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LINCOLN WAY WEST ROAD, 32ND STREET TO 17TH STREET

Corridor Road Diet Study

City of Massillon

Ohio

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1. INTRODUCTION

The City of Massillon Ohio is considering modifications to the existing lane configuration on Lincoln Way West Road. The City would like to consider reducing Lincoln Way W Road from a four-lane to a three-lane road between 32nd Street and 17th Street. This Road Diet Study will analyze alternative cross sections along Lincoln Way Road and review the operations of the signalized intersections at 17th Street, 23rd Street, 27th Street, and 32nd Street along the Lincoln Way West Road corridor.

Lincoln Way West is classified as a principal arterial. It is primarily a four-lane roadway within the study area between 32nd Street and 17th Street. East of the study area, the roadway transitions to a 3-lane section with a two-way center left turn lane between 17th Street and 8th Street. Lincoln Way West has a posted speed limit of 35 mph.

The westbound approach to the signalized intersection of **Lincoln Way W and 17th St NW** (Figure 1) provides an exclusive left turn lane, thru lane, and shared thru/right turn lane. East of this intersection the roadway transitions to a 3-lane roadway. The eastbound approach provides an exclusive left turn and shared thru/right turn lane. The northbound approach provides an exclusive left turn lane and shared thru/right turn lane. The southbound approach utilizes an exclusive left turn lane and a shared thru/right turn lane. Both Lincoln Way and 17th St have a posted speed limit of 35 mph.

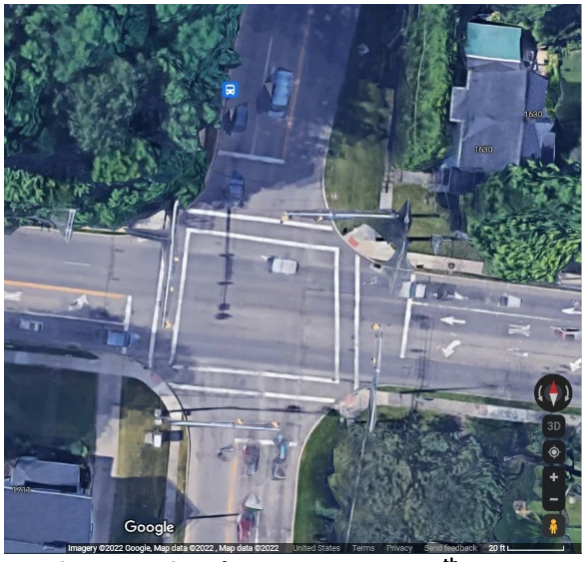

Figure 1: Lincoln Way West at 17th Street

The westbound approach at the signalized intersection of **Lincoln Way W and 23rd St NW,** as shown in Figure 2, provides an exclusive left turn lane and a shared thru/right turn lane. East of this intersection, a second westbound thru lane ends at the intersection of Grosvenor Ave as a right turn only lane. The eastbound approach provides an exclusive left turn and a shared thru/right turn lane. The northbound movement provides an exclusive left turn lane and a shared thru/right turn lane. The southbound approach also utilizes an exclusive left turn lane and a shared thru/right turn lane. While Lincoln Way W has a posted speed limit of 35 mph, 23rd St has a posted speed limit of 25 mph.

Figure 2: Lincoln Way West at 23rd Street

The westbound approach at the signalized intersection of **Lincoln Way W and 27th St NW** provides a shared thru/left turn lane and a shared thru/right turn lane. The eastbound approach provides a shared thru/left turn lane and a shared thru/right turn lane. The northbound movement provides a single approach lane. Similarly, the southbound approach utilizes a single approach lane. Lincoln Way W has a posted speed limit of 35 mph and 27th St has a posted speed limit of 25 mph. This is shown in Figure 3 below.

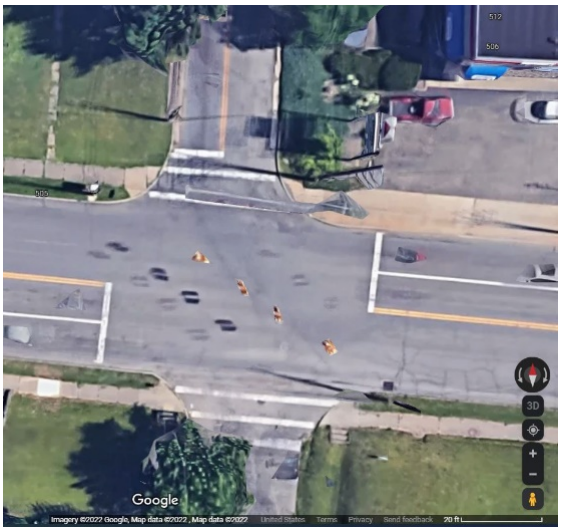

Figure 3: Lincoln Way West at 27th Street

The westbound approach at the unsignalized intersection of **Lincoln Way W and 29th St NW** provides a shared thru/left turn lane and a shared thru/right turn lane. The eastbound approach provides a shared thru/left turn lane and a shared thru/right turn lane. The northbound movement consists of a single approach lane. Similarly, the southbound approach utilizes a single approach lane. Lincoln Way W has a posted speed limit of 35 mph and 29th St has a posted speed limit of 25 mph. The lane configuration of this unsignalized intersection is shown in Figure 4 below. On the southwest corner of the 29th Street is Mercy Health Center of Massillon and on the southeast corner is the St. Barbara Catholic School. Approximately ½ mile south on 29th Street is Massillon Intermediate and Junior High School.

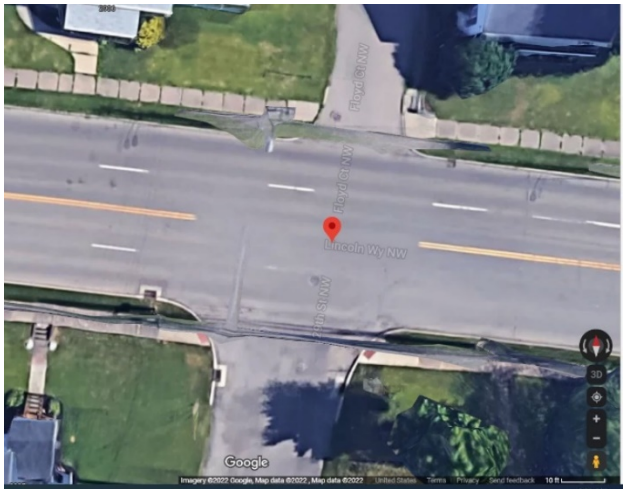

Figure 4: Lincoln Way West at 29th Street

The westbound approach at the signalized intersection of **Lincoln Way W and 32nd St NW** provides a shared thru/left turn lane and a shared thru/right turn lane. The eastbound approach provides a shared thru/left turn lane and a shared thru/right turn lane. The northbound movement provides a single approach lane. The southbound approach also utilizes a single approach lane. While Lincoln Way W has a posted speed limit of 35 mph, 32nd St has a posted speed limit of 25 mph. Figure 5 shows the lane configuration for the intersection.

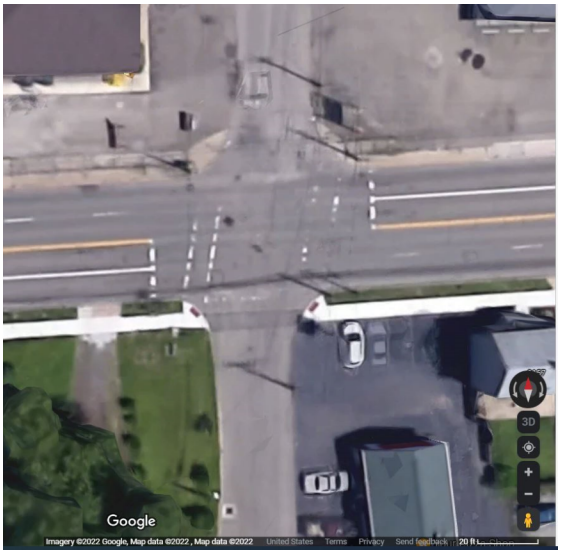

Figure 5: Lincoln Way West at 32nd Street

This study reviews the traffic capacity and operations of each intersection, traffic safety, and basic geometric considerations for the selected alternatives. The traffic projections contained within this study will assist the City of Massillon in determining a selected alternative for implementation at a future date. The study communicates the likely traffic operations if a road diet is to be implemented and provides data for additional discussions on long-term opportunities for Lincoln Way West.

2. TRAFFIC INFORMATION

Traffic data was collected by Loukas Engineering on October 4, 2022. Traffic count data was collected using video data collection for the peak periods (7-9 AM and 4-6 PM) and a midday period (11 AM-1 PM). The morning peak hour occurs between 7:15am and 8:15 am, and the afternoon peak hour occurs between 4:30 pm and 5:30 pm. Data collected as part of this study consists of turning movement counts at the four (4) major study intersections. Existing traffic volume data can be found in **Appendix A**.

To analyze the impacts of future roadway alternatives, traffic data was projected to the horizon year of the study. This study will identify the impacts of these alternatives based on 2040 data. Traffic projections were based on data available on the ODOT TIMS (Traffic Information Mapping System) Website. This data indicated a projected flat 0% annual growth in passenger vehicles, and a more aggressive 2.75% per year annual growth for commercial vehicles. To account for the general impacts of traffic growth, a growth factor of 3.34% between current year and the projected year of 2040 (0.19% per year) was used on Lincoln Way West Road, and on the 17th, 23rd, 27th and 32nd streets.

In addition to general background growth, a proposed new elementary school adjacent to the study area has the potential to increase traffic volumes on Lincoln Way. The planned school is located at 250 29th Street, which is located approximately 0.7 Miles south of the intersection of 29th Street and Lincoln Way. The school has a projected student population of 614 students. Using this number of students, estimates for the number of trips that might be generated by the school were developed. The procedures for these calculations are outlined in the Institute of Transportation Engineers (ITE) publication, Trip Generation Handbook. The data set used is the ITE Trip Generation Manual – 10th Edition. Trips were generated for both the morning and afternoon peak periods of adjacent road traffic.

The proposed school is expected to generate a total of 454 trips in the AM Peak hour and 98 trips in the PM Peak hour. The AM Peak hour volume is significantly higher as school arrival times are more likely to coincide with the AM Peak hour of street traffic. The anticipated school day at this location is 9:05 AM – 3:40 PM. While both the arrival and dismissal times fall outside the corridor peak hour, the calculated number of trips was used to provide a more conservative analysis.

Access to the school site on 29th Street will be provided by Lincoln Way to the north and Millersburg Road to the south. The transportation network in this area is well connected and it is anticipated that both routes will be heavily used by parents and staff. The trips generated by the proposed school were distributed with 50% of the trips traveling using Millersburg Road and the other 50% traveling through the study area to access the school. With an existing educational facility adjacent to the proposed new school, trips were further distributed along the Lincoln Way corridor using existing travel patterns. The 2040 analysis in this study includes the additional traffic generated by the school.

3. SAFETY ANALYSIS

A safety analysis was performed to explore the recent crash history at the four study intersections, as well as the corridor segments. The primary focus of this analysis was to summarize and identify crash patterns. These patterns help identify safety concerns, some of which may be reduced by the proposed intersection improvements included in the remaining sections of this study. Particular attention was given to head-on and angle crashes, which tend to result in more serious injuries and greater property damage.

Crash data for the analysis was obtained from the Crash Analysis Module (CAM) Tool and GIS Crash Analysis Tool (GCAT) in the form of a crash summary report. Detailed traffic crash reports for the most

severe collisions were downloaded and reviewed in detail. The crash data encompassed a period of three full years spanning January 1, 2019, thru December 31, 2021. Historical Crash Data can be found in **Appendix B**.

Intersection Crash Analysis

A summary of the intersection crash data is shown in Table 1, and a summary of the segment crash data is presented in Table 2.

Table 1: Intersection Crash Summary

Intersection	Crash Type									Injuries			
	Side Swipe Sm	Head On	Head On Left Turn	Angle	Rear End	Single Vehicle	Backing	Other	TOTAL	Fatal	A-Level (Incapacitating)	B-Level (Non-Incapacitating)	C-Level (Possible)
17th Street	2	0	0	1	1	1	0	0	**5**	0	0	1	1
23rd Street	0	0	0	4	3	0	0	0	**7**	0	0	0	0
27th Street	0	0	0	7	0	2	0	0	**9**	0	0	1	0
32nd Street	1	0	0	6	0	1	2	0	**10**	0	0	0	1
TOTAL	**3**	**0**	**0**	**18**	**4**	**4**	**2**	**0**	**31**	**0**	**0**	**2**	**2**
% TOTAL	**10%**	**0%**	**0%**	**58%**	**13%**	**13%**	**6%**	**0%**	**100%**	**0%**	**0%**	**6%**	**6%**

There were 31 total crashes at the four study intersections during the study period. The prominent crash type at the study intersections was Angle collisions, accounting for 58 percent of all crashes. Rear-end, Sideswipe and Single vehicle collisions were the other prominent collision types at the study intersections accounting for 13 percent, 10 percent, and 13 percent of all crashes respectively. It is worth noting that 6 percent of the crashes resulted from Backing.

Table 2: Segment Crash Summary

Segment	Crash Type									Injuries			
	Side Swipe Sm	Head On	Head On Left Turn	Angle	Rear End	Single Vehicle	Backing	Other	TOTAL	Fatal	A-Level (Incapacitating)	B-Level (Non-Incapacitating)	C-Level (Possible)
Between 27th & 32nd St.	3	0	0	5	4	2	0	0	**14**	0	0	2	0
Between 23rd & 27th St.	0	0	0	3	0	1	0	0	**4**	0	0	1	0
Between 17th & 23rd St.	1	0	1	3	0	2	2	0	**9**	0	0	0	1
TOTAL	**4**	**0**	**1**	**11**	**4**	**5**	**2**	**0**	**27**	**0**	**0**	**3**	**1**
% TOTAL	**15%**	**0%**	**4%**	**41%**	**15%**	**19%**	**7%**	**0%**	**100%**	**0%**	**0%**	**11%**	**4%**

There were 27 total crashes along the Lincoln Way Road segments outside the vicinity of a major intersection. On the segment sections of the Lincoln Way West Road, the most prominent crash types

recorded during the study period were Angle, Rear-end, Sideswipe, and Single vehicle collisions representing 41 percent, 15 percent, 15 percent, and 19 percent, respectively. It is worth noting here that, 70 percent of the segment crashes occurred at either an unsignalized intersection or a driveway. Of the 14 crashes that occurred on the section between 27th Street and 32nd Street, 3 occurred at the 28th Street intersection and 4 at the 29th Street intersection.

During the analysis period, there were no crashes which resulted in a fatality or an A-type (incapacitating) injury, however, a total of five crashes resulted in B-level (non-incapacitating) injuries and three resulted in C-level (possible) injuries. The balance of the crashes resulted in property damage only (PDO). There were no crashes involving a pedestrian or a bicyclist during the study period.

Further Considerations

The majority of the crashes that occurred during the analysis period were rear-end and angle collisions. It is worth noting that about 34 percent of the crashes involved drivers making a left turn in areas without a designated left turn lane. A change in the roadway cross-section such as the addition of a two-way center left turn lane may help lessen the observed crash patterns. Any changes in geometry should include verification that the clearance intervals are appropriate, which may also help reduce the observed crash tendencies.

4. EXISTING OPERATIONAL ANALYSIS

The study intersections were analyzed according to the methodologies published in the Highway Capacity Manual, 2010 edition. For this project, Synchro Version 11 software was used to conduct the analysis for traditional intersections. Software printouts for the evaluations of intersections have been included in **Appendix C** and **Appendix D**. These software packages computes delay values based on factors such as number and type of lanes, intersection controls such as STOP signs or traffic signals, traffic volumes, pedestrian volumes, geometric characteristics, signal timing characteristics, roadway grade, speed limit, etc. This analysis determines the average delay experienced by vehicles. This value is an average across the entire peak hour, vehicles arriving during the busiest portion of the peak hour or arriving in a clustered group of vehicles instead of in a random pattern could experience longer delays. On the other hand, vehicles arriving during a lighter portion of the peak hour could experience a shorter delay. The average delay is used to determine the corresponding level of service (LOS) values for each intersection movement, as well as the intersection as a whole.

The LOS of an intersection is based on factors such as number and types of lanes, intersection controls such as STOP signs or traffic signals, traffic volumes, pedestrian volumes, etc. LOS is expressed as a letter grade, in a range from A thru F. In this context, 'A' represents the best conditions, with very little or no average delay to vehicles. LOS 'F' is the worst of conditions, equated with very large average delays and few gaps of acceptable length. The following tables (3 and 4) identify level of service criteria for signalized intersections.

Table 3: Level of Service Criteria For Signalized Intersections

Level of Service	Average Delay/Vehicle (seconds)	Description
A	Less than or equal to 10	Most vehicles do not stop at all. Most arrive during the green phase. Little or no delay.
B	> 10 to 20	More vehicles stop than for LOS A. Still good progression thru lights. Short traffic delays.
C	> 20 to 35	Significant numbers of vehicles stop, although many pass thru without stopping.
D	> 35 to 55	Many vehicles stop. Individual signal cycle failures are noticeable. Progression is intermittent.
E	> 55 to 80	Considered to be the limit of acceptable delay. Individual cycle failures are frequent, and progression is poor.
F	>80	Extreme and unacceptable traffic delays.

SOURCE: Transportation Research Board, Highway Capacity Manual 2010.

Table 4: Level of Service Criteria For Unsignalized Intersections

Level of Service	Average Delay/Vehicle (seconds)	Description
A	0 to 10	Little or no delay, very low main street traffic
B	> 10 to 15	Short traffic delays, many acceptable gaps
C	> 15 to 25	Average traffic delays, frequent gaps still occur
D	> 25 to 35	Longer traffic delays, limited number of acceptable gaps
E	> 35 to 50	Very long traffic delays, very small number of acceptable gaps
F	>50	Extreme traffic delays, virtually no acceptable gaps in traffic

An intersection LOS 'D' is considered by many traffic safety professionals to be the minimum acceptable condition in an urban/suburban area. For rural areas, most highway agencies consider LOS 'C' the minimum. Given the location of the study intersections, on the edge of an urbanized area, LOS 'D' was utilized as the study goal.

The four signalized intersections and one unsignalized intersection were evaluated under the existing conditions during both peak periods. Tables 5 and 6 show the existing condition intersection LOS and corresponding delays during the AM Peak Hour and PM Peak respectively. Tables 7 and 8 show the intersection LOS and corresponding delays for the future scenario with no build condition (2040) during the AM Peak and PM Peak Hour respectively.

Table 5: 2020 AM Peak Delay and Level of Service – Existing Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	**38.3**	**D**	**28.4**	**D**	7.3	A	7.8	A	12.8	B
Lincoln Way @ 23rd Street	**42.3**	**D**	**38.3**	**D**	4.2	A	4.3	A	6.5	A
Lincoln Way @ 27th Street	17.3	B	9.3	A	7.6	A	6.3	A	7.6	A
Lincoln Way @ 29th Street	12.7	B	0.0	A	0.0	A	4.0	A	5.2	A
Lincoln Way @ 32nd Street	13.8	B	19.2	B	5.3	A	5.2	A	6.9	A

Table 6: 2020 PM Peak Delay and Level of Service – Existing Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	**40.4**	**D**	**40.2**	**D**	11.2	B	12.1	B	19.3	B
Lincoln Way @ 23rd Street	**35.2**	**D**	21.8	C	5.2	A	10.5	B	9.1	A
Lincoln Way @ 27th Street	13.2	B	20.0	B	8.2	A	6.5	A	9.4	A
Lincoln Way @ 29th Street	11.4	B	0.0	A	0.0	A	1.6	A	2.4	A
Lincoln Way@ 32nd Street	16.4	B	18.7	B	5.6	A	5.2	A	7.6	A

Table 7: 2040 AM Peak Delay and Level of Service – Future Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	**38.5**	**D**	26.6	C	6.3	A	8.5	A	12.0	B
Lincoln Way @ 23rd Street	20.7	C	32.4	C	8.5	A	6.3	A	9.5	A
Lincoln Way @ 27th Street	17.2	B	8.8	A	8.0	A	6.7	A	7.9	A
Lincoln Way @ 29th Street	**25.3**	**D**	0.0	A	0.0	A	4.6	A	10.8	B
Lincoln Way @ 32nd Street	13.1	B	20.0	B	5.4	A	5.3	A	7.0	A

Table 8: 2040 PM Peak Delay and Level of Service – Future Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	**40.6**	**D**	**40.5**	**D**	11.2	B	12.6	B	19.4	B
Lincoln Way @ 23rd Street	24.0	C	24.8	C	10.3	B	10.9	B	12.1	B
Lincoln Way @ 27th Street	13.2	B	20.5	C	8.0	A	6.9	A	9.4	A
Lincoln Way @ 29th Street	12.4	B	0.0	A	0.0	A	2.0	A	3.1	A
Lincoln Way@ 32nd Street	16.2	B	18.6	B	5.7	A	5.6	A	7.6	A

The corridor experiences congestion during both peak periods for 2022. The 2040 no build conditions also show similar congestion at most locations. Impacts of the additional school traffic are most evident at the 29th street intersection during the AM Peak hour. The intersections of Lincoln Way at 17th Street and Lincoln Way at 23rd Street experience delays during both peak periods. During the afternoon peak period, the intersection of Lincoln Way at 17th Street experiences lengthy delays, most notably in the Northbound and Southbound directions. Delay at these intersections contributes to congestion throughout the corridor. While many of the study intersections and individual intersection approaches experience longer delays, the LOS still falls within an acceptable range for all intersections.

5. IMPROVEMENT CONCEPTS PRELIMINARY ANALYSIS

Within the corridor there is opportunity for modifications to the existing roadway. Conversion of the existing 4-lane section to a section providing a two-way center-left turn lane would help address some of the observed safety and operational concerns. To provide additional understanding on how this type of a change would impact operations, a road diet was considered for further evaluation.

3 Lane Road Diet

This traditional road diet would use the existing pavement limits to provide one lane in each direction and a two-way center left-turn lane. The 3-lane cross section would be consistent without the addition of auxiliary lanes at intersections. Additional paved space not needed for vehicular lanes would be used as a paved shoulder with the potential for future projects to adjust the curb line to narrow the roadway.

This option provides the needed two-way center left-turn lane to address some of the safety concerns in the corridor. It also provides the opportunity for reuse of the space currently dedicated to vehicle lanes. The traffic operations for the conversion (road diet) at the signalized intersections indicate that additional auxiliary approach lanes are not needed in conjunction with a road diet. Proposed conditions for the Road Diet Conversion Alternative under both the 2022 and 2040 conditions are shown in tables 9-12.

Table 9: 2022 AM Peak Delay and Level of Service – Road Diet Conversion Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	30.8	C	20.5	C	2.7	A	3.7	A	7.7	A
Lincoln Way @ 23rd Street	31.2	C	28.7	C	1.1	A	2.0	A	3.3	A
Lincoln Way @ 27th Street	9.4	A	6.1	A	9.3	A	9.0	A	8.7	A
Lincoln Way @ 29th Street	14.2	B	0.0	A	0.0	A	3.6	A	5.4	A
Lincoln Way @ 32nd Street	8.0	A	10.3	B	7.4	A	6.9	A	7.4	A

Table 10: 2022 PM Peak Delay and Level of Service – Road Diet Conversion Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	33.6	C	24.6	C	7.5	A	6.5	A	13.0	B
Lincoln Way @ 23rd Street	32.1	C	16.1	B	1.9	A	5.2	A	4.7	A
Lincoln Way @ 27th Street	7.0	A	8.6	A	16.2	B	12.6	B	13.5	B
Lincoln Way @ 29th Street	13.4	B	0.0	A	0.0	A	1.3	A	2.6	A
Lincoln Way@ 32nd Street	9.0	A	10.1	B	8.4	A	7.3	A	8.2	A

Table 11: 2040 AM Peak Delay and Level of Service – Road Diet Conversion Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	25.9	C	16.2	B	4.9	A	4.6	A	7.9	A
Lincoln Way @ 23rd Street	7.0	A	11.7	B	6.7	A	6.1	A	6.6	A
Lincoln Way @ 27th Street	9.3	A	6.0	A	10.8	B	10.7	B	10.1	B
Lincoln Way @ 29th Street	**33.6**	**D**	0.0	A	0.0	A	4.1	A	13.5	B
Lincoln Way @ 32nd Street	7.6	A	10.6	B	7.9	A	7.2	A	7.7	A

Table 12: 2040 PM Peak Delay and Level of Service – Road Diet Conversion Conditions

	Northbound		Southbound		Eastbound		Westbound		Intersection	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lincoln Way @ 17th Street	30.0	C	22.3	C	7.3	A	7.2	A	12.3	B
Lincoln Way @ 23rd Street	10.6	B	11.4	B	5.9	A	6.5	A	6.8	A
Lincoln Way @ 27th Street	8.1	A	10.6	B	14.4	B	11.7	B	12.7	B
Lincoln Way @ 29th Street	15.1	C	0.0	A	0.0	A	1.6	A	3.4	A
Lincoln Way@ 32nd Street	8.9	A	10.1	B	8.6	A	7.4	A	8.2	A

The corridor experiences reduced congestion and delays after the conversion during both peak periods for the 2022 and 2040 scenarios. The most significant operational improvement occurs during the afternoon peak period at the intersection of Lincoln Way at 17th Street, most notably in the Northbound and Southbound directions. The Northbound 29th street approach sees the longest delays during the AM Peak period, coinciding with the proposed school morning arrival traffic.

6. CONCEPT OPERATIONAL ANALYSIS

A comparison of delay and level of service results for the existing conditions and the 3-lane road diet conversion is shown in tables 13-17. The existing condition and the 3-Lane Road diet were analyzed during both peak periods for the 2022 and 2040 study years.

Lincoln Way at 17th Street

At this intersection, Lincoln Way West is a 4-lane roadway. The eastbound Lincoln Way West Road approach consists of two lanes, used as left turn lane and a shared thru/right lane. The westbound Lincoln Way West Road approach consists of three lanes, used as a left turn, a thru lane and a shared thru/right lane. At this location 17th Street consists of a two-lane roadway with an auxiliary left turn lane. The four-legged intersection is surrounded by residential buildings.

The conversion of this intersection and the corridor to a three-lane road diet provides a left turn lane and shared thru/ right turn lane on the eastbound and westbound approaches. At this intersection, the northbound and southbound 17th Street approaches will remain as they are with left turn lanes and a shared thru/ right turn lane.

Table 13: Lincoln Way @ 17th Street

		Northbound		Southbound		Eastbound		Westbound		Intersection	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2022 AM	Existing Conditions	**38.3**	**D**	**28.4**	**D**	7.3	A	7.8	A	12.8	B
	3 – Lane Road Diet	30.8	C	20.5	C	2.7	A	3.7	A	7.7	A
2040 AM	Existing Conditions	**38.5**	**D**	**26.6**	**C**	**6.3**	**A**	**8.5**	**A**	12.0	B
	3 – Lane Road Diet	25.9	C	16.2	B	4.9	A	4.6	A	7.9	A
2022 PM	Existing Conditions	**40.4**	**D**	**40.2**	**D**	11.2	B	12.1	B	19.3	B
	3 – Lane Road Diet	33.6	C	24.6	C	7.5	A	6.5	A	13.0	B
2040 PM	Existing Conditions	**40.6**	**D**	**40.5**	**D**	11.2	B	12.6	B	19.4	B
	3 – Lane Road Diet	30.0	C	22.3	C	7.3	A	7.2	A	12.3	B

As shown in table 13, under existing conditions, the intersection experiences lengthy delay on 17th Street (northbound and southbound) during both peak periods with LOS D. A conversion of this intersection (road diet) provides the opportunity for signal retiming, including the implementation of a consistent corridor cycle length, to help alleviate a small portion of this delay and allow for improved signal corridor progression. At the intersection, left turns are provided a protected phase in addition to permissive phasing. The 3-lane road diet provides improvements to all approaches, with both peak hours operating at a LOS C or better. Similar operational performances were observed for the 2040 future conditions during both peak periods.

Lincoln Way at 23rd Street

This section of Lincoln Way West Road consists of a 4-lane roadway transitioned to a 3-lane roadway on approach to the intersection. The eastbound and westbound Lincoln Way West Road approaches consist of a left turn lane and a shared thru/right lane at each approach. At this intersection 23rd Street consists of a two-lane roadway with an auxiliary left turn lane and shared thru/right turn lanes for each approach. This is a four-legged intersection with both commercial and residential buildings surrounding it.

The conversion of this intersection and the corridor to a three-lane road diet provides a left turn lane and shared thru/ right turn lane on the eastbound and westbound approaches. The road diet alternative maintains the existing lane configuration on Lincoln Way West at this location. At this intersection, the road geometry for the northbound and southbound 23rd Street approaches will be maintained with a left turn lane and a shared thru/ right turn lane.

Table 14: Lincoln Way at 23rd Street

		Northbound		Southbound		Eastbound		Westbound		Intersection	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2022 AM	Existing Conditions	**42.3**	**D**	**38.3**	**D**	4.2	A	4.3	A	6.5	A
	3 – Lane Road Diet	31.2	C	28.7	C	1.1	A	2.0	A	3.3	A
2040 AM	Existing Conditions	20.7	C	32.4	C	8.5	A	6.3	A	9.5	A
	3 – Lane Road Diet	7.0	A	11.7	B	6.7	A	6.1	A	6.6	A
2022 PM	Existing Conditions	**35.2**	**D**	21.8	C	5.2	A	10.5	B	9.1	A
	3 – Lane Road Diet	32.1	C	16.1	B	1.9	A	5.2	A	4.7	A
2040 PM	Existing Conditions	24.0	C	24.8	C	10.3	B	10.9	B	12.1	B
	3 – Lane Road Diet	10.6	B	11.4	B	5.9	A	6.5	A	6.8	A

Under existing conditions shown in table 14, the intersection experiences lengthy delay for the northbound and southbound 23rd Street during both peak periods with LOS D. A conversion of this intersection (road diet) provides the opportunity for signal retiming, including the implementation of a consistent corridor cycle length, to help alleviate a portion of this delay and allow for improved signal corridor progression. At the intersection, left turns are provided a protected phase in addition to permissive phasing. A conversion of this intersection (road diet) provides improvements to the northbound and southbound approaches. Similar operational performances were observed for the 2040 future conditions during both peak periods.

Lincoln Way at 27th Street

This section of Lincoln Way West consists of a 4-lane roadway, with two lanes in each direction providing for a shared thru/left lane and a shared thru/right turn lane at the intersection. At this intersection, 27th street consists of a 2-lane roadway with a single approach lane in each direction. This is a four-legged intersection with both commercial and residential buildings surrounding it.

The conversion of this intersection and the corridor to a three-lane road diet provides a left turn lane and shared thru/ right turn lane on the eastbound and westbound approaches. The road geometry for the southbound and northbound approaches will be maintained with a single approach lane. At the intersection left turns occur under permissive phasing.

Table 15: Lincoln Way at 27th Street

		Northbound		Southbound		Eastbound		Westbound		Intersection	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2022 AM	Existing Conditions	17.3	B	9.3	A	7.6	A	6.3	A	7.6	A
	3 – Lane Road Diet	9.4	A	6.1	A	9.3	A	9.0	A	8.7	A
2040 AM	Existing Conditions	17.2	B	8.8	A	8.0	A	6.7	A	7.9	A
	3 – Lane Road Diet	9.3	A	6.0	A	10.8	B	10.7	B	10.1	B
2022 PM	Existing Conditions	13.2	B	20.0	B	8.2	A	6.5	A	9.4	A
	3 – Lane Road Diet	7.0	A	8.6	A	16.2	B	12.6	B	13.5	B
2040 PM	Existing Conditions	13.2	B	20.5	C	8.0	A	6.9	A	9.4	A
	3 – Lane Road Diet	8.1	A	10.6	B	14.4	B	11.7	B	12.7	B

As can be seen in table 15, this intersection operates with acceptable delay under existing conditions during both peak periods. The conversion provides similarly acceptable operations during both peak periods with the most significant improvement observed for the northbound and southbound 27th street approaches.

Lincoln Way at 29th Street (unsignalized)

This section of Lincoln Way West consists of a 4-lane roadway, two lanes in each direction with a shared thru/left lane and a shared thru/right turn lane provided at the intersection. At the intersection, 29th street consists of a 2-lane roadway with a single approach lane in each direction. This is a four-legged intersection with both commercial and residential buildings surrounding it. On the southwest corner of the 29th street intersection is Mercy Health Center of Massillon and on the southeast corner is the St. Barbara Catholic School. Approximately ½ mile south on 29th Street is Massillon Intermediate and Junior High School.

The conversion of this intersection and the corridor to a three-lane road diet provides a left turn lane and shared thru/ right turn lane on the eastbound and westbound approaches. The road geometry for the southbound and northbound will be maintained with a single approach lane.

Table 16: Lincoln Way at 29th Street (Unsignalized)

		Northbound		Southbound		Eastbound		Westbound		Intersection	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2022 AM	Existing Conditions	12.7	B	0.0	A	0.0	A	4.0	A	5.2	A
	3 – Lane Road Diet	14.2	B	0.0	A	0.0	A	3.6	A	5.4	A
2040 AM	Existing Conditions	**25.3**	**D**	0.0	A	0.0	A	4.6	A	10.8	B
	3 – Lane Road Diet	**33.6**	**D**	0.0	A	0.0	A	4.1	A	13.5	B
2022 PM	Existing Conditions	11.4	B	0.0	A	0.0	A	1.6	A	2.4	A
	3 – Lane Road Diet	13.4	B	0.0	A	0.0	A	1.3	A	2.6	A
2040 PM	Existing Conditions	12.4	B	0.0	A	0.0	A	2.0	A	3.1	A
	3 – Lane Road Diet	15.1	C	0.0	A	0.0	A	1.6	A	3.4	A

Under existing conditions shown in table 16, this intersection operates with acceptable delay during both peak periods. The conversion provides similarly acceptable operations during both peak periods. The addition of the proposed school traffic at this location results in increased delays for the 2040 AM Peak

hour analysis under both alternatives. Should consistently longer delays develop at this location, further evaluation for intersection signalization could be considered under either alternative.

Lincoln Way at 32nd Street

This section of Lincoln Way West consists of a 4-lane roadway, two lanes in each direction with a shared thru/left lane and a shared thru/right turn lane provided at the intersection. At the intersection, 32nd street consists of a 2-lane roadway with a single approach lane in each direction. This is a four-legged intersection with both commercial and residential buildings surrounding it.

The conversion of this intersection and the corridor to a three-lane road diet provides a left turn lane and shared thru/ right turn lane on the eastbound and westbound approaches. The road geometry for the southbound and northbound approaches will be maintained with a single approach lane. At the intersection left turns occur under permissive phasing.

Table 17: Lincoln Way at 32nd Street

		Northbound		Southbound		Eastbound		Westbound		Intersection	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2022 AM	Existing Conditions	13.8	B	19.2	B	5.3	A	5.2	A	6.9	A
	3 – Lane Road Diet	8.0	A	10.3	B	7.4	A	6.9	A	7.4	A
2040 AM	Existing Conditions	13.1	B	20.0	B	5.4	A	5.3	A	7.0	A
	3 – Lane Road Diet	7.6	A	10.6	B	7.9	A	7.2	A	7.7	A
2022 PM	Existing Conditions	16.4	B	18.7	B	5.6	A	5.2	A	7.6	A
	3 – Lane Road Diet	9.0	A	10.1	B	8.4	A	7.3	A	8.2	A
2040 PM	Existing Conditions	16.2	B	18.6	B	5.7	A	5.6	A	7.6	A
	3 – Lane Road Diet	8.9	A	10.1	B	8.6	A	7.4	A	8.2	A

Under existing conditions shown in table 17, this intersection operates with acceptable delay during both peak periods. The conversion provides similarly acceptable operations during both peak periods with the most significant improvement observed for the northbound and southbound 32nd street approaches.

7. CONCEPT DISCUSSION AND CONCLUSION

Under existing conditions there are identified operational and safety concerns within the Lincoln Way West Corridor. Crash data indicates that the lack of a center left turn lane is contributing to crash patterns, especially in the vicinity of unsignalized intersections and driveways. Peak hour congestion on the roadway further contributes to these safety concerns. While existing operations within the study area fall within an acceptable level of service, some of the approaches experience noticeable delays during the peak hour. Delays are most significant at the intersection of Lincoln Way West at 17th Street and Lincoln Way West at 23rd Street. The intersection at 29th Street is projected to see growing delays in the AM Peak hour with the addition of a school approximately 0.7 miles south of the intersection. In addition to school related traffic, volumes in this area are expected to see a modest increase, further decreasing the operational and safety performance of the existing configuration. With the operational and safety performance of the existing corridor, consideration of improvements to the corridor is appropriate.

3 Lane Road Diet

This alternative configuration would provide one lane in each direction and a two-way center left-turn lane within the existing pavement limits. The study area would have a constant 3-lane cross section. Portions of the roadway would have additional paved space not needed for vehicular lanes. Additional

paved space not needed for vehicular lanes could be used as a paved shoulder with the potential for future projects to adjust the curb line to narrow the roadway.

Adjustments to the lane configuration on Lincoln Way W provides an opportunity for additional modifications to the operations of the existing intersections. The existing signal timing plans within the study area use a variety of signal cycle lengths, some significantly longer than necessary for the protected phasing used. Modifications to the existing signal timing plans in the corridor could be used to establish a common cycle length along the corridor. This would allow for improved corridor progression minimizing delay as vehicles travel the corridor. Implementing a shorter cycle length could help reduce side street approach delay, and half cycling intersections without protected left turn phasing could also be explored.

This alternative provides the needed two-way center left-turn lane to address safety concerns in the corridor. It would also provide some opportunity for reuse of the space currently dedicated to vehicle lanes. The inclusion of a center left turn lane allows space for left turning vehicles to wait outside of a thru lane to complete their turn, which will be especially beneficial with the anticipated traffic growth related to the school. A three-lane section provides a consistent and predictable road section for drivers. The operational impact of the reduction in thru lanes is offset by adjustments to the signal timing.

Conclusion

The existing road section contributes to the operational and safety concerns along the Lincoln Way West Road corridor. The number and concentration of access points combined with the lack of a center left turn lane results in both intersection and driveway related crash patterns along the corridor.

The evaluated alternative provides the safety and operational benefit of a center left turn lane. This provides a space for vehicles to wait to complete left turns into driveways and side streets along the corridor. The alternative minimizes abrupt lane changes and vehicles stopping in thru lanes. Signal timing adjustments can be used to minimize the operational impacts of the proposed lane changes, and in many cases provide a reduction in delay at signalized intersections in the corridor.