Memorandum

Date: June 10, 2024

To: DDA Board Members

From: Giles Tucker, Community Development Director

Subject: 11 Mile Streetscape Plan- Main Street Placemaking Grant

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11 Mile Rd Streetscape Plan Update

The 11 Mile Streetscape plan was developed to identify opportunities to enhance the pedestrian environment, better use public space, and create more of a "downtown feel" along 11 Mile Road in the Downtown Development Authority (DDA) area. The project area begins at Stephenson Highway and ends at Lorenz. The plan provides an overall vision of the corridor. It offers greater detail, including conceptual engineering for the first phase, which is called the "focus area" of the project and is located between John R Road and Lorenz. The DDA has budgeted $400,000 of its funds to match requirements for grant opportunities for the project. The plan's development was officially kicked off with an Open House held at Woodpile BBQ in October 2023.

The primary grant funding source that city staff targeted was MDOT's Transportation Alternatives Program (TAP) grant. As the Streetscape plan began to take shape, the city provided the plan concepts to MDOT staff for feedback in preparation for grant submittal. Based on these conversations, staff learned that a TAP grant would cover none of the costs associated with the on-street parking and that while we were proposing widening the existing 6ft sidewalks to 8ft, these paths would need to be increased to 10ft multi-use paths to be an eligible grant expense.

In April 2024, the Streetscape Plan was completed by Nowak Fraus and MKSK and included a design for a 4-lane configuration with a landscaping median for the focus area. The only difference between this design and the "preferred option" based on the feedback of the October 2023 Open House was that it now proposed a 6ft wide sidewalk on the south side of 11 Mile and a TAP grant-eligible multi-use path on the north side of 11 Mile. Recognizing the limited amount of TAP grant-eligible project activities with this option and the costs associated with constructing the on-street parking in the existing right-of-way, the DDA board decided to request a 3-lane configuration to the existing Streetscape plan, including a traffic study and cost comparison. This addition was completed on June 3rd.

Main Street Oakland County Placemaking Grant Opportunity

On June 4th, Main Street Oakland County contacted staff to inform them that the Main Street Oakland County Placemaking grant had additional funds available for downtown projects and asked if the 11 Mile Streetscape plan was developed enough to apply. The grant is a 60/40 match, and a complete application is due by June 18th. Funds for the project must be expended no later than September 2026, and a funding decision will be made on July 11th, 2024. A letter of support from the City Council demonstrating support for the project and preferred road configuration needs to be included with our grant application to

Oakland County to take advantage of this grant opportunity. This grant would be available for either the original 4-lane option or the new 3-lane option.

11 Mile Road Study Results

The most significant part of adding a 3-lane option to the streetscape plan is the Road Diet Corridor Study of 11 Mile Rd conducted by Feis & Vandenbrink (F&V). The Road Study examined the traffic operations and capacity of 11 Mile Rd from Stephenson Hwy to Dequindre. This analysis aimed to determine the feasibility of a road diet and determine what improvements, if any, are recommended to accommodate a 3-lane road configuration.

With the current 4-lane configuration (without landscape medians), all movements at the studied intersections operated acceptably except for Dequindre and 11 Mile Rd, which operated at unacceptable levels during peak periods. V&F indicates that the signal, under the jurisdiction of Macomb County, operates with a 180-second cycle, causing vehicles to experience delays.

The analysis for reducing to three lanes throughout the corridor found that all intersection approaches and movements would continue to operate in a manner like the existing conditions of 11 Mile Rd, with the exemption of Dequindre & 11 Mile Rd. With the 3-lane configuration, it is anticipated that there could be up to a 3-minute delay in the Westbound right turn lane during the school PM peak hour.

In addition to a 3-lane analysis, the F&V study also projected how a 3-lane roadway would operate 20 years from now (2044), given annual population growth estimates. The study found that nearly all observed intersections would see traffic conditions similar to those of the current four-lane configuration. However, traffic simulations found that long periods of vehicle queues would be present at AM, School PM, and PM peak periods at Dequindre & 11 Mile Rd. In addition, the simulation found that there could be up to 4 minutes of delay during school PM peak hour at John R & 11 Mile Rd.

The study concluded that for the most part, a 3-lane configuration throughout the entire 11 Mile corridor has minimal impact on the (6) intersections that were studied, apart from some delays at Dequindre and John R. To help mitigate existing delays already present at Dequindre & 11 Mile Rd, F&V recommended that the signal cycle be reduced to 120 seconds and that the westbound approach be restriped to include a left turn lane, through lane and a right turn lane. The study also found that a 3-lane configuration is anticipated to reduce **crash rates to 15-16% annually**. Based on these findings, F&V recommended that the 3-lane configuration be implemented instead of the 4-lane configuration. The complete Road Diet Corridor Study, 3-lane conceptual design, conceptual engineering, and engineering cost estimates are attached to this memo for review.

3-Lane v. 4-Lane Comparison

The primary benefit of the 4-lane configuration that includes a landscaping median is that it provides modest improvements to the beautification of the downtown area without a significant change to the existing roadway. The landscaping median throughout the focus areas will be around 4-6 feet, slightly narrowing existing lanes. However, this configuration has considerable costs, including more excavation and installation of aggregate within the ROW for on-street parking. Further, because the distance across the roadway remains the same, additional crosswalks require more robust signal structures (HAWK signals). The total costs, including landscaping, are estimated to be **$1,138,896.50 for phase 1.**

By comparison, the 3-lane option is preferred because of its considerable cost savings, improvements to pedestrian safety, reduced crash rates, and the likelihood of its features being TAP grant-eligible. A 3-lane configuration uses less ROW to add in the on-street parking; this means less excavation and aggregate costs. Further, it leaves more room for pathways or amenities such as bike racks, benches, and enhanced features for transit stops. The 3-lane option results in inherent improvements to pedestrian safety because of its bumped-out intersections and the fact there are fewer lanes to cross. This makes it easier for pedestrians to get to downtown businesses, transit stops, and schools. The shorter distances also eliminate the need for higher-intensity crosswalks such as HAWK signals. Finally, a 3-lane option will likely have more costs covered by the TAP grant. The TAP grant covers pedestrian infrastructure such as bump-outs, including curb & gutter and water tap costs required to construct them. If we successfully receive the Main Street Placemaking grant, the DDA will be positioned better to use the TAP grant for future project phases. **The total cost of a 3-lane configuration is estimated to be $684,953.75.**

Staff Recommendation

Unfortunately, to take advantage of this very significant opporunity, staff needs a motion/resolution of support for one of these two options today in order to meet the grant submittal deadline. At this time, the options are:

1. **(Staff Preferred)** Support for the 3-lane road configuration, which includes pedestrian safety features including bump out at each intersection, on-street parking, a 6ft sidewalk on the southside of 11 Mile Rd, and a 10ft multi-use pathway on the northside of 11Mile Rd.

2. Support for a 4-lane road configuration with a landscaping median, which includes a 6ft sidewalk on the south side of 11 Mile Rd and a 10ft multi-use pathway on the north side of 11 Mile Rd.

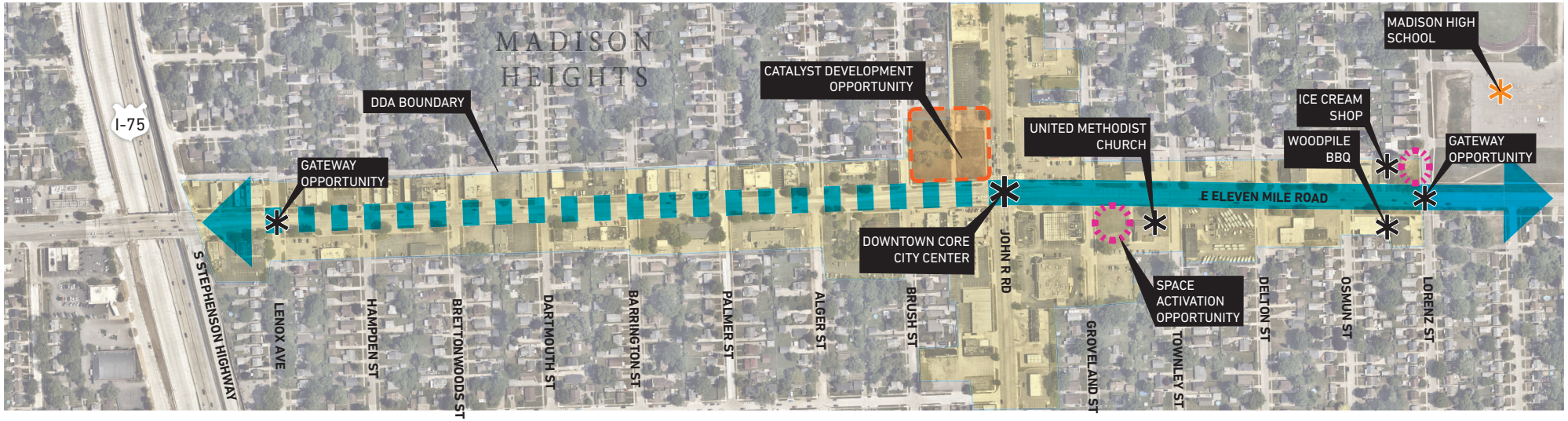
Attachments:

1. 4-Lane Design & Engineering Cost Estimate
2. 3-Lane Design & Engineering Cost Estimate
3. Road Diet Corridor Study of 11 Mile Rd

Project Overview:

As outlined in recent master planning efforts, the City of Madison Heights has prioritized developing an improved streetscape environment along 11 Mile Road, focusing on areas between John R. Road and Lorenz Street. This effort is part of a larger plan to facilitate future development within the 11 Mile corridor extending from Lorenz Street to I-75. This plan will guide the vision and design for future improvement projects that promote a more walkable, pedestrian friendly, and attractive downtown district.

FULL CORRIDOR



FOCUS AREA

School | Points of Interest | Activity Node | Downtown Development Authority Boundary

Project Goals & Objectives

As part of an initial project kick off and visioning session, the Design Team worked with City staff to refine project goals, review challenges, and develop conceptual options to meet project needs

The following project goals were established to help inform project development:

1. CREATE ENHANCED PHYSICAL ENVIRONMENTS WITHIN THE CORRIDOR FOCUSING ON
    - Pedestrians
    - Cyclists
    - Transit Users
    - Automobile drivers

2. PROMOTE THE IDENTITY OF MADISON HEIGHTS THROUGH GATEWAY FEATURES AND OTHER AMENITIES

3. MAXIMIZE RIGHT OF WAY ENVIRONMENTS TO ALLOW FOR A BETTER USE OF PUBLIC SPACE

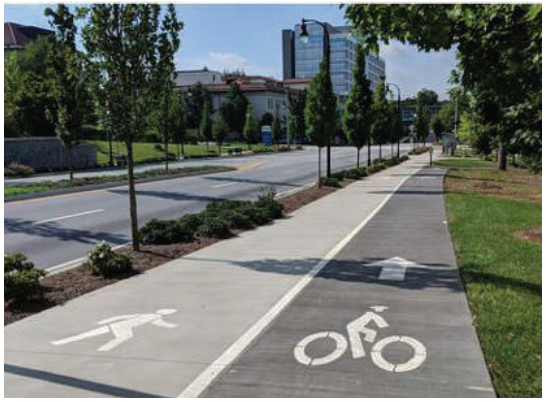
4. ENHANCE PARKING AND ACCESS TO BUSINESSES ALONG THE CORRIDOR

5. IMPROVE SAFETY FOR ALL USERS

6. DEVELOP DESIGN CONTENT TO HELP INFORM FUNDING AND IMPLEMENTATION STRATEGIES

Design Context Images

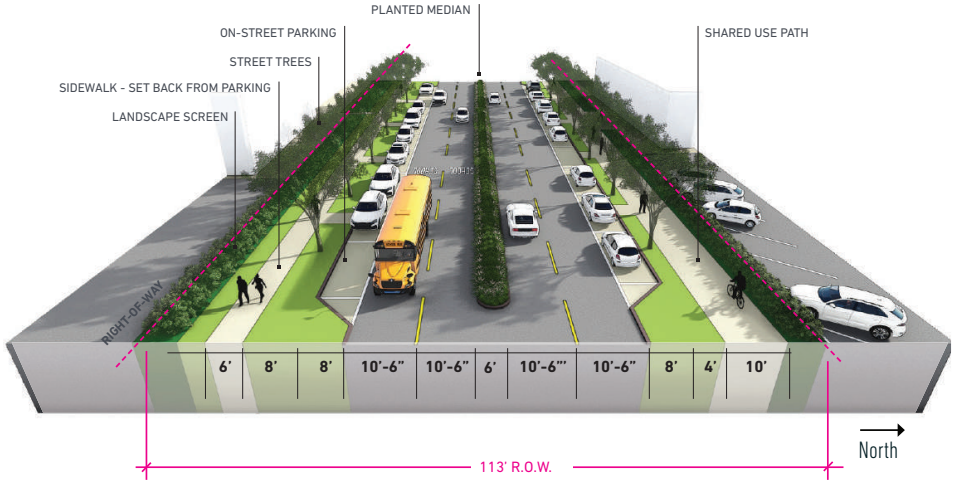
A shared use path is typically wider than a traditional sidewalk and is designed to accommodate pedestrians and cyclists.



Lane markings and changes in material can be used to define various uses.

Providing thoughtful solutions for transit riders, pedestrians, scooters, and bicyclists can improve the mobility, access, and safety.

PREFERRED OPTION – WITH SHARED USE PATH



Preferred Option – With Shared Use Path

An alternate consideration of the perferred option included the addition of a 10' wide Shared Use Path along the north side of the study corridor.

A shared use path provides a travel area separate from motorized traffic for bicyclists, scooter users, pedestrians, skaters, wheelchair users, joggers, and other users.

Shared use paths can provide a low-stress experience for people using the network for transportation or recreation and are fully separated from vehicular traffic. Shared use paths differ from cycle tracks in that they are can include pedestrians even if the primary anticipated users are cyclists and scooters.

This option is shown as "Option 2" in Appendix A8- A11.

PARKING & CIRCULATION - FOCUS AREA

Parking and access to adjacent businesses and property owners was a key issue during the design study. Within the focus area, the Design Team developed conceptual plans to illustrate how site access to adjacent parcels could be re-configured to allow for proposed right of way improvements. In some cases, closing curb cuts along 11 Mile were a proposed way of creating a more cohesive streetscape helping improve pedestrian safety.

The diagram below illustrates locations where curb cuts could be removed (shown with a blue "X") and how internal circulation could be adjust to accommodate the right of way improvements (shown in red).

As a result of adding the on-street parking there was a net gain of approximately 19 parking spaces within the focus area parking spaces

213-241 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	29
PROPOSED SURFACE LOT SPACES	21
PROPOSED PARALLEL PARKING SPACES	9
PROPOSED NEW PARKING SPACES	**30 (NET GAIN OF 1**

307-341 E. ELEVEN MILE ROAD - PARKING TABLE

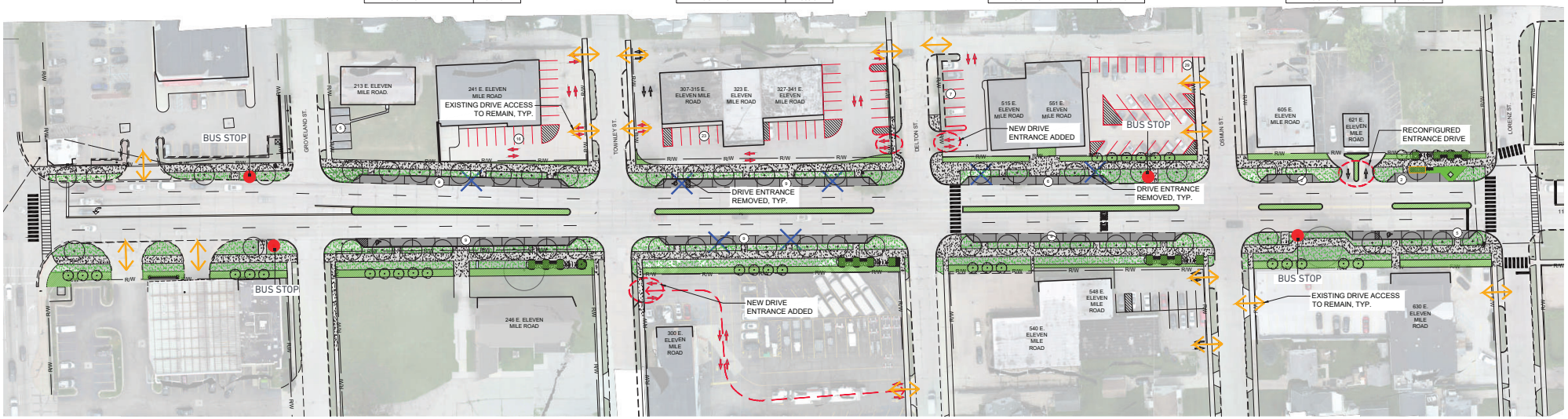
PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	39
PROPOSED SURFACE LOT SPACES	23
PROPOSED PARALLEL PARKING SPACES (INCLUDING 1 ADA SPACE)	9
PROPOSED NEW PARKING SPACES	**32 (NET LOSS OF 7**

515-551 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	40
PROPOSED SURFACE LOT SPACES	36
PROPOSED PARALLEL PARKING SPACES	6
PROPOSED NEW PARKING SPACES	**42 (NET GAIN OF 2**

605-621 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	28
PROPOSED SURFACE LOT SPACES	N/A
PROPOSED PARALLEL PARKING SPACES	4
PROPOSED NEW PARKING SPACES	**4 (NET GAIN OF 4**



LEGEND

SYMBOL	DESCRIPTION
	DRIVE AISLES REMOVED
	DRIVE AISLES ADDED AND/OR RELOCATED
	PROPOSED DECIDUOUS TREE PLANTING
	PROPOSED ENHANCED LANDSCAPE AREA
	PROPOSED ENHANCED SIDEWALKS
	PROPOSED ON STREET PARALLEL PARKING
	EXISTING CURBING TO REMAIN

246 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	N/A
PROPOSED SURFACE LOT SPACES	N/A
PROPOSED PARALLEL PARKING SPACES (INCLUDING 1 ADA SPACE)	9
PROPOSED NEW PARKING SPACES	**9 (NET GAIN OF 9)**

300 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	36
PROPOSED SURFACE LOT SPACES	32
PROPOSED PARALLEL PARKING SPACES	9
PROPOSED NEW PARKING SPACES	**41 (NET GAIN OF 5)**

540-548 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	37
PROPOSED SURFACE LOT SPACES	28
PROPOSED PARALLEL PARKING SPACES	9
PROPOSED NEW PARKING SPACES	**37 (NO CHANGE)**

630 E. ELEVEN MILE ROAD - PARKING TABLE

PARKING TYPE	QUANTITY
APPROXIMATE EXISTING PARKING LOT SPACES	31
PROPOSED SURFACE LOT SPACES	N/A
PROPOSED PARALLEL PARKING SPACES (INCLUDING 1 ADA SPACE)	5
PROPOSED NEW PARKING SPACES	**5 (NET GAIN OF 5)**

North

0 30' 60'
SCALE IN FEET

NF ENGINEERS

CIVIL ENGINEERS

LAND SURVEYORS

LAND PLANNERS

11 Mile Streetscape Project - Option 2
11 Mile Road - John R Rd. to Lorenz St.
City of Madison Heights, Oakland County, MI
Engineer's Opinion of Probable Cost (Budget Purposes Only)

City of Madison Heights
300 W 13 Mile Road
Madison Heights, Michigan 48071

Engineer's Estimate
Nowak & Fraus Engineers
46777 Woodward Avenue
Pontiac, MI 48342

Roadway Length - 1,405 LF

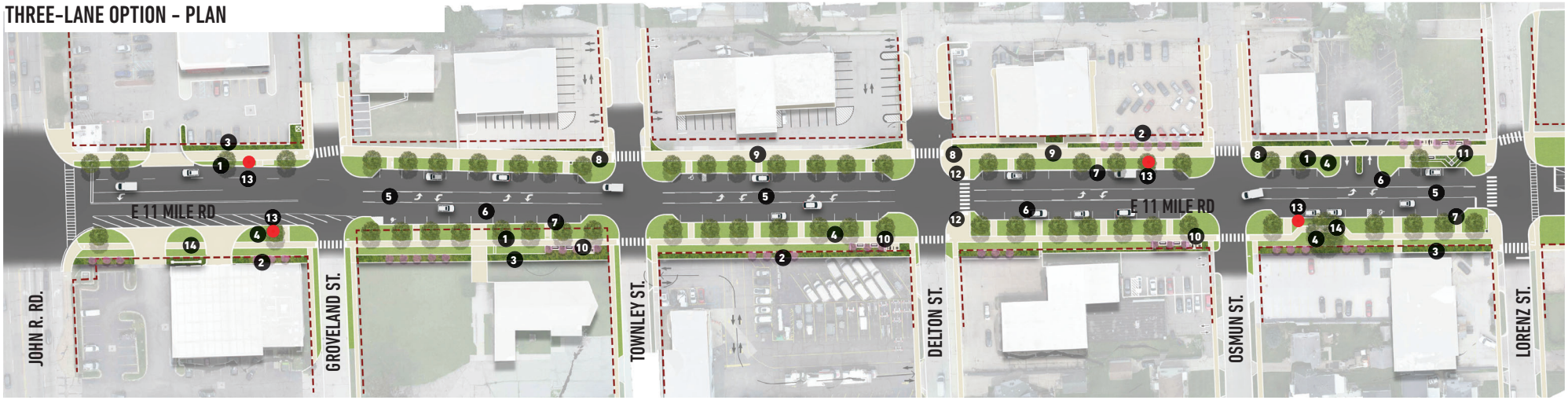
Item	Quantity		*Unit Price	Amount
Section I - Pavement				
Earth Excavation	1,100	C.Y.	$28.00	$30,800.00
Pavement Removal	1,400	S.Y.	$15.00	$21,000.00
Curb & Gutter Removal	1,700	L.F.	$12.50	$21,250.00
Sidewalk Removal	2,250	S.Y.	$11.00	$24,750.00
Bumper Block Removal	11	EA.	$50.00	$550.00
Drive Approach Removal	300	S.Y.	$14.00	$4,200.00
Remove & Relocate Light Pole	10	EA.	$5,000.00	$50,000.00
Tree Removal	15	EA.	$2,000.00	$30,000.00
Root Grinding	15	EA.	$500.00	$7,500.00
Striping Removal	3,000	L.F.	$1.00	$3,000.00
8" Concrete Drive Approach w/ Integral C& G	175	S.Y.	$65.00	$11,375.00
9" Concrete Pavement	250	S.Y.	$70.00	$17,500.00
7" Blackened Concrete Pavement w/ Integral C& G	1,250	S.Y.	$70.00	$87,500.00
18" Concrete Curb	3,250	L.F.	$25.00	$81,250.00
4" Concrete Sidewalk	20,800	S.F.	$6.50	$135,200.00
6" Concrete Sidewalk Ramp	2,500	S.F.	$11.50	$28,750.00
8" Concrete Sidewalk	1,400	S.F.	$10.00	$14,000.00
Aggregate Base, 4" CIP - 21 AA	2,560	S.Y.	$15.00	$38,400.00
Aggregate Base, 6" CIP - 21 AA	1,650	S.Y.	$25.00	$41,250.00
24" White Overlay Cold Plastic (Crosswalk)	1,200	L.F.	$16.00	$19,200.00
Parking Lot Striping	1	LSUM	$2,000.00	$2,000.00
4" Polyurea Paint (White or Yellow)	1,300	L.F.	$2.00	$2,600.00
School Symbol Overlay Cold Plastic	2	EA.	$600.00	$1,200.00
LT Arrow Symbol Overlay Cold Plastic	1	EA.	$250.00	$250.00
Pedestrian Hawk Signal	1	LSUM	$150,000.00	$150,000.00
Silt Sack	21	EA.	$150.00	$3,150.00
Maintaining Traffic & Const. Signing	1	LSUM	$20,000.00	$20,000.00
Structure Adjustments	10	EA.	$500.00	$5,000.00
			Sub Total Section I:	**$851,675.00**

Item	Quantity		*Unit Price	Amount
Section II - Landscape				
Deciduous Canopy Tree (3" Cal.)	56	EA.	$900.00	$50,400.00
Ornamental Tree (2" Cal.)	44	EA.	$750.00	$33,000.00
Deciduous Shrub (7 Gal.)	289	EA.	$85.00	$24,565.00
Deciduous Shrub (5 Gal.)	125	EA.	$65.00	$8,125.00
Ornamental Grass (2 Gal.)	658	EA.	$30.00	$19,740.00
Perennial (1 Gal.)	492	EA.	$20.00	$9,840.00
Shredded Hardwood Mulch (3" Depth)	1,697	S.Y.	$5.00	$8,485.00
Organic Soil Mix - Turf (6" Depth)	12,806	C.F.	$2.00	$25,612.00
Organic Soil Mix - Plant Beds (12" Depth)	14,555	C.F.	$2.00	$29,110.00
Organic Soil Mix - Trees (24" Depth)	1,432	C.F.	$2.00	$2,864.00
Seed Lawn (Bed prep, fertilizer, seed & cover)	2,846	S.Y.	$1.75	$4,980.50
Gateway Signage Pier	1	LSUM	$40,000.00	$40,000.00
Bus Shelter	1	LSUM	$7,500.00	$7,500.00
Trash Receptacles	8	EA.	$1,000.00	$8,000.00
Benches	9	EA.	$1,000.00	$9,000.00
Bike Racks	12	EA.	$500.00	$6,000.00
			Sub Total Section II:	**$287,221.50**
			Overall Total:	**$1,138,896.50**

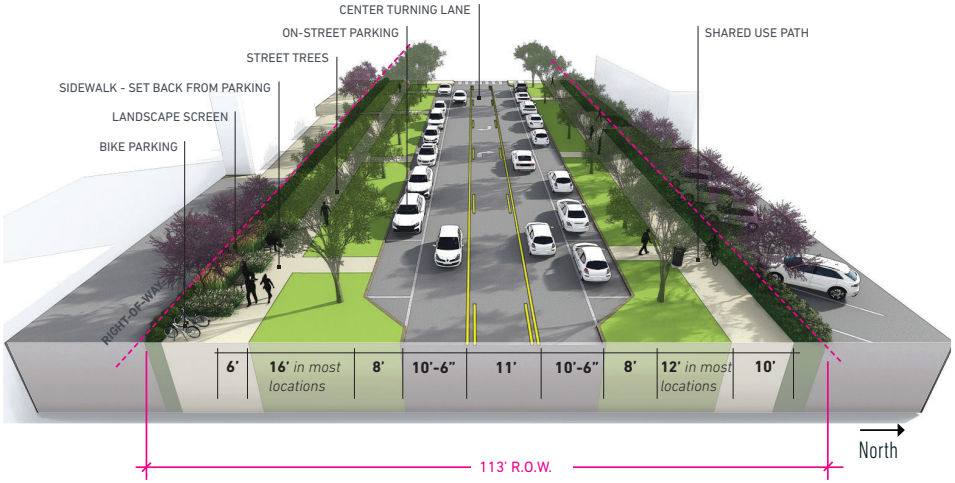
Revised 4/5/2024

*Design and Inspection is not included in the total.
This represents anticipated construction cost
for budgeting purposes only.

THREE-LANE OPTION - PLAN



THREE LANE OPTION



Three-Lane Option

An alternative alignment suggests narrowing the street to three lanes: two travel lanes and a center turn lane. For roads with suitable traffic volumes, converting four-lane undivided roads to a three-lane cross-section can enhance safety.

This change can reduce vehicle speeds, lower vehicle-pedestrian conflicts, and simplify left turns, reducing crash risks and collision severity.

Additionally, lane reduction projects often boost economic vitality by creating space for parking, bike lanes, and other improvements that encourage active transportation and support the local economy.

LEGEND

1. Deciduous Canopy Tree
2. Ornamental Tree
3. Plant Buffer
4. Tree Lawn
5. Center Turning Lane
6. Reduced Width Vehicle Travel Lanes
7. Parallel Parking Stalls
8. Traffic Calming Bumpouts
9. 10' Wide Shared Use Path
10. Amenity Areas
11. Gateway Area
12. Pedestrian Activated Crossing Signals
13. Bus Stops
14. 6' Wide Sidewalk

11 Mile Streetscape Project - Option 3 - (3 Lane Option)
11 Mile Road - John R Rd. to Lorenz St.
City of Madison Heights, Oakland County, MI

Engineer's Opinion of Probable Cost (Budget Purposes Only)

City of Madison Heights
300 W 13 Mile Road
Madison Heights, Michigan 48071

Engineer's Estimate
Nowak & Fraus Engineers
46777 Woodward Avenue
Pontiac, MI 48342

Roadway Length - 1,405 LF

Item	Quantity	*Unit Price	Amount
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Earth Excavation	200 C.Y.	$28.00	$5,600.00
Pavement Removal	1000 S.Y.	$15.00	$15,000.00
Curb & Gutter Removal	200 L.F.	$12.50	$2,500.00
Sidewalk Removal	2,250 S.Y.	$11.00	$24,750.00
Bumper Block Removal	11 EA.	$50.00	$550.00
Drive Approach Removal	300 S.Y.	$14.00	$4,200.00
Tree Removal	15 EA.	$2,000.00	$30,000.00
Root Grinding	15 EA.	$500.00	$7,500.00
Striping Removal	3,000 L.F.	$1.00	$3,000.00
8" Concrete Drive Approach w/ Integral C& G	200 S.Y.	$65.00	$13,000.00
9" Concrete Pavement	350 S.Y.	$70.00	$24,500.00
18" Concrete Curb	675 L.F.	$25.00	$16,875.00
4" Concrete Sidewalk	2,300 S.F.	$6.50	$14,950.00
6" Concrete Sidewalk Ramp	3,250 S.F.	$11.50	$37,375.00
8" Concrete Sidewalk	1,200 S.F.	$10.00	$12,000.00
Aggregate Base, 4" CIP - 21 AA	620 S.Y.	$15.00	$9,300.00
Aggregate Base, 6" CIP - 21 AA	685 S.Y.	$25.00	$17,125.00
24" White Overlay Cold Plastic (Crosswalk)	650 L.F.	$16.00	$10,400.00
Parking Lot Striping	1 LSUM	$2,000.00	$2,000.00
4" Polyurea Paint (White or Yellow)	6,000 L.F.	$2.00	$12,000.00
School Symbol Overlay Cold Plastic	2 EA.	$600.00	$1,200.00
LT Arrow Symbol Overlay Cold Plastic	1 EA.	$250.00	$250.00
~~Pedestrian Hawk Signal~~	~~1 LSUM~~	~~$150,000.00~~	~~$150,000.00~~
Silt Sack	21 EA.	$150.00	$3,150.00
Maintaining Traffic & Const. Signing	1 LSUM	$20,000.00	$20,000.00
12" Dia. C-76 CL IV Sewer Pipe - Complete	400 L.F.	$130.00	$52,000.00
2' Dia. Inlet - Complete w/F&C	4 EA.	$3,000.00	$12,000.00
4' Dia. C.B. w/ Sump & Trap - Complete w/F&C	4 EA.	$5,000.00	$20,000.00
Sewer Tap	4 EA.	$1,000.00	$4,000.00
Structure Adjustments	10 EA.	$500.00	$5,000.00
		Sub Total Section I:	~~**$530,225.00**~~
			$380,225.00

Item	Quantity		*Unit Price	Amount
Section II - Landscape				
Deciduous Canopy Tree (3" Cal.)	57	EA.	$900.00	$51,300.00
Ornamental Tree (2" Cal.)	44	EA.	$750.00	$33,000.00
Deciduous Shrub (7 Gal.)	289	EA.	$85.00	$24,565.00
Deciduous Shrub (5 Gal.)	125	EA.	$65.00	$8,125.00
Ornamental Grass (2 Gal.)	583	EA.	$30.00	$17,490.00
Perennial (1 Gal.)	492	EA.	$20.00	$9,840.00
Shredded Hardwood Mulch (3" Depth)	1,697	S.Y.	$5.00	$8,485.00
Organic Soil Mix - Turf (6" Depth)	24,088	C.F.	$2.00	$48,176.00
Organic Soil Mix - Plant Beds (12" Depth)	10,508	C.F.	$2.00	$21,016.00
Organic Soil Mix - Trees (24" Depth)	1,432	C.F.	$2.00	$2,864.00
Seed Lawn (Bed prep, fertilizer, seed & cover)	5,353	S.Y.	$1.75	$9,367.75
Gateway Signage Pier	1	LSUM	$40,000.00	$40,000.00
Bus Shelter	1	LSUM	$7,500.00	$7,500.00
Trash Receptacles	8	EA.	$1,000.00	$8,000.00
Benches	9	EA.	$1,000.00	$9,000.00
Bike Racks	12	EA.	$500.00	$6,000.00
Revised 5/31/2024			**Sub Total Section II:**	**$304,728.75**
*Design and Inspection is not included in the total. This represents anticipated construction cost for budgeting purposes only.			**Overall Total:**	~~**$834,953.75**~~ $ 684,953.75

46777 WOODWARD AVENUE
PONTIAC, MI 48342-5032

NOWAK FRAUS ENGINEERS
WWW.NOWAKFRAUS.COM

VOICE: 248.332.7931
FAX: 248.332.82

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

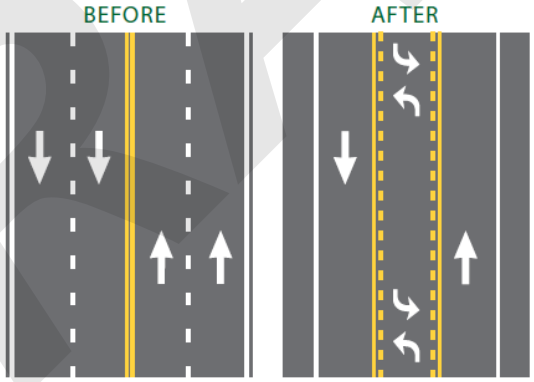
MEMO

VIA EMAIL BBrickel@nfe-engr.com

To:	**Brad Brickel** **Nowak & Fraus Engineers**
From:	**Julie M. Kroll, PE, PTOE** **Paul Bonner, EIT** **Fleis & VandenBrink**
Date:	**May 28, 2024**
Re:	**Road Diet Corridor Study, 11 Mile Road** **Madison Heights, Michigan** **Traffic Engineering Study**

1 INTRODUCTION

This memorandum presents the results of the Road Diet Traffic Study for the 11 Mile Road corridor through the City of Madison Heights, Michigan. The City is evaluating the possibility of a road diet through the City limits, from NB Stephenson Highway to Dequindre Road, to change the existing 4-Lane sections to 3-Lane sections, thereby providing a "road diet" through the corridor. The potential road diet will provide a three-lane cross-section, with one (1) lane in each direction and a center two-way left-turn lane (TWLTL).



The primary goal of the proposed road diet is improved safety and reduce traffic crashes along the corridor. The project limits are shown on the attached **Figure 1** and additional roadway information is summarized in **Table 1**.

Table 1: Existing Roadway Information (11-Mile Road)

11 Mile Road (NB Stephenson Highway to Dequindre Road)	
Lane	4-lanes (2 lanes in each direction)
Average Daily Traffic (2023)	13,360 vpd
Functional Classification	Minor Arterial
Posted Speed Limit	35 mph

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This study has been completed to examine the traffic operations and capacity, safety, and geometric needs of the corridor, including the following study intersections on 11 Mile Road:

1. Dequindre Road
2. Hales Street
3. Lorenz Street
4. John R Road
5. Hampden Street
6. NB Stephenson Highway

The study includes the evaluation of the existing intersection operations and recommendations, including safety improvements, signal timing optimization along 11 Mile Road, geometric improvements, and other measures that would be effective in improving the operations along the roadway corridor.

This evaluation included the following analyses:

Existing Conditions (2024)	Road Diet Opening Day (2024)	Road Diet Horizon Year (2044)
• Existing Traffic Volumes • 4-Lanes Undivided • Existing Geometry	• Existing Traffic Volumes • 3-Lanes (Center TWLTL) • Proposed Geometry	• Horizon Year Traffic Volumes • 3-Lanes (Center TWLTL) • Proposed Geometry

The purpose of this analysis is to determine the feasibility of a road diet for this study corridor and to determine what improvements, if any, are recommended to accommodate such a road diet. The scope of this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practices and information published by the Institute of Transportation Engineers (ITE). The study analyses were completed using Synchro/SimTraffic (Version 11). Sources of data for this study include F&V subconsultant Quality Counts, LLC (QC), Michigan Department of Transportation (MDOT), Road Commission for Oakland County (RCOC), Monroe County Road Commission (MCRC), and ITE.

2 DATA COLLECTION

The existing weekday turning movement traffic volume data was collected by F&V subconsultant Quality Counts, LLC (QC) on Wednesday, April 24, 2024. Intersection Turning Movement Counts (TMC) were collected during the weekday AM (7:00 AM to 9:00 AM), MD (11:00 AM to 1:00 PM), School PM (2:00 PM to 4:00 PM), and PM (4:00 PM to 6:00 PM) peak periods at all study intersections. The data collection included Peak Hour Factors (PHFs), pedestrian volumes, and commercial trucks percentages which were used in the analysis in accordance with MDOT Electronic Traffic Control Devices guidelines. The peak hours at each intersection were utilized and through volumes were carried along the main study roadways and were balanced upwards through the study roadway network in accordance with MDOT guidelines. Additionally, at locations where access is provided between study intersections, "dummy node" intersections were used in the traffic modeling to account for sink and source volumes. Therefore, the traffic volumes utilized in the analysis and shown on the attached traffic volume figures may not match the raw traffic volumes shown in the data collection.

F&V collected an inventory of existing lane use and traffic controls, as shown on the attached **Figure 2**. Additionally, F&V obtained the current signal timing permits for the signalized study intersections from RCOC and MCRC. The existing 2024 peak hour traffic volumes used in the analysis are shown on the attached **Figure 3**. All applicable background data referenced in this memorandum is attached.

3 EXISTING (2024) CONDITIONS ANALYSIS

The existing AM, MD, School PM, and PM peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 11) traffic analysis software. This analysis was performed based on the existing peak hour traffic volumes sown on the attached **Figure 3**, the existing lane use and traffic control shown on the attached **Figure 2**, and methodologies presented in the *Highway Capacity Manual 6th Edition* (HCM6). *Note: The NB Stephenson Highway & 11 Mile Road intersection has a northbound shared through/left-turn lane, which is not supported by the HCM6 methodology; therefore, the HCM 2000 methodology was determined to be more appropriate for use at this study intersection.*

All of the signalized study intersections (with the exception of 11 Mile Road & NB Stephenson Highway and 11 Mile Road & Dequindre Road), operate on RCOC's Sydney Coordinated Adaptive Traffic System (SCATS). Therefore, the baseline timings were input, and the signal timings were optimized for each scenario studied at each of these SCATS intersections, in order to reflect the real time optimizations that are occurring to accommodate the actual traffic volumes observed by the approach lane detectors.

Descriptions of LOS "A" through "F", as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay and LOS F indicating failing conditions. Additionally, SimTraffic network simulations were reviewed to evaluate network operations and vehicles queues. The results of the existing conditions analysis are attached and summarized in **Table 2**.

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better during the AM, MD, School PM, and PM peak periods with the following exceptions:

Dequindre Road & 11 Mile Road

- Several intersection approaches and movements currently operate a LOS E or F during the peak periods.
- Review of the operations shows that the signal currently operates with a 180 second cycle length. Therefore, it is not unreasonable for vehicles to experience high delays. Review of SimTraffic network simulations indicates that the majority of vehicle queue were observed to be serviced within each cycle length throughout the study corridor.

Table 2: Existing Geometry (4-Lanes) Intersection Operations

11 Mile Road Intersection		Control	Approach	Existing Conditions (2024)							
				AM Peak		MD Peak		School PM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Dequindre Road	Signalized	EBL	136.4	F	69.7	E	151.2	F	133.0	F
			EBTR	87.0	F	47.9	D	84.4	F	85.2	F
			WBL	59.7	E	35.9	D	68.1	E	72.0	E
			WBT	85.4	F	36.2	D	97.5	F	81.9	F
			WBTR	112.3	F	55.0	D	100.2	F	93.3	F
			NBL	42.3	D	25.8	C	50.5	D	51.9	D
			NBTR	81.1	F	48.5	D	71.6	E	71.5	E
			SBL	49.5	D	29.9	C	62.7	E	57.9	E
			SBT	71.5	E	41.6	D	66.7	E	62.9	E
			SBR	46.2	D	27.6	C	41.0	D	34.6	C
			Overall	**80.0**	**E**	**44.6**	**D**	**77.5**	**E**	**73.6**	**E**
2	Hales Street	Signalized	EBTL	0.3	A	1.4	A	12.2	B	2.0	A
			EBTR	0.3	A	1.5	A	12.7	B	2.1	A
			WBTL	3.0	A	1.4	A	3.8	A	1.7	A
			WBTR	3.0	A	1.4	A	3.9	A	1.8	A
			NB	33.5	C	38.4	D	32.3	C	37.6	D
			SB	36.8	D	38.4	D	36.4	D	38.6	D
			Overall	**5.2**	**A**	**2.8**	**A**	**10.3**	**B**	**3.1**	**A**
3	Lorenz Street	Signalized	EBTL	0.2	A	0.2	A	0.4	A	0.4	A
			EBTR	0.3	A	0.2	A	0.4	A	0.5	A
			WBTL	12.9	B	0.2	A	0.6	A	0.4	A
			WBTR	13.0	B	0.2	A	0.7	A	0.5	A
			NB	31.2	C	37.1	D	31.9	C	35.1	D
			SB	35.6	D	38.6	D	36.1	D	37.5	D
			Overall	**12.4**	**B**	**3.6**	**A**	**4.3**	**A**	**3.6**	**A**

11 Mile Road Intersection		Control	Approach	Existing Conditions (2024)							
				AM Peak		MD Peak		School PM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
4	John R Road	Signalized	EBL	38.6	D	36.1	D	42.6	D	37.3	D
			EBT	36.6	D	34.8	C	34.1	C	43.0	D
			EBTR	37.3	D	35.2	D	34.7	C	44.1	D
			WBL	33.0	C	33.5	C	32.4	C	36.4	D
			WBT	39.4	D	40.1	D	46.4	D	43.6	D
			WBTR	40.1	D	41.3	D	46.7	D	44.9	D
			NBL	20.8	C	15.3	B	29.2	C	23.8	C
			NBT	29.1	C	24.0	C	31.6	C	26.3	C
			NBR	24.1	C	20.6	C	24.2	C	21.3	C
			SBL	21.0	C	17.4	B	30.2	C	27.9	C
			SBT	26.6	C	23.1	C	30.3	C	25.9	C
			SBR	26.5	C	22.6	C	26.2	C	23.1	C
			Overall	**31.6**	**C**	**27.6**	**C**	**35.4**	**D**	**32.9**	**C**
5	Hampden Street	Signalized	EBTL	0.2	A	0.2	A	0.3	A	0.5	A
			EBTR	0.2	A	0.2	A	0.4	A	0.5	A
			WBTL	2.6	A	2.4	A	3.1	A	2.6	A
			WBTR	2.7	A	2.4	A	3.1	A	2.7	A
			NB	44.2	D	38.3	D	39.1	D	38.6	D
			SB	43.4	D	38.3	D	38.8	D	38.5	D
			Overall	**4.1**	**A**	**3.6**	**A**	**4.0**	**A**	**3.0**	**A**
6	NB Stephenson Highway	Signalized	EBL	18.5	B	3.7	A	15.6	B	7.2	A
			EBT	8.4	A	2.1	A	10.8	B	3.0	A
			WBT	13.2	B	8.2	A	11.6	B	12.0	B
			WBR	14.5	B	8.4	A	13.7	B	12.4	B
			NBL	36.3	D	37.7	D	35.9	D	34.9	C
			NBTL	38.8	D	36.9	D	34.7	C	33.8	C
			NBR	35.5	D	37.2	D	34.0	C	34.3	C
			Overall	**21.9**	**C**	**14.9**	**B**	**18.7**	**B**	**15.2**	**B**

4 ROAD DIET (3-LANES)

4.1 OPENING DAY ANALYSIS (2024)

The proposed road diet configuration (3-lanes) was evaluated along the 11 Mile Road corridor, based on the proposed lane use and traffic control shown on the attached **Figure 4**, existing (2024) peak hour traffic volumes shown on the attached **Figure 3**, and methodologies presented in the HCM. The road diet intersection operations analysis results are attached and summarized in the attached **Table 3**. The results of the road diet evaluation indicate that, with the implementation of the proposed three-lane road-diet, all study intersection approaches and movements will continue to operate in a manner similar to the existing conditions analysis, with additional impacts for LOS for the following location:

Dequindre Road & 11 Mile Road

- During the MD peak hour: The westbound right-turn lane is expected to operate at LOS E.
- Review of SimTraffic network simulations indicates the westbound right-turn movement operates acceptably during the MD peak hour, the majority of vehicle queues were observed to be serviced within each cycle length.

Review of SimTraffic network simulations indicates generally acceptable operations throughout the study roadway network. Vehicle queues were observed to be serviced within each cycle length with minimal residual vehicle queueing. However, the westbound through movement at the intersection of Dequindre Road & 11 Mile

Road was observed to experience periods of long vehicle queues during the School PM peak period. However, these queues were observed to dissipate throughout the School PM peak period.

A corridor travel time evaluation was completed utilizing SimTraffic network simulations to calculate the existing network travel time and the projected travel time with the proposed road diet. The results of this comparison show negligible change in travel time for the peak periods, with the highest increase occurring for the westbound traffic during the School PM peak which is anticipate to increase by approximately three (3) minutes. The travel time summary for each peak period is attached and summarized in **Table 4.**

Table 3: Road Diet Geometry (3-Lanes) Travel Time – Opening Day (2024)

Peak Period	Existing Conditions (2024)		Road Diet Opening Day (2024)		Difference	
	EB (minutes)	WB (minutes)	EB (minutes)	WB (minutes)	EB (minutes)	WB (minutes)
AM Peak	4.36	5.06	4.54	5.35	0.18	0.29
MD Peak	3.85	4.44	3.92	4.63	0.07	0.19
School PM Peak	4.64	5.16	4.74	8.19	0.10	3.04
PM Peak	4.39	5.13	4.47	5.59	0.08	0.46

4.2 HORIZON YEAR ANALYSIS (2044)

Historical population and economic profile data was obtained for the City of Madison Heights from the Southeast Michigan Council of Governments (SEMCOG) database, in order to calculate a background growth rate to project the existing 2024 peak hour traffic volumes to the horizon year of 2044. Population and employment projections from 2020 to 2050 were reviewed and show an average annual growth rate of 0.15% and 0.32%, respectively. Therefore, a conservative background growth rate of **0.5%** per year was applied to the existing peak hour traffic volumes to forecast the horizon year 2044 peak hour traffic volumes, as shown on the attached **Figure 5**.

The Horizon Year (2044) conditions analysis was evaluated based on the recommended lane use and traffic control shown on the attached **Figure 4**, peak hour traffic volumes shown on the attached **Figure 5**, and methodologies presented in the HCM. The Horizon Year (2024) intersection operations analysis results are attached and summarized in the attached **Table 5**. The results of the Horizon Year (2044) road diet evaluation indicate that all study intersection approaches and movements will continue to operate in a manner similar to the Opening Day (2024) conditions analysis, with following additional impacts to LOS:

Dequindre Road & 11 Mile Road

- During the AM peak hour: The southbound left-turn movement is expected to operate at LOS E.
- During the School PM peak hour: The northbound left-turn movement is expected to operate at LOS E.

  Review of SimTraffic network simulations indicate long periods of vehicle queues for the southbound left-turn and westbound through movements during the AM, School PM, and PM peak periods. These queues were observed to be present throughout the School PM peak hour. The 95th percentile queue length for the southbound left-turn and westbound through movements were observed to be the highest during the AM peak hour, at 880 feet, and the School PM peak hour, at 1,650 feet, respectively. This intersection is under the jurisdiction of Macomb County Department of Road (MCDR) and currently operates with a 180 second cycle length. Preliminary analysis indicates that queues would be reduced by optimizing the cycle length to 120 seconds.

John R Road & 11 Mile Road

- During the School PM peak hour: The northbound and southbound through movements are expected to operate at LOS F and the overall intersection is expected to operate at LOS E.

  Review of SimTraffic network simulations indicated periods of long vehicle queues during the School PM peak period for the northbound and southbound approaches. However, these queues were observed to dissipate and were not present throughout the entire peak hour.

A corridor travel time evaluation was completed utilizing SimTraffic network simulations to calculate the projected Opening Day (2024) network travel time and the projected Horizon Year (2044) travel time with the proposed road diet. The results of this comparison show negligible change in travel time for the peak periods, with the highest increase occurring for the westbound traffic during the School PM peak which is anticipate to increase by approximately four (4) minutes. The travel time summary for each peak period is attached and summarized in **Table 6.**

Table 4: Road Diet Geometry (3-Lanes) Travel Time – Horizon Year (2044)

Peak Period	Road Diet Opening Day (2024)		Road Diet Horizon Year (2044)		Difference	
	EB (minutes)	WB (minutes)	EB (minutes)	WB (minutes)	EB (minutes)	WB (minutes)
AM Peak	4.54	5.35	4.44	5.98	-0.10	0.63
MD Peak	3.92	4.63	3.95	4..73	0.04	0.10
School PM Peak	4.74	8.19	4.76	11.91	0.02	3.71
PM Peak	4.47	5.59	4.77	5.78	18.1	0.20

Note: Decreased travel times result from SCATS optimizations, improved progression, and HCM methodologies.

5 SAFETY STUDY

5.1 CRASH ANALYSIS

A crash analysis was conducted at the study intersections and roadway segments along the 11 Mile Road corridor. F&V obtained the crash data used in the analysis from the Michigan Traffic Crash Facts (MTCF) historical crash database for the most recent **five years** (January 1, 2018 to December 31, 2022) of available data. There were a total of 289 crashes reported along the study corridor in the past five years. There were 86 crashes with injuries, include four (4) "Type A" injury crashes; however, there were no fatalities.

The general crash type along the corridor is Angle (43%), Rear-End – Straight (27%), and Sideswipe – Same Direction (11%) crashes. The majority of crashes at the signalized intersections and angle and rear-end crashes, which is typical of signalized intersections. Review of the UD-10 reports for these intersections indicate that the crashes were distributed equally from all directions of travel, suggesting that a directional crash pattern was not present. All crashes included in this analysis are summarized in **Chart 1**. The individual intersection and segment crash types along the 11 Mile Road corridor are summarized in **Table 7**. Review of the summary data indicate that the majority of crashes occurred at the 11 Mile Road intersections with NB Stephenson Highway and Dequindre Road and along the roadway segments between Hampden Street and John R Road, John R Road and Lorenz Street, and Lorenz Street and Dequindre Road.

Chart 1: Percentage of Crashes by Type

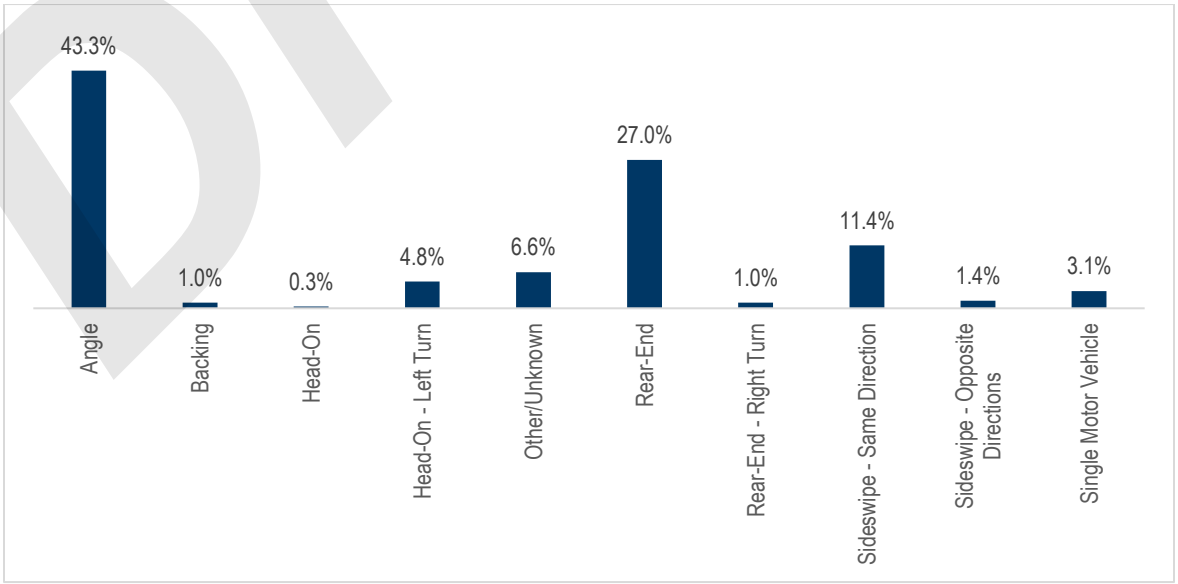


Table 5: Intersection and Segment Crash Summary by Crash Type

11 Mile Road – Road Location		Angle	Backing	Head-On	Head-On Left-Turn	Other/Unknown	Rear-End (Straight)	Rear-End Right-Turn	Sideswipe – Opposite	Sideswipe - Same	Single Motor Vehicle	Total	Percentage
NB Stephenson Hwy	Intersection	22	0	0	4	4	4	0	1	2	1	**38**	13%
NB Stephenson Hwy – Hampden Street	Segment	13	0	0	0	0	6	0	0	6	0	**25**	9%
Hampden Street	Intersection	1	0	0	0	1	1	0	0	0	0	**3**	1%
Hamden Street – John R Road	Segment	14	1	0	1	3	19	1	0	5	6	**50**	17%
John R Road	Intersection	13	0	0	1	3	4	0	1	4	0	**26**	9%
John R Road – Lorenz Street	Segment	17	0	1	1	3	16	1	0	6	0	**45**	16%
Lorenz Street	Intersection	7	0	0	0	1	1	0	0	0	0	**9**	3%
Lorenz Street – Hales Street	Segment	10	0	0	1	1	7	0	0	1	0	**20**	7%
Hales Street	Intersection	3	0	0	0	0	0	0	0	0	0	**3**	1%
Hales Street – Dequindre Road	Segment	9	1	0	1	1	13	0	1	7	2	**35**	12%
Dequindre Road	Intersection	16	1	0	5	2	7	1	1	2	0	**35**	12%
Total		**125**	**3**	**1**	**14**	**19**	**78**	**3**	**4**	**33**	**9**	**289**	**100%**

Table 6: Road Conditions Summary

Road Conditions		
Condition	**Number of Crashes**	**%**
Dry	217	75%
Other/Unknown	2	0%
Wet	53	18%
Snowy/Icy/Slush	17	6%
Total	**289**	**100%**

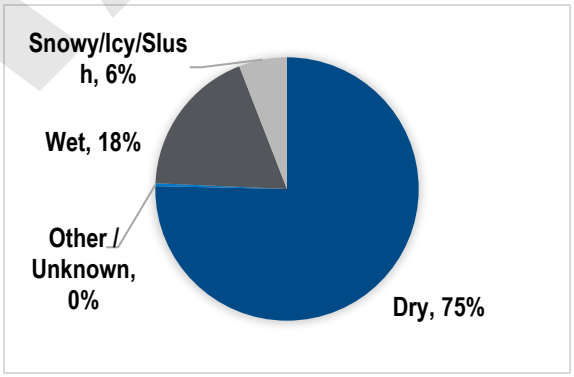


Table 7: Light Conditions Summary

Light Conditions		
Condition	**Number of Crashes**	**%**
Dark-Lighted	52	18%
Dark-Unlighted	1	0%
Dusk	4	1%
Dawn	3	1%
Daylight	229	79%
Total	**289**	**100%**

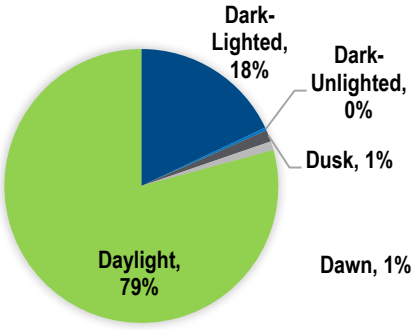
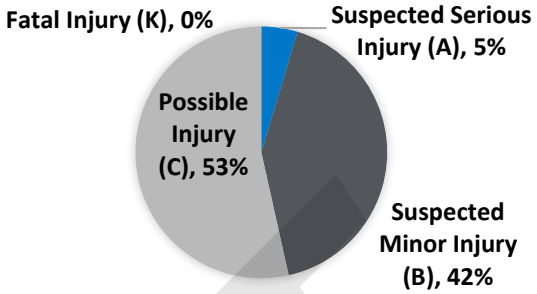


Table8: Crashes with Injury

Worst Injury in Crash		
Severity	**Crashes with Injury**	**% of Injuries**
Fatalities	0	0%
"A" Injuries	4	5%
"B" Injuries	36	42%
"C" Injuries	46	53%
Total	**86**	**100%**



The SEMCOG Crash Analysis Process *Regional Critical Intersection Crash Rates, Frequencies and Casualty Ratios: By Presence or Absence of Signalization* was used to compare the actual crash rates and frequencies to the regional rates for similar intersection operations. The study area included in this analysis is located within the SEMCOG region. Therefore, the data provided by SEMCOG provides an applicable comparison to the crash rates experienced within the study area. The results of the analysis are summarized in **Table 11**.

Table 9: Study Network Intersection Crash Comparison

	Intersection	Average ADT (Entering Volume vpd)	Total (5 years)	Crash Frequency (crashes/year)			Crash Rate (crashes per MV)		
				Intersection Annual Crash Frequency	SEMCOG Average Annual Crash Frequency	Difference	Intersection Crash Rate	SEMCOG Average Crash Rate	Difference
1	11 Mile Road & Dequindre Road	34,223	35	7.0	13.51	-6.51	0.56	1.07	-0.51
2	11 Mile Road & Hales Street	10,373	3	0.6	4.69	-4.09	0.16	0.87	-0.71
3	11 Mile Road & Lorenz Street	10,900	9	1.8	4.69	-2.89	0.45	0.87	-0.42
4	11 Mile Road & John R Road	23,607	26	5.2	8.77	-3.57	0.60	0.96	-0.36
5	11 Mile Road & Hampden Street	11,477	3	0.6	4.69	-4.09	0.14	0.87	-0.73
6	11 Mile Road & NB Stephenson Hwy	17,573	38	7.6	4.69	2.91	1.18	0.87	0.31

The results of the analysis indicates that the majority of the study intersections currently have crash frequencies (crashes per year) and crash rates (crashes per million entering vehicles) below the SEMCOG average for intersections with similar characteristics. The study intersection of 11 Mile Road and NB Stephenson Highway has crash frequency and crash rate above the SEMCOG average. Further review of the crash reports indicates that the majority of crashes at the 11 Mile Road & NB Stephenson Highway intersection were angle crashes (58%). However, NB Stephenson Highway is the project limits for this study; therefore, no changes to the roadway geometry or traffic control operations are recommended as part of this study. It should be noted that the intersection of NB Stephenson Highway and 11 Mile Road is under the jurisdiction of the City of Royal Oak; therefore, any further investigation into this intersection would be completed by the City of Royal Oak.

5.2 Highway Safety Manual Analysis

The Federal Highway Administration (FHWA) has identified Road Diets a proven safety countermeasure and promotes them as a safety-focused design alternative to a traditional four-lane. In order to determine the predictive impact on safety, an analysis was performed according to the Highway Safety Manual (HSM) crash predictive methodology. The analysis included the evaluation of the existing operations along the 11-Mile Road corridor and a safety review of the operations after the implementation of the recommended road diet to provide corridor-wide three-lane striping.

The latest HSM predictive methods analysis spreadsheet, provided by the MDOT Safety Programs Unit, was utilized to determine the expected and predicted crashes associated with the existing conditions and proposed road diet conditions. This analysis used the urban/sub-urban segments model and the crash prediction values

provided by MDOT in the HSM spreadsheet. The results of the analysis are summarized in **Table 12** below and the detailed HSM summary sheets are attached.

Table 12: Highway Safety Analysis Summary

Scenario	Property Damage Only (PDO)		Fatal and Injury (FI)		Total			
	Predicted Crashes per Year	Crash Rate (Crashes / mile / year)	Predicted Crashes per Year	Crash Rate (Crashes / mile / year)	Predicted Crashes per Year	Reduction (%)	Crash Rate (Crashes / mile / year)	Reduction (%)
NB Stephenson Hwy to Hamden St	0.46	4.64	0.10	0.95	0.56		5.59	
Road Diet (4-lane to 3-lane)	0.41	4.11	0.06	0.64	0.47	**15.1%**	4.74	**15.1%**
Hampden St to John R Rd	2.07	4.94	0.43	1.02	2.50		5.96	
Road Diet (4-lane to 3-lane)	1.83	4.35	0.29	0.68	2.12	**15.5%**	5.04	**15.5%**
John R Rd to Lorenz St	1.14	4.06	0.23	.084	1.37		4.89	
Road Diet (4-lane to 3-lane)	1.00	3.58	0.16	0.56	1.16	**15.4%**	4.14	**15.4%**
Lorenz St to Hales St	0.96	2.66	0.22	0.60	1.18		3.27	
Road Diet (4-lane to 3-lane)	0.85	2.36	0.15	0.40	0.99	**15.5%**	2.76	**15.5%**
Hales St to Dequindre Rd	1.90	5.01	0.42	1.10	2.32		6.11	
Road Diet (4-lane to 3-lane)	1.68	4.41	0.28	0.74	1.96	**15.7%**	5.15	**15.7%**

The result of the analysis indicates that the 4-lane to 3-lane road diet is expected to reduce the predicted crash rates and frequencies by approximately 15-16% per year throughout the 11-Mile Road study corridor.

6 CONCLUSIONS

The conclusions of this Traffic Study are as follows:

1. EXISTING CONDITIONS ANALYSIS (4-LANES)

- The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better, during the AM, MD, School PM, and PM peak periods with the following exceptions:
  - **Dequindre Road & 11 Mile Road**
    - Several intersection approaches and movements currently operate at LOS E or F during the peak periods.
    - Review of the operations show that the signal currently operates with a 180 second cycle length. Therefore, it is not unreasonable for vehicles to experience high delays. Review of SimTraffic network simulations indicates that the majority of vehicle queues were observed to be serviced within each cycle length throughout the study corridor.

2. ROAD DIET ANALYSIS (3-LANES)

Opening Day (2024)

- The results of the road diet evaluation indicate that, with the implementation of the proposed three-lane road-diet, all study intersection approaches and movements will continue to operate in a manner similar to the existing conditions analysis, with the exception of the following:
  - **Dequindre Road & 11 Mile Road**
    - During the MD peak hour: The westbound right-turn lane is expected to operate at LOS E.
- Review of SimTraffic network simulations indicates the westbound right-turn movement operates acceptably during the MD peak hour, the majority of vehicle queues were observed to be serviced within each cycle length.

- A corridor travel time evaluation was completed utilizing SimTraffic network simulations to calculate the existing network travel time and the projected travel time with the proposed road diet. The results of this comparison show negligible change in travel time for the peak periods, with the highest increase occurring for the westbound traffic during the School PM peak which is anticipated to increase by approximately three (3) minutes.

Horizon Year (2044)

- The results of the Horizon Year (2044) road diet evaluation indicates that all study intersection approaches and movements will continue to operate in a manner similar to the Opening Day (2024) conditions analysis, with the exception of the following:
  - **Dequindre Road & 11 Mile Road**
    - During the AM peak hour: The southbound left-turn movement is expected to operate at LOS E.
    - During the School PM peak hour: The northbound left-turn movement is expected to operate at LOS E.
    - Review of SimTraffic network simulations indicates long periods of vehicle queues for the southbound left-turn and westbound through movements during the AM, School PM, and PM peak periods. These queues were observed to be present throughout the School PM peak hour. The 95th percentile queue length for the southbound left-turn and westbound through movemetns were observed to be highest during the AM peak hour, at 880 feet, and the School PM peak hour, at 1,650 feet, respectively. This intersection is under the jurisdiction of MCDR and currently operates with a 180 second cycle length. Preliminary analysis indicates that queues would be reduced by optimizing the cycle length to 120 seconds.
  - **John R Road & 11 Mile Road**
    - During the School PM peak hour: The northbound and southbound through movements are expected to operate at LOS F and the overall intersection is expected to operate at LOS E.
    - Review of SimTraffic network simulations indicated periods of long vehicle queues during the School PM peak period for the northbound and southbound approaches. However, these queues were observed to dissipate and were not present throughout the entire peak hour.
- A corridor travel time evaluation was completed utilizing SimTraffic network simulations to calculate the projected Opening Day (2024) network travel time and the projected Horizon Year (2044) travel time with the proposed road diet. The results of this comparison show negligible change in travel time for the peak periods, with the highest increase occurring for the westbound traffic during the School PM peak which is anticipated to increase by approximately four (4) minutes.

3. SAFETY ANALYSIS

- The result of the crash analysis indicates that there were a total of 289 crashes reported along the 11 Mile Road corridor in the past five year (2018-2022); of these crashes, 86 involved injuries, including four (4) “Type A” injuries. The general crash type trends were Angle (43%), Rear-End – Straight (27%), and Sideswipe – Same Direction (11%) crashes.
- The analysis indicates that the majority of the study intersections have crash frequencies and crash rates below the SEMCOG average for comparable intersections. The study intersection of 11 Mile Road & NB Stephenson Highway has crash frequency and crash rate above the SEMCOG average. It should be noted that the intersection of NB Stephenson Highway & 11 Mile Road is under the jurisdiction of the City of Royal Oak; therefore, any further investigation into this intersection would be completed by the City of Royal Oak.
- A safety review was performed according to the Highway Safety Manual (HSM) crash predictive methodology. The result of the analysis indicates that 4-lane to 3-lane road diet would reduce the

predicted crash rates and frequencies by approximately 15-16% per year throughout the 11 Mile Road study corridor.

7 RECOMMENDATIONS

- The primary goal of this road diet is to improve safety and reduce the crashes along the 11 Mile Road corridor. The result of the analysis indicates that crashes are expected to be reduced by **15-16%.**
- It is recommended that the road diet is implemented. There are several options to consider for the extra space created by the eliminated lanes, such as parking space, bike lanes, additional green space, etc. The use of the additional space is up to the discretion of the city.
- It is recommended that at the intersection of Dequindre Road & 11 Mile Road, that the westbound approach be restriped to include a left-turn lane, a through lane, and a right-turn lane.
- It is recommended that at the intersection of John R Road & 11 Mile Road, that the eastbound and westbound approaches be restriped to include a left-turn lane, a through lane, and a right-turn lane.

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

Attached:
Figures 1-5
Traffic Volume Data
HCM LOS Description
Synchro Results
Table 3
Table 5
HSM Crash Analysis

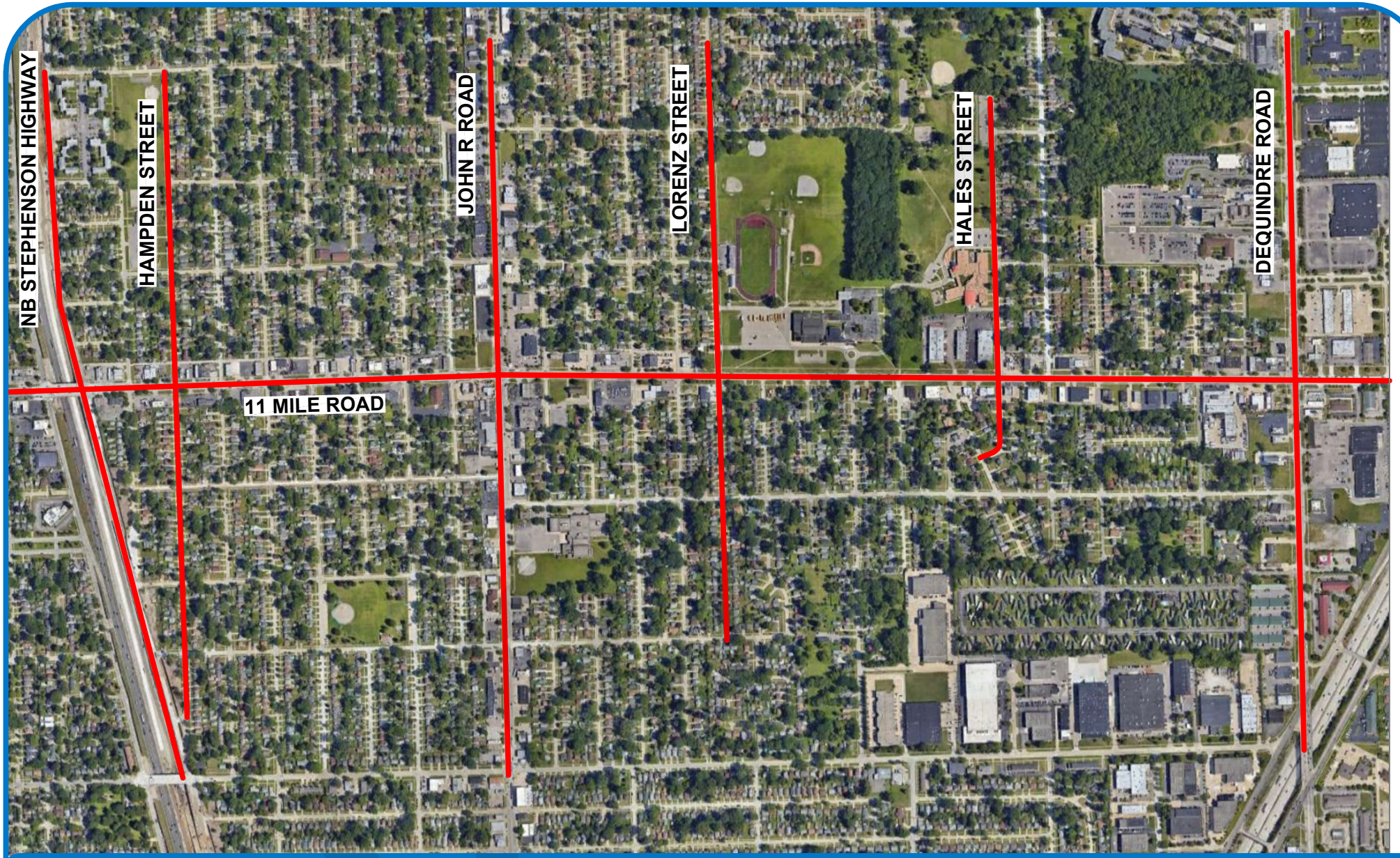


FIGURE 1

SITE LOCATION

11 MILE ROAD - ROAD DIET STUDY, MADISON HEIGHTS, MI

LEGEND

NORTH
SCALE: NOT TO SCALE

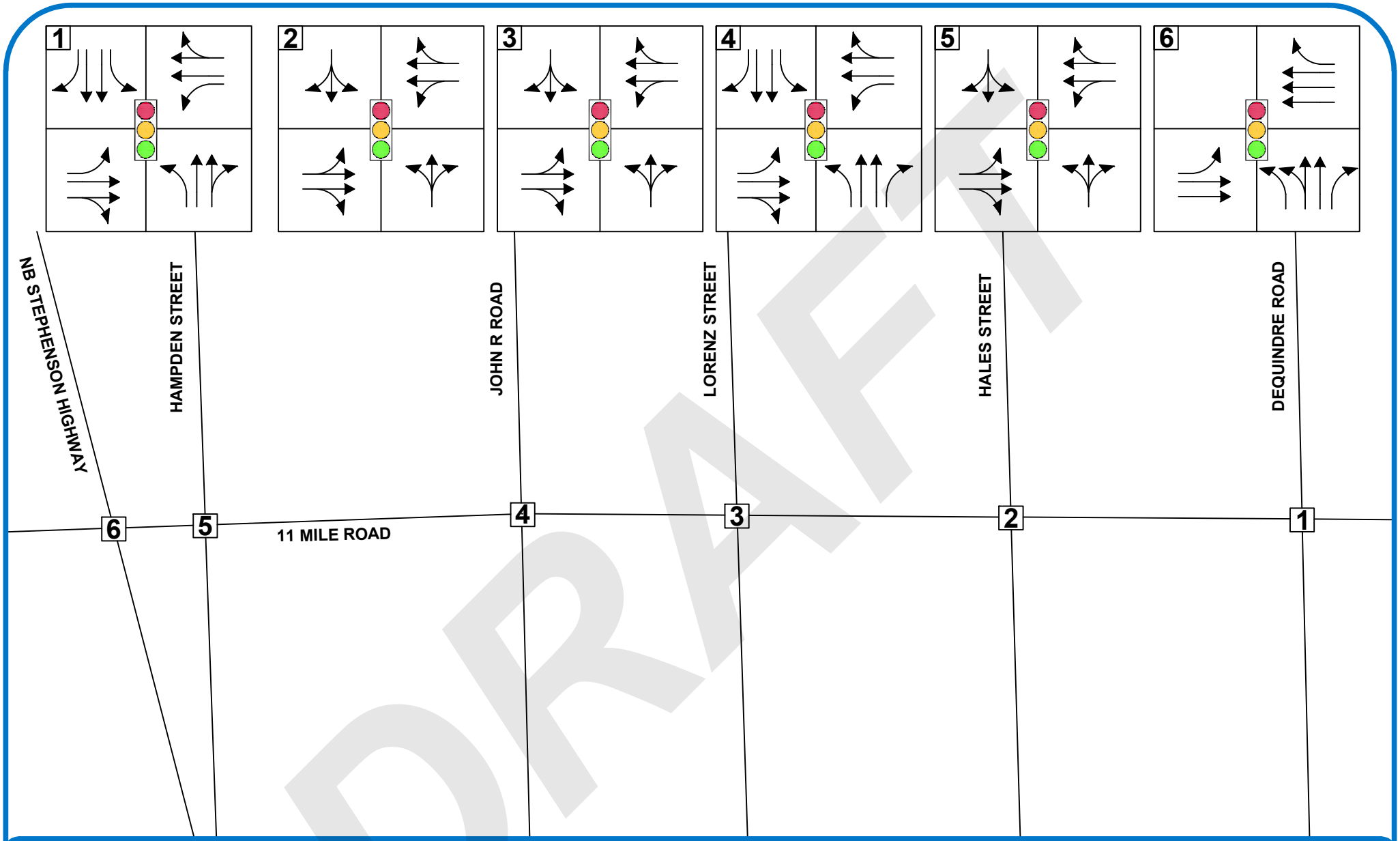


FIGURE 2
EXISTING LANE USE AND TRAFFIC CONTROL

11 MILE ROAD - ROAD DIET STUDY, MADISON HEIGHTS, MI

LEGEND

ROADS

LANE USE

SIGNALIZED INTERSECTION

NORTH

SCALE: NOT TO SCALE

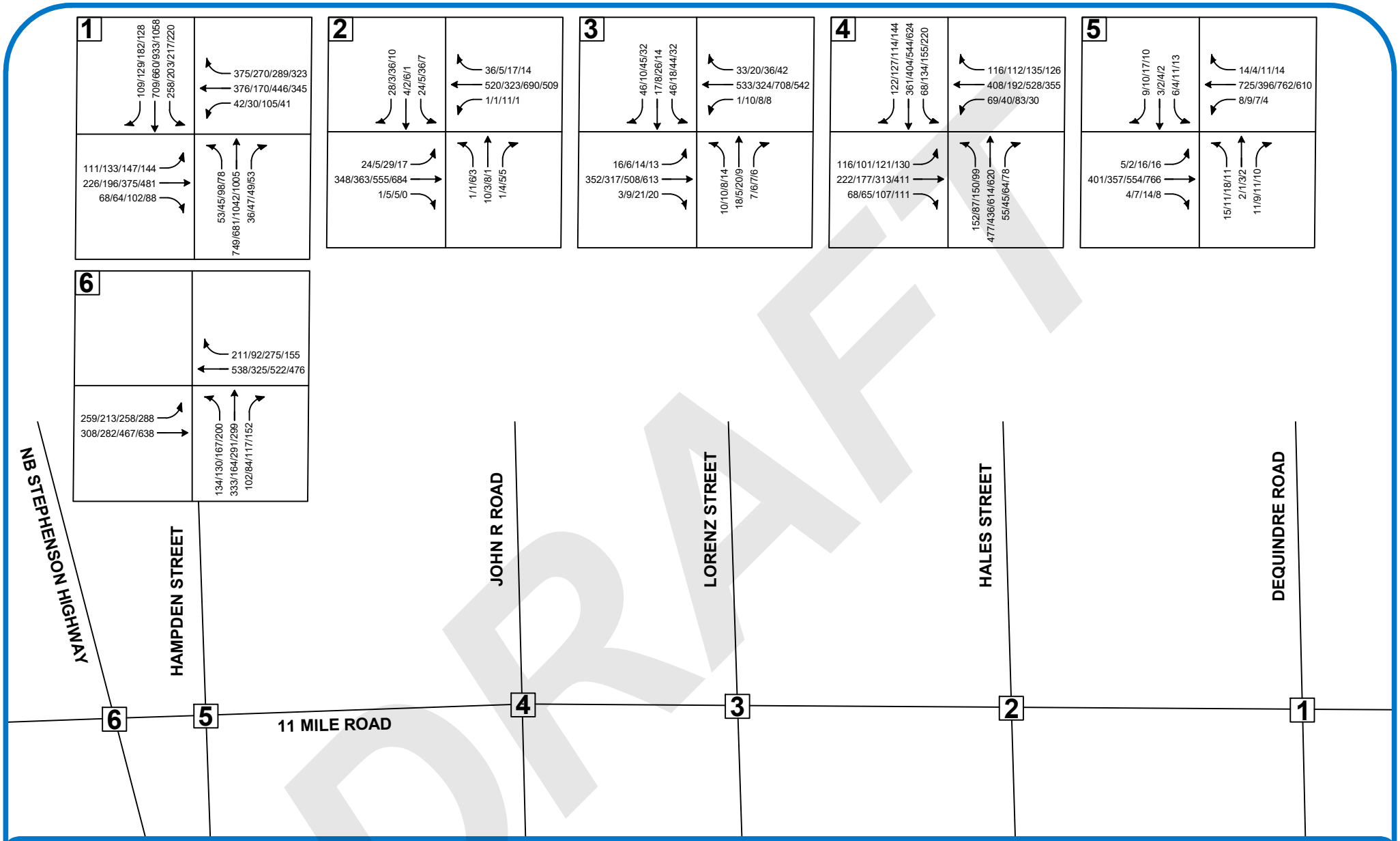


FIGURE 3

EXISTING TRAFFIC VOLUMES

11 MILE ROAD - ROAD DIET STUDY, MADISON HEIGHTS, MI

LEGEND

ROADS

TRAFFIC VOLUMES (AM/MD/School PM/PM)

NORTH

SCALE: NOT TO SCALE

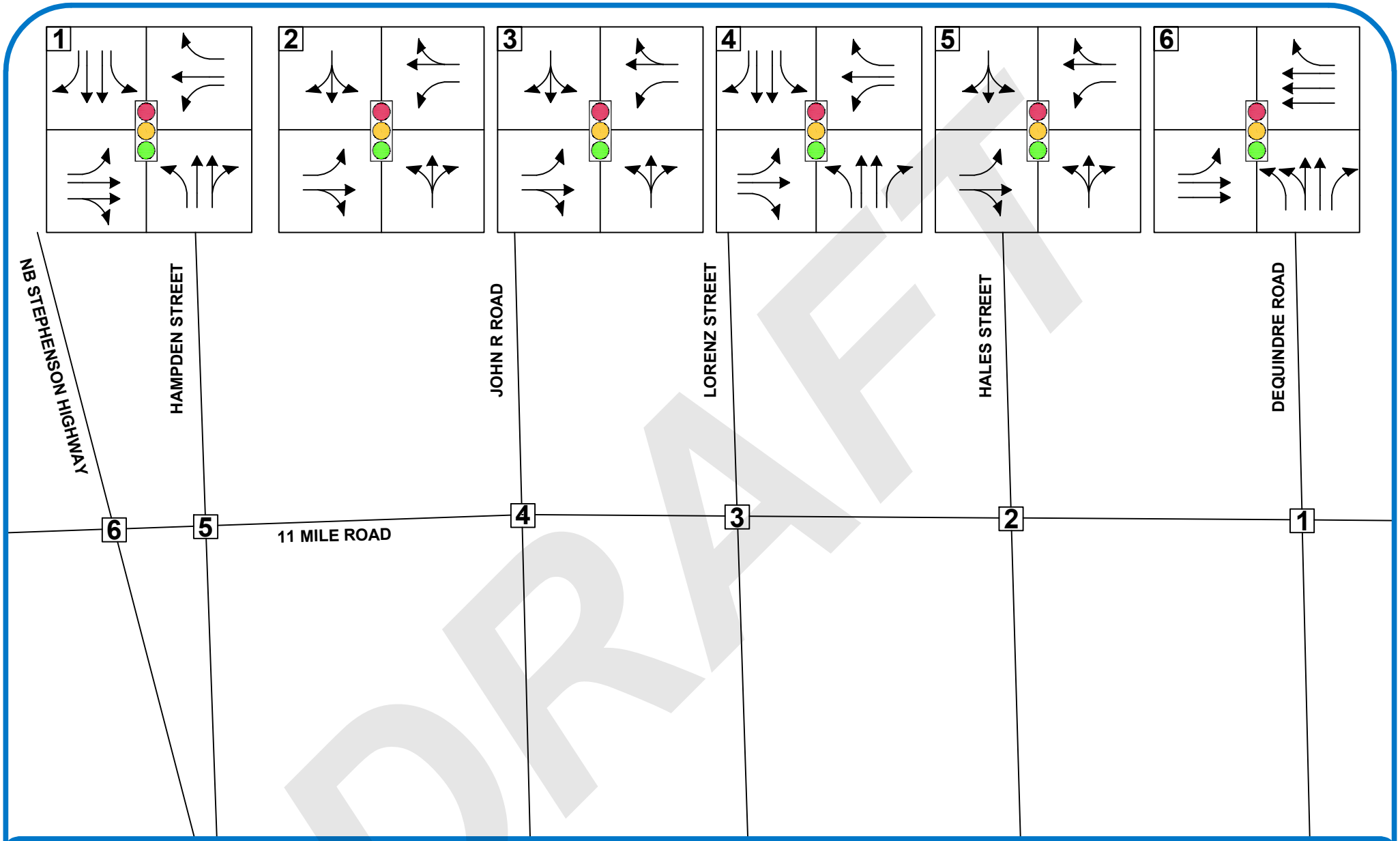


FIGURE 4
ROAD DIET LANE USE W/ RECOMMENDATIONS

11 MILE ROAD - ROAD DIET STUDY, MADISON HEIGHTS, MI

LEGEND

- ROADS
- ROAD DIET LANE USE
- SIGNALIZED INTERSECTION

NORTH

SCALE: NOT TO SCALE

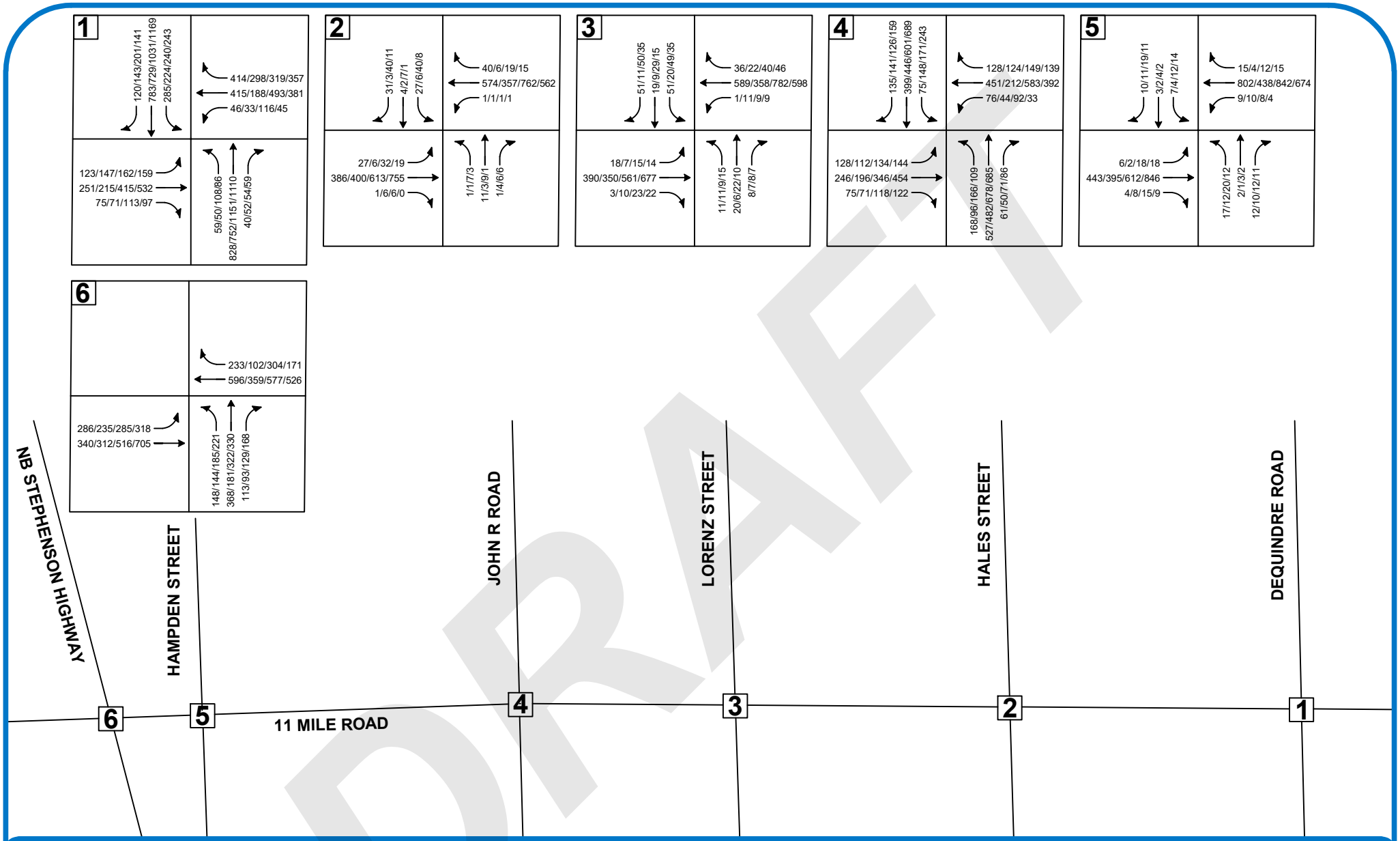


FIGURE 5
HORIZON YEAR (2044) TRAFFIC VOLUMES

11 MILE ROAD - ROAD DIET STUDY, MADISON HEIGHTS, MI

LEGEND

ROADS

TRAFFIC VOLUMES (AM/MD/School PM/PM)

NORTH

SCALE: NOT TO SCALE

Table 3: Road Diet Geometry (3 Lanes) Intersection Operations - Opening Day

	Intersection	Control	Approach	Existing Conditions (2024)								Road Diet (Opening Day 2024)								Difference							
				AM Peak		MD Peak		School PM Peak		PM Peak		AM Peak		MD Peak		School PM Peak		PM Peak		AM Peak		MD Peak		School PM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Dequindre Road & 11 Mile Road	Signalized	EBL	136.4	F	69.7	E	151.2	F	133.0	F	136.4	F	63.9	E	151.2	F	119.7	F	0.0	-	-5.8	-	0.0	-	-13.3	-
			EBTR	87.0	F	47.9	D	84.4	F	85.2	F	87.0	F	47.9	D	84.4	F	85.2	F	0.0	-	0.0	-	0.0	-	0.0	-
			WBL	59.7	E	35.9	D	68.1	E	72.0	E	59.7	E	37.6	D	67.6	E	72.5	E	0.0	-	1.7	-	-0.5	-	0.5	-
			WBT	85.4	F	36.2	D	97.5	F	81.9	F	78.3	E	36.1	D	120.4	F	77.3	E	-7.1	F→E	-0.1	-	22.9	-	-4.6	F→E
			WBTR / WBR	112.3	F	55.0	D	100.2	F	93.3	F	112.3	F	56.6	E	74.9	E	94.9	F	0.0	-	1.6	D→E	-25.3	F→E	1.6	-
			NBL	42.3	D	25.8	C	50.5	D	51.9	D	42.3	D	24.3	C	50.9	D	51.5	D	0.0	-	-1.5	-	0.4	-	-0.4	-
			NBTR	81.1	F	48.5	D	71.6	E	71.5	E	81.1	F	48.5	D	71.6	E	71.5	E	0.0	-	0.0	-	0.0	-	0.0	-
			SBL	49.5	D	29.9	C	62.7	E	57.9	E	49.5	D	28.3	C	63.2	E	57.4	E	0.0	-	-1.6	-	0.5	-	-0.5	-
			SBT	71.5	E	41.6	D	66.7	E	62.9	E	71.5	E	41.6	D	66.7	E	62.9	E	0.0	-	0.0	-	0.0	-	0.0	-
			SBR	46.2	D	27.6	C	41.0	D	34.6	C	46.2	D	29.1	C	41.0	D	34.7	C	0.0	-	1.5	-	0.0	-	0.1	-
			Overall	**80.0**	**E**	**44.6**	**D**	**77.5**	**E**	**73.6**	**E**	**79.2**	**E**	**44.4**	**D**	**78.3**	**E**	**72.8**	**E**	**-0.8**	**-**	**-0.2**	**-**	**0.8**	**-**	**-0.8**	**-**
2	Hales Street & 11 Mile Road	Signalized	EBTL / EBL	0.3	A	1.4	A	12.2	B	2.0	A	1.0	A	0.1	A	8.6	A	0.3	A	0.7	-	-1.3	-	-3.6	B→A	-1.7	-
			EBTR	0.3	A	1.5	A	12.7	B	2.1	A	0.5	A	0.4	A	4.7	A	1.0	A	0.2	-	-1.1	-	-8.0	B→A	-1.1	-
			WBTL / WBL	3.0	A	1.4	A	3.8	A	1.7	A	2.1	A	1.1	A	5.6	A	1.3	A	-0.9	-	-0.3	-	1.8	-	-0.4	-
			WBTR	3.0	A	1.4	A	3.9	A	1.8	A	4.3	A	1.7	A	6.1	A	2.3	A	1.3	-	0.3	-	2.2	-	0.5	-
			NB	33.5	C	38.4	D	32.3	C	37.6	D	33.5	C	38.4	D	32.4	C	37.6	D	0.0	-	0.0	-	0.1	-	0.0	-
			SB	36.8	D	38.4	D	36.4	D	38.6	D	36.9	D	38.4	D	36.8	D	38.6	D	0.1	-	0.0	-	0.4	-	0.0	-
			Overall	**5.2**	**A**	**2.8**	**A**	**10.3**	**B**	**3.1**	**A**	**6.0**	**A**	**2.4**	**A**	**8.5**	**A**	**2.8**	**A**	**0.8**	**-**	**-0.4**	**-**	**-1.8**	**B→A**	**-0.3**	**-**
3	Lorenz Street & 11 Mile Road	Signalized	EBTL / EBL	0.2	A	0.2	A	0.4	A	0.4	A	2.9	A	0.0	A	1.0	A	0.1	A	2.7	-	-0.2	-	0.6	-	-0.3	-
			EBTR	0.3	A	0.2	A	0.4	A	0.5	A	0.5	A	0.4	A	0.9	A	1.1	A	0.2	-	0.2	-	0.5	-	0.6	-
			WBTL / WBL	12.9	B	0.2	A	0.6	A	0.4	A	5.5	A	0.0	A	0.0	A	0.0	A	-7.4	B→A	-0.2	-	-0.6	-	-0.4	-
			WBTR	13.0	B	0.2	A	0.7	A	0.5	A	11.0	B	0.4	A	2.0	A	1.1	A	-2.0	-	0.2	-	1.3	-	0.6	-
			NB	31.2	C	37.1	D	31.9	C	35.1	D	31.4	C	37.1	D	32.1	C	35.1	D	0.2	-	0.0	-	0.2	-	0.0	-
			SB	35.6	D	38.6	D	36.1	D	37.5	D	35.9	D	38.6	D	36.5	D	37.7	D	0.3	-	0.0	-	0.4	-	0.2	-
			Overall	**12.4**	**B**	**3.6**	**A**	**4.3**	**A**	**3.6**	**A**	**11.5**	**B**	**3.8**	**A**	**5.3**	**A**	**4.2**	**A**	**-0.9**	**-**	**0.2**	**-**	**1.0**	**-**	**0.6**	**-**
4	John R Road & 11 Mile Road	Signalized	EBL	38.6	D	36.1	D	42.6	D	37.3	D	39.8	D	36.5	D	44.4	D	33.5	C	1.2	-	0.4	-	1.8	-	-3.8	D→C
			EBT	36.6	D	34.8	C	34.1	C	43.0	D	36.4	D	38.3	D	33.5	C	43.9	D	-0.2	-	3.5	C→D	-0.6	-	0.9	-
			EBTR / EBR	37.3	D	35.2	D	34.7	C	44.1	D	30.3	C	32.8	C	26.3	C	22.9	C	-7.0	D→C	-2.4	D→C	-8.4	-	-21.2	D→C
			WBL	33.0	C	33.5	C	32.4	C	36.4	D	31.4	C	34.7	C	30.0	C	37.1	D	-1.6	-	1.2	-	-2.4	-	0.7	-
			WBT	39.4	D	40.1	D	46.4	D	43.6	D	43.0	D	40.7	D	54.8	D	43.5	D	3.6	-	0.6	-	8.4	-	-0.1	-
			WBTR / WBR	40.1	D	41.3	D	46.7	D	44.9	D	29.8	C	37.1	D	26.0	C	31.2	C	-10.3	D→C	-4.2	-	-20.7	D→C	-13.7	D→C
			NBL	20.8	C	15.3	B	29.2	C	23.8	C	25.3	C	15.8	B	38.6	D	29.8	C	4.5	-	0.5	-	9.4	C→D	6.0	-
			NBT	29.1	C	24.0	C	31.6	C	26.3	C	32.2	C	23.0	C	39.5	D	30.5	C	3.1	-	-1.0	-	7.9	C→D	4.2	-
			NBR	24.1	C	20.6	C	24.2	C	21.3	C	25.9	C	19.9	B	27.0	C	23.9	C	1.8	-	-0.7	C→B	2.8	-	2.6	-
			SBL	21.0	C	17.4	B	30.2	C	27.9	C	25.3	C	18.0	B	43.6	D	36.0	D	4.3	-	0.6	-	13.4	C→D	8.1	C→D
			SBT	26.6	C	23.1	C	30.3	C	25.9	C	28.8	C	22.2	C	36.4	D	29.9	C	2.2	-	-0.9	-	6.1	C→D	4.0	-
			SBR	26.5	C	22.6	C	26.2	C	23.1	C	28.8	C	21.7	C	29.6	C	26.2	C	2.3	-	-0.9	-	3.4	-	3.1	-
			Overall	**31.6**	**C**	**27.6**	**C**	**35.4**	**D**	**32.9**	**C**	**33.1**	**C**	**27.2**	**C**	**39.6**	**D**	**33.9**	**C**	**1.5**	**-**	**-0.4**	**-**	**4.2**	**-**	**1.0**	**-**
5	Hampden Street & 11 Mile Road	Signalized	EBTL / EBL	0.2	A	0.2	A	0.3	A	0.5	A	1.1	A	0.2	A	2.3	A	0.7	A	0.9	-	0.0	-	2.0	-	0.2	-
			EBTR	0.2	A	0.2	A	0.4	A	0.5	A	0.5	A	0.4	A	0.8	A	1.4	A	0.3	-	0.2	-	0.4	-	0.9	-
			WBTL / WBL	2.6	A	2.4	A	3.1	A	2.6	A	1.8	A	1.9	A	2.0	A	1.9	A	-0.8	-	-0.5	-	-1.1	-	-0.7	-
			WBTR	2.7	A	2.4	A	3.1	A	2.7	A	4.1	A	3.0	A	5.4	A	3.7	A	1.4	-	0.6	-	2.3	-	1.0	-
			NB	44.2	D	38.3	D	39.1	D	38.6	D	44.2	D	38.3	D	39.2	D	38.6	D	0.0	-	0.0	-	0.1	-	0.0	-
			SB	43.4	D	38.3	D	38.8	D	38.5	D	43.4	D	38.3	D	38.8	D	38.5	D	0.0	-	0.0	-	0.0	-	0.0	-
			Overall	**4.1**	**A**	**3.6**	**A**	**4.0**	**A**	**3.0**	**A**	**5.0**	**A**	**4.0**	**A**	**5.5**	**A**	**3.9**	**A**	**0.9**	**-**	**0.4**	**-**	**1.5**	**-**	**0.9**	**-**
6	NB Stephenson Highway & 11 Mile Road	Signalized	EBL	18.5	B	3.7	A	15.6	B	7.2	A	18.5	B	3.7	A	15.6	B	7.2	A	0.0	-	0.0	-	0.0	-	0.0	-
			EBT	8.4	A	2.1	A	10.8	B	3.0	A	8.4	A	2.1	A	10.8	B	3.0	A	0.0	-	0.0	-	0.0	-	0.0	-
			WBT	13.2	B	8.2	A	11.6	B	12.0	B	12.9	B	8.4	A	12.4	B	12.5	B	-0.3	-	0.2	-	0.8	-	0.5	-
			WBR	14.5	B	8.4	A	13.7	B	12.4	B	13.8	B	8.5	A	14.0	B	12.7	B	-0.7	-	0.1	-	0.3	-	0.3	-
			NBL	36.3	D	37.7	D	35.9	D	34.9	C	36.3	D	37.7	D	35.9	D	34.9	C	0.0	-	0.0	-	0.0	-	0.0	-
			NBTL	38.8	D	36.9	D	34.7	C	33.8	C	38.8	D	36.9	D	34.7	C	33.8	C	0.0	-	0.0	-	0.0	-	0.0	-
			NBR	35.5	D	37.2	D	34.0	C	34.3	C	35.5	D	37.2	D	34.0	C	34.3	C	0.0	-	0.0	-	0.0	-	0.0	-
			Overall	**21.9**	**C**	**14.9**	**B**	**18.7**	**B**	**15.2**	**B**	**21.7**	**C**	**15.0**	**A**	**19.0**	**B**	**15.3**	**B**	**-0.2**	**-**	**0.1**	**B→A**	**0.3**	**-**	**0.1**	**-**

** Decreased delays and improved LOS are the result of improved progression and arrival on green factors and HCM methodology*

Table 5: Road Diet Geometry (3 Lanes) Intersection Operations - Horizon Year (2044)

	Intersection	Control	Approach	Road Diet (Opening Day 2024)								Road Diet (Horizon Year 2044)								Difference							
				AM Peak		MD Peak		School PM Peak		PM Peak		AM Peak		MD Peak		School PM Peak		PM Peak		AM Peak		MD Peak		School PM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Dequindre Road & 11 Mile Road	Signalized	EBL	136.4	F	63.9	E	151.2	F	119.7	F	166.0	F	66.7	E	179.9	F	146.5	F	29.6	-	2.8	-	28.7	-	26.8	-
			EBTR	87.0	F	47.9	D	84.4	F	85.2	F	85.7	F	47.3	D	85.4	F	86.6	F	-1.3	-	-0.6	-	1.0	-	1.4	-
			WBL	59.7	E	37.6	D	67.6	E	72.5	E	61.3	E	36.3	D	70.8	E	72.3	E	1.6	-	-1.3	-	3.2	-	-0.2	-
			WBT	78.3	E	36.1	D	120.4	F	77.3	E	92.8	F	35.0	D	157.6	F	78.7	E	14.5	E→F	-1.1	-	37.2	-	1.4	-
			WBTR / WBR	112.3	F	56.6	E	74.9	E	94.9	F	143.0	F	59.9	E	85.5	F	100.4	F	30.7	-	3.3	-	10.6	E→F	5.5	-
			NBL	42.3	D	24.3	C	50.9	D	51.5	D	45.8	D	27.9	C	55.4	E	59.1	E	3.5	-	3.6	-	4.5	D→E	7.6	D→E
			NBTR	81.1	F	48.5	D	71.6	E	71.5	E	77.5	E	47.1	D	68.6	E	68.5	E	-3.6	F→E	-1.4	-	-3.0	-	-3.0	-
			SBL	49.5	D	28.3	C	63.2	E	57.4	E	55.9	E	32.8	C	73.8	E	69.5	E	6.4	D→E	4.5	-	10.6	-	12.1	-
			SBT	71.5	E	41.6	D	66.7	E	62.9	E	68.2	E	40.3	D	63.2	E	59.4	E	-3.3	-	-1.3	-	-3.5	-	-3.5	-
			SBR	46.2	D	29.1	C	41.0	D	34.7	C	42.9	D	27.0	C	37.6	D	31.1	C	-3.3	-	-2.1	-	-3.4	-	-3.6	-
			Overall	79.2	E	44.4	D	78.3	E	72.8	E	**84.1**	**F**	**44.4**	**D**	**83.5**	**F**	**73.5**	**E**	**4.9**	**E→F**	**0.0**	**-**	**5.2**	**E→F**	**0.7**	**-**
2	Hales Street & 11 Mile Road	Signalized	EBTL / EBL	1.0	A	0.1	A	8.6	A	0.3	A	1.4	A	0.1	A	4.5	A	0.4	A	0.4	-	0.0	-	-4.1	-	0.1	-
			EBTR	0.5	A	0.4	A	4.7	A	1.0	A	0.5	A	0.4	A	1.4	A	1.3	A	0.0	-	0.0	-	-3.3	-	0.3	-
			WBTL / WBL	2.1	A	1.1	A	5.6	A	1.3	A	2.2	A	1.2	A	3.0	A	1.3	A	0.1	-	0.1	-	-2.6	-	0.0	-
			WBTR	4.3	A	1.7	A	6.1	A	2.3	A	4.8	A	1.8	A	7.6	A	2.6	A	0.5	-	0.1	-	1.5	-	0.3	-
			NB	33.5	C	38.4	D	32.4	C	37.6	D	33.4	C	38.3	D	31.7	C	37.5	D	-0.1	-	-0.1	-	-0.7	-	-0.1	-
			SB	36.9	D	38.4	D	36.8	D	38.6	D	37.3	D	38.4	D	36.3	D	38.5	D	0.4	-	0.0	-	-0.5	-	-0.1	-
			Overall	6.0	A	2.4	A	8.5	A	2.8	A	**6.2**	**A**	**2.4**	**A**	**7.9**	**A**	**2.9**	**A**	**0.2**	**-**	**0.0**	**-**	**-0.6**	**-**	**0.1**	**-**
3	Lorenz Street & 11 Mile Road	Signalized	EBTL / EBL	2.9	A	0.0	A	1.0	A	0.1	A	3.9	A	0.0	A	0.1	A	0.1	A	1.0	-	0.0	-	-0.9	-	0.0	-
			EBTR	0.5	A	0.4	A	0.9	A	1.1	A	0.6	A	4.0	A	1.1	A	1.4	A	0.1	-	3.6	-	0.2	-	0.3	-
			WBTL / WBL	5.5	A	0.0	A	0.0	A	0.0	A	5.8	A	0.0	A	0.0	A	0.1	A	0.3	-	0.0	-	0.0	-	0.1	-
			WBTR	11.0	B	0.4	A	2.0	A	1.1	A	12.4	A	0.4	A	2.8	A	1.4	A	1.4	B→A	0.0	-	0.8	-	0.3	-
			NB	31.4	C	37.1	D	32.1	C	35.1	D	30.7	C	37.0	D	31.3	C	34.9	C	-0.7	-	-0.1	-	-0.8	-	-0.2	D→C
			SB	35.9	D	38.6	D	36.5	D	37.7	D	35.5	D	38.7	D	36.1	D	37.4	D	-0.4	-	0.1	-	-0.4	-	-0.3	-
			Overall	11.5	B	3.8	A	5.3	A	4.2	A	**12.2**	**B**	**3.9**	**A**	**5.8**	**A**	**4.4**	**A**	**0.7**	**-**	**0.1**	**-**	**0.5**	**-**	**0.2**	**-**
4	John R Road & 11 Mile Road	Signalized	EBL	39.8	D	36.5	D	44.4	D	33.5	C	42.7	D	37.0	D	50.5	D	34.9	C	2.9	-	0.5	-	6.1	-	1.4	-
			EBT	36.4	D	38.3	D	33.5	C	43.9	D	35.8	D	37.9	D	32.3	C	49.3	D	-0.6	-	-0.4	-	-1.2	-	5.4	-
			EBTR / EBR	30.3	C	32.8	C	26.3	C	22.9	C	29.4	C	32.1	C	25.0	C	21.9	C	-0.9	-	-0.7	-	-1.3	-	-1.0	-
			WBL	31.4	C	34.7	C	30.0	C	37.1	D	31.1	C	34.7	C	27.1	C	37.1	D	-0.3	-	0.0	-	-2.9	-	0.0	-
			WBT	43.0	D	40.7	D	54.8	D	43.5	D	45.1	D	40.7	D	48.8	D	45.7	D	2.1	-	0.0	-	-6.0	-	2.2	-
			WBTR / WBR	29.8	C	37.1	D	26.0	C	31.2	C	29.0	C	36.7	D	20.5	C	30.6	C	-0.8	-	-0.4	-	-5.5	-	-0.6	-
			NBL	25.3	C	15.8	B	38.6	D	29.8	C	28.3	C	17.5	B	46.4	D	32.0	C	3.0	-	1.7	-	7.8	-	2.2	-
			NBT	32.2	C	23.0	C	39.5	D	30.5	C	30.5	C	24.7	C	134.6	F	38.6	D	-1.7	-	1.7	-	95.1	D→F	8.1	C→D
			NBR	25.9	C	19.9	B	27.0	C	23.9	C	24.3	C	20.7	C	31.8	C	26.0	C	-1.6	-	0.8	B→C	4.8	-	2.1	-
			SBL	25.3	C	18.0	B	43.6	D	36.0	D	28.1	C	20.3	C	52.3	D	46.7	D	2.8	-	2.3	B→C	8.7	-	10.7	-
			SBT	28.8	C	22.2	C	36.4	D	29.9	C	27.2	C	23.6	C	100.9	F	36.8	D	-1.6	-	1.4	-	64.5	D→F	6.9	C→D
			SBR	28.8	C	21.7	C	29.6	C	26.2	C	27.1	C	23.0	C	37.6	D	29.4	C	-1.7	-	1.3	-	8.0	C→D	3.2	-
			Overall	33.1	C	27.2	C	39.6	D	33.9	C	**33.0**	**C**	**28.2**	**C**	**69.6**	**E**	**39.1**	**D**	**-0.1**	**-**	**1.0**	**-**	**30.0**	**D→E**	**5.2**	**C→D**
5	Hampden Street & 11 Mile Road	Signalized	EBTL / EBL	1.1	A	0.2	A	2.3	A	0.7	A	1.6	A	0.3	A	3.5	A	0.9	A	0.5	-	0.1	-	1.2	-	0.2	-
			EBTR	0.5	A	0.4	A	0.8	A	1.4	A	0.5	A	0.4	A	1.0	A	1.7	A	0.0	-	0.0	-	0.2	-	0.3	-
			WBTL / WBL	1.8	A	1.9	A	2.0	A	1.9	A	1.8	A	2.0	A	2.0	A	1.9	A	0.0	-	0.1	-	0.0	-	0.0	-
			WBTR	4.1	A	3.0	A	5.4	A	3.7	A	4.6	A	3.1	A	6.3	A	4.0	A	0.5	-	0.1	-	0.9	-	0.3	-
			NB	44.2	D	38.3	D	39.2	D	38.6	D	44.4	D	38.3	D	39.3	D	38.7	D	0.2	-	0.0	-	0.1	-	0.1	-
			SB	43.4	D	38.3	D	38.8	D	38.5	D	43.6	D	38.3	D	39.0	D	38.5	D	0.2	-	0.0	-	0.2	-	0.0	-
			Overall	5.0	A	4.0	A	5.5	A	3.9	A	**5.4**	**A**	**4.0**	**A**	**6.1**	**A**	**4.2**	**A**	**0.4**	**-**	**0.0**	**-**	**0.6**	**-**	**0.3**	**-**
6	NB Stephenson Highway & 11 Mile Road	Signalized	EBL	18.5	B	3.7	A	15.6	B	7.2	A	23.5	C	4.2	A	19.3	B	9.2	A	5.0	B→C	0.5	-	3.7	-	2.0	-
			EBT	8.4	A	2.1	A	10.8	B	3.0	A	10.2	B	2.1	A	12.2	B	3.2	A	1.8	A→B	0.0	-	1.4	-	0.2	-
			WBT	12.9	B	8.4	A	12.4	B	12.5	B	14.1	B	8.9	A	13.9	B	13.1	B	1.2	-	0.5	-	1.5	-	0.6	-
			WBR	13.8	B	8.5	A	14.0	B	12.7	B	15.2	B	8.9	A	16.1	B	13.5	B	1.4	-	0.4	-	2.1	-	0.8	-
			NBL	36.3	D	37.7	D	35.9	D	34.9	C	34.8	C	37.7	D	34.9	C	34.5	C	-1.5	D→C	0.0	-	-1.0	D→C	-0.4	-
			NBTL	38.8	D	36.9	D	34.7	C	33.8	C	37.4	D	36.7	D	33.6	C	33.3	C	-1.4	-	-0.2	-	-1.1	-	-0.5	-
			NBR	35.5	D	37.2	D	34.0	C	34.3	C	34.0	C	37.0	D	32.8	C	34.0	C	-1.5	D→C	-0.2	-	-1.2	-	-0.3	-
			Overall	21.7	C	15.0	A	19.0	B	15.3	B	**22.5**	**C**	**15.2**	**B**	**20.0**	**C**	**15.8**	**B**	**0.8**	**-**	**0.2**	**A→B**	**1.0**	**B→C**	**0.5**	**-**

** Decreased delays and improved LOS are the result of improved progression and arrival on green factors and HCM methodology*