsamo	Analysis Year	2021
Agency/Company	Carpenter Marty Transportation		

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
		\$0.00			\$0.00	\$0.00	-0.001	\$792
		\$0.00			\$0.00	\$0.00		
		\$0.00			\$0.00	\$0.00		
		\$0.00			\$0.00	\$0.00		
CMF 1 - Convert intersection with minor-road stop control to modern roundabout (Rural)	20	\$2,772,157.85			\$2,772,157.85	\$2,772,157.85	-1.955	\$1,541,388
		\$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
		\$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		\$2,772,157.85	\$0.00	\$0.00	\$2,772,157.85	\$2,772,157.85	-1.956	\$1,542,180

Benefit - Cost Calculator	
Net Present Value of Project	\$2,772,157.85
Net Present Value of Safety Benefits	\$1,542,179.60
Net Benefit	(\$1,229,978.25)
Benefit / Cost Ratio	0.56

Expected Annual Crash Adjustment	
Number of Fatal & Incapacitating Injury Crashes	-0.179
Number of Injury Crashes	-0.900
Number of Total Crashes	-1.956

Comments: