Roads Committee Discoveries

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February 22, 2021

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Roads Committee Discoveries

Introduction

The Novi Roads Committee was formed in December of 2019 at the direction of City Council with the goal of developing a plan to prioritize road projects to maintain safety, improve road conditions and traffic flow, and explore funding opportunities.

The committee members were appointed by Mayor Bob Gatt the committee and is composed of the following members:

- Mayor, Bob Gatt
- City Council Member/Committee Chair, Laura Marie Casey
- City Council Member, Andrew Mutch
- Citizen Representative, Brian Bartlett
- Citizen Representative, Alex Dinser
- City Manager, Pete Auger
- Director of Public Works, Jeff Herczeg
- Assistant Chief of Police, Erick Zinser
- City Planner, Barb McBeth
- CFO/Finance Director, Carl Johnson
- Community Relations Specialist, Nathan Mueller
- Consulting Engineer OHM Advisors, Tim Juidici
- Consulting Engineer AECOM, Mark Koskinen

The staff and Consulting Engineer committee members provided information and presentations to the committee which were relevant to the committee's goals and objectives. Staff participation was for guidance and facilitation only, in order to maintain unbiased and transparent results.

The committee began meeting bi-monthly in January of 2020 and continued through March of 2020. Meetings were suspended during the first wave of the COVID-19 pandemic and resumed in September of 2020. With the economic conditions brought on by the pandemic, the committee's task turned to developing a set of findings to share with Council and the community, excluding funding recommendations as had initially been intended.

The findings provided in this report focus on, but are not limited to, the time period from 2012 to present day and include projections out through 2026. This timeline corresponds to the previous road condition assessment provided by OHM Advisors in 2012 (Appendix F), the passing of the Road Millage in 2013, and the subsequent influx of additional road funds into the local road program. The committee also looked at long-term planning and megaprojects to address traffic movement and capacity. Furthermore, analysis of safety and accident mitigation and new design and technology opportunities were also presented and reviewed.

The initial committee meetings consisted of roundtable discussions and presentations on **ROADS 101** (Appendix A & B). This information provided a foundation for the committee to build on and a general direction for the group to follow.

Introductory topics included road funding, road jurisdictions, the impact of other franchise utilities, asset management, and the capital improvement planning process (see Roads 101, Appendix A & B). The most significant component to all discussions herein is funding. Below are Novi's three major road fund sources and how they are generated:

- **202–Major Roads**
  - Funded by Act 51 ~ $4M/year

- **203–Local Roads**
  - Funded by Act 51 ~ $1.5M/year

- **204–Municipal Roads**
  - Funded by Metro Act Revenue approx. $185,000/year
  - Funded by Trunkline Revenue approx. $113,000/year
  - Funded by dedicated road millage (1.5 mills), which has generated between $4.9-$5.3M/year to supplement 202 and 203.

In general, the City has ~$11M of funds dedicated to roads per year. The City expends between $2-3M for maintenance, leaving $7-9M targeted for capital expenditures for road improvements and non-motorized projects.

Maximizing these funds is critical since the cost of road rehabilitation and reconstruction per lane mile in today's dollars is as follows:

Asphalt	Structural Improvement/Rehabilitation	$300,000 – $500,000
Asphalt	Reconstruction	$800,000 – 1,250,000
Concrete	Structural Improvement/Rehabilitation	$350,000 - $500,000
Concrete	Reconstruction	$1,000,000 – $1,500,000

The City's road network is a mix of jurisdictions between the City, Michigan Department of Transportation (MDOT) and the Road Commission for Oakland County (RCOC), which presents unique circumstances for maintenance, prioritization, and project planning. The even-numbered Mile Roads and east-west borders are RCOC roads (8 Mile shared with Wayne County), and M-5 and I-96/696 are MDOT. For the rest of the city network and road designation, refer to Roadway Jurisdiction Map (Appendix 5)

The discoveries encompass the City road network that is 187 centerline miles of local and major roads. The entirety of road surface is expressed lane miles, which is centerline miles multiplied by number of lanes per segment (length x width, one mile segment of a 4-lane road = 4 lane miles). The City's total lanes miles are 391.

Novi driver experience and satisfaction are critical, and working with other agencies to initiate, fund, and execute projects in the city has been a priority. Several projects with outside entities are currently underway or are in the planning stages. An expansion of those projects can be found later in this document under **Major Roads Projects and Traffic Improvements.**

Asset management and capital planning are essential for Novi's for budgeting purposes, and the roads program is critical within this process. In accordance with Public Act 325, the City is required to submit a Transportation Asset Management Plan (TAMP) to the Michigan Transportation Asset Management Council (TAMC). A TAMP is required for every local agency with 100 or more miles of roadway under their jurisdiction. While the City is not required to submit the TAMP until October 1, 2022, staff took a proactive approach to complete the report early. The TAMP effort also includes an additional prioritization for the road CIP program from 2020-2024, which is referred to as the **Road Report** for the purposes of this document. The TAMP document, in its own specific format, will be delivered as part of the normal Act 51 yearly reporting in 2022.

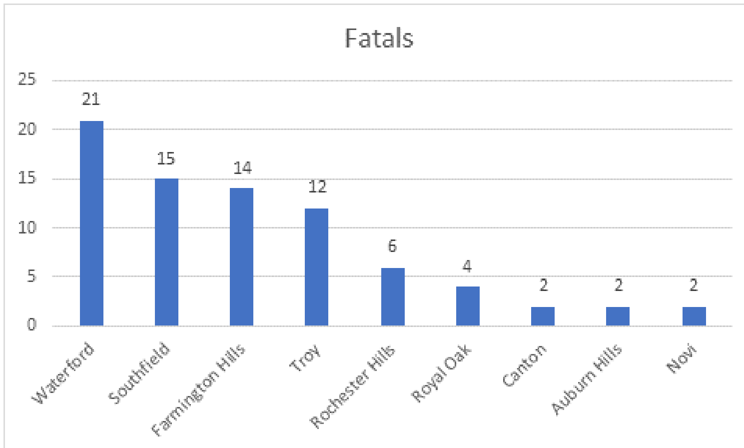
The committee was tasked with the review and endorsement of the **Road Report** (Appendix G)**.** Over the duration of several committee meetings, staff introduced and presented the draft deliverables for feedback and discussion. The findings in the report were assembled from historical data, and updates were made through 2020. The Road Report is detailed more under the following Local Roads section of this document.

Safety

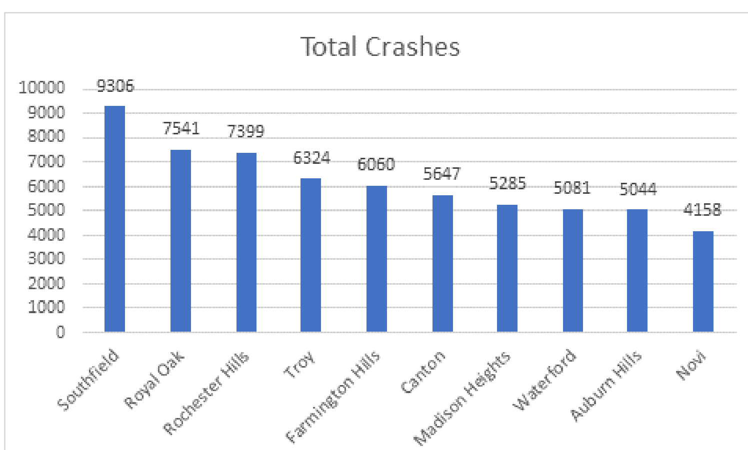
Safety for motorists living in and traveling through Novi is a priority for staff and City Council. Addressing the most dangerous intersections was a City Council goal following the Thoroughfare Master Plan update (2016, Appendix K) which identified opportunities for crash reduction by implementing countermeasures. These countermeasures included: adjusting the traffic signal timing, traffic signal modernization upgrades, and the Novi Police Department utilizing an innovative approach to reduce traffic crashes through a Data-Driven Approach to Crime and Traffic Safety (DDACTS).

The concept behind DDACTS is to analyze three to five years of data to identify where most traffic crashes are happening, both by date and time of day. Based on the data, DDACTS Zones, or "hot spots", are created. These zones become the focus of extra police presence during peak times of crime and crashes. The goal is not necessarily to issue citations, but rather initiate police contacts and have highly visible traffic enforcement. The Novi Police Department has seen significant decreases in traffic crashes in identified DDACTS Zones. The intersection of Beck Road and Grand River saw a 50% decrease in traffic crashes from 2018 to 2020. The intersection of Novi Road and I-96 saw a 34% decrease for the same period.

The Roads Committee reviewed crash results from 2012-2016 through the Top 15 Most Dangerous Intersection memo (Appendix V) and from 2018-2020 from the Public Safety Crash Analysis (Appendix E), and the findings were encouraging in both reports. A three-year analysis of traffic crashes from 2018-2020 show overall crashes are down 35.2% from the three years prior to 2018. Further, the City of Novi experienced only two fatal crashes during the same time frame; however, neither crash was on a public roadway.



The common characteristic in both the consulting traffic engineer's (AECOM) study and the police department's crash analysis are that rear-end crashes are the most common occurrence (40% of all crashes). These types of crashes are usually caused by driver distraction and are rarely severe or deadly. Countermeasures such as new roundabouts, signal modernizations, lighting, and DDACTS have been effective in reducing traffic crashes. Furthermore, weather related crashes during the same time only accounted for 8% of the total crashes reported. This leads to the conclusion that distracted driving is four times more likely to be the cause of a crash versus poor road conditions and confirms advancements in winter maintenance operations have paid off for Novi motorist. A comparison of data from 2018-2020 shows Novi has significantly fewer crashes than comparable jurisdictions.



All other crash data is included in Appendix E, along with maps of intersection improvements and countermeasures completed/planned for reference (Appendix 3).

Local Roads

Local roads, also referred to as neighborhood roads, is comprised of ~155 centerline miles and makes up around 80% of the total network. These are the subdivision streets and other roads that Novi residents use and live on, and therefore, generally draw the most attention. Since the local roads make up a significant amount of the overall network, the information and recommendations in the Road Report are critical for planning and prioritizing. Constructing the Road Report consisted of the following steps:

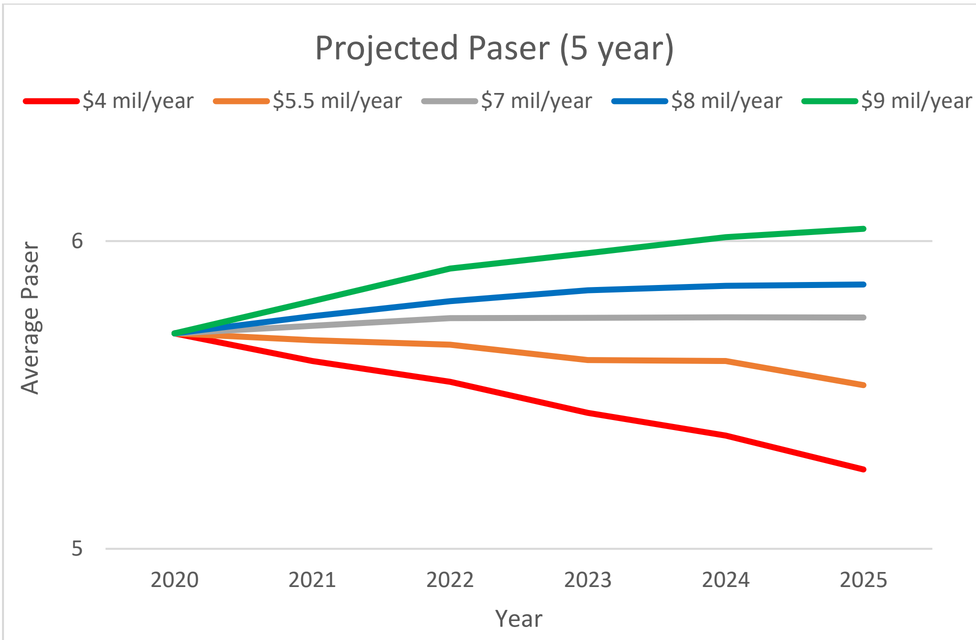
- Survey of the roads (visual, see PASER memo Appendix S)
- Update of completed projects to ensure good data.
- Update of current project costs.
- Budget/forecast data/optimize fixes and funding levels.
- Build 5-Year plan based on need and value to enhance driver/resident experience and satisfaction.

Novi has made significant investment and has improved conditions over the last several years with Neighborhood Road Programs (NRP) including Asphalt and Concrete reconstructions/rehabilitations, and a Concrete Panel Repair program (CPR). Total dollars invested in the NRP from 2014-2020 is ~$25M. Below is the year over year costs for the local road's programs and the proposed three-year plan for the NRP. At the end of 2023, the total investment in local roads will reach almost $40M in just over ten years' time.

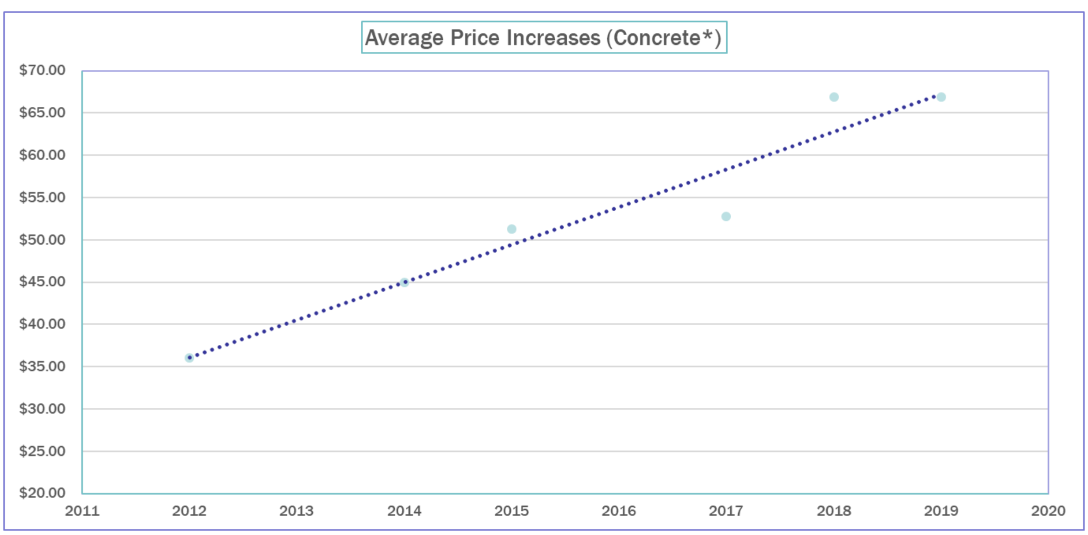
Year	NRP+CPR Costs	Program	Notes
2012	$1,181,611.00	NRP	Additional road millage passed
2013	$1,632,271.00	NRP	Collection of millage begins on winter tax
2014	$1,429,864.00	NRP	Projects planned in CIP with millage collection
2015	$4,010,101.00	NRP	Project implemented with millage funds
2016	$2,128,387.00	NRP	
2017	$3,236,738.00	NRP+CPR	Initiate Concrete Panel Repair Program (CPR)
2018	$3,563,860.94	NRP+CPR	
2019	$3,423,724.00	NRP+CPR	
2020	$4,998,525.00	NRP+CPR	Includes Cranbrooke Phase 1
	$25,605,081.94		Total Investment in Neighborhood Roads
	3 Year Proposed		
2021	$5,973,069.00	NRP+CPM	Initiate Asphalt Capital Preventative Maintenance (CPM), Cranbrooke Phase 2
2022	$3,900,000.00	NRP+CPM	
2023	$3,700,000.00	NRP+CPM	

NRP: Neighborhood Road Programs, CPR: Concrete Panel Repair, CPM: Capital Preventative Maintenance

A graph presented in the Road Report using 2018 road data (local and major) and costs of construction (pg 7, App G) showed projected network PASER ratings related to dollars invested. Based on the most recent PASER evaluation in October 2020, the last 3 years of investment in the above programs has resulted in an overall network PASER rating increase from 5.4 (2018) to 5.8 (2020). The updated graph below projects the next five years for both local and major roads.



Although the current trend is favorable, by maintaining the existing road funding levels ($7-$9M), the City will see a flat or slight increase in network road condition moving forward. Construction costs since 2012 have increased ~30% per square yard of material (see below).



*concrete used as base line, but asphalt and aggregate prices have seen parallel increase

While concrete unit prices have since leveled off at an average of $60/square yard (based on bid tabs from 2020) the reduction is likely related to COVID-19 and a drop in demand. Larger regional and state projects coming forward will likely again push price increases over the next few years. Asphalt unit prices increased from $80/ton in 2018 to $120/ton in 2020 and aggregate base material increased proportionately, impacting how far road dollars can be stretched. Unit prices (concrete vs. asphalt) are reviewed annually to determine cost-saving opportunities. For example, Jo Drive, part of the 2020 NRP, was designed as an asphalt reconstruction, but was changed to concrete based on program pricing. However, generally infrastructure is replaced in kind based on service life.

It is estimated an additional $1.5M - $2M/year of road funding spent mostly on local roads, with the right mix of fixes, would provide a comparable increase (in rating) to the overall network condition. Considerations (if any) for additional road funding should include a level of service/experience expectation for residents tempered by the economic conditions.

In the short term, the asset management plan is performing adequately. However, based on the Road Report, almost 50% of the City's road network is in the "fair" range (see below) with the majority of the mileage being asphalt.

Category	Rating					Total (centerline miles)
	Excellent (9-10)	Very Good (8)	Good (6-7)	Fair (4-5)	Poor (1-3)	
Major	5.36	1.64	4.24	18.95	2.91	33.09
Local	7.47	11.95	46.65	70.08	18.44	154.60
Total Mileage	12.8	13.6	50.9	89.0	21.3	187.7
% of network	7%	7%	27%	47%	11%	100%

The total mileage of asphalt pavement in "fair" range is approximately 59.5 miles (with an estimated cost of almost $65 million if left untouched until reconstruction is needed).

It is possible to effectively extend the life of asphalt roads in the "fair" range less expensively through the use of surface sealers, crack filling, and minor patching, referred to as the Asphalt Capital Preventative Maintenance program (CPM). Similar to the way the CPR addressed concrete roads, this program should maintain asphalt roads in the fair/good category, and thereby, extending service life and increasing local network integrity. Therefore, implementing a CPM program is both recommended and supported by the committee.

A NRP and CPM map of work planned and performed is included in Appendixes 1 and 2 for reference.

Major Road Projects and Traffic Improvements

While Major Roads only account for 20% of the system, they are critical for traffic movement into and out of the city. Poor conditions on major roads are usually a greater concern as they carry exponentially more traffic and generally consist of more lane miles, resulting in higher cost to maintain.

The City proactively pursues alternative funding and leverages relationships to complete major projects and stretch road dollars. Since 2014, the City has been successful in obtaining ~$4M (since 2014) of funding from federal and local road programs to supplement Novi road projects.

Advance constructing projects and partnerships to acquire federal road funds with RCOC has also been beneficial. The City has recently taken advantage of agreements to front funds and to expedite construction with RCOC on projects with obligated (or yet to be assigned) dollars in future fiscal years. These agreements benefit all entities, as well as the residents, since much needed local and regional improvements are being addressed. In 2019, Novi Road and 12 Mile Road intersection (~$1M) was reconstructed using the advanced construct method, and in 2022, 10 Mile Road from Haggerty to Meadowbrook (~$5M) will be rehabilitated with a continuous center left-turn lane utilizing the same type of agreement. In 2017, Novi used federal funds in a partnership with RCOC and Lyon Township to rehabilitate Napier Road from 9 Mile to 10 Mile (~$5M) including a new roundabout.

Additionally, Great Lakes Water Authority (GLWA) is installing a 54" Transmission Main through Novi starting in 2022. Four major road segments are impacted by the route and staff negotiated the complete reconstruction of all four segments in a cost-share agreement with GLWA. By reconstructing the roads now, the City stands to save significant dollars in economies of scale and only pay for half the cost of total road replacement, since GLWA replaces the portions of all roads impacted by their pipe zone.

Traffic congestion and capacity were some of the committee's most deliberated subjects. Issues with congestion, primarily during peak times (rush hour), both impact and are impacted by residents, local businesses, and traffic in the surrounding communities. However, Novi's position in the center of the mixing bowl (1-96/696, 275, M-5) creates unique circumstances and challenges (pain points identified in projects below) for traffic flow. Novi's major roads are directly affected by the regional traffic using the mixing bowl and any commuting traffic passing through the city.

The MDOT flex route project scheduled to begin in 2021 will have the most regional impact on capacity. The project includes installation of an Active Traffic Management System (Flex Lane) from Kent Lake Road to the I-275/I-696/M-5 interchange, along with a full reconstruction of all lanes and shoulders and is being proposed to alleviate congestion, reduce travel time during peak hours, improve safety, and restore pavement condition.

What else is Novi doing to mitigate traffic capacity? The following projects address capacity:

Completed Projects

- Ring Roads – create alternate movement for the Grand River and Novi Road intersection *
    - o Southeast - Main Street (early 2000s)
    - o Northeast - Crescent to Town Center (2017)
    - o Southwest – Bond Street to Flint (2020, Phase 2 connection to Grand River pending)
    - o Northwest - Crescent to Grand River (2021)
- Napier and 10 Mile roundabout (2017) – improved traffic flow and safety at this historically dangerous intersection
- Novi Road Bridge over I-96 (2020) – bridge improvements, pedestrian sidewalk, and traffic signal improvements
- Grand River and Beck – Right turn lane extension (2015), Dual left turn lane (2016)

Planned Projects

- 10 Mile Road from Haggerty to Meadowbrook (2022) – continuous turn lane and selective widening *
- Taft and 9 Mile Roundabout (2022)
- Meadowbrook and 11 Mile Road – right turn lane on southbound Meadowbrook

Projects Under Consideration

- Beck Road –regional expansion (Novi, Wixom, Northville Twp.) from 6 Mile Road to Pontiac Trail, pursuing federal funding (4-lane boulevard, potential roundabout at 10 Mile Rd). *
- 12 Mile Road from Beck Road to Cabaret Drive – expand to 4-lane boulevard, RCOC project moving into to ROW acquisition. *
- Ten Mile and Wixom Road, and 10 Mile and Taft Road –analyze cost benefit of roundabouts.
- Crescent Road connection to Lee BeGole/11 Mile – northeast Ring Road addition
- Taft Road/ I-96 Bridge – bridge over I-96 with connection to 12 Mile Road.

**committee identified pain points*

A map and detailed listing of all major road projects discussed by the committee is included in Appendix 3.

Since major road projects are both expansive and expensive, they must be considered in steps and phases to address resident and regional traffic concerns. These projects almost always include right-of-way acquisition, partnerships with other stakeholders, and funding obstacles. Most traffic challenges will not be resolved instantaneously, and the return on investment of multi-million-dollar road projects should be viewed not just locally, but regionally. Does it make sense for the City to invest in *mega-projects* (>$10M) that may move traffic within the city at one point but move the issue elsewhere?

Of the committee identified *mega-projects* the Taft Road bridge over I-96 to 12 Mile Road, was being considered for construction simultaneously with the MDOT Flex Route. However, ultimately the cost-benefit analysis of the project (~$15M) and overall impact on the network was not beneficial. Conversely, Beck Road widening (~$30M) would have significant benefits to the City and the region, therefore, the City is aggressively pursuing federal match funding to implement the project. Likewise, the RCOC 12 Mile expansion (~$14M) would considerably improve traffic flow north of I-96 and acknowledged by the committee as a priority.

Consequently, the overall plan included herein has been thoroughly vetted by the committee with the following recommendations for major road projects:

- Verify the impact of the Flex Route project before committing to other projects.
- Continue to pursue Beck Road funding – identified as major point of pain.
    - Strong desire to complete this project with or without federal funds.
- Partner with RCOC to execute 12 Mile expansion.
    - Priority project and pain point for local traffic.
- Cost-benefit analysis on roundabouts during the design phase for 10 Mile Road projects (Taft Road and Wixom Road intersections).
- Continue partnerships with stakeholders and other entities to capitalize on high-value investments in the region.
- Consider the impact of COVID-19 on revenue and the future of commuting traffic in the region.

Design

There is no singular design prescription for road construction, and each project is unique in community context. Projects are prioritized in a consistently changing landscape of revenue/budget/funding sources, development, constructability, and are based on additional factors listed below:

- **Geotechnical surveys**
    - Soil borings and pavement cores to determine existing conditions.
- **Historical knowledge**
    - Past observations of the trend of pavement deterioration.
- **Cost of maintenance**
    - How much does the road cost us to maintain?
- **Economies of scale**
    - Combine large segments to save on mobilization costs and to get better unit prices for volume.
- **Traffic movement and interruptions**
    - How do we impact residents and commuter traffic flow and access?
- **Other capital improvement projects**

- o Are there other capital improvements to align with road construction (drains, water/sewer, sidewalks/pathways, RCOC, MDOT, GLWA).

Working as a team made of transportation planners and engineers and consulting engineers, staff takes a holistic approach to design. Projects, when applicable, are designed to make the street network safer and more convenient for drivers, transit users, pedestrians, bicycles, and other non-motorized users - making the community a better place to live.

For example, connections identified in the Non-Motorized Master plan are considered when major road projects are executed. The planned 10 Mile Road enhancements (Haggerty to Meadowbrook) include the construction of a high priority pathway segment on the south side of 10 Mile. The same project will simultaneously replace aging water main infrastructure and two deteriorated culverts under 10 Mile Rd (crossings). This project demonstrates a practical use of the three factors above (historical knowledge, economies of scale, other capital projects).

When planning for road expansion projects, analyzing opportunities to enhance the driver experience and create aesthetically pleasing corridors are a priority. One way to achieve this is the implementation of boulevards, which are roads with a median splitting up the lanes of traffic. They are generally safer and more pleasing than a traditional 5 lane design and can usually be accomplished within the same footprint. The expansion projects considered for 12 Mile Road (Beck to Cabaret) and the Beck Road corridor are recommended as boulevard cross-sections, with support of the committee.

Driving in a roundabout is safer when compared to a traditional, signalized intersection. In a roundabout, the cars are traveling at a slower speed, with fewer conflict points, and the accidents, which do occur, are much less severe, typically resulting only in property damage rather than personal injury. Not only are roundabouts safer, but they allow for more traffic to move through an intersection than signalized intersections. Studies have indicated that replacing traffic signals with roundabouts can increase the capacity of a road by 30 to 50 percent. The newer roundabouts in the city have proved successful (Napier and 10 Mile, Crescent NE Ring Road) and the Roads Committee recommends investigation and design for others if applicable.

The Roads Committee discussed several advances in pavement design considered for road projects. There are numerous products that can be added to a pavement cross-section to increase pavement strength and durability, resulting in a longer useful life and a reduced cost for maintenance. Geosynthetic pavement interlayers (Town Center, 11 Mile, Meadowbrook) are used to increase strength, resist crack propagation, and essentially waterproof the pavement. Pavement additives such as fibers and modified binders (used on Cabot/Lewis and Trans-X) can be added to extend the life of pavements. Geosynthetic grids are now used in the NRP to mitigate poor soil conditions and reduce the cost of expensive excavation and/or additional stone base.

Finally, the committee recognizes rapid advancement in driver-less vehicles and electric (EV) or alternate fueled cars, and therefore recommends evaluating future design and infrastructure needs created by these emerging technologies.

Long-Term Planning

Overall, the road network has seen marked improvements in the last decade, with investment made to both improve and add to the infrastructure. While progress has been made, long-term planning is essential as the city continues to develop. Adding more local roads and addressing current and future capacity needs will be challenging. The goals outlined in the Road Report are for programs with the right mix of fixes, driven by maintenance not reconstruction. How do we plan for this ***"maintenance vs. repair"*** ideal? The committee recommends the following:

Benchmarking

The Road Report creates a baseline for staff and City Council to evaluate status and need of all road and related projects. The committee recommends a biannual refresh of the report to coincide with the PASER rating evaluations, and a renew of the report every 5 years to capture and include improvements and modified plans. Thereby creating a perpetual "*living document*" to provide direction to staff and transparency to residents, at the discretion of City Council.

Road Report Schedule
2020 – Draft Submitted to Roads Committee
2021 – Presentation to City Council
2023 – Refresh
2025 – Refresh
2026 – Renew

Partnerships

Fostering relationships and collaborative efforts with other entities will be key to future success for the city and the region. Working with MDOT, RCOC and surrounding communities to identify opportunities and execute projects by combining funding strategies should be a priority.

Recent success in obtaining funds from the Federal Aid Commission (FAC), Highway Safety Improvement Program (HSIP) and Local Road Improvement Program (LRIP) have been beneficial. Therefore, continue the practice of securing available funding resources from local, state and federal programs to supplement city investment on roads.

Evaluate City Road Funding

The aforementioned mega-projects will undoubtably require some source of additional funding and the $1.5-$2M gap in recommended funding for local roads (NRP) warrants deliberation.

Options for the NRP could include a low interest bonds of $10M over the next five years ($2M/year) in order to accelerate the overall network integrity. The City could pledge a portion of the annual ACT 51 revenue towards the annual debt service and issue road bonds. Act 51 road bonds are limited to 10 years.

However, the City could choose the bond levy process to address the more costly mega-projects. For example, $100 million borrowing for 30 years with an estimated interest rate of 3% has an estimated annual debt service payment (principal and interest) $5,102,000 and an estimated annual levy l.33 (mills) with estimated residential increases below:

Taxable Value of Home	Tax Owed
$75,000	$100
$150,000	$200
$250,000	$330
$350,000	$465
$450,000	$600

Voter approval is necessary to authorize the City to levy a tax to pay the principal and interest on the bond but not required if the City were to use ACT 51or other funds to repay the debt.

Finally, the Municipal Road voted tax levy (l.4484 mills) could be increased with a ballot on a future election. Overall millage rate for City is 10.5376, and currently one of the lowest tax rates in the entire State.

Summarization of Findings to Council

The findings provided in this report focus on, but are not limited to, the time period from 2012 to present day and include projections out through 2026.

$7-9M/year is targeted for capital expenditures for road improvements and non-motorized projects.

The discoveries encompass the City road network that is 187 centerline miles of local and major roads. The entirety of the network totals 391 lane miles, which is centerline miles multiplied by number of lanes per segment.

A Transportation Asset Management Plan (TAMP) is required for every local agency with 100 or more miles of roadway under their jurisdiction.

The committee was tasked with the review and endorsement of the **Road Report.**

Accidents are down 35.2% from the three years prior to 2018. Rear-end crashes are the most common occurrence (40% of all crashes). Weather related accounted for 8% of the total crashes reported. Conclusion, distracted driving is four times more likely to be the cause of a crash versus poor road conditions.

Local roads, also referred to as neighborhood roads, is comprised of ~155 centerline miles and makes up around 80% of the total network.

Novi has made significant investment in local roads from 2014-2020 (~$25M).

Current asset management plan is performing adequately. However, 50% of the City's road network is in the "fair" range.

It is estimated an additional $1.5M - $2M/year of road funding is required to continue an upward trend in PASER condition.

Major Roads account for 20% of the system and are critical for traffic movement into and out of the city.

Traffic congestion and capacity issues, primarily during peak times (rush hour), both impacts and are impacted by residents, local businesses and traffic in the surrounding communities.

The MDOT flex route project scheduled to begin in 2021 will have the most regional impact on capacity.

There is no singular design prescription for road construction, and each project is unique in community context.

Boulevards enhance the driver experience and create aesthetic corridors.

Driving in a roundabout is safer when compared to a traditional, signalized intersection.

Technological advances in pavement design should be/are considered for road projects.

The Roads Committee endorses the Road Report and recommends the following:

- Utilize Road Report as road program benchmarking document.
- Verify the impact of the Flex Route before committing to other projects.
- Continue to pursue funding for mega-projects (Beck Road, 12 Mile).
- Continue to foster partnerships with other entities.
- Evaluate City road funding.
- Consider the impact of COVID-19 on revenue and the future of commuting traffic in the region.

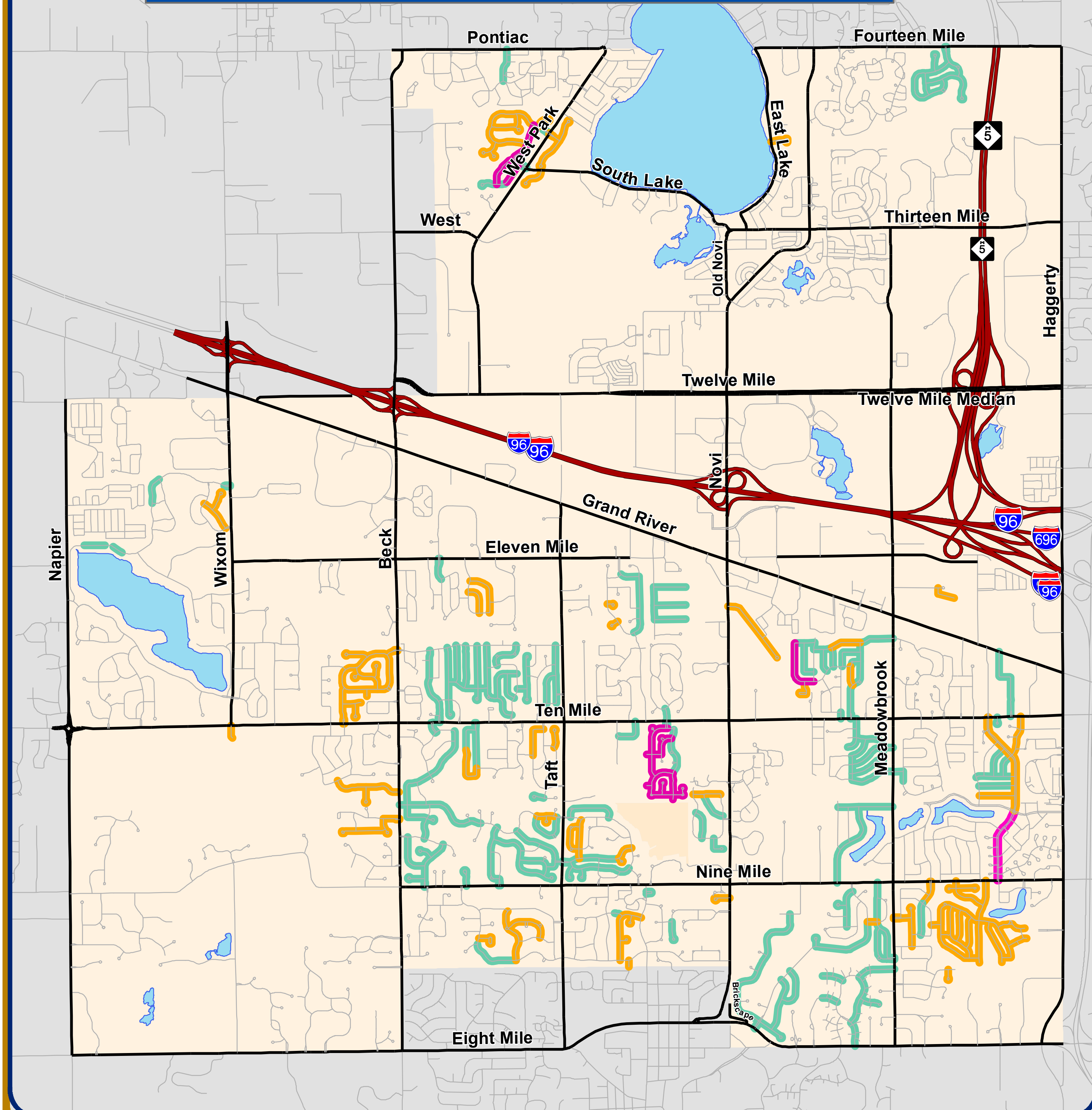
Appendix with Resources

Appendix 1

Neighborhood Roads Program & Concrete Panel Replacement 2014-2021

Neighborhood Roads Program 2014-2021

City of Novi, Michigan



Map Author: Blough/Anjum
Date: 1-15-2021
Project: NRP & CRP Projects
Version #: 1.2

Road Construction Projects

2014-2018 | 2019-2020 | 2021

City of Novi

Engineering Division
Department of Public Works
26300 Lee BeGole Drive
Novi, MI 48375
cityofnovi.org

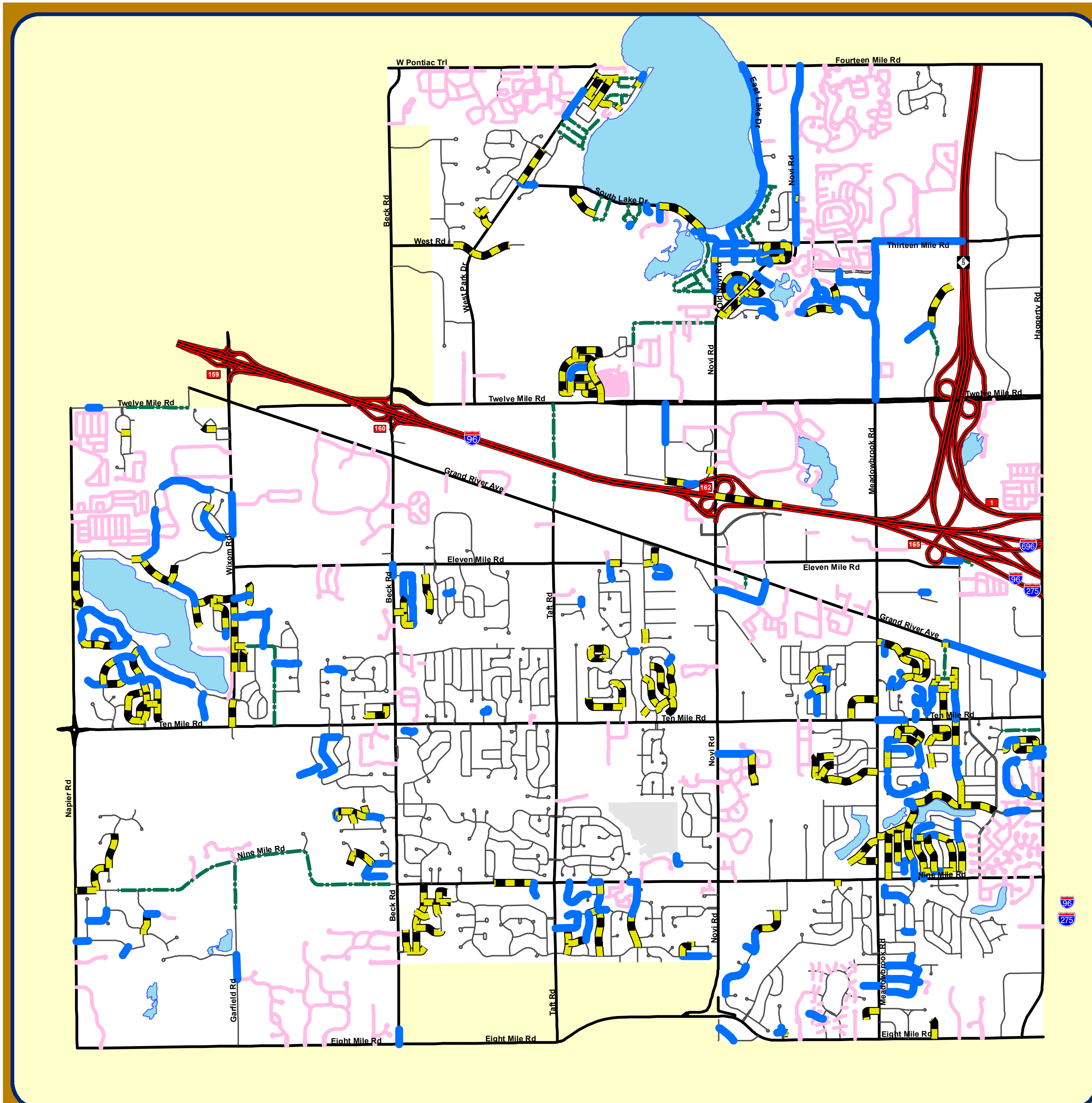
Feet

0 900 1,800 3,600 5,400

1 inch = 4,433 feet

Appendix 2

Capital Preventative Maintenance – Proposed



Capital Preventative Maintenance

Asphalt & Sealcoat Roads 2020 PASER 5 & 6 Ratings

Map Legend

PASER Street Rating

- 5 (242)
- 6 (246)
- Private Streets
- Gravel or Chip Seal Roads

City of Novi
Engineering Division
Department of Public Works
26300 Lee BeGole Drive
Novi, MI 48375
cityofnovi.org

Map Author: Runkel
Date: 1/22/21
Project: Asphalt PASER 5&6
Version #: 1.0

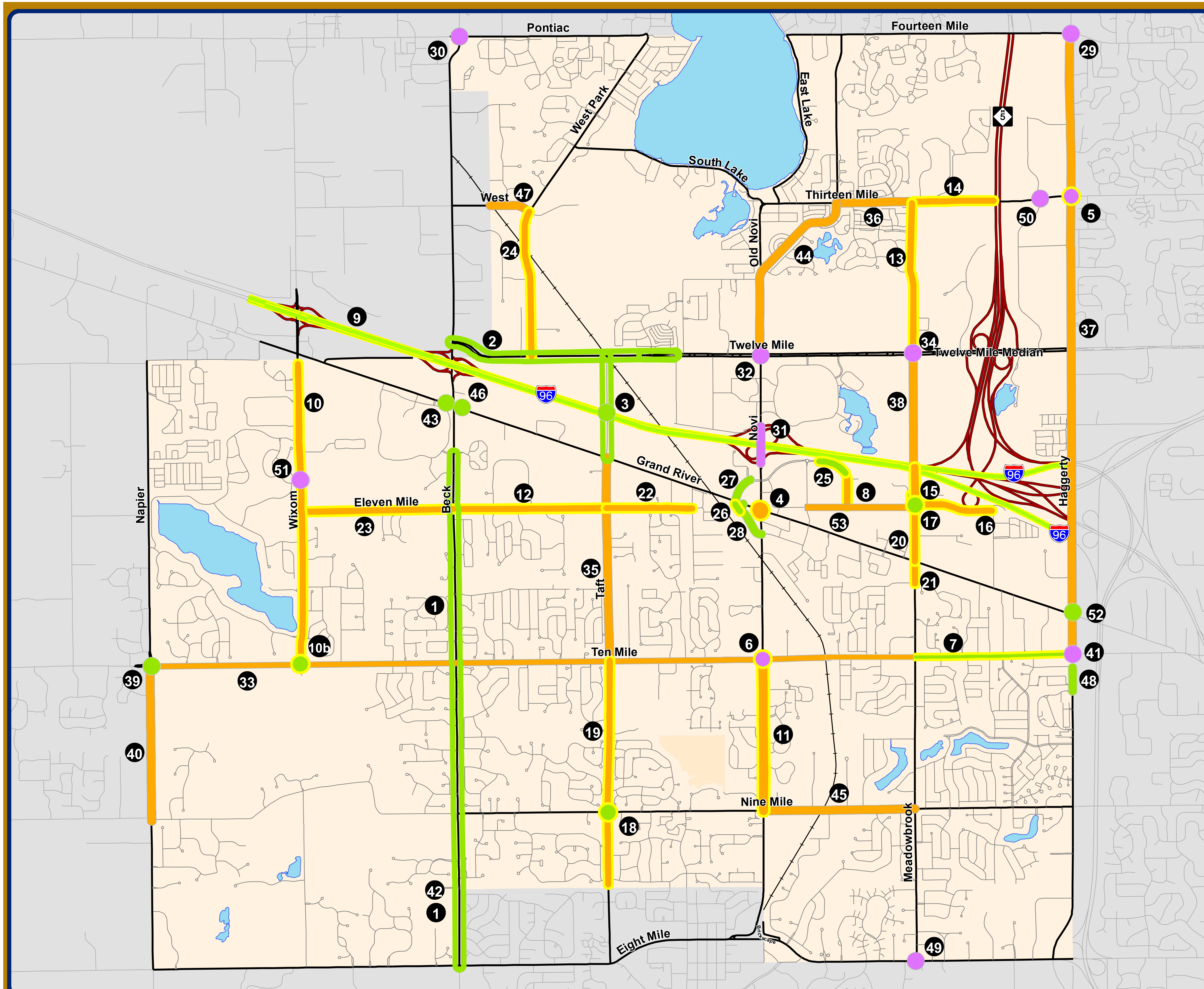
Amended By:
Date:
Department:

MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.

Appendix 3

Major Road and Traffic Improvements



Major Road and Traffic Improvements

Completed (2014 - 2020), Planned, and Under Consideration

Legend

- Capacity Improvement, Under Consideration
- Capacity Improvement, Planned
- Capacity Improvement, Completed
- Road Surface Improvement, Planned
- Road Surface Improvement, Completed
- Intersection Improvment, Planned
- Intersection Improvment, Completed

0 1,100 2,200 4,400 6,600
Feet

1 inch = 3,312 feet

City of Novi

Engineering Division
Department of Public Works
26300 Lee BeGole Drive
Novi, MI 48375
cityofnovi.org

Map Author: Anjum/Runkel
Date: January 11, 2021
Project: Major Road/Traffic Improvements
Version #: 2.0

MAP INTERPRETATION NOTICE

Traffic & Road Improvements - Completed (2014 - 2020), Planned, and Under Consideration
January 2021

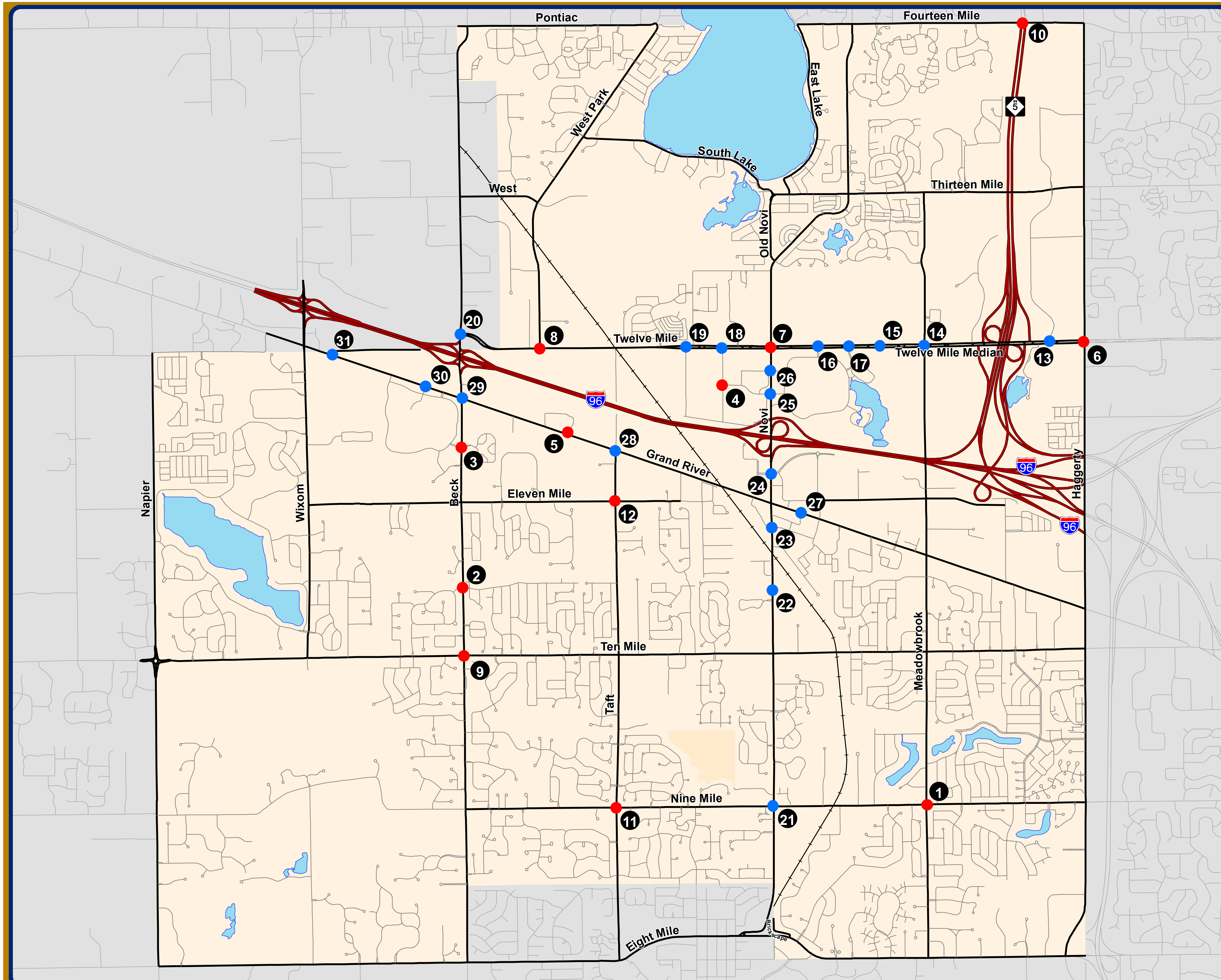
#	Category	Improvement	Project	Limits/Type	Agency	Year	Construction Cost	Outside Funding	Notes
	Projects under Consideration								
1	Road	Capacity	Beck Road Widening	City Limits	Multi	2026+	$ 35,184,310.00	TBD	
2	Road	Capacity	12 Mile Road Widening	Beck Rd to Dixon Rd	RCOC	2026+	$ 13,136,894.00	TBD	
3	Road	Capacity	Taft Road Bridge	Grand River Ave to 12 Mile Rd	City	2026+		TBD	
	Planned Projects								
4	Intersection	Road Surface	Novi Rd & Grand River	CPR, Main St to Grand River	RCOC	2021	$ 1,201,741.00	100% RCOC	
5	Intersection	Intersection	13 Mile Rd/Haggerty Rd	Traffic signal upgrade	RCOC	2021	$ 260,000.00	50% RCOC ($130,000) 25% Farmington Hills ($65,000)	$65,000 City share
6	Intersection	Intersection	10 Mile Rd/Novi Rd	Traffic signal upgrade	RCOC	2021	$ -	100% RCOC	
7	Road	Capacity	10 Mile Road Improvements	Meadowbrook Rd to Haggerty Rd	RCOC	2021	$ 3,677,460.00	$108,480 Design (County) $458,480 Design (RCOC Board)	$772,500 current City share
8	Road	Road Surface	Lee BeGole Dr Reconstruction	11 Mile Rd to terminus	City	2021	$ 854,700.00		
9	Road	Capacity	I-96 Flex Route	Kent Lake Rd to 696 Interchange	MDOT	2021-24	$ 223,600,000.00	100% MDOT/Federal	
10	Road	Road Surface	Wixom Road Rehabilitation	10 Mile Rd to City Limits	City	2023	$ 1,617,530.00	$1,294,024 FAC funding	$323,506 City match
10b	Intersection	Capacity	Wixom Road & 10 Mile	Intersection	City	2023	See #10	See #10	Part of #10 (Wixom Rd Rehab)
11	Road	Road Surface	Novi Road Resurfacing	9 Mile Rd to 10 Mile Rd	RCOC	2022	$ 1,875,000.00	$1,500,000 FAC funding	$212,430 City share
12	Road	Road Surface	11 Mile Rd Rehabilitation	Beck Rd to Taft Rd	City	2022	$ 1,708,153.00	Applying for FAC	Right turn lane addition
13	Road	Road Surface	Meadowbrook Rd Reconstruction	12 Mile Rd to 13 Mile Rd	GLWA	2022	$ 3,900,904.00	$3,452,797 GLWA	$448,107 City share
14	Road	Road Surface	13 Mile Rd Reconstruction	Meadowbrook Rd to M-5 Bike Path	GLWA	2022	$ 3,164,740.00	$1,907,793 GLWA	$1,257,747 City share
15	Road	Road Surface	Meadowbrook Rd Reconstruction	11 Mile Rd to I-96	GLWA	2022	$ 910,154.00	$395,132.65 GLWA	$515,021 City share
16	Road	Road Surface	11 Mile Rd Reconstruction	Meadowbrook Rd to Seeley Rd	GLWA	2022	$ 1,839,859.00	$1,255,206 GLWA	$584,653 City share. Road costs only.
17	Intersection	Capacity	Meadowbrook Rd/11 Mile Rd	Southbound right turn lane to 11 Mile	City	2022	$ 134,650.00		Right turn lane addition
18	Intersection	Capacity	9 Mile Rd/Taft Rd Roundabout	Roundabout at intersection	City	2022	$ 825,735.00	$600,000 HSIP	$225,735 City share
19	Road	Road Surface	Taft Road Rehabilitation	City limits to 10 Mile Rd	City	2022	$ 1,137,610.00	$910,088 FAC	$227,522 City share
20	Road	Road Surface	Meadowbrook Rd Reconstruction	Grand River Ave to 11 Mile Rd	City	2023	$ 597,962.00		
21	Road	Road Surface	Meadowbrook Rd Rehabilitation	Cherry Hill Rd to Grand River Ave	City	2023	$ 376,232.00		
22	Road	Road Surface	11 Mile Rd Rehabilitation	Taft Rd to Clark St	City	2024	$ 1,014,341.00		
23	Road	Road Surface	11 Mile Rd Rehabilitation	Beck Rd to Wixom Rd	City	2024	$ 1,158,434.00	Applying for FAC	
24	Road	Road Surface	West Park Dr Rehabilitation	12 Mile Rd to West Rd	City	2026+	$ 2,508,140.00		
25	Road	Capacity	Lee BeGole Dr Extension	Terminus to Crescent Blvd	City	2026+	$ 1,882,170.00		
26	Road	Capacity	Bond (fka Flint) St Construction - Phase 2	Terminus to Grand River	City	2025	$ 636,519.00		
	Completed Projects								
27	Road	Capacity	Crescent Blvd Extension	Novi Rd to Grand River Ave	City	2020	$ 5,019,223.00		
28	Road	Capacity	Bond (fka Flint) St Construction - Phase 1	Novi Rd to Grand River Ave	City	2020	$ 1,411,817.00	$244,897 LRIP (2016-18)	
29	Intersection	Intersection	14 Mile Rd/Haggerty Rd	Traffic signal modernization	RCOC/City	2020	$ 263,529.00	$206,683.20 HSIP $28,423 RCOC	$28,423 City share

30	Intersection	Intersection	Pontiac Trl/Beck Rd	Traffic signal modernization	RCOC/City	2020	$ 227,427.00	$178,341.60 HSIP $24,542.70 RCOC	$24,543 City share
31	Intersection	Intersection	Novi Rd Bridge at I-96	Traffic signal improvements	MDOT/City	2020	$ 1,280,264.34	$1,111,264.34 MDOT	$169,000 City share
32	Intersection	Intersection	12 Mile Rd/Novi Rd Improvements	Intersection improvements	RCOC	2019	$ 1,100,000.00	$209,370 County Board $409,371 RCOC Board	$481,259 City share
33	Road	Road Surface	10 Mile Rd Resurfacing	Napier Rd to Haggerty Rd	RCOC	2019	$ -	100% RCOC	
34	Intersection	Intersection	Meadowbrook Rd/12 Mile Rd	Concrete panel replacement	RCOC	2019	$ -	100% RCOC	
35	Road	Road Surface	Taft Rd Rehabilitation	10 Mile Rd to Grand River Ave	City	2018	$ 2,031,844.00		
36	Road	Road Surface	13 Mile Rd Rehabilitation	Novi Rd to Meadowbrook Rd	City	2018	$ 469,417.00		
37	Road	Road Surface	Haggerty Rd PPO	10 Mile Rd to 14 Mile Rd	RCOC	2018	$ -	100% RCOC	
38	Road	Road Surface	Meadowbrook Rd Rehabilitation	12 Mile Rd to I-96	City	2017	$ 1,007,500.00	$231,188.75 FSTP	$776,311.25 City share
39	Intersection	Capacity	10 Mile Rd/Napier Rd Roundabout	Intersection improvements	RCOC	2017	See #39	See #39	See #39
40	Road	Road Surface	Napier Rd Paving	9 Mile Rd to 10 Mile Rd	RCOC	2017	$ 6,261,300.00	$4,796,848 Federal funding $732,226 RCOC Board $366,113 Lyon Township	$366,113 City share
41	Intersection	Intersection	10 Mile Rd/Haggerty Rd Rehabilitation	Intersection Rehabilitation	RCOC	2017	$ -	100% RCOC	
42	Road	Capacity	Beck Rd Reconstruction	8 Mile Rd to 9 Mile Rd	City	2017	$ 1,743,000.00	$278,593.75 FSTP	$1,464,406 City share
43	Intersection	Capacity	Beck Rd/Grand River Ave	Dual Left Turn Lane	City	2016	$ 637,100.00	$448,160 HSIP $53,679 RCOC Board $53,679 County Board	$81,582 City Share
44	Road	Road Surface	Novi Rd Rehabilitation	12 Mile Rd to 13 Mile Rd	City	2016	$ 1,722,200.00	$689,300 FSTP	$1,032,900 City share
45	Road	Road Surface	9 Mile Rd Rehabilitation	Novi Rd to Meadowbrook Rd	City	2016	$ 717,800.00	$262,260 FSTP	$455,540 City share
46	Intersection	Capacity	Beck Rd/Grand River Ave	Rt turn lane extenstion	MDOT/City/RCOC	2015	$ 170,486.00	$145,823	$24,663 City share
47	Road	Road Surface	West Rd Rehab	West Part to CSX RR	City	2015	$ 195,560.00		
48	Intersection	Capacity	SB Haggerty Lane Widening	Stonehenge to 23401 Haggerty	City	2015	$ 193,640.00	$40,000 County Board $40,000 RCOC Board	$113,640 City share
49	Intersection	Intersection	8 Mile Rd/Meadowbrook Rd Improvements	Traffic signal upgrade	City	2014	$ 173,984.00		
50	Intersection	Intersection	13 Mile Rd/Cabot Dr Improvements	Traffic signal install	City	2014	$ 11,553.00		
51	Intersection	Intersection	Wixom Rd/Glenwood Signal	Traffic signal install	City	2014	$ 161,200.00		
52	Intersection	Capacity	SB Haggerty Rd Right Lane Grand River		City	2014	$ 138,900.00	$125,000 FSTP	$13,900 City share
53	Road	Road Surface	11 Mile Recon	Meadowbrook to Town Center	City	2014	$ 841,948.00		

Appendix 4

Intersection and Signal Improvements

Minor Traffic Signal Improvements: Completed and Planned



Map Legend

- Planned Signal Improvements
- Completed Signal Improvements

0 1,050 2,100 4,200 6,300
Feet

1 inch = 3,250 feet

City of Novi
Engineering Division
Department of Public Works
26300 Lee BeGole Drive
Novi, MI 48375
cityofnovi.org

Map Author: Humna
Date: 11-20-2020
Project: Traffic Improvement Summary
Version #: 1.0

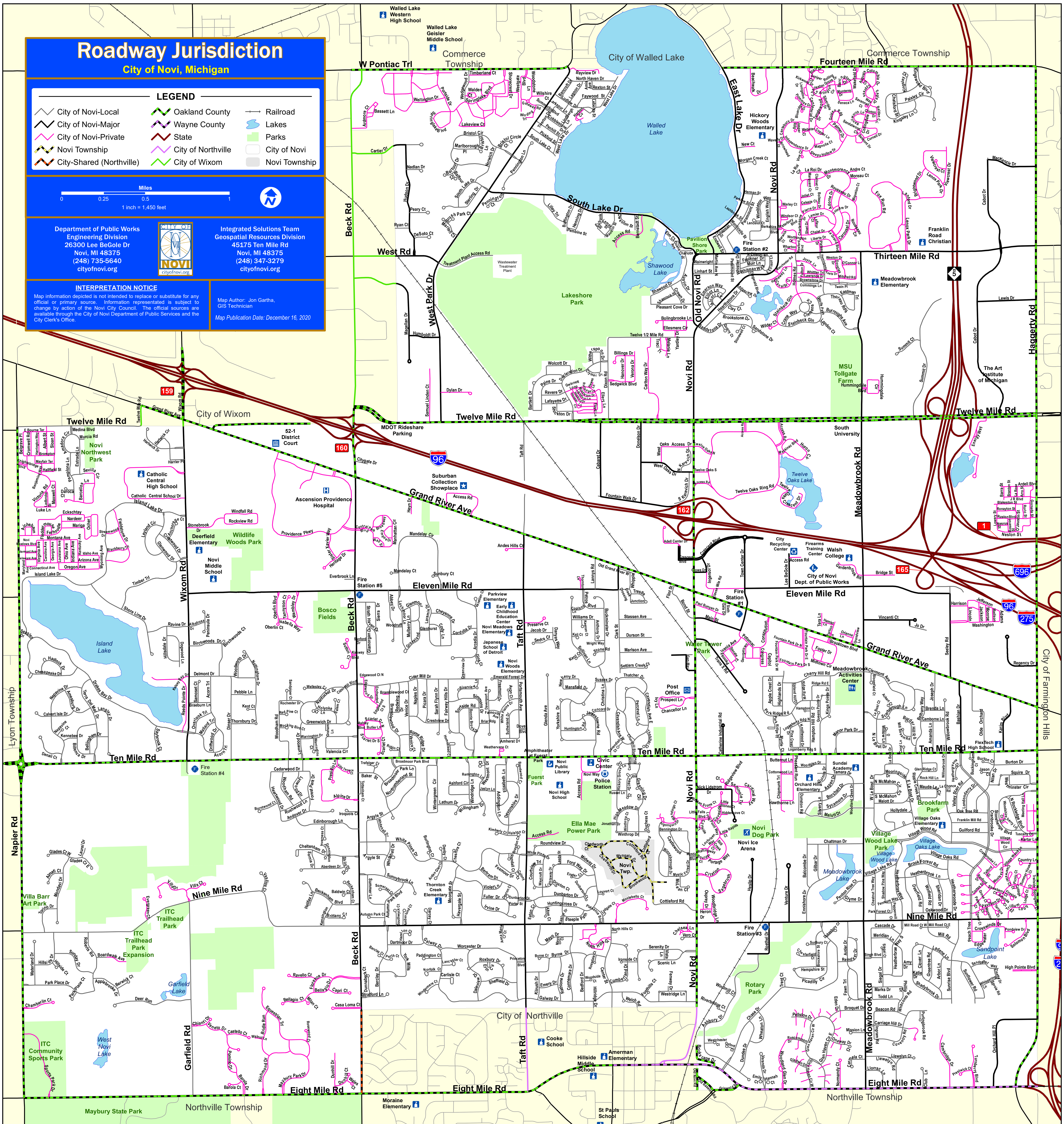
Amended By:
Date:
Department:

Minor Traffic Signal Improvements

#	Category	Status	Project	Limits/Type	Agency	Year	Construction Cost	Outside Funding	Notes
	Minor Traffic Signal Improvements								
1	Intersection	Completed	9 Mile Rd/Meadowbrook Rd	Traffic signal backplates	City/RCOC	2020	$ 15,757.37		100% City share
2	Intersection	Completed	Beck Rd/Cider Mill Dr	Traffic signal backplates	City/RCOC	2020	$ 11,821.17		100% City share
3	Intersection	Completed	Beck Rd/Providence Park	Traffic signal backplates	City/RCOC	2019	$ 7,312.22		100% City share
4	Intersection	Completed	West Oaks Dr/Donelson	Traffic signal backplates	City/RCOC	2019	$ 6,857.92		100% City share
5	Intersection	Completed	Grand River/Suburban Collection	Traffic signal backplates	City/RCOC	2019	$ 5,268.28		100% City share
6	Intersection	Completed	12 Mile Rd/Haggerty Rd	Traffic signal backplates	City/RCOC	2018	$ 5,000.00		100% City share
7	Intersection	Completed	12 Mile Rd/Novi Rd	Traffic signal backplates	City/RCOC	2018	$ 5,000.00		100% City share
8	Intersection	Completed	12 Mile Rd/ W Park Dr	Traffic signal backplates	City/RCOC	2018	$ 5,000.00		100% City share
9	Intersection	Completed	Beck Rd/10 Mile Rd	Traffic signal backplates	City/RCOC	2018	$ 5,000.00		100% City share
10	Intersection	Completed	14 Mile Rd/M-5	Traffic signal backplates	City/RCOC	2018	$ 5,000.00		100% City share
11	Intersection	Completed	Taft Rd/9 Mile Rd	Flashing beacon install	City	2019	$ 5,000.00		Approx. cost
12	Intersection	Completed	Taft Rd/11 Mile Rd	Flashing beacon install	City	2019	$ 5,000.00		Approx. cost
13	Intersection	Planned	12 Mile Rd/Cabot Dr	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
14	Intersection	Planned	Meadowbrook Rd/12 Mile Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
15	Intersection	Planned	12 Mile Rd/Woodland Med Ctr	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
16	Intersection	Planned	12 Mile Rd/12 Oaks W	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
17	Intersection	Planned	12 Mile Rd/12 Oaks E	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
18	Intersection	Planned	Donelson/12 Mile Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
19	Intersection	Planned	Cabaret/12 Mile Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
20	Intersection	Planned	Beck Rd/12 Mile Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
21	Intersection	Planned	9 Mile Rd/ Novi Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
22	Intersection	Planned	Novi Rd/Post office	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
23	Intersection	Planned	Novi Rd/Main St	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
24	Intersection	Planned	Crescent Blvd/Novi Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
25	Intersection	Planned	Novi Rd/ 12 Oaks S	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
26	Intersection	Planned	Novi Rd/ 12 Oaks N	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
27	Intersection	Planned	Grand River/Main St	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
28	Intersection	Planned	Grand River/Taft Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
29	Intersection	Planned	Beck Rd/Grand River Ave	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
30	Intersection	Planned	Grand River/West Market Sq	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	
31	Intersection	Planned	Grand River/12 Mile Rd	Traffic signal backplates	RCOC	2020	$ -	100% RCOC	

Appendix 5

Road Jurisdiction Map



Abbey Dr	21
Aberdeen Dr	29
Ackert Ct	24
Acorn Trl	20
Adams	24
Addington Ln	28
Adell Center Dr	15
Adorne Dr	2
Aichebaun	18
Albatross Dr	20
Albert St	18
Alcott Cir	11
Algonquin Dr	27
Almafi Ct	30
Alpine Dr	29
Alton Ct	27
Amadora Cir	18
Amanda Ln	24
Amberlund Ct	28
Amesburg Dr	19
Amherst Dr	21
Amis Ave	3
Amy Dr	36
Anchorage Ct	18
Andes Hills Ct	16
Andover Dr	29
Andre Ct	2
Anna Maria Ct	33
Anthony Dr	22
Antler Dr	35
Apple Crest Dr	23
Applebrooke Dr	31
Arbor Ln	36
Arcadia Dr	21
Ardell Blvd	13
Arden Glen Ct	28
Ardmore Ct	4
Argyle St	28
Arizona Ave	18
Arlington Cir	2
Arro St	13
Arrowhead Dr	2
Ashbury Dr	35
Ashford Cir	28
Ashley Blvd	21
Aspen Dr	26
Augusta Cir	1
Austin Dr	10
Autumn Park Blvd	28
Autumn Park Ct	28
Avon Ct	21
B	
Baker St	28
Balcombe Dr	26
Baldwin Ct	29
Balfour Ct	4
Balfour Dr	4
Bancroft Dr	3
Barcellos Ln	18
Barclay Ct	33
Barclay Dr	33
Barola Ct	32
Barola Dr	32
Barra St	13
Barrington Dr	2
Bartlett Dr	10
Bashian Dr	24
Bassett Ln	4
Bayview Dr	3
Beachwalk Dr	2
Beacon Rd	36
Beck Rd	4, 32
Beckenham Blvd	29
Beckenham Ct	29
Bedford Dr	34
Belden Cir	1
Belgrave Pl	18
Bellagio Ct	32
Bellagio Dr	32
Bellingham Dr	19
Belmont Dr	1
Benjamins Way	18
Bennington Dr	27
Berkshire Blvd	2
Bernstadt St	3
Bertram Dr	28
Berwick Ct	31
Bethany Way	24
Billenca Dr	19
Billings Dr	10
Birchwoods Ct	20
Birchwoods Dr	20
Blackberry Trl	18
Blair Dr	2
Blakeston St	13
Bloomfield Ct	24
Blueridge Dr	2
Boardwalk Ave	31
Boileau Dr	2
Bolingbrooke Ln	10
Bond St	22
Bonnie Brook Dr	21
Borchart Dr	26
Border Hill Rd	24
Boulder Ct	26
Braeburn Ln	20
Bramblewood Ct	21
Bramblewood Dr	21
Branton St	13
Braydon Ct	28
Brenda Ln	24
Brentwood Ct	28
Briar Rdg	21
Brickscape Dr	35
Bridge St	13
Bridle Run	32
Brightwood Dr	1
Bristol Cir	4
Bristol Circle Ct	4
Bristol Ln	4
Brittany Ct	29
Broadmoor Park Blvd	28
Broadmoor Park Ln	28
Broadway	16
Brockshire St	35
Broken Stone Ct	26
Brompton	18
Brook Forest Rd	25
Brookstone Dr	11
Brooktown Blvd	23
Broquet Dr	35
Brownstone Dr	11
Brush Park Ct	4
Buckingham Ct	25
Buckminster Dr	22
Buffington Dr	3
Burlington Ct	28
Burntwood Ct	29
Burroughs Ave	11
Burton Ct	25
Burton Dr	25
Butler Ln	21
Butternut Ln	26
Byrne Ct	34
Byrne Dr	34
C	
Cabaret Dr	15
Cabot Dr	1, 12
Calvert Isle Dr	19
Camborne Ln	24
Cambridge Dr	36
Canal Cir	11
Canal St	11
Cantebury Dr	2
Capitol	23
Capri Ct	32
Cardinal Way	26
Carlisle Ct	33
Carlton Way Dr	10
Carmela Ct	35
Carolina Ave	18
Carousel Dr	2
Carriage Hill Dr	36
Cartier Dr	4
Casa Loma Ct	32
Cascade Dr	36
Castello Ct	32
Castlewood Dr	27
Catherine Industrial Rd	23
Catholic Central School Dr	18
Cavendish Ave E	22
Cavendish Ave W	22
Cavendish Ct	22
Cedarwood Dr	29
Celeste Ct	2
Centennial Dr	2
Center St	34
Central Park Blvd	16
Chalet Dr	2
Chamberlin Ct	31
Chancellor Ln	22
Chapman Dr	2
Charlemagne Dr	2
Charleston Ln	2
Charlotte St	3
Chase Dr	35
Chatsford St	1
Chattman Dr	26
Chelsea Ln	34
Cheltenham Dr	29
Cherry Hill Rd	23
Chesapeake Dr	19
Cheshire Ct	28
Chesterfield Ct	35
Chestnut Tree Way	25
Cheyenne Dr	21
Chianti Dr	32
Chipmunk Trl	26
Christina Ln	22
Churchill Blvd	22
Cider Mill Blvd	20
Cider Mill Dr	21
Citation	26
Citygate Dr	16
Clarinette Ct	2
Clark St	22
Clay Ct	11
Clearwater Ct	25
Clemens Cir	11
Clermont Ave	24
Cliffside Ct	26
Clinton Dr	1
Clover Ln	36
Club Ln	36
Clymer Dr	10
Cobblestone Dr	3
Cody Ln	21
Collingdale Dr	1
Colony Ct	28
Columbia Dr	1
Concord Dr	22
Congress	23
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Connemara Dr	34
Constitution	23
Copland Ln	22
Copper Ln	2
Coral Ln	24
Cordoba Dr	21
Cornell Dr	1
Cortes St	25
Cortland Blvd	27
Cottage Ct	25
Cottisford Rd	27
Cottonwood Ln	26
Country Ln	25
Courtview Trl	27
Coventry Rd	36
Coveside Cir	26
Cranbrooke Dr	25
Cranbrooke Ln	25
Crane Way	11
Creek Crossing	22
Crescent Blvd	14, 15
Crestview Dr	21
Crestwood Dr	18
Cromwell Rd	18
Crosswinds Dr	36
Crowe Dr	14
Crown Dr	10
Cumberland Dr	34
Cummings Ln	11
Cypress Way	1
D	
Daleview Dr	33
Danberry Ln	25
Danyas Way	22
Darcey Ct	28
Daroca Ct	18
Dartmoor Dr	33
Davenport Ave	21
Declaration Dr	10
Deer Run	31
Deerfield Rd	25
Delaware Ave	18
Delmont Dr	20
Denali Ct	19
Denby Ct	28
DeSoto Ct	4
Devonshire Dr	28
Devron Ct	28
Dinser Dr	20
Dixon Rd	10
Dogwood Ln	19
Donelson Dr	15
Donnington Ct	29
Douglas Dr	11
Dover Blvd	21
Drakes Bay Dr	19
Driftwood Dr	20
Drocton Ct	27
Duana Ave	3
Duchess Ct	27
Dukesbury Ct	35
Dunbarton Ct	27
Dunbarton Dr	27, 28
Dundee Dr	35
Dunhill Ct	32
Dunhill Dr	32
Dunnabeck Ct	33
Dunston Rd	26
Durson St	22
Dylan Dr	9
E	
E Bourne Ter	18
E Ellison Ln	11
E Le Bost Dr	25
Eagle Dr	1
East Lake Dr	2
Eastman Trl	11
Eaton Ct	27
Eckschtay	18
Eden Dr	35
Edgewater	36
Edgewood Ct N	21
Edgewood Ct S	21
Edgewood Dr	21
Edinborough Ln	29
Eight Mile Rd	32, 36
Eleven Mile Rd	14, 23
Elizabeth Ln	28
Ellery Ln	10
Ellesmere Cir	10
Elliot Ln	11
Elm Ct	3
Emerald Forest Dr	21
Emerson Way	11
Emery Dr	34
Emily Ct	35
Empire Dr	16
Enchanted Dr	21
Endwell St	2
Energy Way	13
English Way	2
Ennishore Dr	26
Equestrian Trl	32
Erin Cir	33
Estrada Ln	18
Eubank St	3
Everbrook Ln	17
Evergreen Ct	30
Exeter Ct	27
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Fairway Hills Dr	21
Falmouth Ave	21
Faulkner Dr	11
Fawn Trl	35
Faywood St	3
Fenmore Way	25
Fenway Dr	34
Ferhoodle	18
Fieldstone Dr	18
Fireside Ct	25
Fitzgerald Blvd	11
Fleddermouse	18
Flint St	22
Florence Dr	32
Floyd Ln	10
Foothills Ct	34
Ford Way Dr	27
Forest Park Dr	29
Foster Dr	23
Fountain Park Dr E	23
Fountain Park Dr N	23
Fountain Park Dr S	23
Fountain Park Dr W	23
Fountain Walk Dr	15
Fourteen Mile Rd	1
Fox Run Rd	1
Foxmoor Dr	28
Foxton Dr	27
Franklin Mill Rd	25
Freemont Dr	21
Fuller Dr	28
Fulton Dr	11
G	
Galway Dr	33, 34
Gardenbrook Rd	14
Garfield Rd	31
Gateway Rd	3
Gen Mar	22
Georgetown	23
Georgia Ave	18
Gilbar Dr	26
Gina Ct	21
Glades Ct E	30
Glades Ct W	30
Gladwin Dr	35
Glamorgan Dr	21
Glen Haven Cir E	35
Glen Haven Cir W	35
Glen Ridge Ct	25
Glenda Ave	22
Glenhurst	21
Glenmoor	21
Glenwood Dr	18
Glyme Dr	26
Golden Rdg	2
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Graham Ln	20
Grand River Ave	16, 24
Grandview Ln	23
Greening Ct	27
Greening Dr	27
Greentree Rd	36
Greenview Dr	21
Greenwich Dr	20
Griswold	35
Grove Ct	25
Groveland	21
Guilford Rd	25
Gwinnett Loop	10
H	
Hadlock Dr	19
Haggerty Rd	12
Halifax Ln	29
Hallfield St	18
Halston Ct	28
Hamlet Ln	23
Hampton Ct	23
Hampton Hill Rd	23
Hannah Ct	35
Hanover Dr	10
Harbor Cv	3
Harrier Pl	18
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Harrison	24
Hartwick Cir	18
Hartwick Dr	18
Harvest Ct	27
Harvest Dr	27
Hathaway Ln	11
Havergale St	28
Hawthorne Ln	26
Hazelton Ct	33
Hearthstone Dr	11
Heartwood Dr	29
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Heatherbrae Way	25
Heatherbrook Ln	25
Heathergreene Ct	25
Heatherwoode Dr	25
Hemingway Dr	11
Hempshire St	35
Henning Dr	3
Heritage Dr	17
Herman St	2
Heron Dr	26
Heslip Dr	26
Hewes Ln	10
Heyn Dr	16
Hickory Grove Ct	27
Hickory Grove Ln	27
Hidden Cove Ct	26
High Pointe Blvd	36
Highlands Dr	23
High-Meadow Dr	27
Hillridge Dr	34
Hillsdale Dr	19
Hillside Ct	31
Hillside Dr	31
Hollydale	25
Holmes Rd	11
Holyoke Ct	20
Holyoke Ln	20
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Hooper Cir	10
Hooper Ln	10
Hopkins Dr	10
Hudson Dr	4
Humboldt Dr	9
Hummingdale Blvd	12
Hummingdale Cir	12
Huntingcross Dr	27
Huntington Rd	22
Huron Cir	14
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Idaho Ave	18
Independence Dr	2
Indiana Ave	18
Ingersol Dr	14
Ingram Rd	36
Inverness Ct	29
Ironside Ct	34
Iroquois Ct	29
Irvine Dr	28
Isabella Way	20
Island Lake Dr	18
Ivy Ln	22
J	
J R Blvd	13
Jackson	24
Jacob Dr	22
Jamestowne Rd	22
Jaslyn Ln	28
Jason Ct	25
Jasper Rdg	2
Jefferson	24
Jo Dr	24
Joindre Dr	2
Joliet Ct	2
Jonathan Dr	27
Joseph Dr	24
Joyce Ln	11
Junction	22
Juniper Cir	2
K	
Kali Ct	22
Karim Blvd	24
Kartar Ln	25
Katie Dr	36
Keenan Ct	22
Kelsey Bay Dr	19
Kenilworth Ln	2
Kennebee Dr	19
Kensington	29
Kent Ct	20
Kentucky Ave	18
Kerri Ct	22
Kilrush Dr	34
Kimberly Ct	28
Kings Pointe Dr	23
Kingsley Ct	1
Kingsley Ln	1
Kingswood Blvd	1
Kirkway Blvd	21
Kirkwood Dr	2
Knightsbridge Blvd	18
Knollwood Dr	23
L	
La Chonce Rd	25
La Roi Cir	2
La Roi Dr	2
La Rose	13
Ladbroke St	18
Ladene Ln	36
Lafayette Dr	10
Lafleur Ct	2
Lagoon Dr	3
Lakeview Ct	4
Lamier Dr	2
Lancaster Ct	33
Lancelot Ct	2
Lanford Dr	1
Langley Dr	19
Lannys Rd	15
Laramie Dr	21
Larkspur Ln	3
Lashbrook St	2
Lathum Dr	28
Laurel Dr	30
Lawrence Dr	11
Le Bost Ct	24
Le Bost Dr	25
Le Grand Blvd	2
Lebenta St	3
Ledgeview Dr	11
Lee BeGole Dr	14
Leeds St	27
Lemay St	3
Lenox Park Dr	1
Lewis Dr	12
Leyland Cir	18
Liberte Dr	2
Lightfoot Ln	10
Lightsway Dr	27
Lilley Trl	3
Lincoln	24
Lindbergh Ln	3
Linhart St	11
Little Falls Blvd	26
Little Rapids Ct	26
Little Stones Ct	26
Livingston Dr	2
Llewelyn Ct	36
Llewelyn Rd	36
Llorrac Ln	36
Lochmoor Ln	21
Lochrisen Way	26
Lodge Ct	25
Loganberry Rdg N	23
Loganberry Rdg S	23
London Ct	11
Londonderry Dr	25
Long Point Way	26
Louisiana Ave	18
Louvert Ct	27
Lowery St	13
Ludlow Dr	3
Luke Ln	18
Lynwood Dr	20, 29
M	
MacKenzie Dr	1
Mackinac Blvd	14
Madison	24
Magellan Dr	9
Magnolia Ct	2
Main St	23
Mallard Trl	20
Malott Dr	25, 26
Manchester Rd	11
Mandalay Cir	16
Mandalay Ct	16
Manhattan Cir	16
Manor Park Dr	23
Mansfield Dr	22
Mansion Ct	25
Mariga	18
Marks Dr	36
Marlborough Pl	4
Marlson Ave	22
Marquant Ct	2
Martell Ct	4
Martin Ave N	11
Maryland Ave	18
Maude-Lea Cir	25
Maudlin St	3
Maxwell Ct	18
Maybury Park Dr	32
Mayfair Ter	18
Mayo Ct	34
Mayo Dr	34
McLean Ct	27
Meadowbrook Rd	14, 36
Medina Blvd	18
Meeting Hall Ln	25
Melanie Ln	10
Meridian Ln	36
Middleton Dr	10
Midtown Cir	23
Midway Dr	27
Milan Ct	32
Mill Rd	36
Mill Road Ct E	36
Mill Road Ct W	36
Mill Stream Ln	24
Miquelon Ct	2
Mission Ln	35
Mitchell Rd	11
Mocking Bird Ct	20
Mondavi Dr	30
Monroe	24
Montana Ave	18
Montebello Ct	27
Monterey Dr	2
Monticello St	2
Montmorency Dr	2
Moorgate St	28
Mooringside Dr	25
Moreau Ct	2
Morgan Creek Ct	2
Muir Ln	11
Mulberry Ln	21
Murcia Rd	18
Myrtle Ct	23
Mystic Blvd	27
Mystic Forest Dr	27
N	
N Ellison Ln	11
N Karevich Dr	15
N Le Bost Dr	24
N McMahon Cir	25
N Rockledge Blvd	25
Nadlan Dr	4
Nantucket Dr	20
Napier Rd	19
Naples Dr	21
Nardeer	18
Nepavine Ct	19
Nepavine Dr	19
Nesrus St	13
Neston St	13
New Ct	2
Newberry Dr	22
Nick Lidstrom Dr	26
Nilan Dr	25
Nine Mile Rd	25, 29
Norfolk Ct	33
Normandy Ct	35
North Haven Dr	3
North Hills Ct	34
North Hills Dr	34
Northumberland St	28
Norwich Dr	4
Nottingham Dr	20
Novi Meadows Blvd	18
Novi Rd	2, 34
Novi Way	27
O	
Oak Tree Rd	25
Oakwood Dr	25
Oberlin Blvd	20
Oberlin Ct	20
Ocher	18
O'Connor Ln	11
Ohio Ave	18
O'Jaustin St	13
Old Baseline Rd	35
Old Grand River W	15
Old Novi Rd	11, 35
Olde Orchard St	24
Onaway Ct	35
Onaway Dr	35
Orchard Hill Pl	36
Oregon Ave	18
Orianna Ln	23
Osprey Dr	26
Overlook Trl	20
Owenton St	3
Oxford Ct	35
P	
Paddington Ct	33
Paine Dr	10
Paisley Cir	1
Palace Ct	25
Palmer Dr	2
Pamplona Ln	18
Paramount St	2, 11
Park Forest Ct	25
Park Place Ct	31
Park Place Dr	31
Park Ridge Ct	23
Park Ridge Rd	23
Parklow St	2
Paul Bunyan Dr	23
Pavilion Dr	25
Peachtree	36
Peary Ct	4
Pebble Ln	20
Pellston Dr	35
Pembine St	3
Penhill St	3
Peninsula Dr	20
Pennington Ct	4
Pennington Ln	4
Pennsylvania Ave	23
Penton Rise Ct	26
Peppermill Ct	25
Perceval Ln	22
Perth Ct	33
Petros Blvd	22
Pheasant Run	26
Phillip Dr	36
Picadilly Cir	35
Picara Dr	21
Pickford St	3
Picnic Ct	25
Pierre Dr	2
Pine Crest Dr	23
Plaisance Blvd	27
Plateau Dr	2
Pleasant Cove Dr	10
Pomino Dr	32
Pondview Dr	36
Portage Way	26
Porter St	28
Portico Ln	23
Portside Dr	4
Portsmouth Ave	21
Potomac	23
Preserve Ct	22
Presidio Ln	29
Prestwick Ct	36
Primrose Dr	2
Princeton Blvd	33
Prospect Ln	22
Providence Pkwy	17
Purlingbrook Rd	36
Q	
Quarry Ct	11
Queens Pointe Dr	23
Quince Dr	26
R	
Raftingway Ct	26
Randall Ct	28
Rathlone Dr	34
Ravello Ct	32
Ravine Dr	19
Red Pine Ct	20
Redwing Dr	21
Reeds Pointe Dr	19
Regency Dr	24
Reindeer Dr	35
Remington Ln	28
Renford Dr	25
Revere Dr	10
Rexton St	3
Richmond Dr	32
Ridge Rd E	23
Ridge Rd W	23
Ridgeview Blvd	26
Ripple Creek Rd	25
Riverbridge Ct	35
Riverview Ln	21
Roberts Rd	31
Robin Ct	21
Rochester Dr	20
Rock Hill Ln	25
Roethel Dr	35
Rolling Grove Dr	2
Roma Ridge Dr	21
Ronayton St	13
Roric St	13
Rosaron St	13
Roscommon Dr	35
Rosewood Ct	32
Rossdale Ct	34
Rotunda Ct	25
Roundview Dr	27
Rousseau Cir	2
Rousseau Dr	2
Roxbury Dr	33
Rushwood Ln	29
Russet Ln	27
Ruston Blvd	13
Rutledge Ln	10
Ryan Ct	4
S	
S Karevich Dr	15
S McMahon Cir	25
Sagebrush	26
Salem Ct	20
Samoset Ct	20
Samuel Linden Ct	9
Sandalwood Cir	2
Sandpiper Ct	20
Sandpoint Way	36
Sandstone Dr	11
Sanford Dr	21
Sarah Flynn Dr	21
Sarnia Dr	29
Savannah Ct	1
Savoie Rd	36
Saybrook Ct	19
Scarborough Ln	24
Scarlet Ct	21
Scarlet Dr N	21
Scarlet Dr S	21
Scenic Ln	34
Seaglen Dr	19
Sedgwick Blvd	10
Sedra Ct	22
Seeley Rd	24
Seminole Ct	26
Seminole Trl	26
Senate Pl	23
Seneca Ln	2
Serenity Dr	34
Settlers Creek Ct	22
Sevilla Cir	18
Shadow Pine Way	25
Shadybrook Dr	36
Shamrock Hl	10
Shawood Dr	10
Sheffield Dr	33
Sheri Dr	2
Sheridan Dr	25
Shilo Ct	29
Shilo Dr	29
Shore Line Dr	19
Shorecrest Dr	4
Siegal Ct	36
Siegal Dr	36
Sierra Dr	21
Silverdale Dr	2
Silvery Ln	26
Simmons Dr	21
Singh Blvd	36
Sister Xavier Way	17
Sixth Gate	23
Sleepy Hollow Dr	2
Sloan St	18
Solomon Blvd	36
Somerset Ct	28
South Lake Ct	3
South Lake Dr	3, 4
Southwyck Ct	28
Sports Park Dr	31
Springlake Blvd	4
Springwell Ct	25
Squire Dr	25
Stassen Ave	22
Steeple Path	27
Steinbeck Gln	11
Sterling Dr	4
Still Creek Ct	26
Stockton Dr	10
Stone Rd	22
Stonebrook Dr	17
Stonehenge Blvd	25
Stonewall Ct	11
Stratford Ln	33
Strath Haven Dr	21
Strawberry Ct	25
Streamwood Dr	18
Sudbury Ct	35
Sullivan Ln	22
Summer House Ct	25
Summer Ln	28
Summerlin Blvd	3
Summit Ct	12
Summit Dr	12
Sunbury Ct	16
Sunday Dr	31
Sunflower Rd	36
Sunnybrook Ln	28
Sunrise Blvd	36
Surfside Rd	21
Sussex Dr	22
Sutherland Dr	21
Sutton Ct	20
Sycamore Dr	26
T	
Taft Rd	16, 33
Talford St	25
Tamara Dr	26
Tanglewood Dr	2
Ten Mile Rd	19, 24
Tennyson Ct	20
Tera Ln	23
Terra Del Mar Dr	19
Terrace Ct	25
Thatcher Ct	22
Thatcher Dr	22
Thirteen Mile Rd	12
Thoreau Rdg	11
Thornbury Dr	20
Thornton Ln	15
Timber Trl	18
Timberlane Ct	4
Tiverton Dr	3
Todd Ln	36
Torino Dr	30
Tottenham Ct	28
Tower Ct	25
Town Center Dr	14
Traci Trl	10
Trafalgar Ct	28
Trailside Ct	25
Trans X Rd	23
Treatment Plant Access Rd	9
Trent Ct	35
Trestle	22
Trillium Dr	25
Trillium Loop	25
Turnberry Blvd	36
Tuscany Ct	25
Twain Pl	11
Twelve 1/2 Mile Rd	10
Twelve Mile Rd	10, 18
Twelve Oaks Crescent Dr	14
Twelve Oaks N	14
Twelve Oaks Ring Rd	14
Twelve Oaks S	14
U	
Upland Hill Dr	23
V	
Valencia Cir	20
Valley Starr Rd	25
Vasilios Ct	29
Venetian Ct	21
Veneto Dr	32
Venice Ct	21
Venice Dr	21
Venture Dr	26
Veranda Dr	35
Vermont Ave	18
Vero Ct	34
Verona Dr	10
Victoria Rd	18
Viewcrest Ct	1
Viewcrest Dr	1
Villa Ct	29
Villa Dr	30
Villa Terrace Ct	29
Village Lake Rd	25
Village Oaks Rd	25
Village Wood Cir	25
Village Wood Ln	25
Village Wood Rd	25
Vincenti Ct	24
Vine Ct	2
Violet Ln	28
Virginia Ave	18
Vista Ln	34
W	
W Le Bost Dr	25
W Pontiac Trl	4
Wainwright St	11
Wakefield Dr	2
Walden Ct	4
Wales Ct	32
Wall St	16
Walnut Ln	32
Warley Ct	2
Warrington Ct	20
Warrington Dr	20
Warwick Ct	2
Washington	24
Waterbury Blvd	2
Waterland Dr	31
Waverly Dr	2
Waycroft Dr	27
Weathervane Ct	21
Webster Ct	2
Wedgewood Dr	4
Welch Rd	34
Wellesley Ct	20
Wellington Dr	4
Wembley Dr	20
Wendingo Ct	27
West Lake Dr	3
West Oaks Access Dr	15
West Oaks Dr	15
West Park Dr	9
West Rd	4
Westchester Ct	35
Westgate Blvd	4
Westminster Cir	25
Westmont Ct	28
Westmont Dr	28
Weston Dr	11
Westridge Ln	34
Wexford Blvd	2
Wharton Ct	2
Wheaton Ln	35
Whipple	15
Whispering Ln	36
Whistler Dr	11
Whitcomb Rd	36
White Pines Dr	27, 28
White Plains Dr	21
Whitehall Dr	28
Whitman Way	11
Whittler Trl	11
Wilder Ct	11
Williams Dr	22
Willingham Dr	28
Willow Ln	24
Willowbrook Dr	25
Willowbrook Rd	24
Wilshire Ct	3
Wimbleton Way	2
Windermere Ct	33
Windfall Rd	17
Winding Trl	3
Windmill Ct	35
Windridge Ln	28
Windsor Ct	2
Winfield Rd	25
Winnsborough Dr	27
Wintergreen Cir	28
Winthrop Ct	27
Winthrop Dr	27
Witherspoon Dr	10
Wixom Rd	18
Wolcott Dr	10
Wolfe Pass	11
Woodbridge Ln	26
Woodglen Dr	26
Woodham Rd	20, 29
Woodland Creek Dr	26
Woodland Glen Dr	35
Woodruff	21
Woodshire Ct	25
Woodside Ct	34
Woodstone Ln	3
Woodworth Dr	20
Woolsey Dr	25
Worcester Dr	33
Worthington Ct	2
Wright Way	22
Wyoming Ave	18
Y	
Yardley Dr	10
Yeats Dr	11
York Mills Cir	33
Yorkshire Dr	22
Z	
Zisette Dr	36

Appendix A

Meeting#1 – Roads 101 Presentation

Welcome

Roads Committee

ROADS - 101

01/13/2020

cityofnovi.org

Roads Team Members

- **DPW Staff**
  - Director
  - Deputy Director, Megan Mikus
  - City Engineer, Ben Croy
  - Construction Engineer, Aaron Staup
  - Staff Engineer, Rebecca Runkel
- **Consulting Engineers**
  - OHM Advisors
    - Tim Juidici
  - AECOM
    - Mark Koskinen
  - Spalding DeDecker
    - Jeremy Schrot

How Novi Funds Roads

- **202 – Major Roads**
  - Funded by ACT 51 ~ $4M/year
    - Anticipate increase of 8% annually through FY 2022-23
- **203 – Local Roads**
  - Funded by ACT 51 ~ $1.5M/year
    - Anticipate increase of 8% annually through FY 2022-23
- **204 – Municipal Roads**
  - Funded by Metro Act Revenue approx. $185,000/year
  - Funded by Trunkline Revenue approx. $113,000/year
  - Funded by dedicated road millage (1.5 mills) which has generated between $4.9 - $5.3M/year to supplement **202, 203** through FY 2018-19**.** Due to rollback, millage rates:
    - FY 2016-17 was 1.4923
    - FY 2017-18 was 1.4708
    - FY 2018-19 was 1.4484
    - FY 2019-20 is 1.4273

Supplementary Roads Funding Sources

- **Oakland County Federal Aid Committee (FAC)**
  - 62 Cities, RCOC, MDOT
  - Discuss and disperse federal road funds
  - Apps are scored and ranked in yearly "call for projects"
  - ~$17M in funding, ~$6M goes to CVT's
  - Wixom Rd, 10 to City Limits (2022), Taft Rd in call, 8 ½ to 10 (2023)
- **Tri-Party**
  - City, County, + RCOC
  - ~$6M ($3M for Twps and $3M Cities and Villages)
  - Dispersed by miles of county roads
  - Can accumulate
  - 12 Mile and Novi Intersection, 10 Mile Road
- **Corridor Improvement Authority (CIA)**
  - Tax Increment Finance capture that can be used on capitol projects
  - Helped fund Ring Roads

Funding, continued

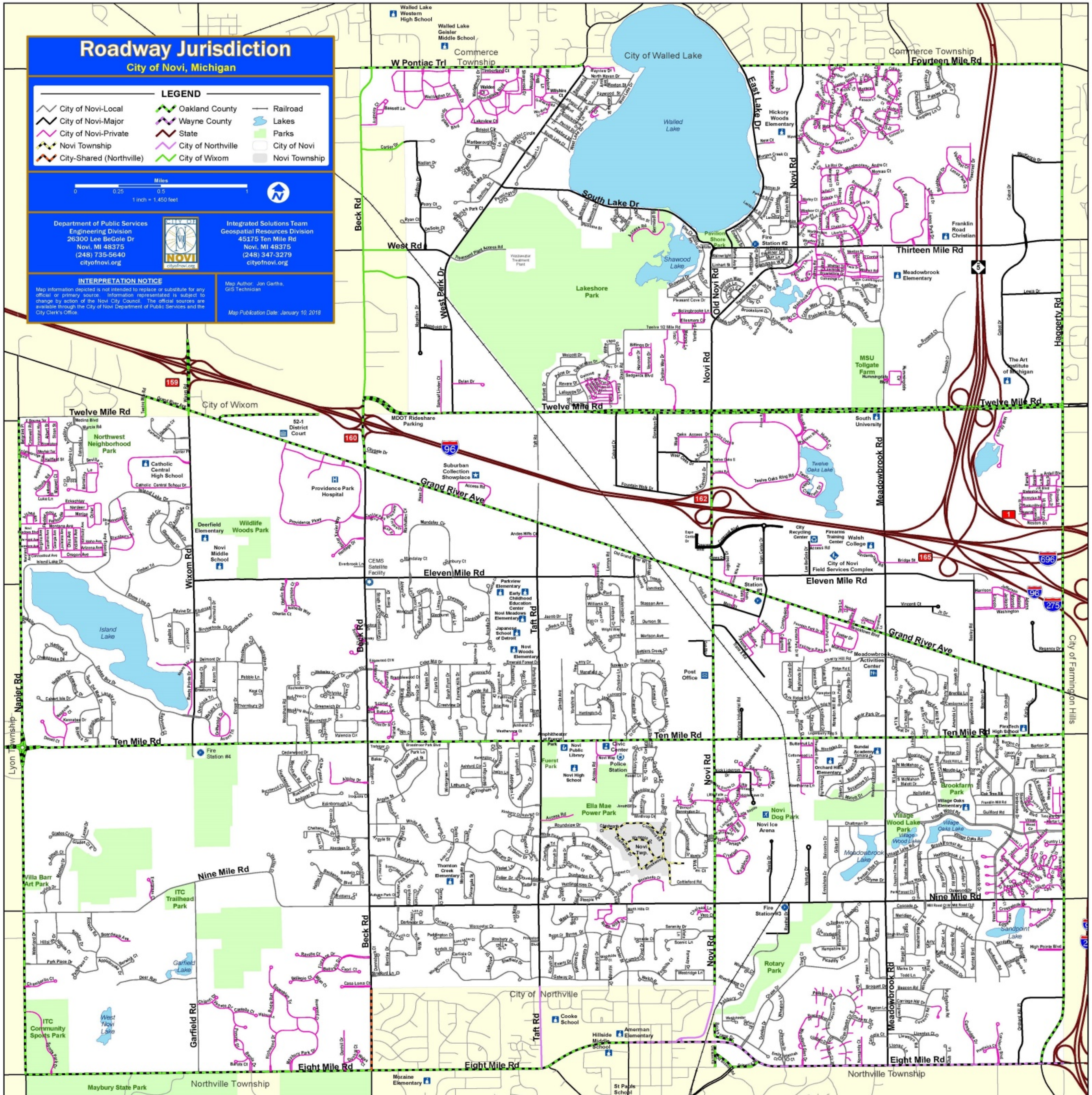
- **Local Road Improvement Program (LRIP)**
  - County Commissioners Office
  - Based on economic development
  - Questionable availability in future
  - Crescent Blvd (NE Ring), Lee BeGole (2019)
- **Highway Safety Improvement Program (HSIP)**
  - Federal program to improve safety
  - Data driven
  - Intersections, 9 Mile and Taft RAB (2023) combined with FAC
- **Transportation Economic Development Fund (TEDF)**
  - Federal job creation and job retention
  - Awarded on case by case basis
- **Better Utilizing Investments to Leverage Development (BUILD)**
  - Federal rigorous merit-based process
  - Beck Road

Other Utilities

- **Road Commission for Oakland County (RCOC)**
  - Even Mile Roads (east-west) and Haggerty, Napier & Novi (8 to 12) (north-south)
  - Strategic Planning, bi-annual
  - 10 Mile, 12 Mile
- **Wayne County Roads Division**
  - 8 Mile (Center to Haggerty)
- **Michigan Department of Transportation (MDOT)**
  - I-96, M-5, etc.
  - Flex Route I-96 (Kensington Road to I-275)
- **Great Lakes Water Authority (GLWA)**
  - Coordinate and planning
  - 14 Mile Redundancy Route
- **DTE Energy**
  - Overhead and Underground relocation
  - NW & SW Ring Roads

Utilities, cont'd

- **Water Resources Commission (WRC)**
  - County water and sewer infrastructure
  - Storm water
- **Environment, Great Lakes & Energy (EGLE)**
  - Formerly MDEQ
  - Permitting wetlands, waters of the state, SESC (Novi handles own)
- **Consumers (natural gas)**
  - Underground relocation
- **ITC Holdings**
  - Independent electricity transmission
  - ITC Trail, Taft Bridge over I-96
- **Franchise Fiber/Cable**
  - Various in Right-of-Way (ROW)

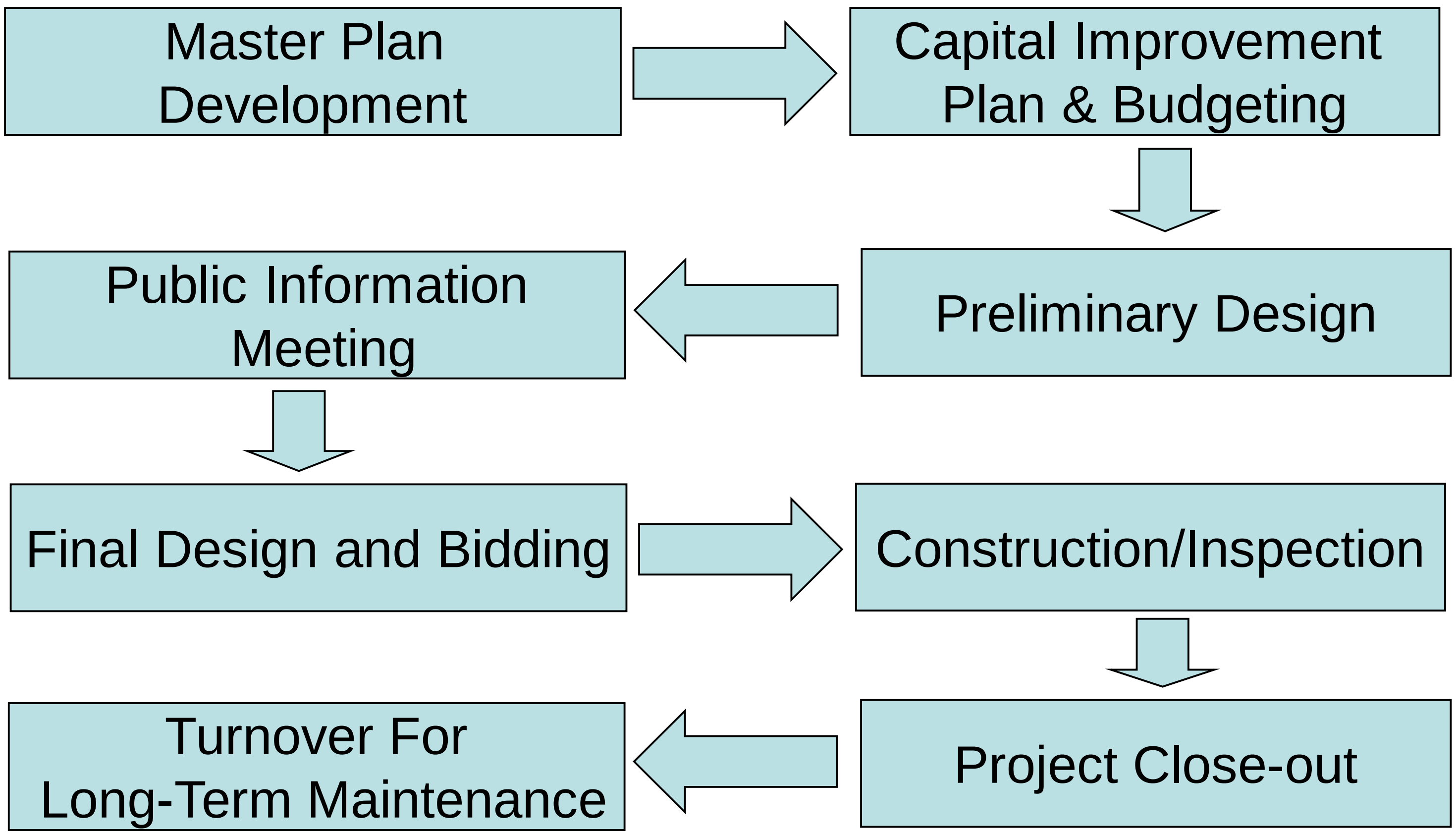


Roadway Jurisdiction
City of Novi, Michigan
LEGEND
City of Novi-Local
City of Novi-Major
City of Novi-Private
Novi Township
City-Shared (Northville)
Oakland County
Wayne County
State
City of Northville
City of Wixom
Railroad
Lakes
Parks
City of Novi
Novi Township
Miles
0 0.25 0.5 1
1 inch = 1,450 feet
Department of Public Services
Engineering Division
26300 Lee BeGole Dr
Novi, MI 48375
(248) 735-5640
cityofnovi.org
CITY OF NOVI
cityofnovi.org
Integrated Solutions Team
Geospatial Resources Division
45175 Ten Mile Rd
Novi, MI 48375
(248) 347-3279
cityofnovi.org
INTERPRETATION NOTICE
Map information depicted is not intended to replace or substitute for any official or primary source. Information represented is subject to change by action of the Novi City Council. The official sources are available through the City of Novi Department of Public Services and the City Clerk's Office.
Map Author: Jon Gartha, GIS Technician
Map Publication Date: January 10, 2018
City of Walled Lake
Walled Lake
Commerce Township
W Pontiac Trl
Fourteen Mile Rd
East Lake Dr
South Lake Dr
Novi Rd
Old Novi Rd
Beck Rd
West Rd
West Park Dr
Thirteen Mile Rd
Haggerty Rd
Lakeshore Park
Shawood Lake
Pavilion Shore Park
MSU Tollgate Farm
Twelve Mile Rd
City of Wixom
Wixom Rd
Northwest Neighborhood Park
Catholic Central High School
Providence Park Hospital
Wildlife Woods Park
Grand River Ave
Taft Rd
Meadowbrook Rd
Twelve Oaks Lake
Eleven Mile Rd
Island Lake
Ten Mile Rd
Napier Rd
Lyon Township
Nine Mile Rd
ITC Trailhead Park
Villa Barr Art Park
Garfield Rd
Garfield Lake
West Novi Lake
ITC Community Sports Park
Eight Mile Rd
Maybury State Park
Northville Township
City of Northville
Ella Mae Power Park
Fuerst Park
Novi Dog Park
Rotary Park
Brookfarm Park
Village Wood Lake Park
Meadowbrook Lake
Sandpoint Lake
City of Farmington Hills

Infrastructure Master Planning

- **Infrastructure master plans are important tools in the development of the Capital Improvement Program (CIP).**
- **The Engineering Division completed the following master plans that are used as the basis for the Year 6 CIP:**
  - Pavement Condition Survey - PASER(2011, 2012, 2013, 2014, 2015, 2017 & 2018)
  - Chip Seal Evaluation and Plan (2013, 2014, 2015, 2016, 2017 & 2019)
  - Master Thoroughfare Plan (2016)
- **Scoping Studies**
  - 10 Mile Scoping Study (2019)
  - Beck Road Scoping Study (2018)
  - Novi and Grand River Corridor Update (2018)
  - Asset Management Plan (2012)
  - TAMC Road Report 2020-2024 (2019-2020)

Lifecycle of a Capital Project



Design & Construction of Capital Projects

- **Design tasks include:**
  - Develop detailed project scope, schedule and budget
  - Contracting with the consultant to complete design of project
  - Easement acquisition (handled primarily by in-house staff)
  - Managing the scope, schedule and budget throughout the design phase of project
  - Communication with the public about the project using mailings and public meetings to deliver information and receive feedback
  - Reviewing bids and recommending award for construction contracts
- **Construction tasks include:**
  - Managing the scope, schedule and budget during construction
  - Communication with residents and businesses during construction
  - Oversight of consultant's inspection team and the contractor
  - Final inspection and close out of the project

Pavement Condition Assessment: PASER

- **PASER = Pavement Surface Evaluation and Rating system**
  - Visually inspecting pavement's surface condition
  - Assigning a quantitative rating on a scale of 1 to 10
    - 1 = failed condition
    - 10 = excellent condition.
- **PASER helps provide the <u>basis</u> for determining the level of future investment required to achieve <u>acceptable pavement</u> conditions throughout the City.**
- **Guidelines for rating the pavement surface using the PASER system have been developed by the State of Michigan's Transportation Asset Management Council (TAMC).**
- **Having an asset management program is now a requirement for ACT 51 dollars.**

PASER Ratings

Asphalt Streets

PASER Rating	Condition	Treatment
9 & 10	Excellent	No maintenance required
8	Very Good	Little or no maintenance
7	Good	Crack sealing and minor patching
5 & 6	Fair – Good	Preservative treatments (non-structural)
3 & 4	Poor – Fair	Structural improvement (overlay)
1 & 2	Failed	Reconstruction

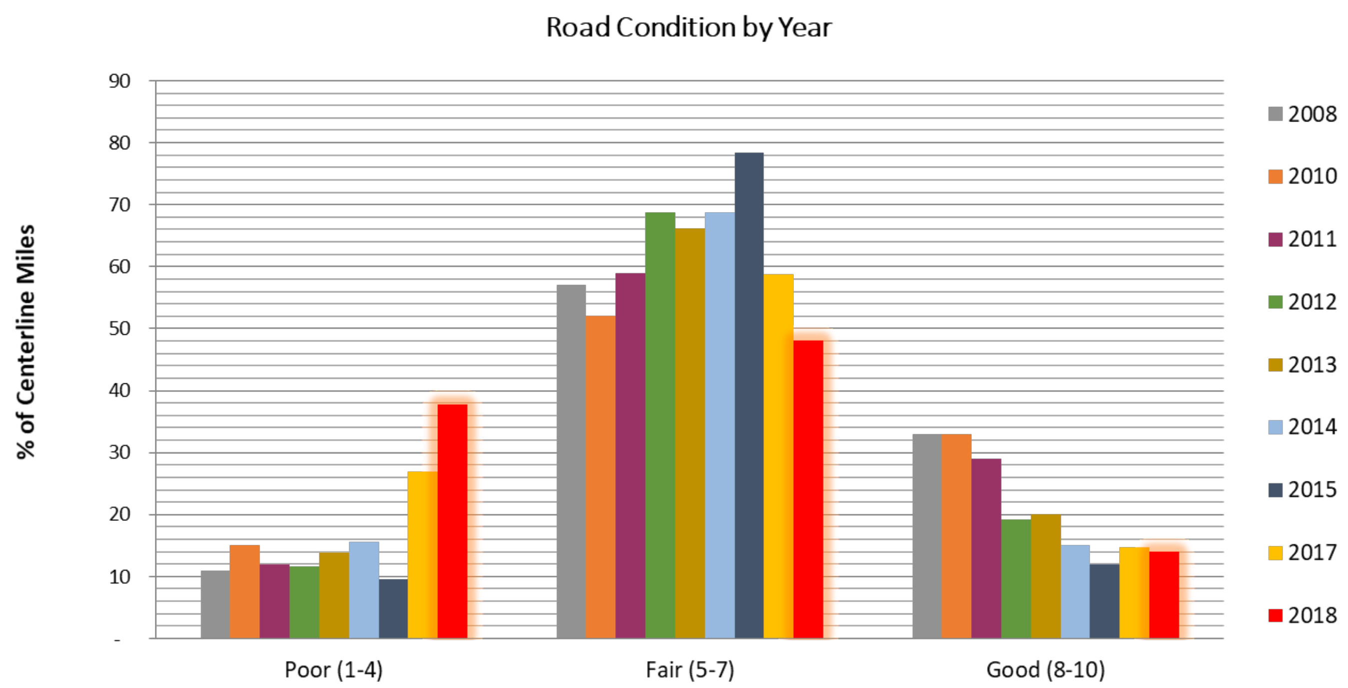
Concrete Streets

PASER Rating	Condition	Treatment
9 & 10	Excellent	No maintenance required
7 & 8	Very Good	Routine maintenance
5 & 6	Fair – Good	Surface repairs, sealing, partial-depth patching
3 & 4	Poor – Fair	Extensive slab or joint rehabilitation
1 & 2	Failed	Reconstruction

2019 PASER Roads by Percentage

Category	Rating					Total
	Excellent (9-10)	Very Good (8)	Good (6-7)	Fair (4-5)	Poor (1-3)	(lane miles)
Major	16	4	9	46	6	81
Local	16	24	94	138	37	309
Total Mileage	32	29	103	184	44	391
% of Road Network	8%	7%	26%	47%	11%	

PASER Average by Year



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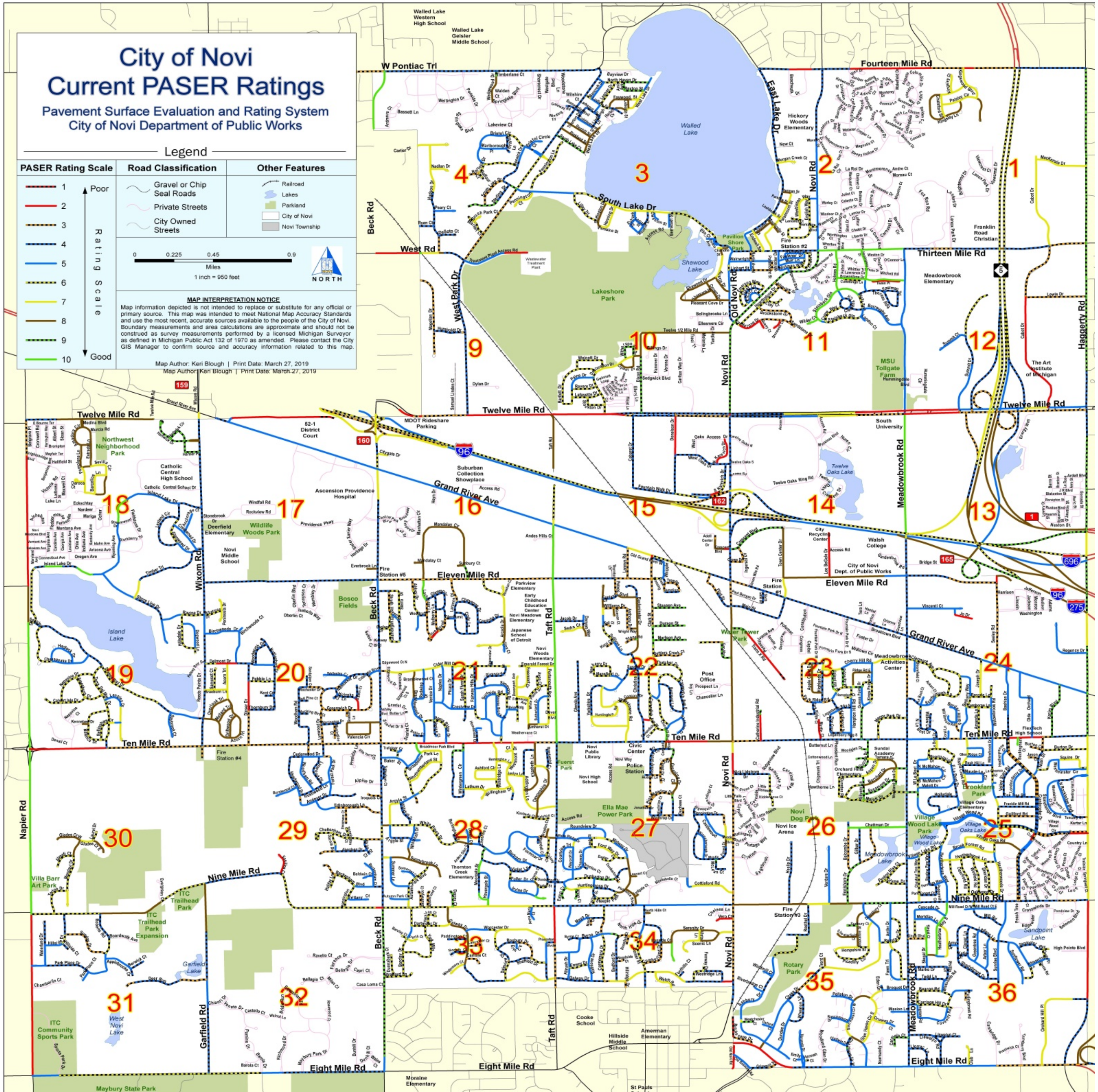

City of Novi
Current PASER Ratings
Pavement Surface Evaluation and Rating System
City of Novi Department of Public Works
Legend
PASER Rating Scale
1 Poor
2
3
4
5
6
7
8
9
10 Good
Rating Scale
Road Classification
Gravel or Chip Seal Roads
Private Streets
City Owned Streets
Other Features
Railroad
Lakes
Parkland
City of Novi
Novi Township
0 0.225 0.45 0.9
Miles
1 inch = 950 feet
NORTH
MAP INTERPRETATION NOTICE
Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.
Map Author: Keri Blough | Print Date: March 27, 2019
Map Author: Keri Blough | Print Date: March 27, 2019
W Pontiac Trl
Fourteen Mile Rd
Walled Lake
South Lake Dr
East Lake Dr
Novi Rd
Old Novi Rd
West Rd
West Park Dr
Beck Rd
Thirteen Mile Rd
Haggerty Rd
Lakeshore Park
Shawood Lake
Pavilion Shore Park
MSU Tollgate Farm
Twelve Mile Rd
Grand River Ave
Meadowbrook Rd
Taft Rd
Wixom Rd
Eleven Mile Rd
Island Lake
Ten Mile Rd
Napier Rd
Nine Mile Rd
Garfield Rd
Eight Mile Rd
Maybury State Park
1
2
3
4
5
6
7
8
9
10
11
12
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General Pavement Considerations

- **Drainage Provisions**
  - Surface & subsurface drainage
- **Subgrade**
  - Support capacity for pavement & during construction
- **Traffic & Loading**
  - Traffic volumes, heavy vehicles
- **Coordination with utility improvements**

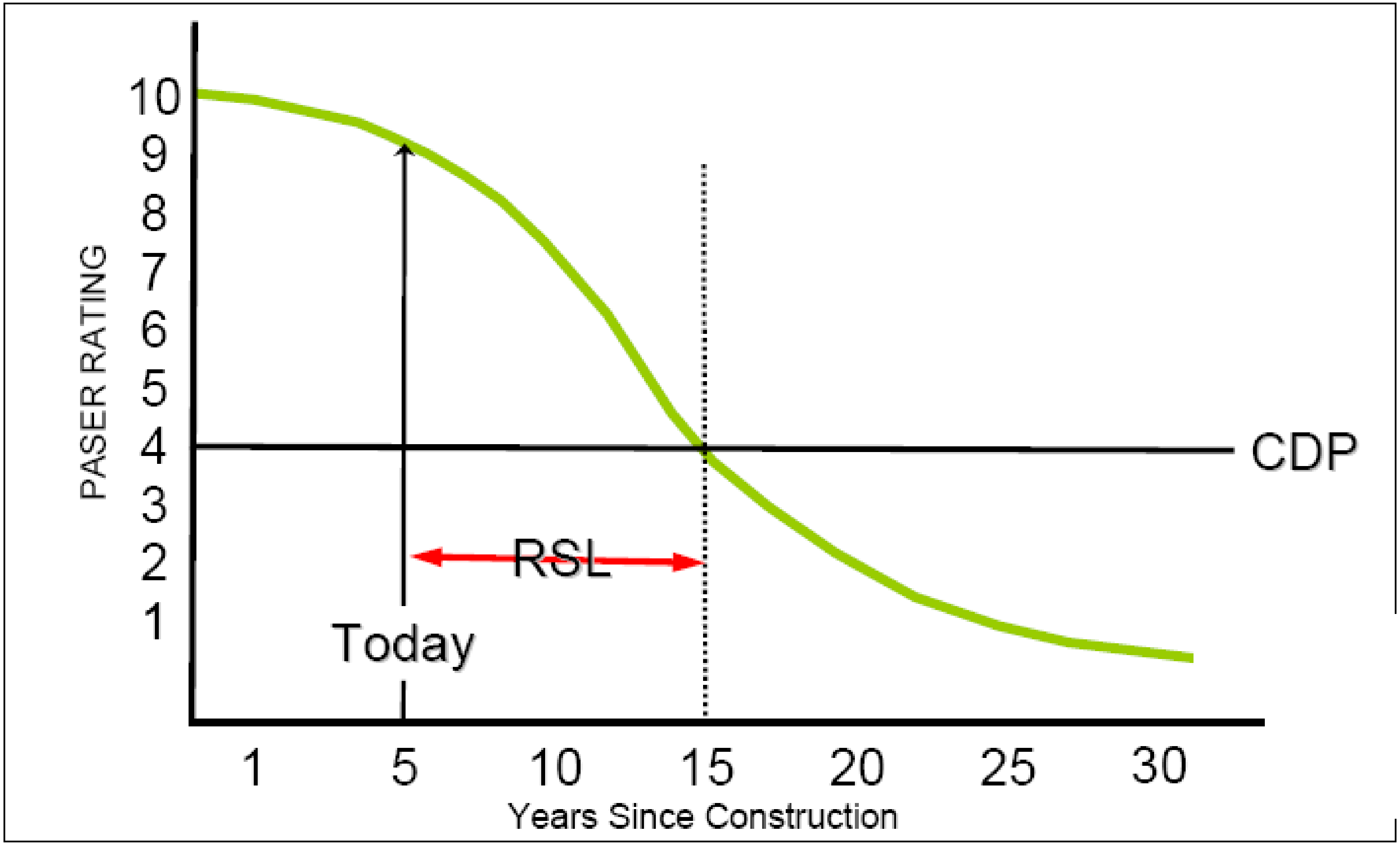
Asphalt Pavement

- "Flexible" pavement – loads distribute to base
- Typical design life 15-20 years
  - 30+ years of life with maintenance/rehab
- Lower initial construction cost vs. concrete
- More frequent maintenance required
- Shorter initial construction & less impactful maintenance durations
- Overall lifecycle cost considers service life and required maintenance

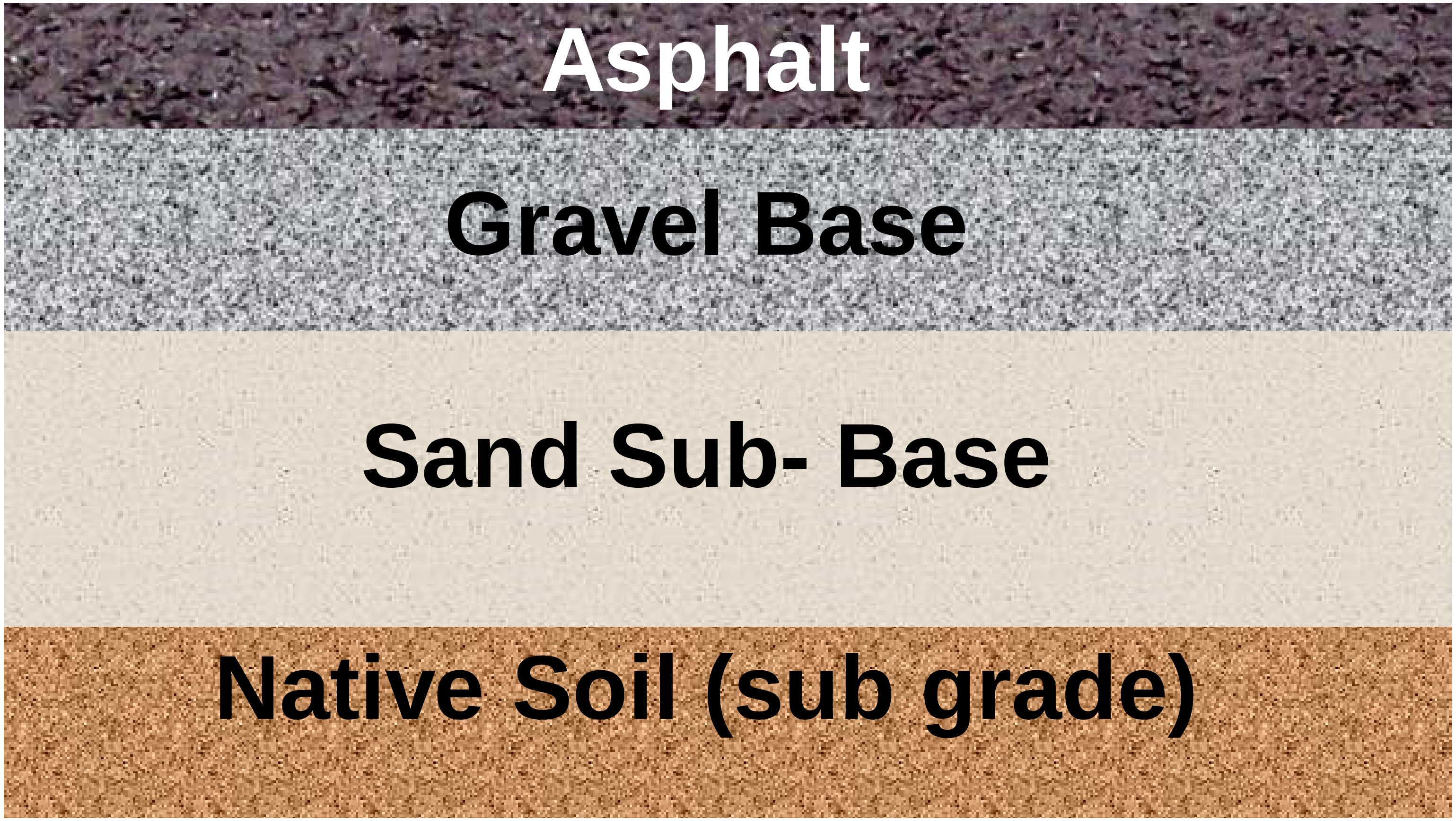
Concrete Pavement

- **Rigid" pavement – higher loads & distribution**
- **Typically long service life - 25 to 35 years design**
  - 70+ years of life with proper maintenance
- **Higher initial construction cost vs. asphalt**
- **Less frequent maintenance, but repairs impactful**
- **Overall lifecycle cost considers pavement longevity and required maintenance**

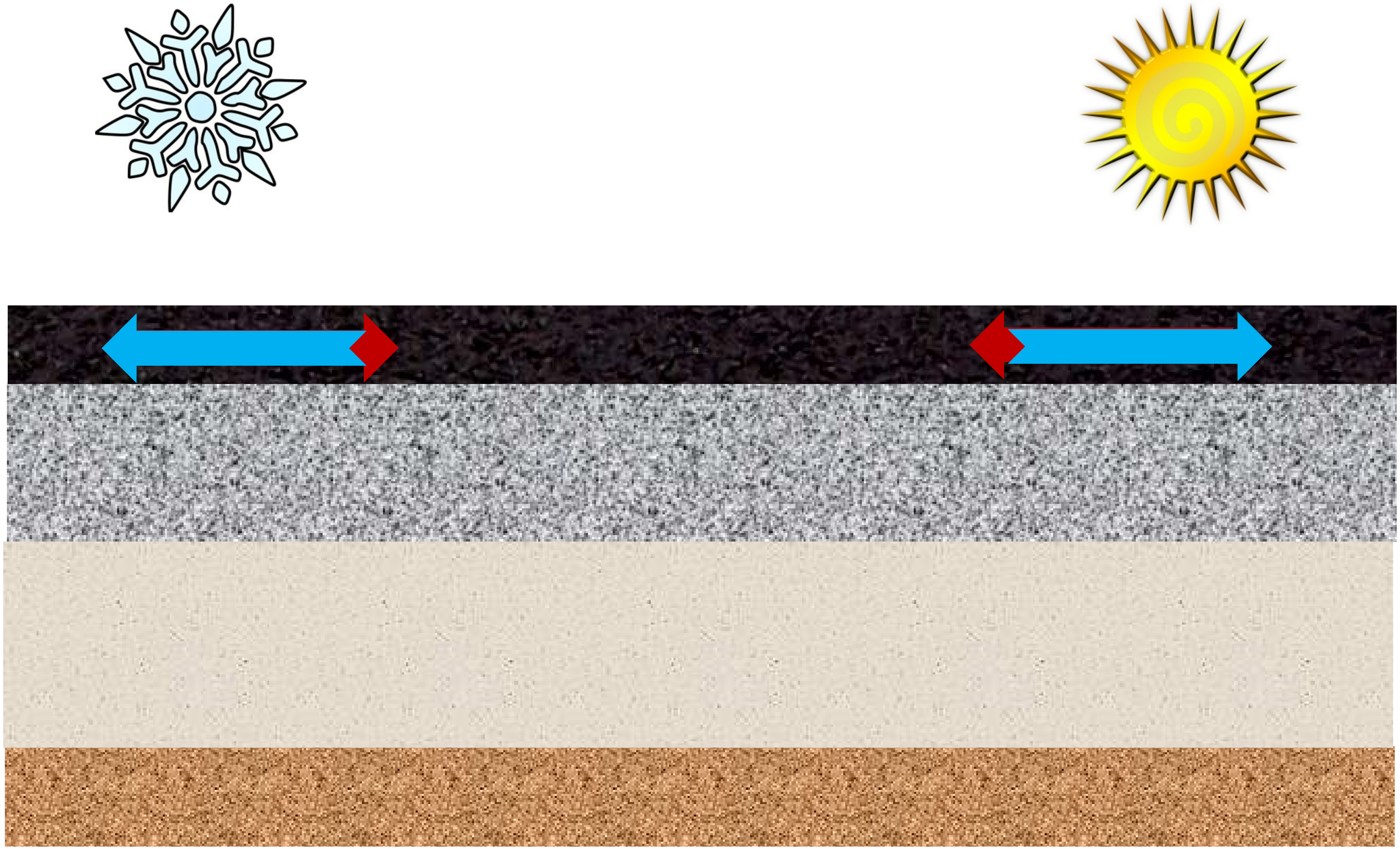
Pavement Deterioration Curve



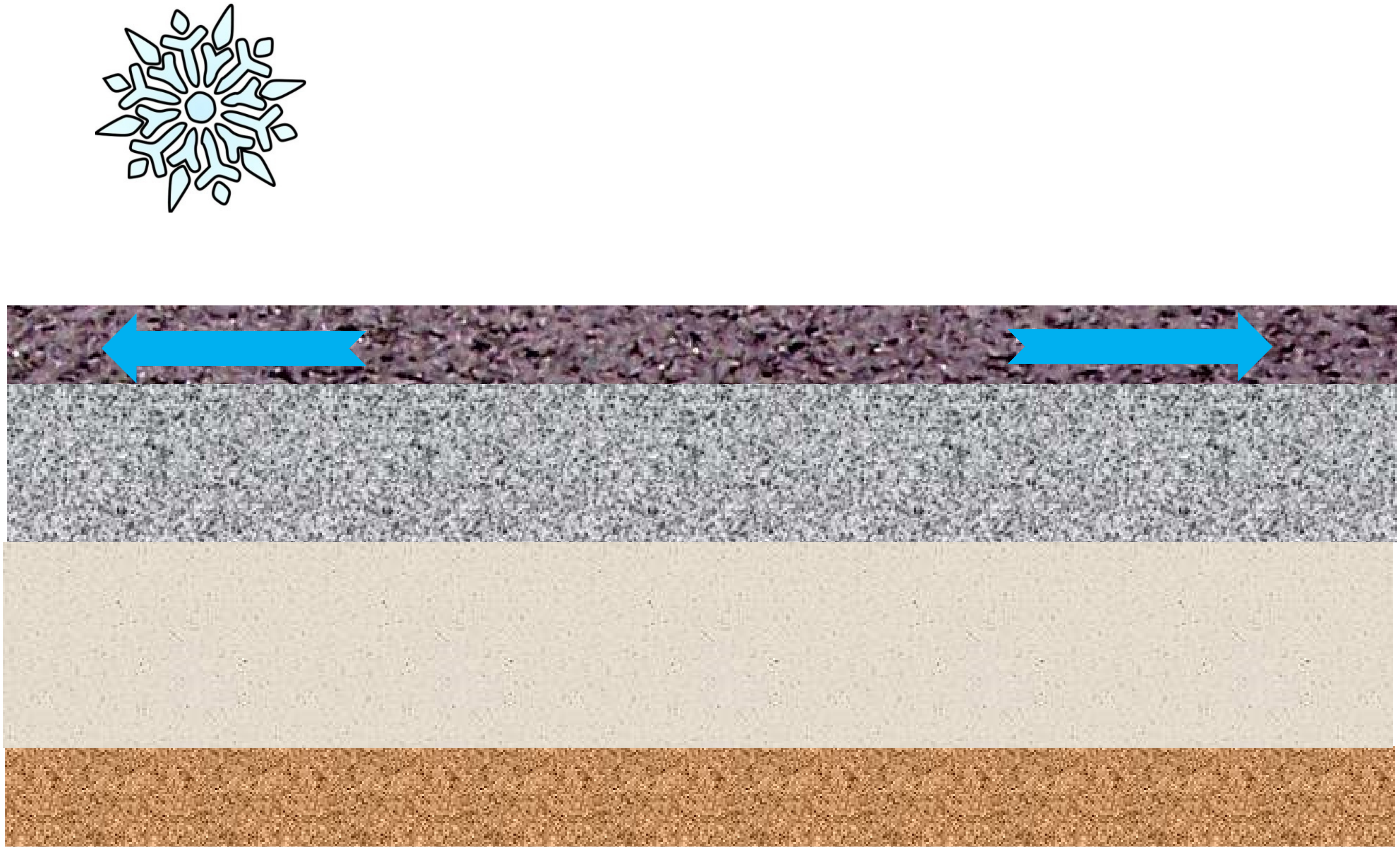
Typical Pavement Section



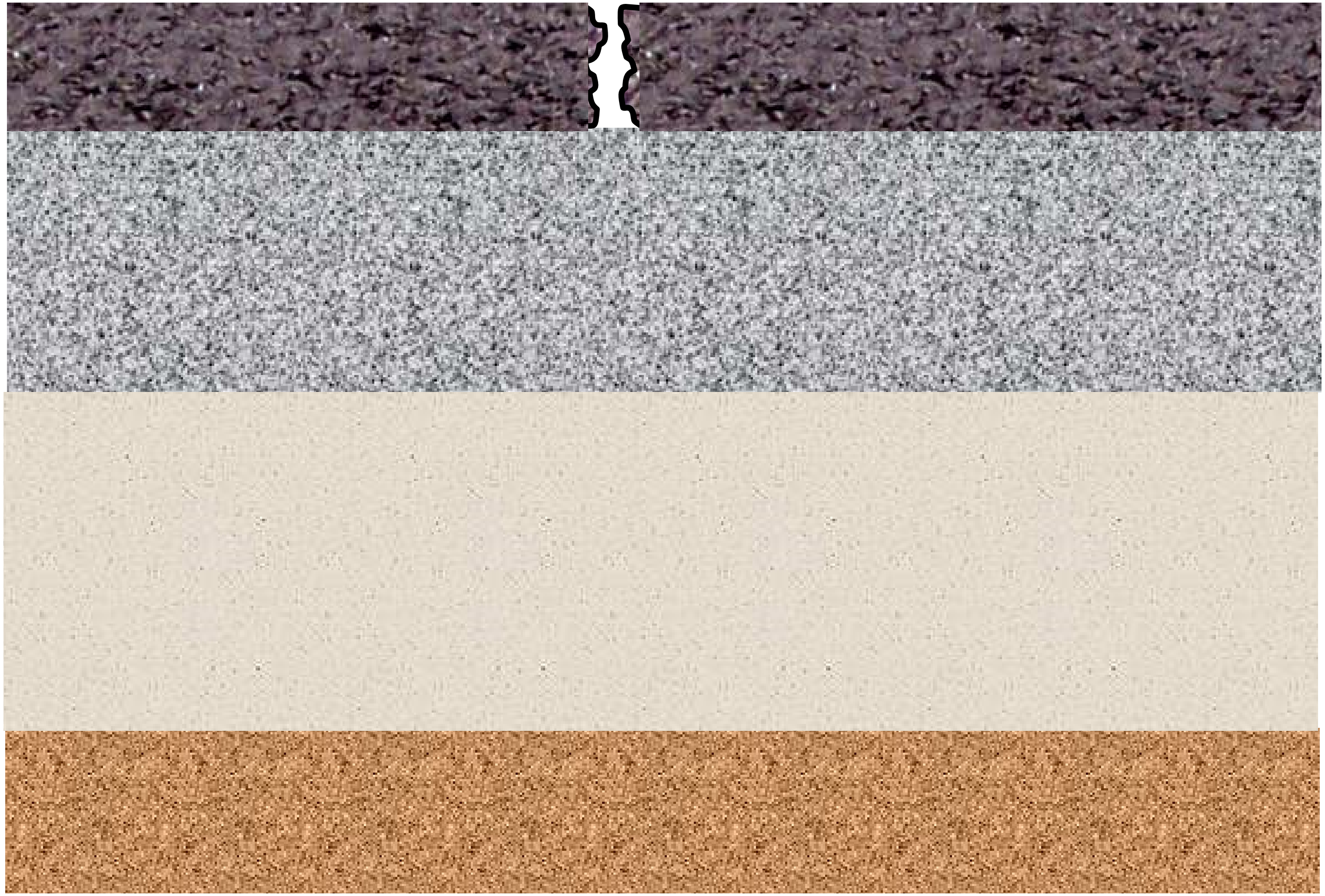
Environment



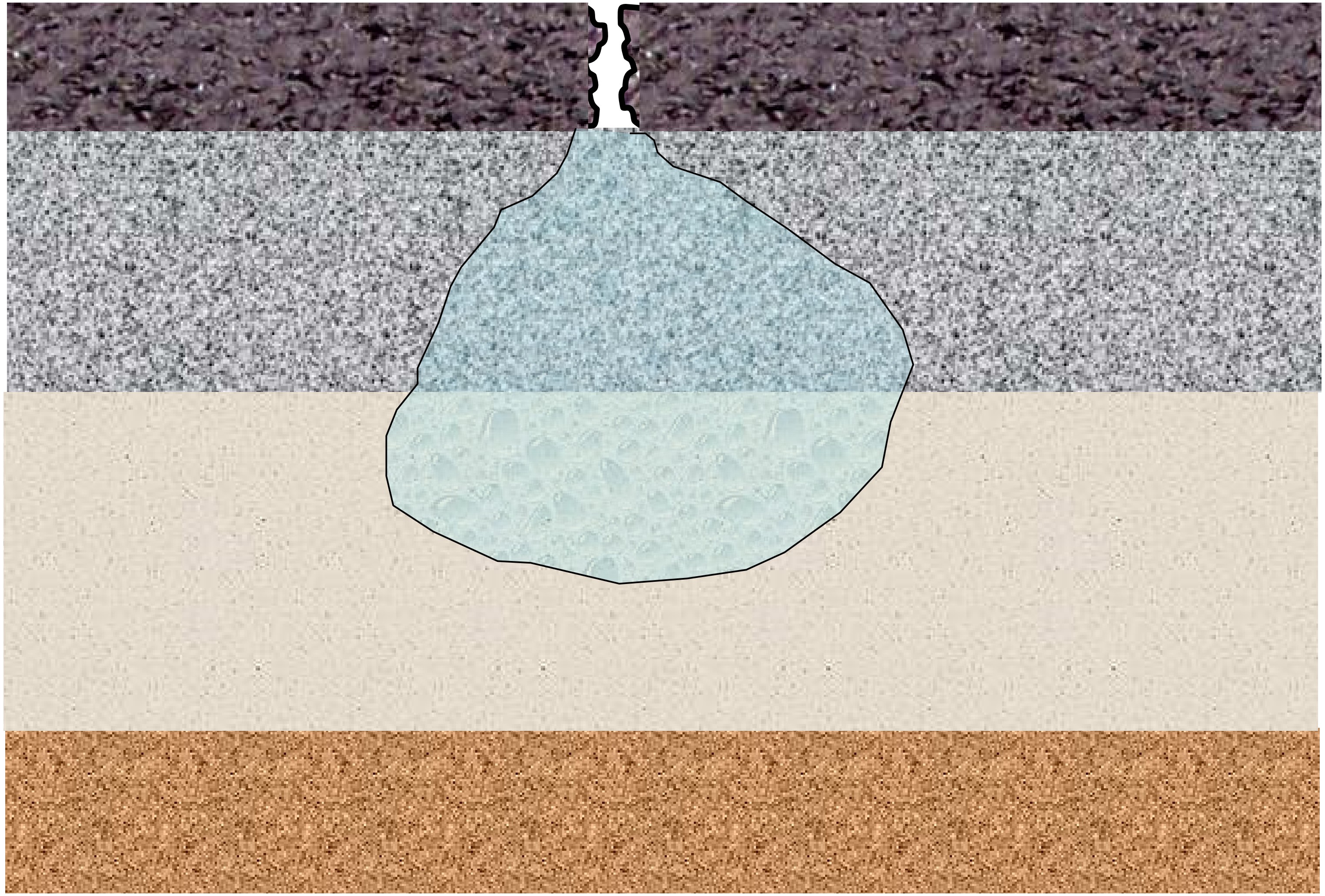
Environment



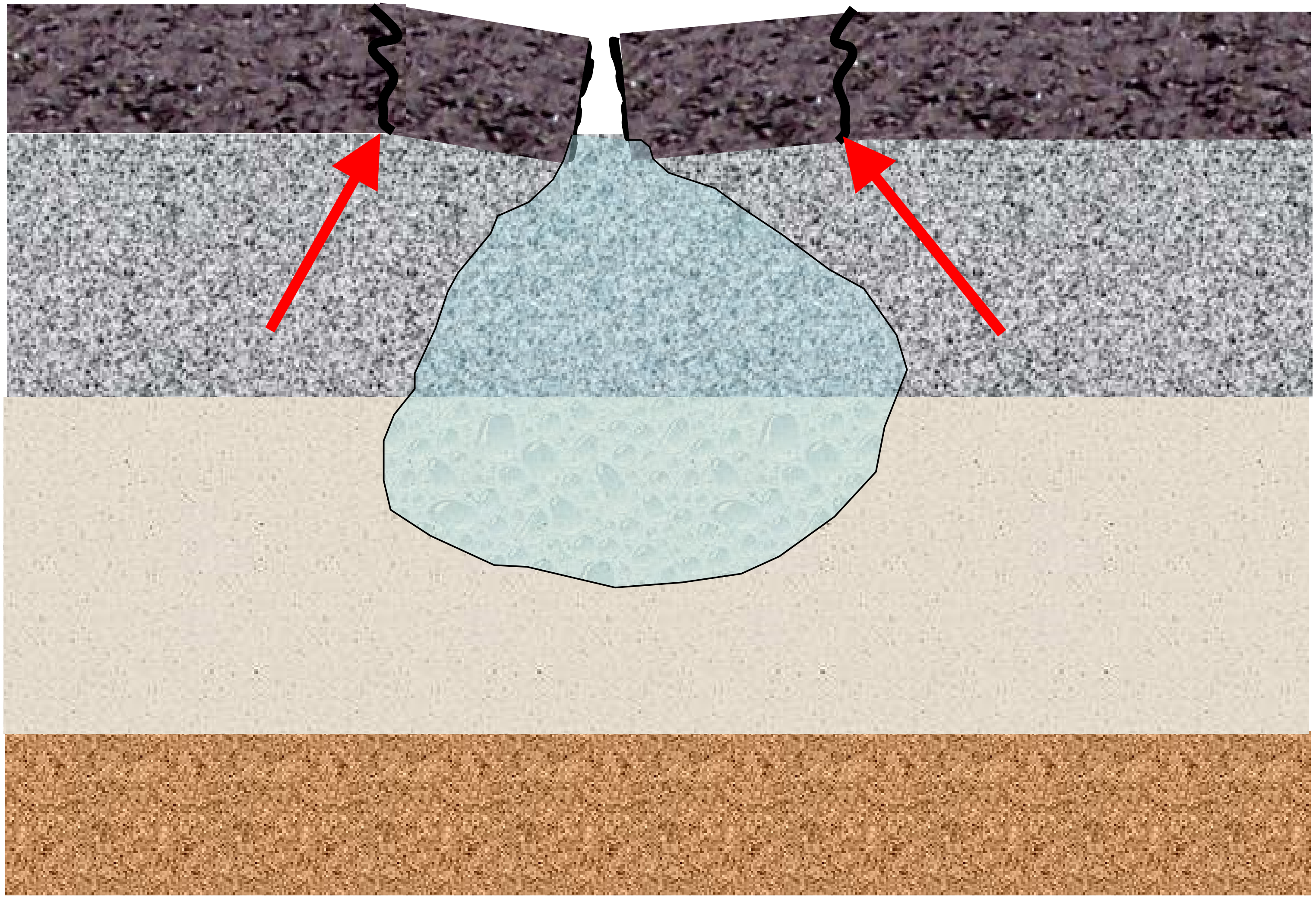
Pavement Crack



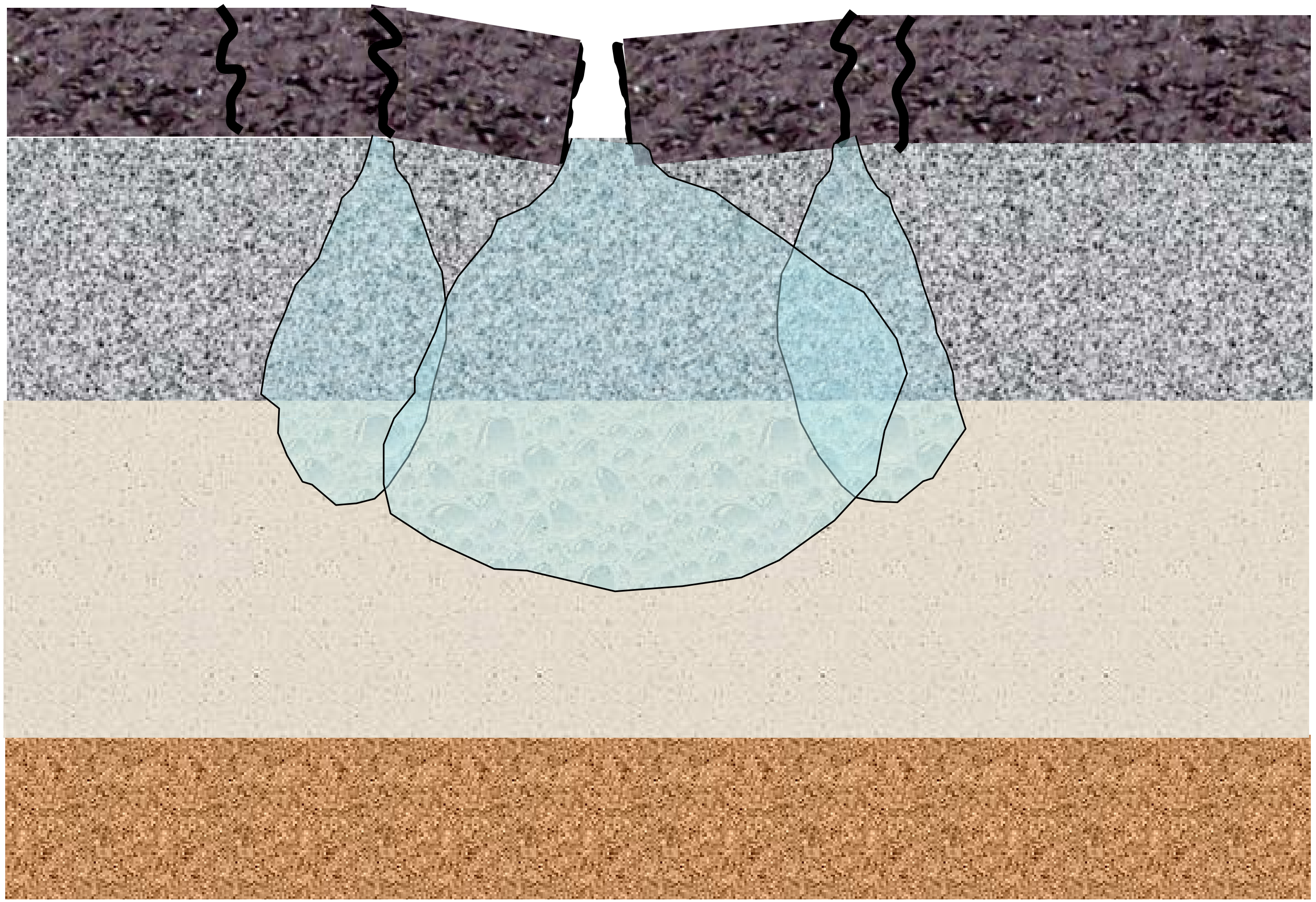
Water Intrusion



Base Weakening



Distress Propagation



Pavement Costs

Pavement Type	Treatment	Cost per Lane Mile
Asphalt	Crack Sealing/Minor Patching	$1000 - $7500
Asphalt	Preservation Treatment (non-structural)	$150,000 - $350,000
Asphalt	Structural Improvement (Overlay)	$350,000 - $500,000
Asphalt	Reconstruction	$800,000 - $1,250,000
Concrete	Joint & Crack Sealing	$1000 - $5000
Concrete	Surface Repairs, Minor Patching	$175,000 - $250,000
Concrete	Major Slab or Joint Replacement	$350,000 - $500,000
Concrete	Reconstruction	$1,000,000 - $1,500,000

Questions???

- Introduction to Meeting 2 – 2019 Road Report

Appendix B

Meeting #2 – Roads 101 Presentation Continued

Pavement Costs (cont'd from Roads 101)

Pavement Type	Treatment	Cost per Lane Mile
Asphalt	Crack Sealing/Minor Patching	$1000 - $7500
Asphalt	Preservation Treatment (non-structural)	$150,000 - $350,000
Asphalt	Structural Improvement (Overlay)	$350,000 - $500,000
Asphalt	Reconstruction	$800,000 - $1,250,000
Concrete	Joint & Crack Sealing	$1000 - $5000
Concrete	Surface Repairs, Minor Patching	$175,000 - $250,000
Concrete	Major Slab or Joint Replacement	$350,000 - $500,000
Concrete	Reconstruction	$1,000,000 - $1,500,000

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Asset Management Program for Roads
Mix of Fixes – Asphalt Pavement Preventative Maintenance (PM – PASER 7-9)

- Overband Crack Seal

- Route and Fill Cracks

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Asset Management Program for Roads
Mix of Fixes – Asphalt Pavement Preventative Maintenance (PM) – PASER 7-9, and Rehabilitation (RH) for PASER 5-6)

- Spray Patch Joint Repair

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Asset Management Program for Roads
Mix of Fixes – Asphalt Pavement (PM – PASER 5-6)

- Slurry Seal

- Cape Seal

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Asset Management Program for Roads
Mix of Fixes – Asphalt Pavement (RH – PASER 3-4)

- Ultra-thin Overlay

- Mill & Overlay

Asset Management Program for Roads Mix of Fixes – Asphalt Pavement – Full Reconstruction

- Recon

Asset Management Program for Roads
Mix of Fixes – Concrete Pavement (PM – PASER 7-9)

- Crack/Joint Sealing

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Asset Management Program for Roads
Mix of Fixes – Concrete Pavement (PM –PASER 4-5-6)

- Techrete Joint Repair

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Asset Management Program for Roads
Mix of Fixes – Concrete Pavement (RH – PASER 3-4)

- Joint Replacement

Asset Management Program for Roads
Mix of Fixes – Concrete Pavement (RH – PASER 3-4)

- Discrete Full Panel Replacement

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Asset Management Program for Roads
Mix of Fixes – Concrete Pavement Full Reconstruction

- Recon

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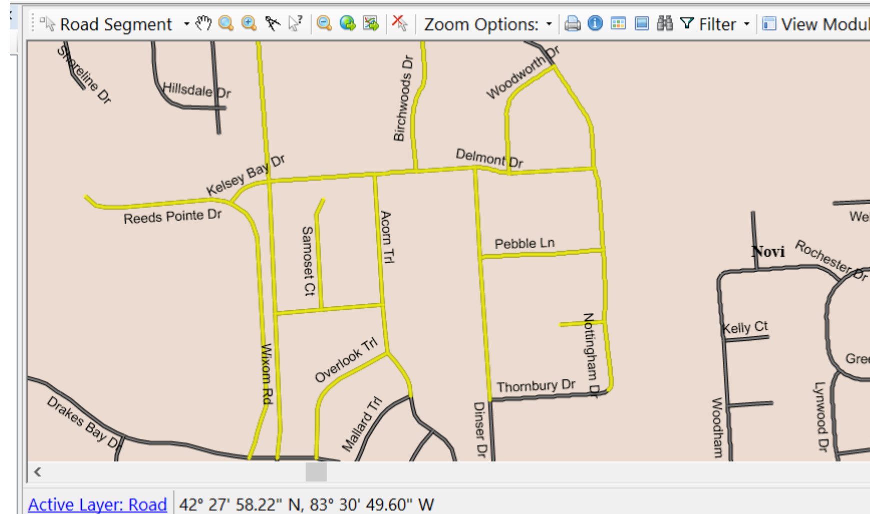
Road Report 2020-2024 - Process

- **Survey of the roads (primarily PASER)**
- **Update completed projects to ensure good data**
- **Update project costs**
- **Budget/forecasting data**
  - Comparing different fixes and funding levels to find an optimum mix
- **Build 5-year plan based on need and value**



Selection Information : Road

PRNo	RoadName	Bmp	Emp	Length	SegmentName	FromDesc	ToDesc	SurfaceType
4413926	Acorn Trl	0.000	0.159	0.159	Acorn Trl	Delmont Dr	Braeburn Ln	Asphalt
4413926	Acorn Trl	0.159	0.196	0.037	Acorn Trl	Braeburn Ln	Dead End or Start	Asphalt
4413926	Acorn Trl	0.196	0.217	0.021	Acorn Trl	Attribute Change	Overlook Trl	Asphalt
4413926	Acorn Trl	0.217	0.279	0.062	Acorn Trl	Overlook Trl	Mallard Trl	Asphalt
4403951	Birchwoods Dr	0.000	0.199	0.199	Birchwoods Dr	Delmont Dr	Birchwoods Ct	Asphalt
4413927	Braeburn Ln	0.000	0.056	0.056	Braeburn Ln	Wixom Rd	Samoset Ct	Asphalt
4413927	Braeburn Ln	0.056	0.130	0.074	Braeburn Ln	Samoset Ct	Acorn Trl	Asphalt
4403949	Delmont Dr	0.000	0.042	0.042	Delmont Dr	Dinser Dr	Woodworth Dr	Asphalt
4403949	Delmont Dr	0.042	0.145	0.103	Delmont Dr	Woodworth Dr	Nottingham Dr	Asphalt

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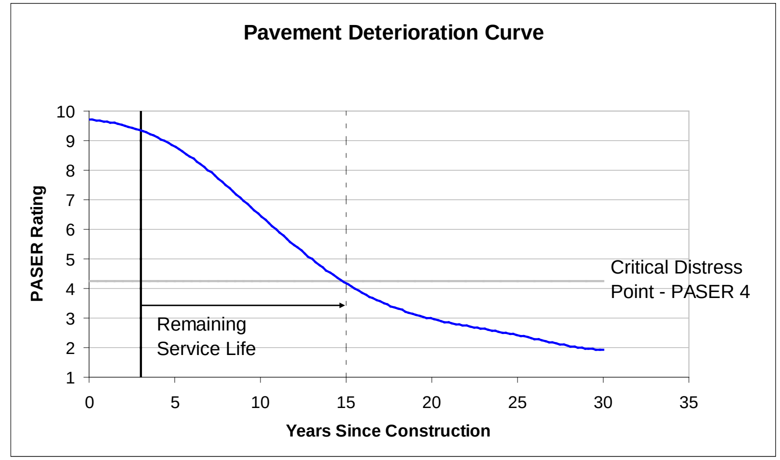
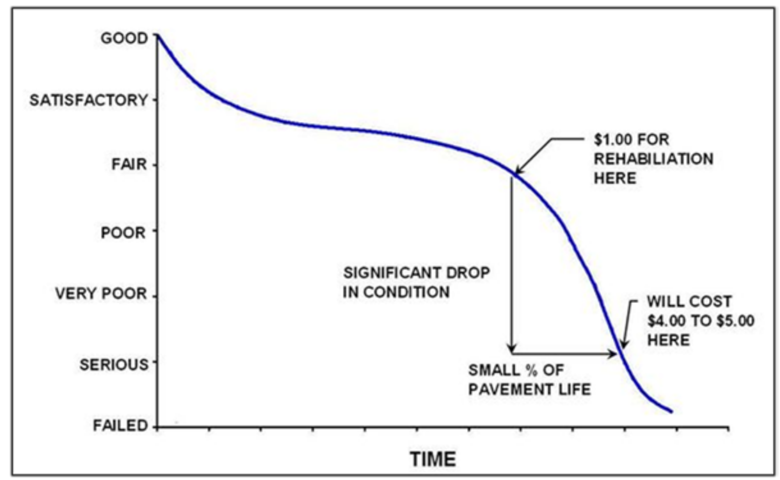
Road Assets Overview

- Roads are a continuously deteriorating asset that require a proactive strategy to maintain them in the most cost effective way possible.
- Using PASER ratings as a guide, roads rated 5 and above are significantly cheaper to maintain and rehabilitate than roads that have fallen to a 4 or below (structural defects present at 4).
- Expanding upon the City's current Capital Preventative Maintenance (CPM) is the best way to slow the decline of the road assets, and depending on funding level approved, improve the overall condition of the roads for the City of Novi.





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OHM Study 2012

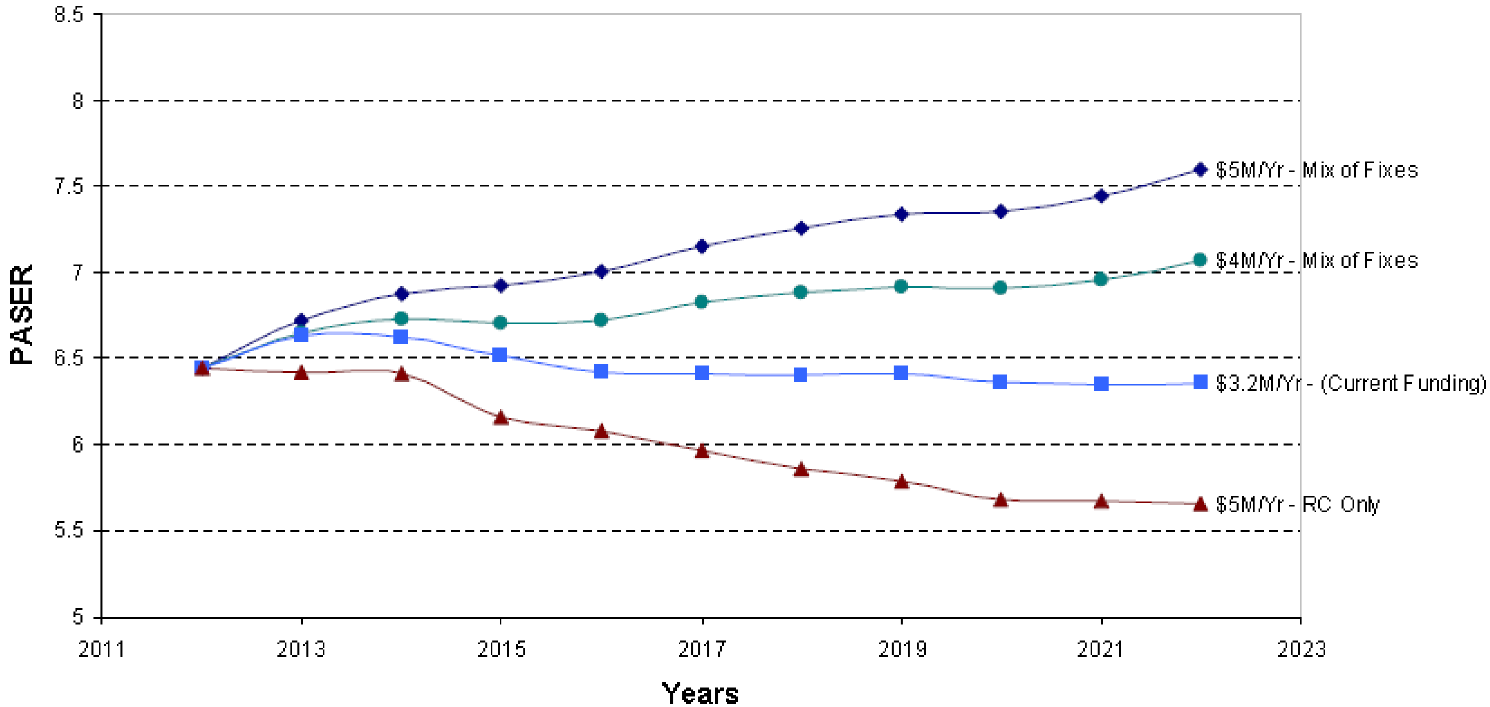

Figure 1: Projected Paser Rating At Various Funding Levels

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Historical Data

Average PASER Rating					
2012	2013	2014	2015	2017	2018
6.0	5.9	5.6	5.6	5.5	5.4

Current Data

2018 Rating by Road Type							
Category (NFC)		10 & 9	8	7 & 6	5 & 4	1-3	Total CL miles
Major	Arterial	4.01	.65	1.65	13.73	1.36	21.4
	Collector	1.35	.98	2.59	5.23	1.55	11.69
Local		7.47	11.95	46.65	70.08	18.44	154.60
Total Mileage		12.8	13.6	50.9	89.0	21.3	187.7
% of Network		7%	7%	27%	47%	11%	100%

City Road Network Status

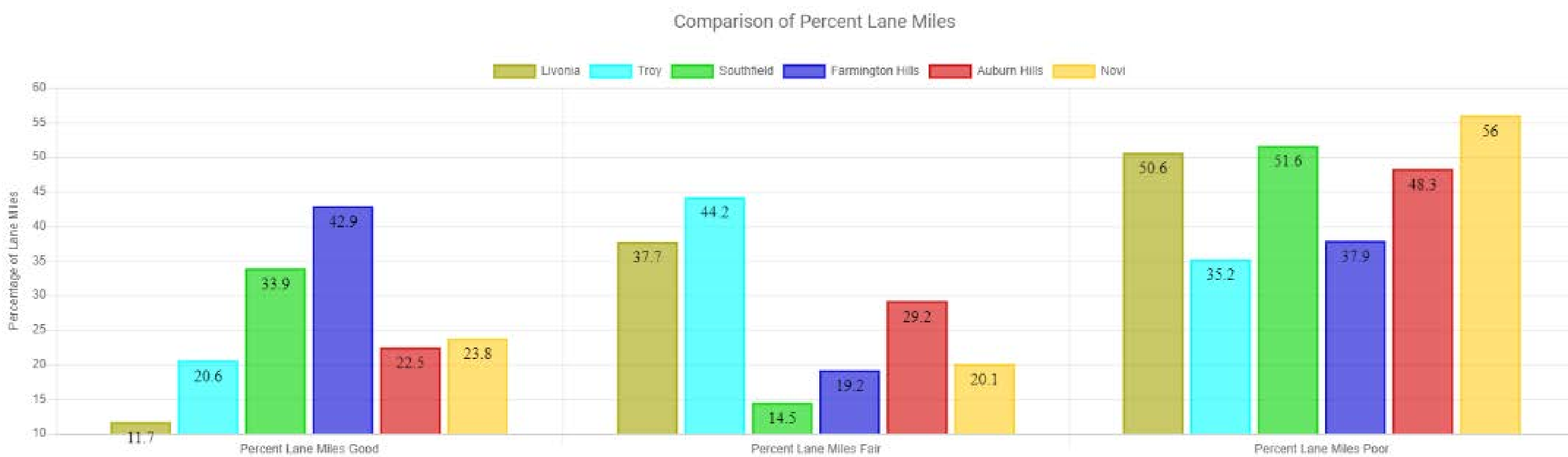
Approximately 188 centerline miles (390 lane miles) of City-owned roads

- 123 Miles of Asphalt
- 62 Miles of Concrete
- 3 Miles of Gravel

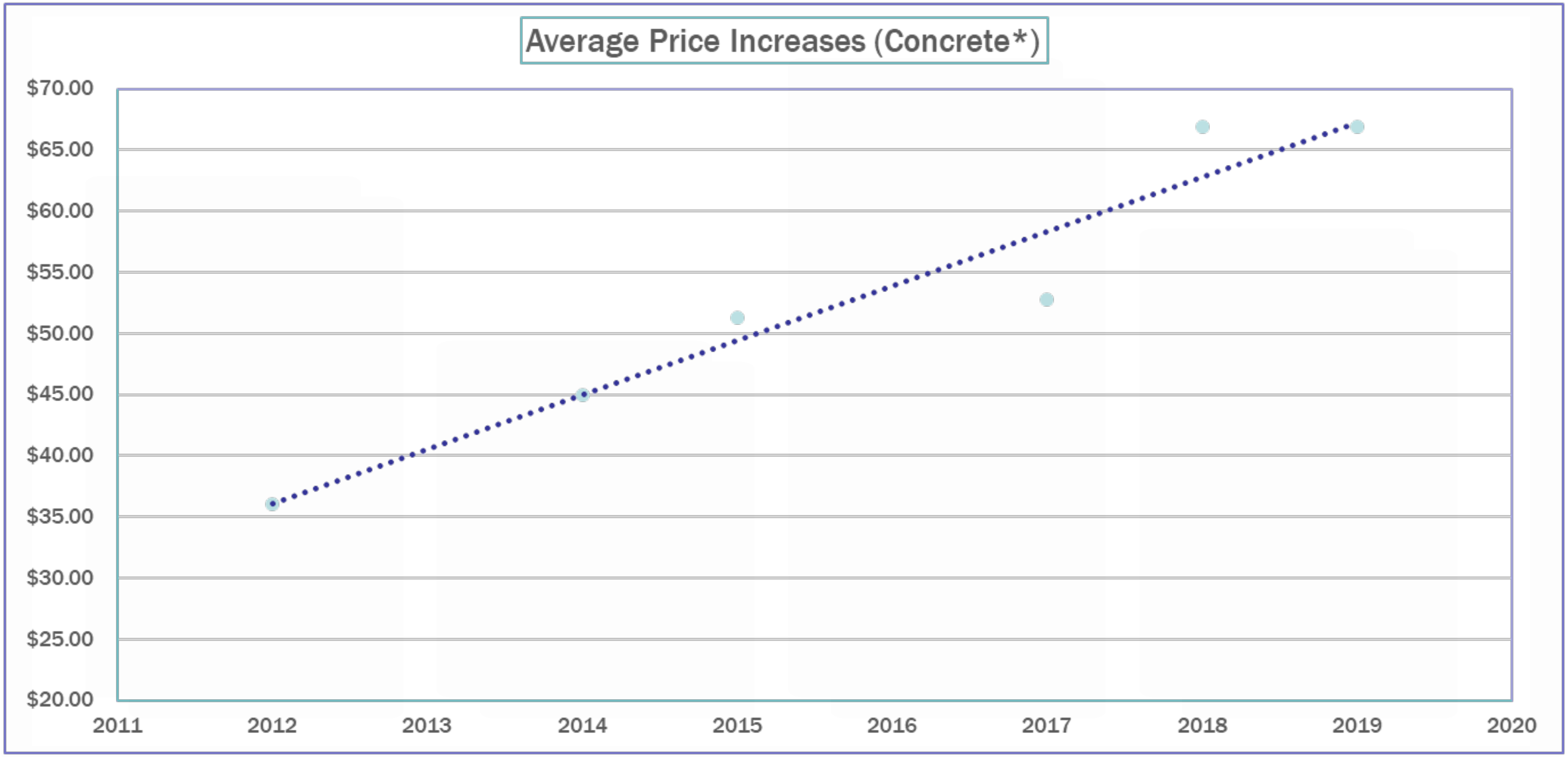
Condition

- 21 Miles Poor (PASER 1-3)
  - Reconstruction Candidates
- 89 Miles Fair (PASER 4-5)
  - Heavy CPM & Rehabilitation Candidates (deterioration dependent)
- 51 miles Good (6-7)
  - Heavy CPM Candidates
- 26 Miles Excellent (8-10)
  - Little to no Maintenance Activities

Community Comparison 2018 (from TAMC)



Increasing Costs (2012-2019)



*Increase in Concrete costs are shown, but aggregate and asphalt have seen parallel increases

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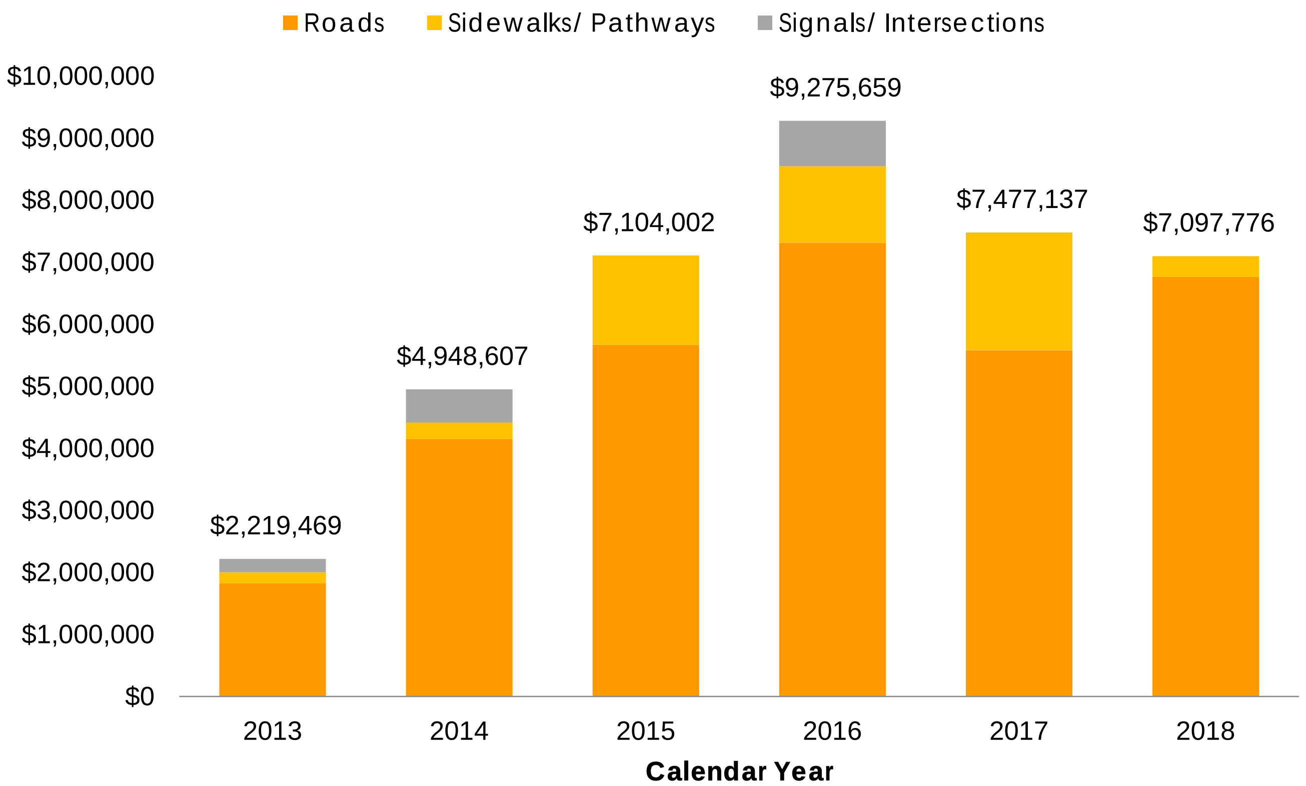
Growing Cost of Construction, Continued

- **Seeing in the range of a 30% increase (in addition to inflation) in the major items (asphalt, concrete and aggregate)**
- **Inflation adds about 15% over the last 8 to 9 years.**

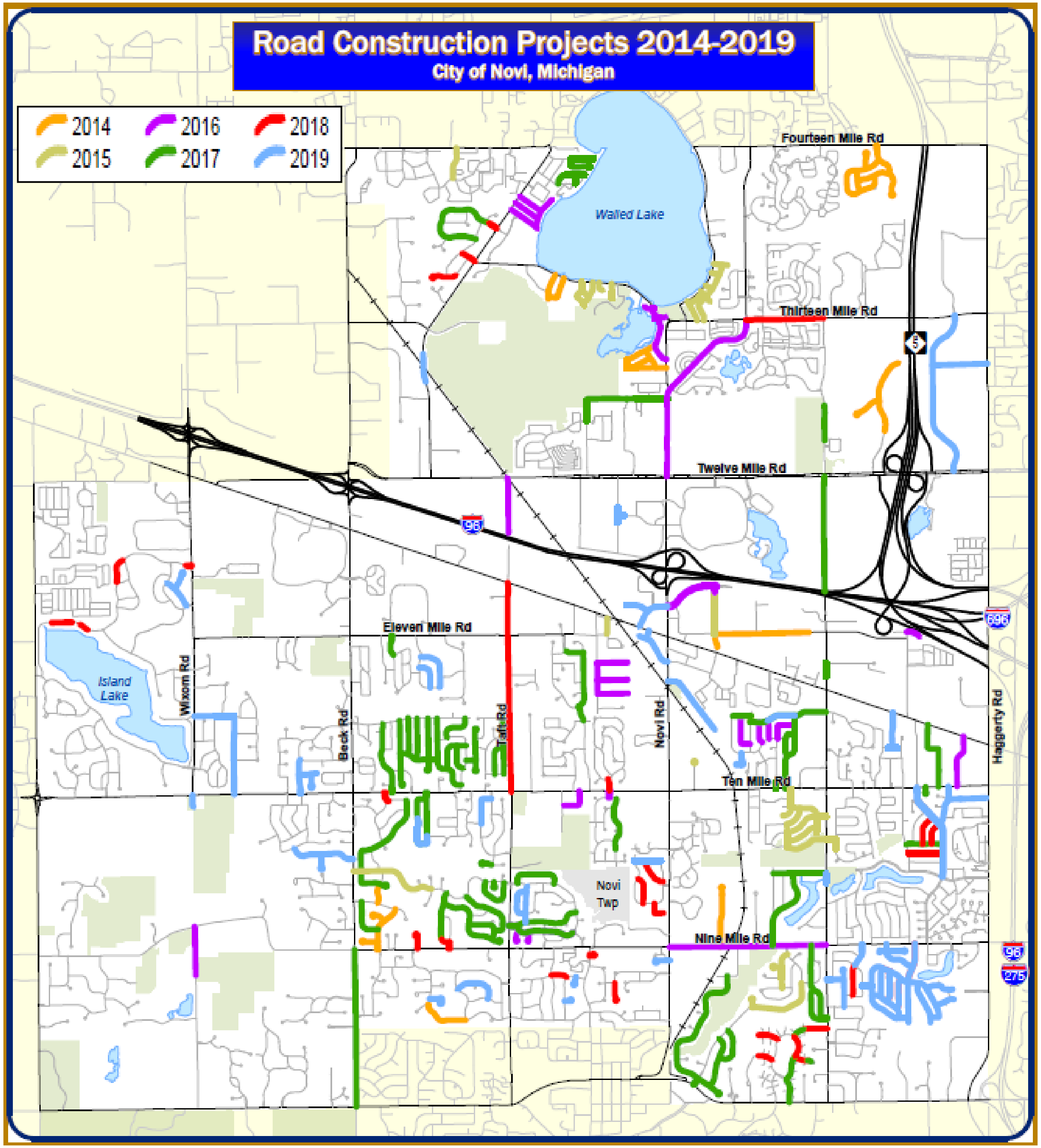
- **4 main factors in why the rating dropped and costs went up**
  - Significant increase in the cost of construction
  - An additional 10% added to the City's road network
  - Lower starting point (a lower PASER rating means more reconstructs are needed which significantly increase the cost to raise the rating)
  - Several record harsh winters – not in temperature, but in the number of freeze thaw cycles causing multiple years of deterioration in one season.

Construction Costs for Transportation Projects

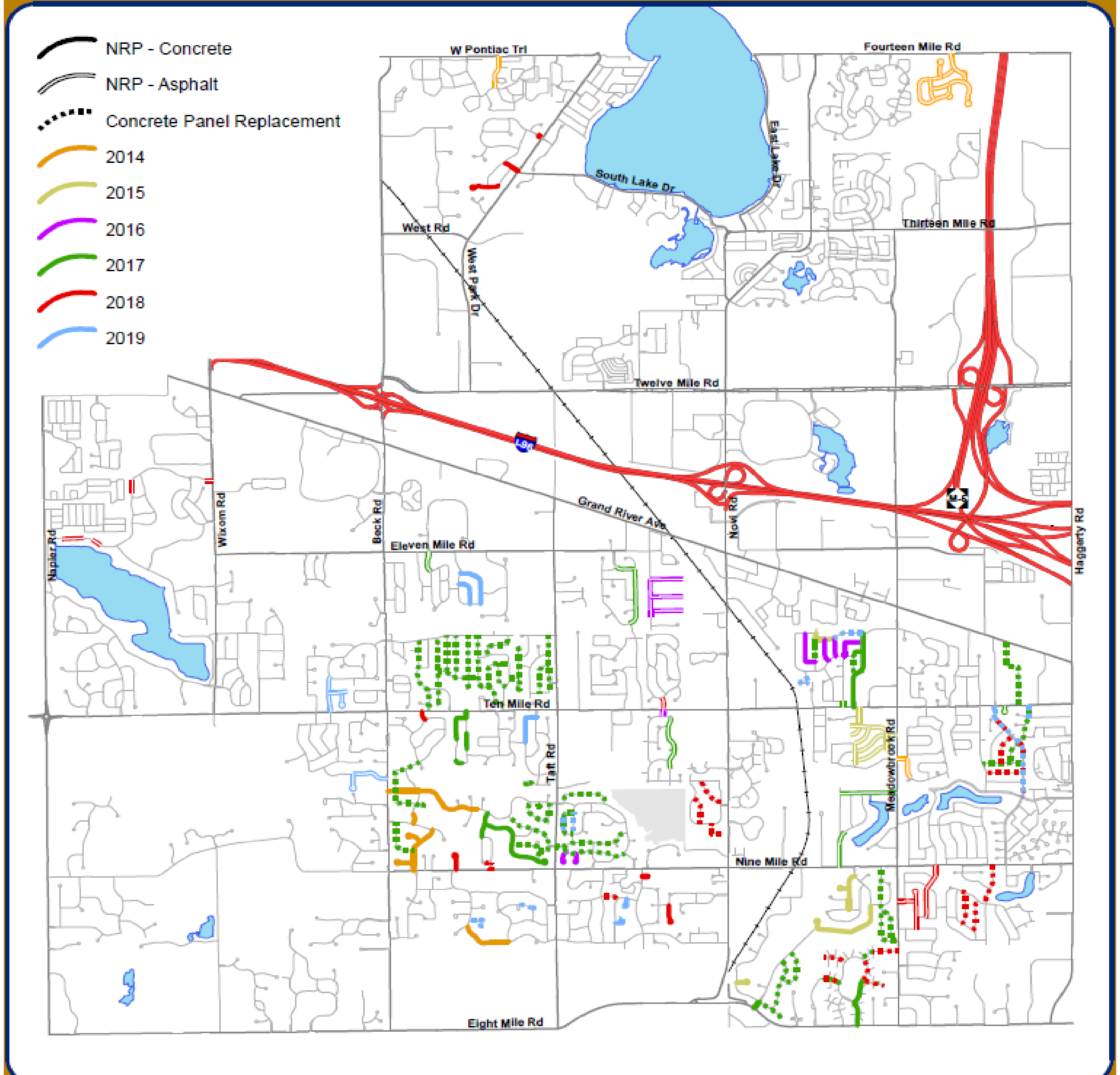
Construction Contractor Costs Only



	2013	2014	2015	2016	2017	2018
Roads	$1,842,424	$4,148,808	$5,665,894	$7,312,013	$5,577,647	$6,759,804
Sidewalks/ Pathways	$177,478	$263,924	$1,438,108	$1,231,076	$1,899,490	$337,972
Signals/ Intersections	$217,567	$535,875	-	$732,570	-	-


Road Construction Projects 2014-2019
City of Novi, Michigan
2014
2015
2016
2017
2018
2019
Fourteen Mile Rd
Walled Lake
Thirteen Mile Rd
Twelve Mile Rd
Eleven Mile Rd
Island Lake
Wixom Rd
Beck Rd
Taft Rd
Novi Rd
Ten Mile Rd
Haggerty Rd
Novi Twp
Nine Mile Rd
96
696
275

2014-19 Neighborhood Roads Programs
2017-19 Concrete Panel Replacement Program
Location Map



Road Report 2020-2024 – Planned Projects (2020)

Local Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Aberdeen Dr	3	$	311,631.47	Rehabillitation
Bedford Dr	3	$	841,373.87	Reconstruct - 7" Conc on 8" Agg
Glenwood Dr	4	$	282,010.67	Mill and Overlay - 3"
Greenwich Dr	3	$	337,186.67	Rehabillitation
Holyoke Ct	4	$	23,877.33	Mill and Overlay - 3"
Holyoke Ln	3	$	158,300.27	Rehabillitation
Jo Dr	2	$	212,185.60	Reconstruct - 7" Conc on 8" Agg
Nantucket Dr	3	$	289,625.60	Rehabillitation
Purlingbrook Rd	3	$	60,016.00	Reconstruct
Salem Ct	4	$	61,048.53	Rehabillitation
Shilo Ct	4	$	24,135.47	Rehabillitation
Willow Ln	4	$	62,597.33	Crush and Shape w/3" Overlay
	Total Cost:	**$**	**2,663,988.80**	**Locals 2020**
	HMA NRP:	**$**	**1,610,429.33**	
	Concrete NRP:	**$**	**1,053,559.47**	
Major Roads:		**$**	**3,483,447.00**	
Local Roads:		**$**	**2,663,988.80**	

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OHM Study 2012

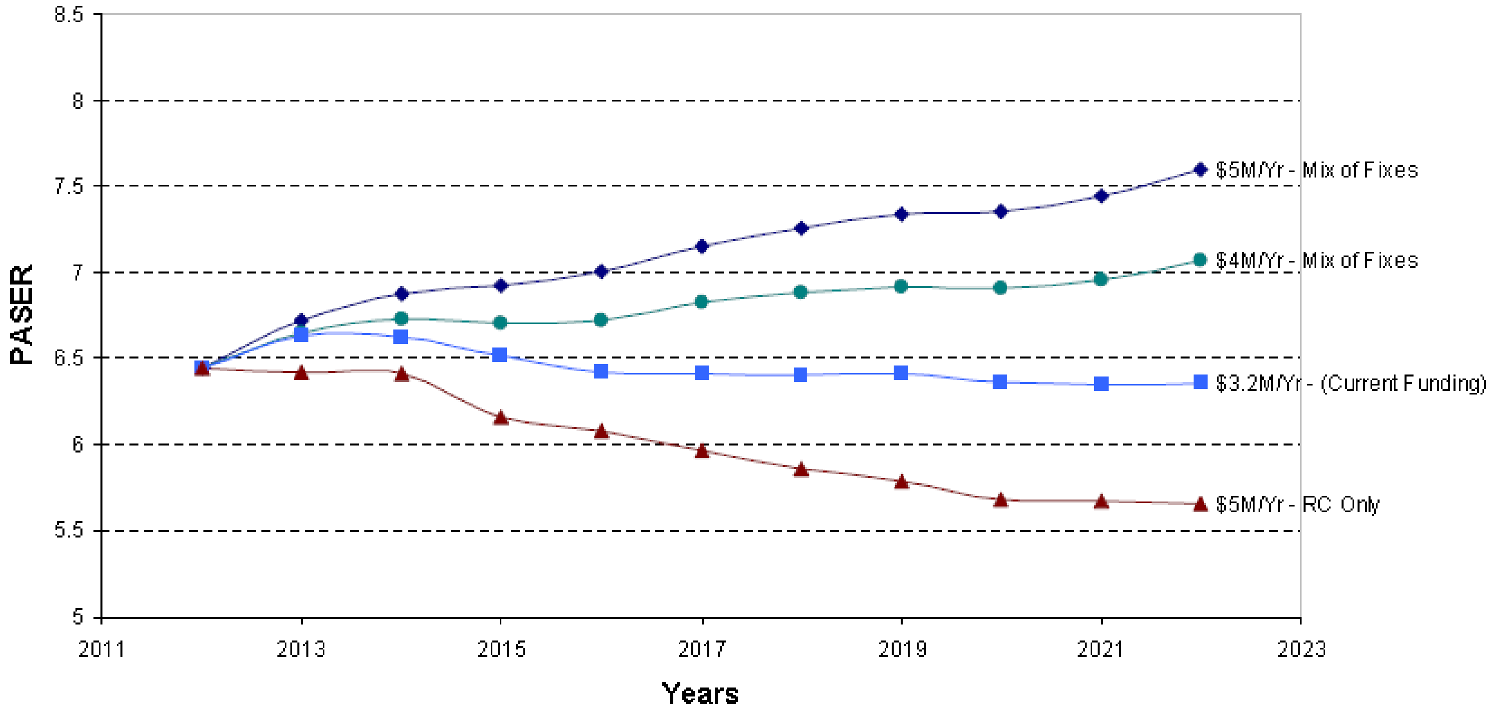
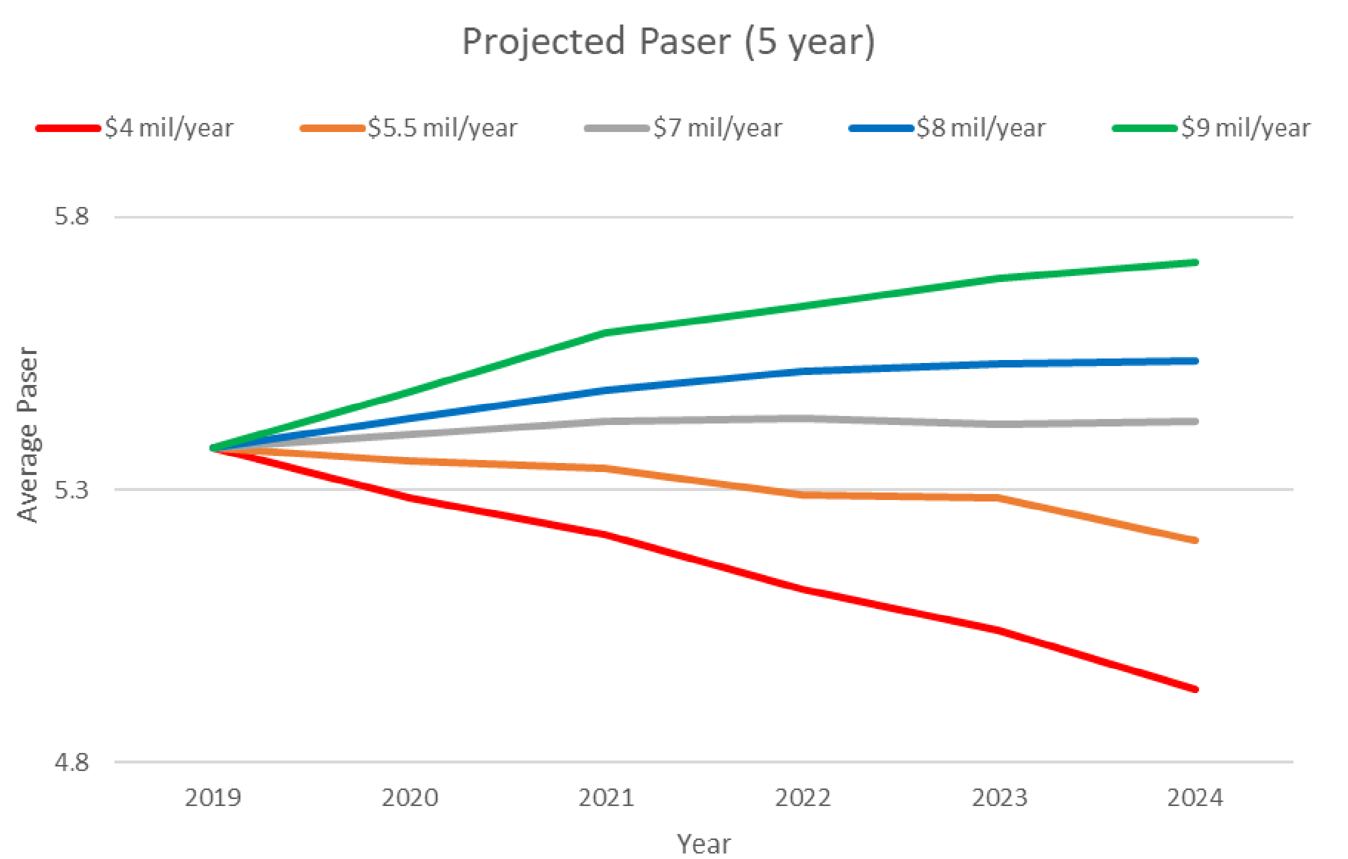


Figure 1: Projected Paser Rating At Various Funding Levels

Road Report 2020-2024 - Forecasting



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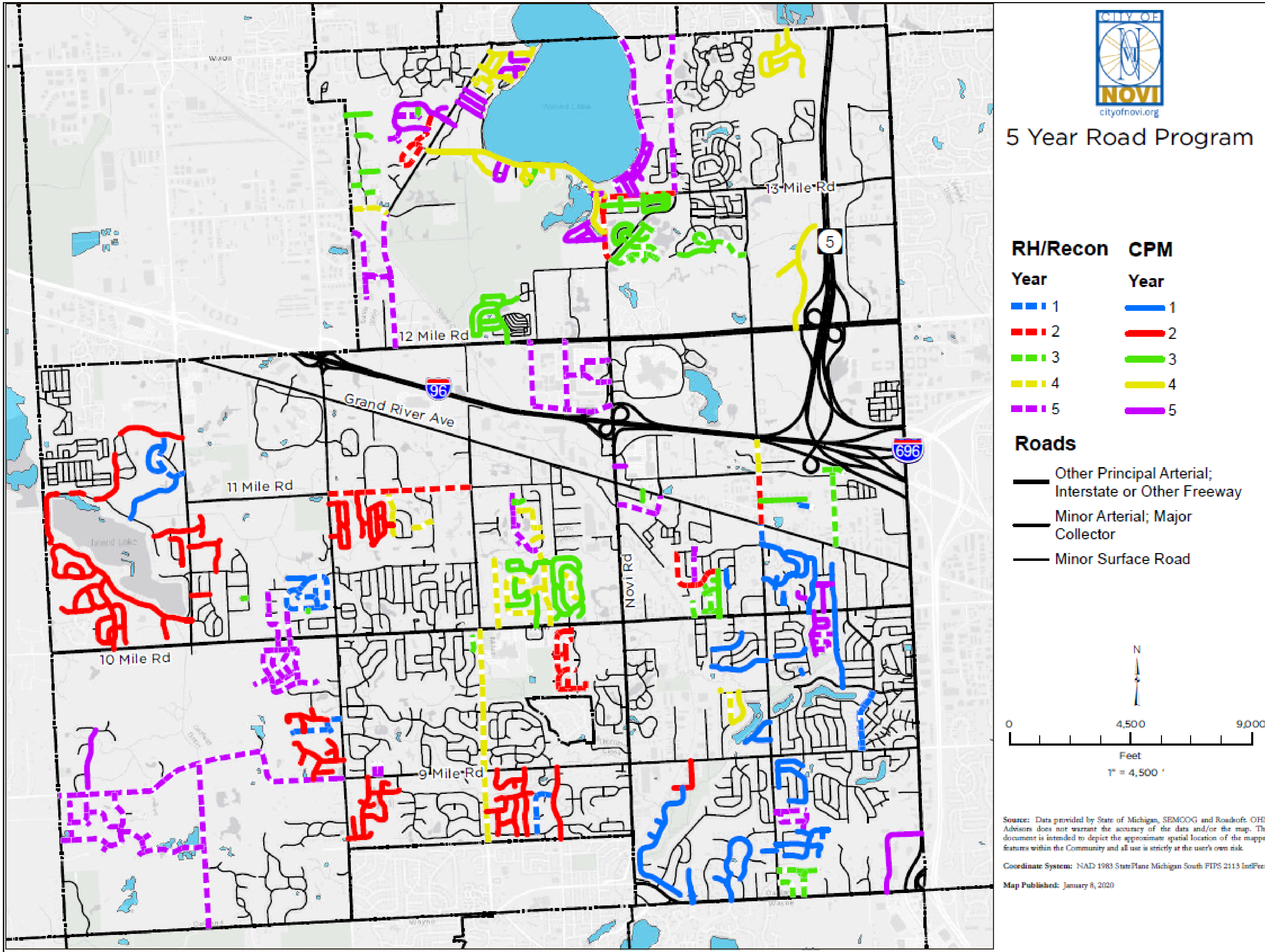
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5 Year Road Program
RH/Recon
Year
1
2
3
4
5
CPM
Year
1
2
3
4
5
Roads
Other Principal Arterial; Interstate or Other Freeway
Minor Arterial; Major Collector
Minor Surface Road
N
0
4,500
9,000
Feet
1" = 4,500 '
Source: Data provided by State of Michigan, SEMCOG and Roadsoft. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet
Map Published: January 8, 2020
13 Mile Rd
12 Mile Rd
Grand River Ave
11 Mile Rd
10 Mile Rd
9 Mile Rd
Novi Rd
96
696
5

Questions?

?

Appendix C

Finance/Funding Presentation

ROAD COMMITTEE

FINANCE STUDY SESSION

FEBRUARY 19, 2020

CURRENT ROAD FUNDING AVAILABLE

- Act 51 Revenue (City's share of gas tax in Michigan)
  - Major Streets $4,555,000
  - Local Streets $1,603,000
- Municipal Road voted tax levy of 1.4484 mills, generates $5,502,800 of revenue
- In 2004, City had approx. **$71 M** of bonds of which the majority were street paving bonds. In 2020, there are **$0** road bonds outstanding
- Overall millage rate for City is 10.5376, one of the lowest tax rates in the entire State

WHAT IS A MILL?

- The millage rate is the **amount of tax payable per dollar of the assessed value of a property**. The millage rate is commonly referred to as "mills.". It is a figure that represents the amount per $1,000 of the assessed value of the property, which is used to calculate the amount of property tax.
- Tax bill is equal to Taxable Value (TV) * mill rate
  - Taxable value of $150,000 * 1 mills = $150 tax liability
- Total taxable value of the City is approximately $3.8 billion
- One (1) mill generates approximately $3.8 million for the City of Novi

BOND LEVY PROCESS

- City administration drafts the debt levy ballot language, including a not to exceed dollar value of loan and a not to exceed number of years for levy.
- Ballot language must be provided to the City Clerk and County Clerk months in advance to the actual election date (for example, language must be provided in August for the November election).
- Voter approval is necessary to authorize the City to levy a tax to pay the principal and interest on the bond but not required if the City were to use ACT 51or other funds to repay the debt.

DEBT/BOND PROCESS

- Voter approves debt and levy (once approved process takes 45-60 days)
- City council/administration selections professional services team (underwriters, bond counsel, trustee, financial advisor)
- Structure the debt (i.e., most cost effective interest, terms of repayment, length of bond)
- S&P bond ratting AAA (best rating possible) which will provide the City with a good interest rate
- Draft documents – board resolutions, official statement
- Sell the bonds (distribute official statement, underwriters market bond
- Close (sign bond purchase agreement, finalize offering document)

DEBT/BOND LEVY

- $100 million borrowing for 30 years with an estimated interest rate of 3% has an estimated annual debt service payment (principal and interest) $5,102,000
- Estimated annual levy: 1.33

Taxable Value of Home	Tax Owed
$75,000	$100
$150,000	$200
$250,000	$330
$350,000	$465
$450,000	$600

Appendix D

Meeting #3 – RCOC Projects Presentation

Welcome

Roads Committee

Meeting 3 – RCOC Projects

02/03/2020

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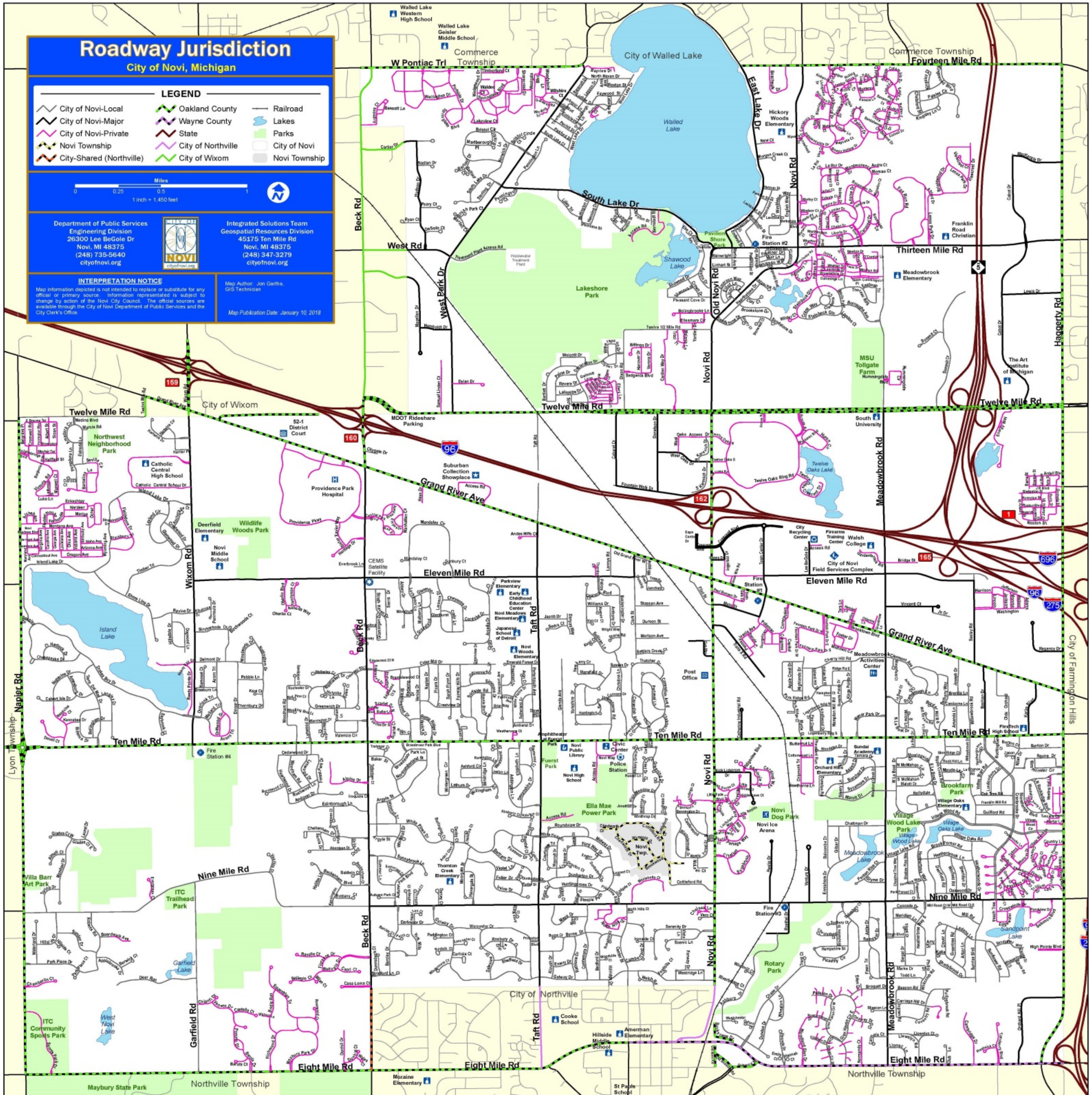
County Roads in Novi

- **Road Commission for Oakland County (RCOC)**
  - Even Mile Roads (east-west) and Haggerty, Napier & Novi (8 to 12) (north-south), Grand River
  - Strategic Planning, bi-annual
  - 10 Mile, 12 Mile
- **Wayne County Roads Division**
  - 8 Mile (Center to Haggerty)
- **Maintenance**
  - Agreements with RCOC for Snow Removal and Street Sweeping for non-border County roads in Novi
  - Nothing with Wayne County


Roadway Jurisdiction
City of Novi, Michigan
LEGEND
City of Novi-Local
City of Novi-Major
City of Novi-Private
Novi Township
City-Shared (Northville)
Oakland County
Wayne County
State
City of Northville
City of Wixom
Railroad
Lakes
Parks
City of Novi
Novi Township
Miles
0 0.25 0.5 1
1 inch = 1,450 feet
Department of Public Services
Engineering Division
26300 Lee BeGole Dr
Novi, MI 48375
(248) 735-5640
cityofnovi.org
Integrated Solutions Team
Geospatial Resources Division
45175 Ten Mile Rd
Novi, MI 48375
(248) 347-3279
cityofnovi.org
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Map information depicted is not intended to replace or substitute for any official or primary source. Information represented is subject to change by action of the Novi City Council. The official sources are available through the City of Novi Department of Public Services and the City Clerk's Office.
Map Author: Jon Gartha, GIS Technician
Map Publication Date: January 10, 2018
City of Walled Lake
Walled Lake
Commerce Township
W Pontiac Trl
Fourteen Mile Rd
East Lake Dr
South Lake Dr
Old Novi Rd
Novi Rd
West Rd
West Park Dr
Beck Rd
Lakeshore Park
Shawood Lake
Thirteen Mile Rd
Meadowbrook Rd
Haggerty Rd
MSU Tollgate Farm
City of Wixom
Twelve Mile Rd
Grand River Ave
Wixom Rd
Taft Rd
Eleven Mile Rd
Island Lake
Ten Mile Rd
Napier Rd
Lyon Township
Nine Mile Rd
Garfield Rd
Eight Mile Rd
City of Northville
Northville Township
Maybury State Park
City of Farmington Hills
Ella Mae Power Park
ITC Trailhead Park
ITC Community Sports Park
Rotary Park
Villa Barr Art Park
Brookfarm Park
Fuerst Park
Wildlife Woods Park
Northwest Neighborhood Park
Twelve Oaks Lake
Meadowbrook Lake
Sandpoint Lake
Garfield Lake
West Novi Lake
Village Oaks Lake

Oakland FAC FY2022 Call For Project Submissions

SEMCOG Issued Funding Target $17,806,200.00

Project Name	Limits	Submitting Agency	Points As Submitted	Points As Reviewed	Federal Share	Local Share	3R Running Total Federal Share
Pave Gravel	Various	RCOC			$2,000,000	$500,000	$2,000,000
Urban to Rural Transfer	Various	RCOC			$500,000	$125,000	$2,500,000
RCOC Projects	Various	RCOC			$9,786,278	$1,909,074	$12,286,278
Remaining STPU Available For Cities and Villages							$5,519,922
RRR Project Submittals from Cities and Villages							
Walton Road	West City Limits to Baldwin Rd	City of Pontiac	67.00	67.00	$2,344,240	$586,060	$2,344,240
Berg Road	Eight Mile Road to Simmons Road	City of Southfield	63.00	63.00	$1,355,460	$338,865	$3,699,700
Decker Road	14 Mile Rd to E West Maple Rd	City of Walled Lake	63.00	63.00	$1,089,169	$272,292	$4,788,869
Shiawassee Road	Eight Mile Road to Inkster Road	City of Southfield	62.00	62.00	$771,984	$192,996	$5,560,852
NB NW Service Drive	Bell Road to Telegraph Road	City of Southfield	60.00	60.00	$839,411	$209,853	$6,400,263
Wixom Road	790' South of Grand River to South City Limit	City of Novi	59.00	59.00	$1,294,024	$323,506	$7,694,287
14 Mile Road	Drake Rd to Farmington Rd	City of Farmington Hills	58.00	58.00	$1,257,929	$314,482	$8,952,217
Taft Rd	Ten Mile Rd to South City Limit	City of Novi	58.00	58.00	$955,643	$238,911	$9,907,860
Orchard Lake Road	US-24 to West of Voorheis St	City of Pontiac	57.00	57.00	$934,147	$233,537	$10,842,007
Farmington Road	12 Mile Rd to 13 Mile Rd	City of Farmington Hills	57.00	57.00	$964,903	$241,226	$11,806,910
Farmington Road	13 Mile Rd to 14 Mile Rd	City of Farmington Hills	57.00	57.00	$867,967	$216,992	$12,674,877
Taylor Road	Joslyn Rd to Giddings Rd	City of Auburn Hills	57.00	57.00	$559,452	$139,863	$13,234,329
11 Mile Road	Farmington Rd to Orchard Lake Rd	City of Farmington Hills	56.00	56.00	$754,581	$188,645	$13,988,910
Rochester Road*	Main St to 14 Mile Rd	City of Royal Oak	56.00	55.00	$3,125,411	$1,339,462	$17,114,321
N Milford Road	Abbey Lane to CSX Railroad Crossing	Village of Milford	54.00	54.00	$526,583	$131,646	$17,640,904
Five Points Drive	University Dr to North Squirrel Rd	City of Auburn Hills	53.00	53.00	$313,682	$78,420	$17,954,585
Shiawassee Road	Farmington Rd to Orchard Lake Rd	City of Farmington	52.00	53.00	$530,247	$132,562	$18,484,832
Crooks Road*	Main St to Webster Rd	City of Royal Oak	51.00	51.00	$1,184,859	$507,797	$19,669,691
Power Road	Grand River Ave to Ten Mile Rd	City of Farmington	51.00	51.00	$267,032	$66,758	$19,936,723
11 Mile Road*	Troy St to Campbell St	City of Royal Oak	51.00	51.00	$1,042,079	$446,605	$20,978,801
Crooks Road*	Webster Rd to 13 Mile Rd	City of Royal Oak	51.00	51.00	$648,601	$227,972	$21,627,403
West Nine Mile Road	Republic Ave to Pinecrest Dr	City of Ferndale	60.00	50.00	$420,511	$105,128	$22,047,914
Hamlin Road*	515 ft east of Adams Rd to 380 ft west of Crooks Rd	City of Rochester Hills	49.00	49.00	$1,396,124	$598,339	$23,444,038
Ladd Road	W West Maple Rd to North City Limits	City of Walled Lake	48.00	48.00	$320,835	$80,209	$23,764,873

Approved 2022 Project

**More Than 20% Local Match. Federal share is locked.*

1/22/2019

FY2022 Total Requests **$23,764,873**

2021-2022 RCOC Project List

TIP Year	Project Name	Limits	Municipality	Length	Federal Share	Local Share	Total Project Cost	TOTAL POINTS	Safety Review Committee List Ranking	Safety Points	NFC Classification	NFC Points	AADT	AADT Points	Truck and Bus Counts	Truck and Bus Points	NHS	NHS Points	Points fo Other Consider ations
2022	**Orchard Lake Road**	East of Cass Lake to Pontiac City Limits	Keego Harbor, Sylvan Lake, West Bloomf	1.36	$2,000,000	$500,000.00	$2,500,000	**83**	11 to 25	15	Principal Arterial	20	25,000 or More	25	1,000-1,999	8	Yes	5	10
2021	**Livernois Road**	Avon Road to Walton Blvd	Rochester Hills	1.25	$3,600,000	$900,000.00	$4,500,000	**81**	51 to 100	5	Principal Arterial	20	25,000 or More	25	500-999	6	Yes	5	20
2022	**14 Mile Road**	Stephenson to Edward	Madison Heights, Troy	0.5	$960,000	$240,000.00	$1,200,000	**100**	Top 10	20	Principal Arterial	20	25,000 or More	25	2,000 or More	10	Yes	5	20
2022	**14 Mile Road**	Edward to Dequindre	Madison Heights, Troy	0.85	$1,200,000	$300,000.00	$1,500,000	**75**	51 to 100	5	Principal Arterial	20	25,000 or More	25	2,000 or More	10	Yes	5	10
2021	**12 Mile Road**	Lahser to Evergreen	Southfield	0.87	$3,500,000	$875,000.00	$4,375,000	**71**	51 to 100	5	Principal Arterial	20	20,000 to 24,999	20	500-999	6	Yes	5	15
2022	**Pontiac Trail**	Haggerty to Green Lake	West Bloomfield	1.19	$1,300,000	$325,000.00	$1,625,000	**71**	Below 100	0	Principal Arterial	20	20,000 to 24,999	20	500-999	6	Yes	5	20
2022	**12 Mile Road**	Farmington to Orchard Lake Road	Farmington Hills	1.1	$1,400,000	$350,000.00	$1,750,000	**69**	26 to 50	10	Principal Arterial	20	25,000 or More	25	250-499	4	Yes	5	5
2021	**Walton Road**	Dixie to Sashabaw	Waterford	0.7	$2,500,000	$625,000.00	$3,125,000	**64**	Below 100	0	Principal Arterial	20	15,000 - 19,999	15	250-499	4	Yes	5	20
2021	**Maple Road**	Inkster to Franklin	Bloomfield Hills	1.4	$2,000,000	$500,000.00	$2,500,000	**61**	51 to 100	5	Principal Arterial	20	15,000 - 19,999	15	500-999	6	Yes	5	10
	~~**Maple Road**~~	~~Orchard Lake to Middlebelt~~	~~West Bloomfield~~	~~1~~	~~$1,280,000~~	~~$320,000.00~~	~~$1,600,000~~	~~**54**~~	~~26 to 50~~	~~10~~	~~Principal Arterial~~	~~20~~	~~10,000 to 14,999~~	~~10~~	~~250-499~~	~~4~~	~~Yes~~	~~5~~	~~5~~
	~~**Pontiac Trail**~~	~~Arrowhead to Orchard Lake~~	~~West Bloomfield~~	~~1.55~~	~~$3,500,000~~	~~$875,000.00~~	~~$4,375,000~~	~~**51**~~	~~Below 100~~	~~0~~	~~Principal Arterial~~	~~20~~	~~15,000 - 19,999~~	~~15~~	~~500-999~~	~~6~~	~~Yes~~	~~5~~	~~5~~
	~~**10 Mile Road**~~	~~Evergreen to Southfield~~	~~Southfield~~	~~0.96~~	~~$1,900,000~~	~~$475,000.00~~	~~$2,375,000~~	~~**49**~~	~~Below 100~~	~~0~~	~~Minor Arterial~~	~~15~~	~~10,000 to 14,999~~	~~10~~	~~250-499~~	~~4~~	~~No~~	~~0~~	~~20~~
	~~**Adams Road**~~	~~Long Lake to Square Lake~~	~~Bloomfield Township, Troy~~	~~1.04~~	~~$1,300,000~~	~~$325,000.00~~	~~$1,625,000~~	~~**46**~~	~~Below 100~~	~~0~~	~~Principal Arterial~~	~~20~~	~~15,000 - 19,999~~	~~15~~	~~500-999~~	~~6~~	~~Yes~~	~~5~~	—
	Grand River Ave	Napier to Wixom	Wixom	1.05	$2,200,000	$550,000.00	$2,750,000	**46**	51 - 100	5	Minor Arterial	15	20,000 - 24,999	20	500-999	6	No	0	-
2022	**Novi Road**	9 Mile to 10 Mile	Novi	0.9	$1,500,000	$375,000.00	$1,875,000	**46**	Below 100	0	Principal Arterial	20	15,000 - 19,999	15	500-999	6	Yes	5	-
	~~**Maple Road**~~	~~Middlebelt to Inkster~~	~~West Bloomfield~~	~~1~~	~~$1,200,000~~	~~$300,000.00~~	~~$1,500,000~~	~~**44**~~	~~Below 100~~	~~0~~	~~Principal Arterial~~	~~20~~	~~15,000 - 19,999~~	~~15~~	~~250-499~~	~~4~~	~~Yes~~	~~5~~	—
	Novi Road	8 Mile to 9 Mile	Novi	1.03	$1,700,000	$425,000.00	$2,125,000	**39**	Below 100	0	Principal Arterial	20	10,000 to 14,999	10	250-499	4	Yes	5	-
	Brown - Giddings - Silverbell	Jamm to M-24	Orion Township, Auburn Hills	2.35	$11,200,000	$2,800,000.00	$14,000,000	**38**	Below 100	0	Minor Arterial	15	15,000 - 19,999	15	1,000-1,999	8	No	0	-
	Middlebelt Road	Northwestern Highway to 14 Mile	Farmington Hills	0.68	$1,400,000	$350,000.00	$1,750,000	**36**	Below 100	0	Minor Arterial	15	15,000 - 19,999	15	500-999	6	No	0	-
	~~**10 Mile Road**~~	~~I-75 Service Drive to Dequindre~~	~~Hazel Park~~	~~1.23~~	~~$2,400,000~~	~~$600,000.00~~	~~$3,000,000~~	~~**24**~~	~~Below 100~~	~~0~~	~~Major Collector~~	~~10~~	~~10,000 to 14,999~~	~~10~~	~~250-499~~	~~4~~	~~No~~	~~0~~	—

Selected projects (2021)
Selected projects (2022)
Repairs from non-federal funds.

	Tentative FY2022
Fiscal Year Target	$17,806,200
31% Cities and Villages	$5,519,922
69% RCOC	$12,286,278
Safety Intersection Improvements	$1,686,278
RCOC Set Asides*	$2,300,000
Remaining available for RCOC projects	**$8,300,000**
Projects Selected Total	**$8,360,000**

**RCOC Set asides include $2 Million for paving gravel and a transfer of $500,000 for urban to rural.*

Scoring System

Safety	
Top 10	20
11 to 25	15
26 to 50	10
51 to 100	5
Below 100	0

NFC Classification	
Principal Arterial	20
Minor Arterial	15
Major Collector	10
Minor Collector	5
Local	0

AADT	
25,000 or more	25
20,000-24,999	20
15,000-19,000	15
10,000-14,999	10
5,000-9,999	5
0-4,999	0

Truck & Bus Counts	
2,000 or more	10
1,000 - 1,99 9	8
500-999	6
250-499	4
100-249	2
Less than 100	0

NHS	
Yes	5
No	0

Other Considerations	
Points Available	20

Points are awarded based on local participation, pavement condition, project scheduling to minimize traffic impacts,mobilization factors, regional equity, public input, etc.

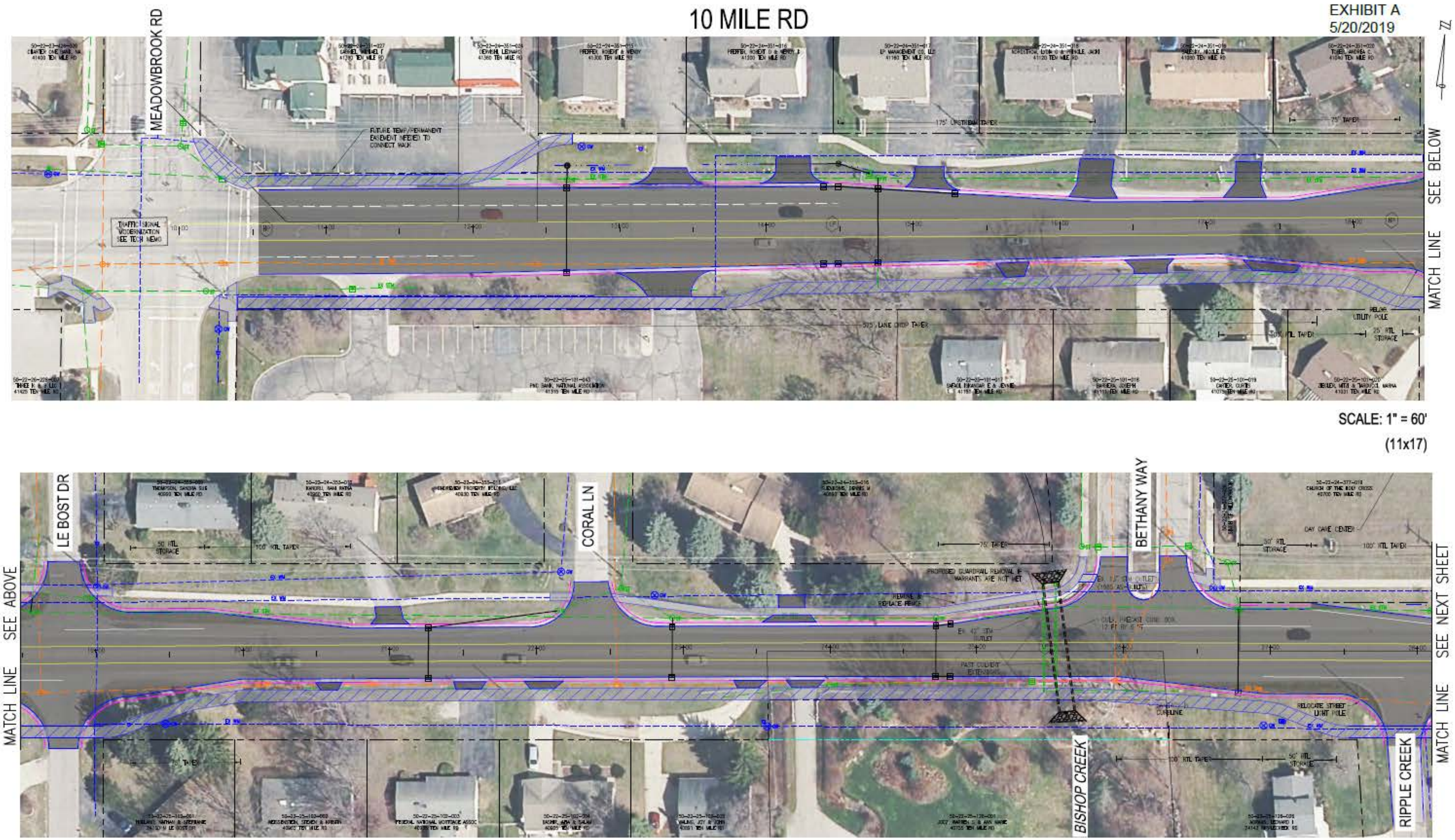
TOTAL POSSIBLE POINTS
100

10 Mile Schedule Update - OHM

- **OHM Survey** **Jan 2020**
- **Design** **2020**
  - Estimated $500K ($250 City share)
- **Construct** **2021**
  - Estimated $5.5M (City share $500K) ½ federal match $1M
- **Payback** **2024**
  - Fronted funds become available

*non-motorized portion is not participating funds and costs will be covered by the City estimated at $1.5M

10 Mile Road Exhibits



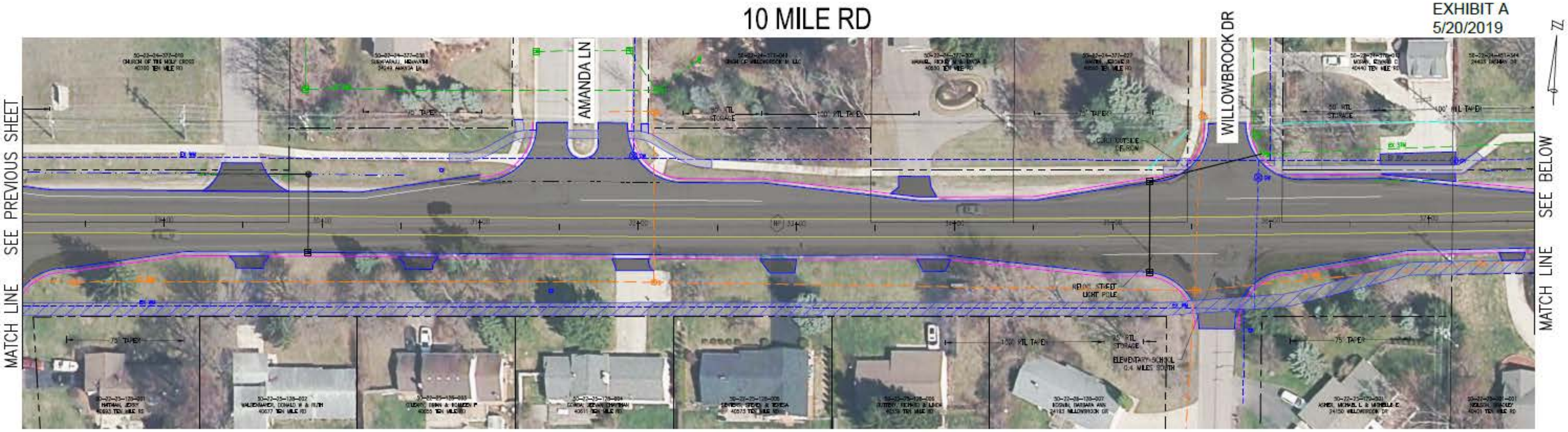
LEGEND

- EXISTING ROW
- PROPERTY LINE
- PROPOSED HIGHWAY EASEMENT
- PROPOSED ROADWAY
- PROPOSED WALK
- PROPOSED FUTURE PATHWAY
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF GRAVEL
- PROPOSED BACK OF CURB
- PROPOSED DITCH CENTERLINE
- PROPOSED STORM SEWER

OHM Advancing Communities®

10 MILE RD

EXHIBIT A
5/20/2019



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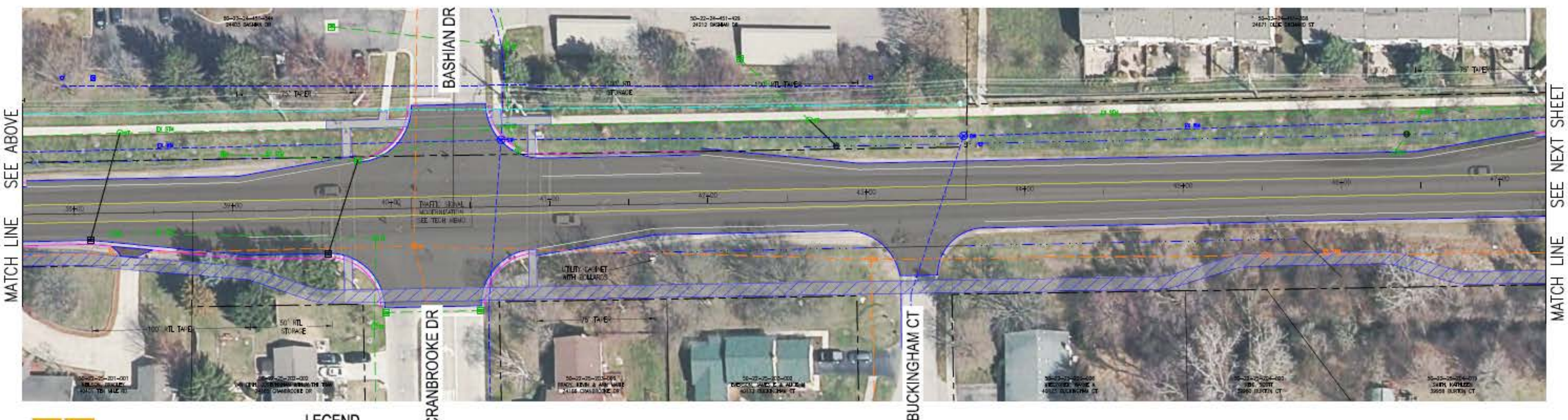
(11x17)



LEGEND

- EXISTING ROW
- PROPERTY LINE
- PROPOSED HIGHWAY EASEMENT
- PROPOSED ROADWAY
- PROPOSED WALK
- PROPOSED FUTURE PATHWAY
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EDGE OF GRAVEL
- PROPOSED BACK OF CURB
- PROPOSED DITCH CENTERLINE
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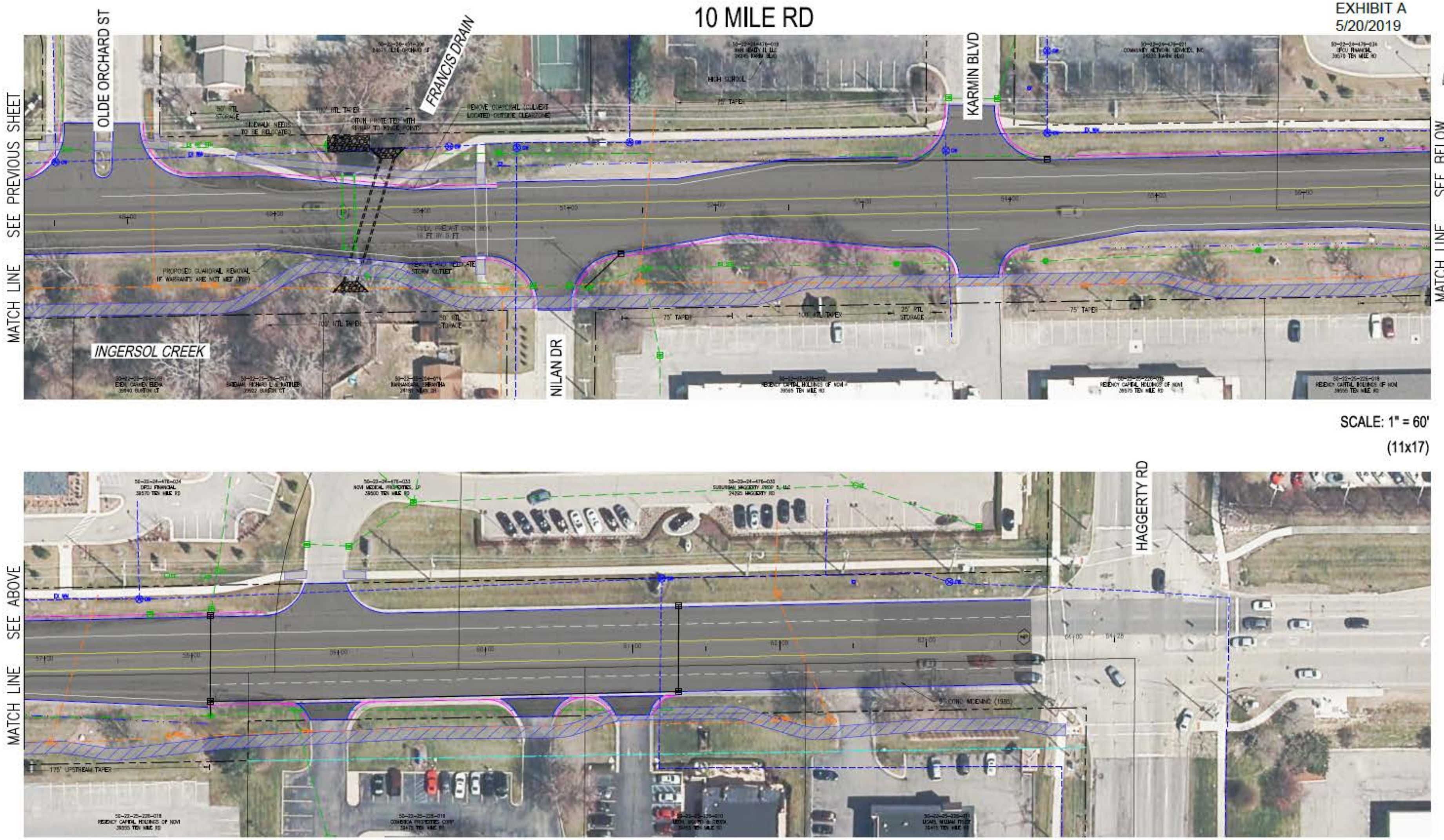
OHM Advancing Communities®

10 MILE RD

EXHIBIT A
5/20/2019



SCALE: 1" = 60'
(11x17)

LEGEND

EXISTING ROW	PROPOSED ROADWAY	PROPOSED EDGE OF PAVEMENT
PROPERTY LINE	PROPOSED WALK	PROPOSED EDGE OF GRAVEL
PROPOSED HIGHWAY EASEMENT	PROPOSED FUTURE PATHWAY	PROPOSED BACK OF CURB
PROPOSED DITCH CENTERLINE	PROPOSED STORM SEWER	

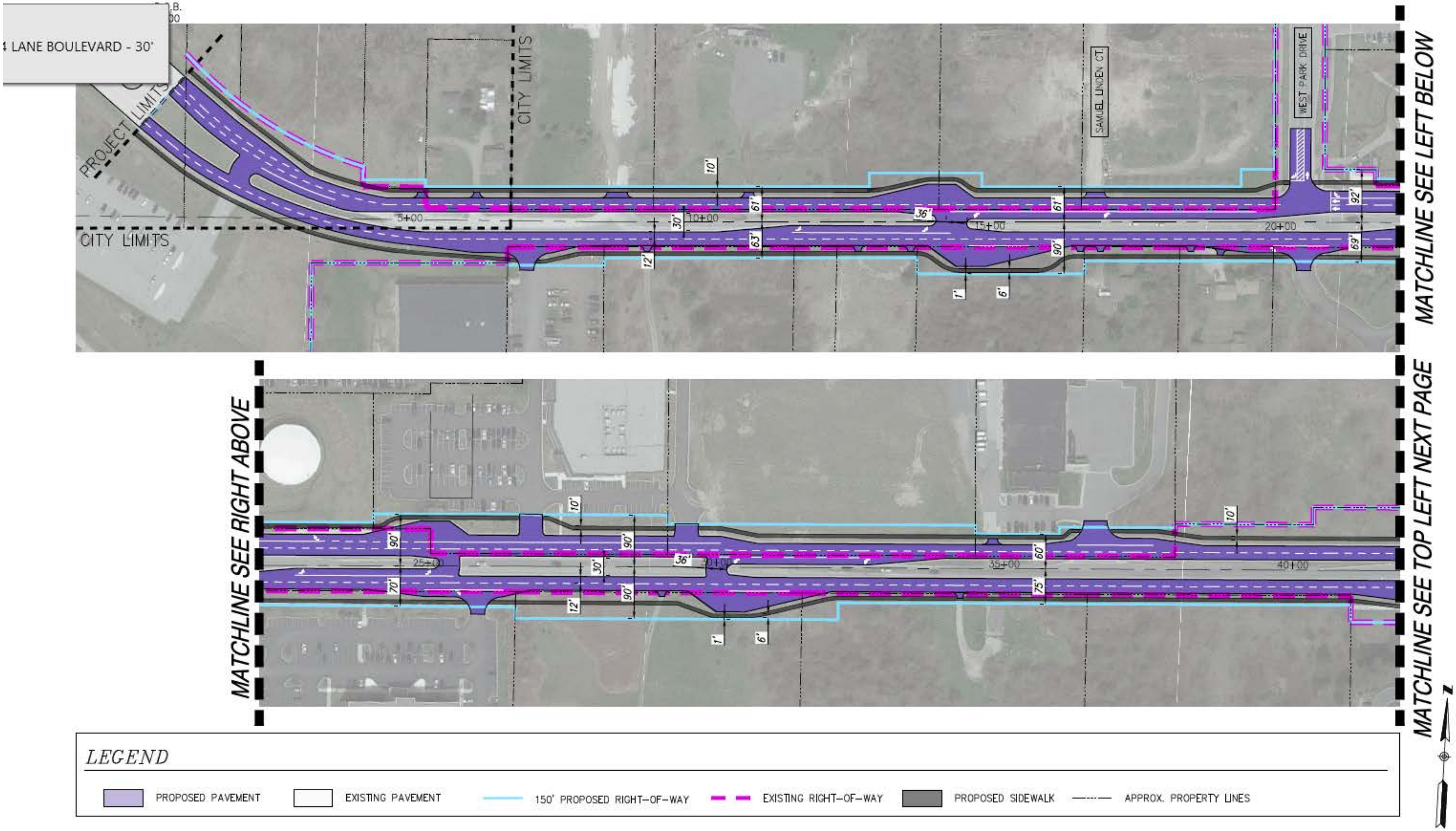
OHM
Advancing Communities®

12 Mile Road Schedule Update - SDA

▪ **City/MDOT Progress Meeting**	**Jan 29, 2020**
▪ **Public Information Meeting**	**Feb-March, 2020**
▪ **Draft (EA) Environmental Assess**	**June, 2020**
▪ **Review Period MDOT/FHWA**	**June-Dec, 2020**
▪ Federal Highway Admin	
▪ **Public Review Request/Hearing**	**Feb-March, 2020**
▪ **Submit FONSI**	**May, 2020**
▪ Finding of No Significant Impact	
▪ **Acquire Final FHWA Approval**	**August, 2021**

*no funding identified in the Transportation Improvement Plan yet

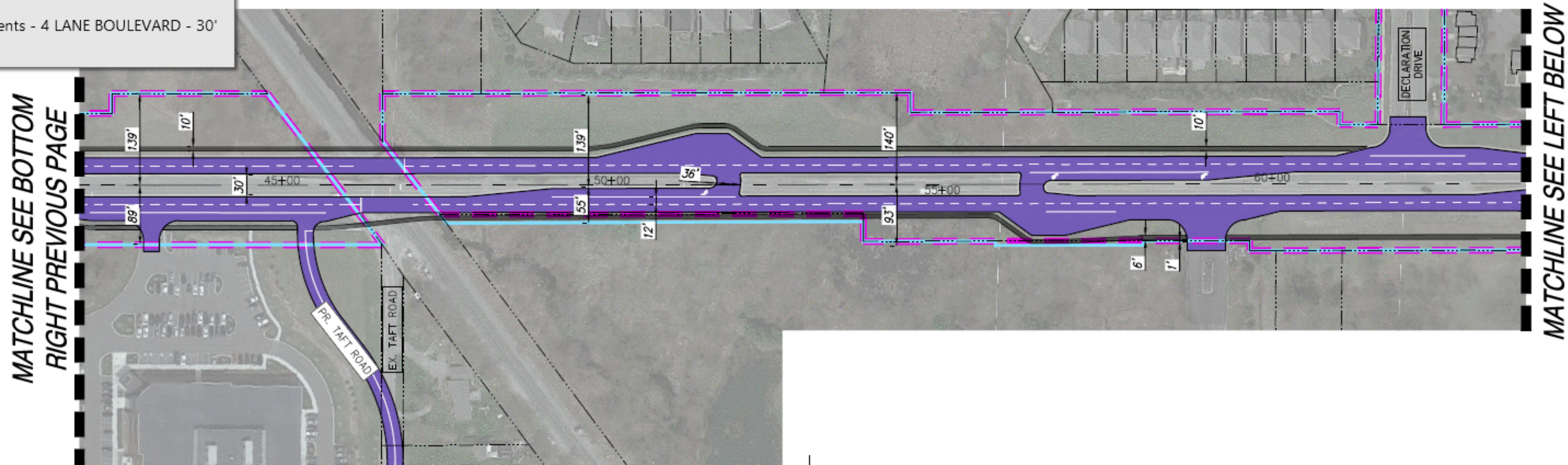
12 Mile Road Improvements – 4 LANE BOULEVARD – 30' MEDIAN

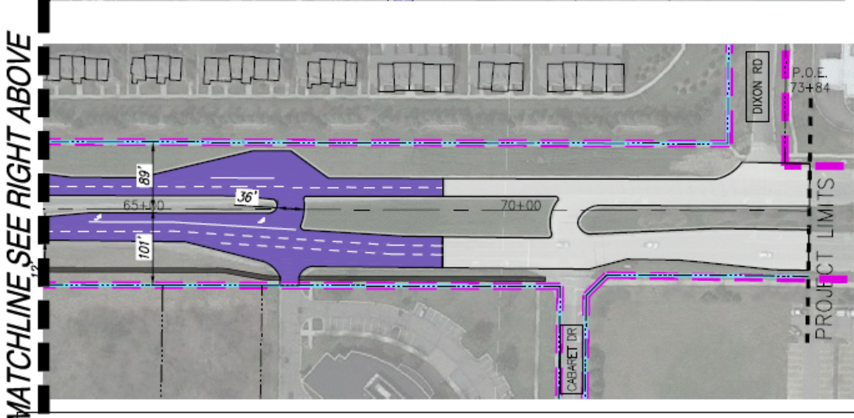


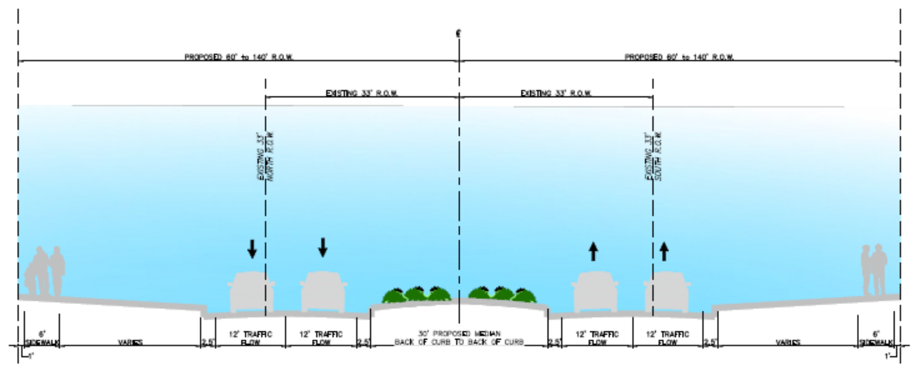
12 Mile Road Improvements – 4 LANE BOULEVARD – 30' MEDIAN

SPALDING DEDECKER
Engineering and Surveying
Excellence Since 1954

ements - 4 LANE BOULEVARD - 30'



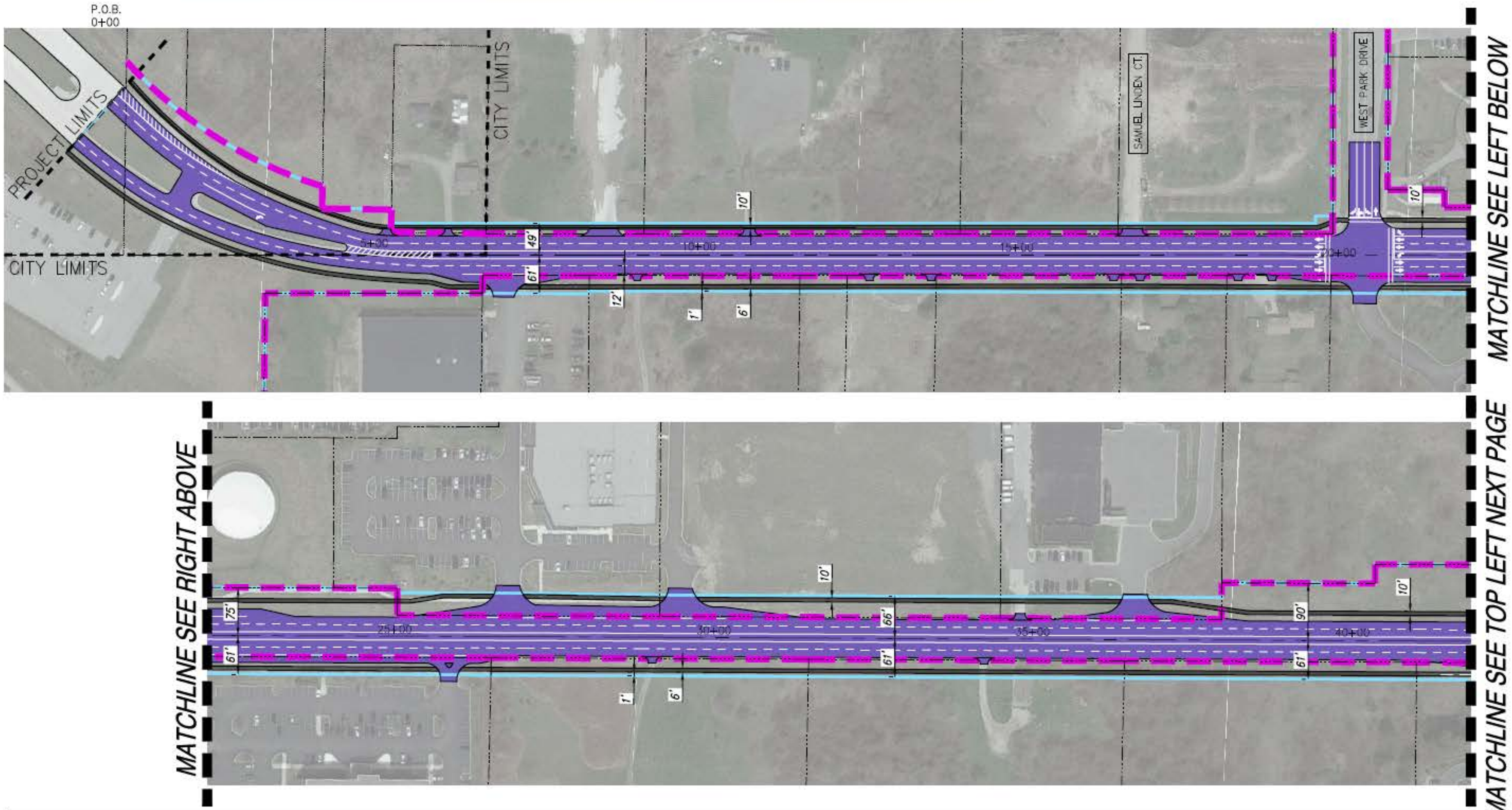




LEGEND

PROPOSED PAVEMENT | EXISTING PAVEMENT | 150' PROPOSED RIGHT-OF-WAY | EXISTING RIGHT-OF-WAY | PROPOSED SIDEWALK | APPROX. PROPERTY LINES

12 Mile Road Improvements – 5 Lane Road

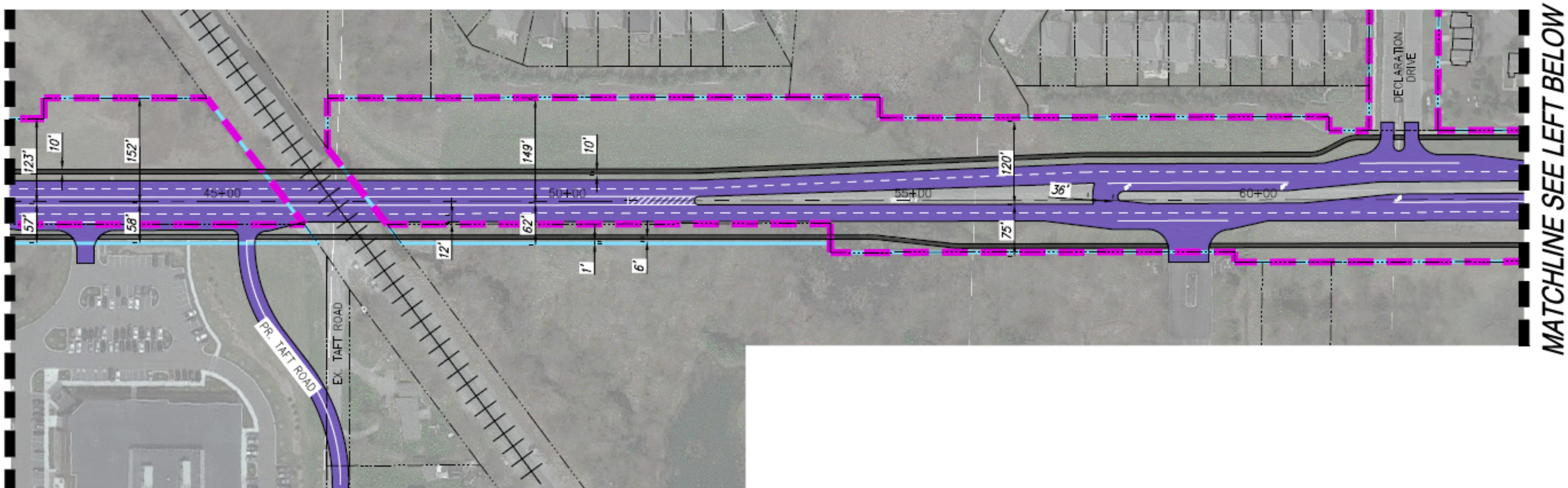


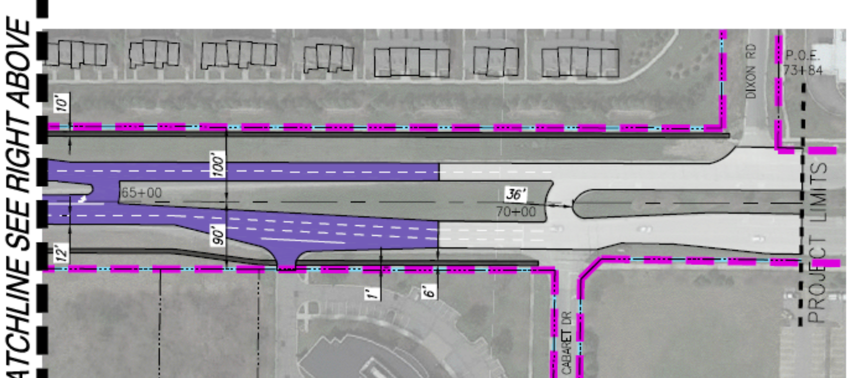
LEGEND

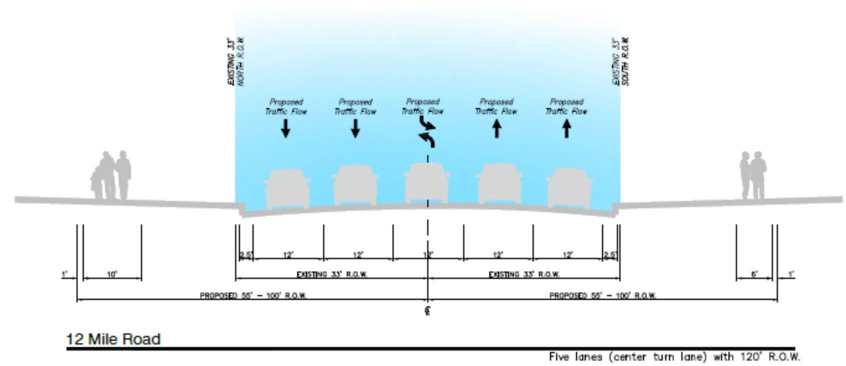
PROPOSED PAVEMENT | EXISTING PAVEMENT | 150' PROPOSED RIGHT–OF–WAY | EXISTING RIGHT–OF–WAY | PROPOSED SIDEWALK | APPROX. PROPERTY LINES

12 Mile Road Improvements – 5 Lane Road

SPALDING DeDECKER
Engineering and Surveying Excellence Since 1954







LEGEND

PROPOSED PAVEMENT | EXISTING PAVEMENT | 150' PROPOSED RIGHT-OF-WAY | EXISTING RIGHT-OF-WAY | PROPOSED SIDEWALK | APPROX. PROPERTY LINES

12 Mile Road Improvements – Beck Road Intersection

LEGEND

PROPOSED PAVEMENT
EXISTING PAVEMENT
150' PROPOSED RIGHT-OF-WAY
EXISTING RIGHT-OF-WAY
PROPOSED SIDEWALK
APPROX. PROPERTY LINES

Questions?

?

Appendix E

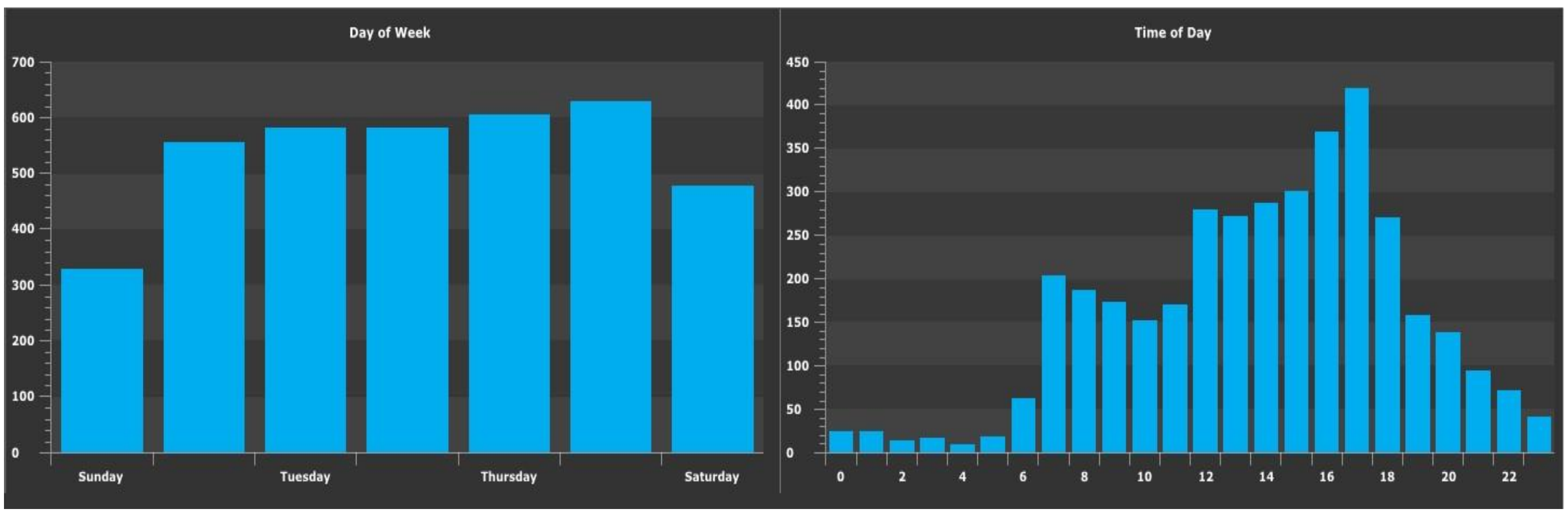
Crash Analysis Presentation

Novi Police Department

Traffic Crash Analysis

City Wide Crashes – Three Year Data

From January 1, 2018 to November 30, 2020, there were 4,158 reported traffic crashes in the City of Novi. A breakdown of the days and times shows that most crashes happen during the weekdays and most often during the evening rush hour.



Day and Time Breakdown

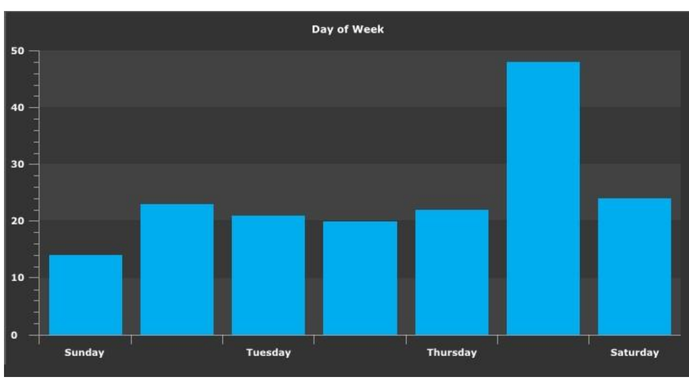
Top Six Intersections

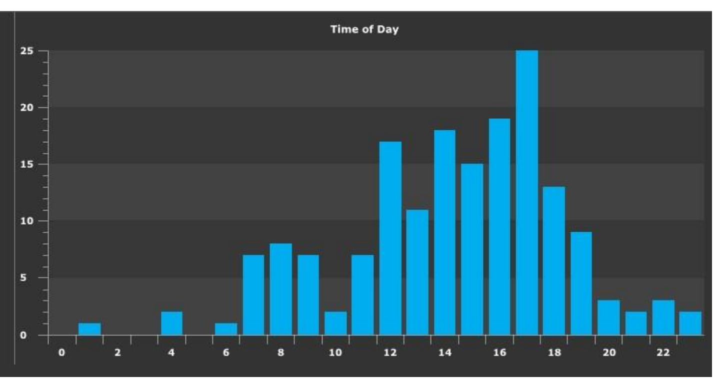
As determined by current data, our top six intersections for traffic crashes over the last three years are:

- Novi Road and Grand River Avenue
- Novi Road and Twelve Mile Road
- Novi Road and I-96
- M-5 and Thirteen Mile Road
- Beck Road and Grand River Avenue
- Beck Road and Pontiac Trail

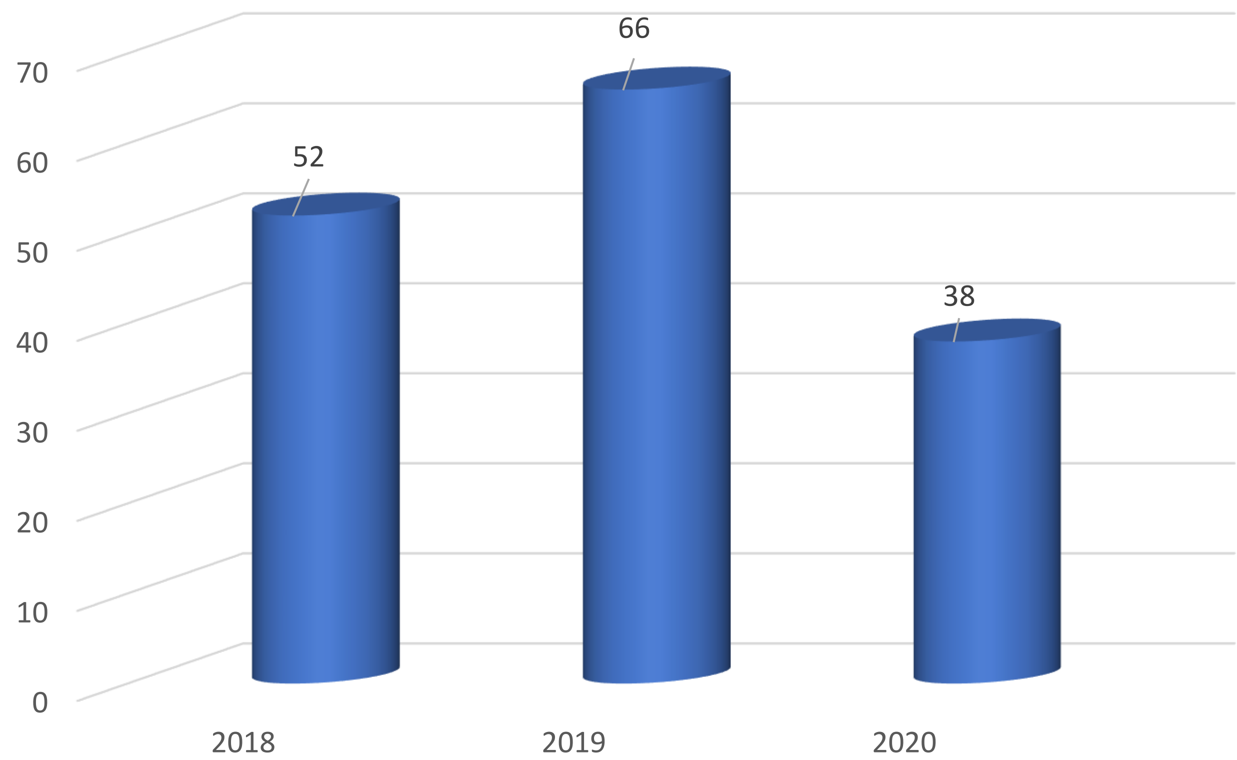
Novi Road and Grand River Avenue

During the three-year time period, there were 175 reported crashes at this intersection. The majority of these crashes occurred on Fridays and most were during the evening rush hour. 77 of those crashes were rear end crashes or roughly 44% of the total.



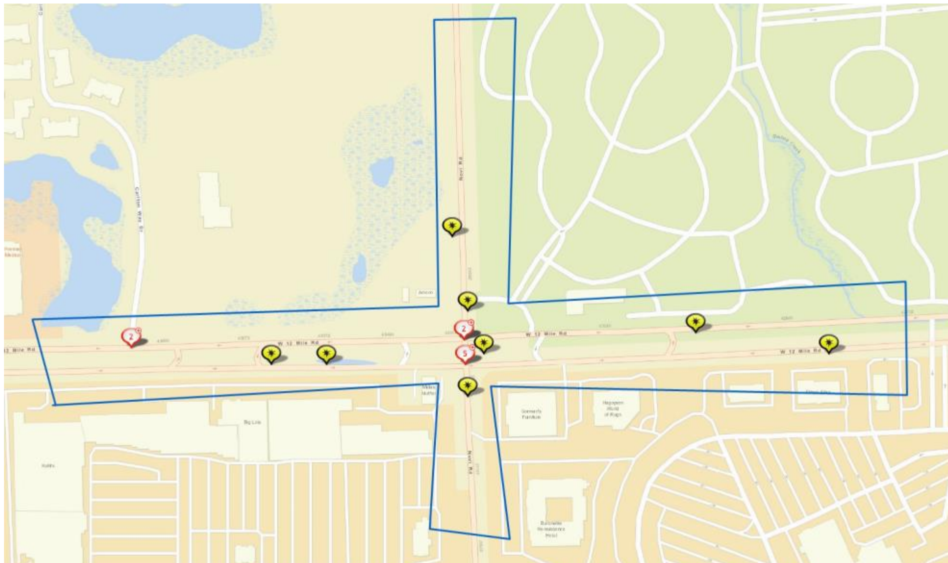


Novi Road and Grand River Avenue

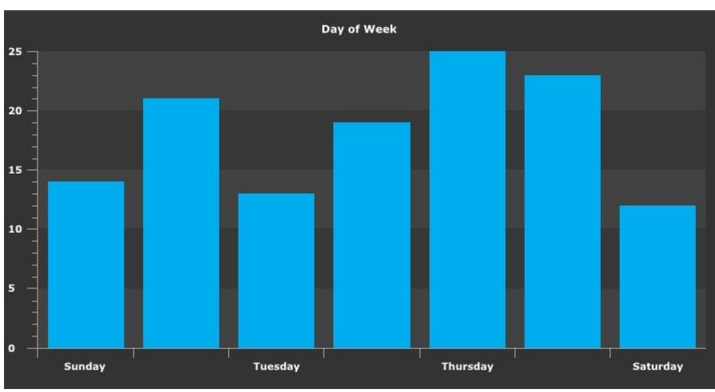


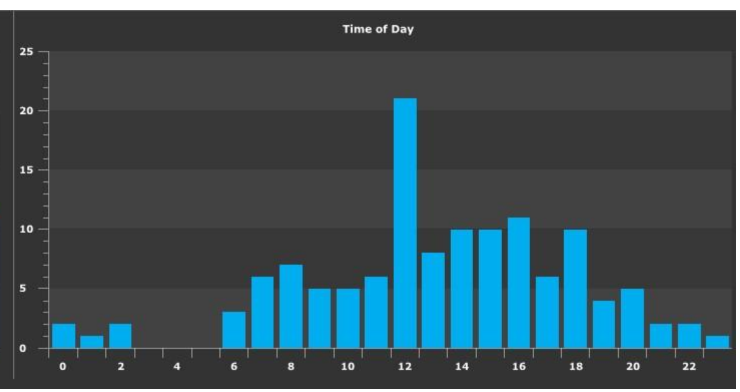
Total Crashes
January 1st to November 30th

Novi Road and Twelve Mile Road

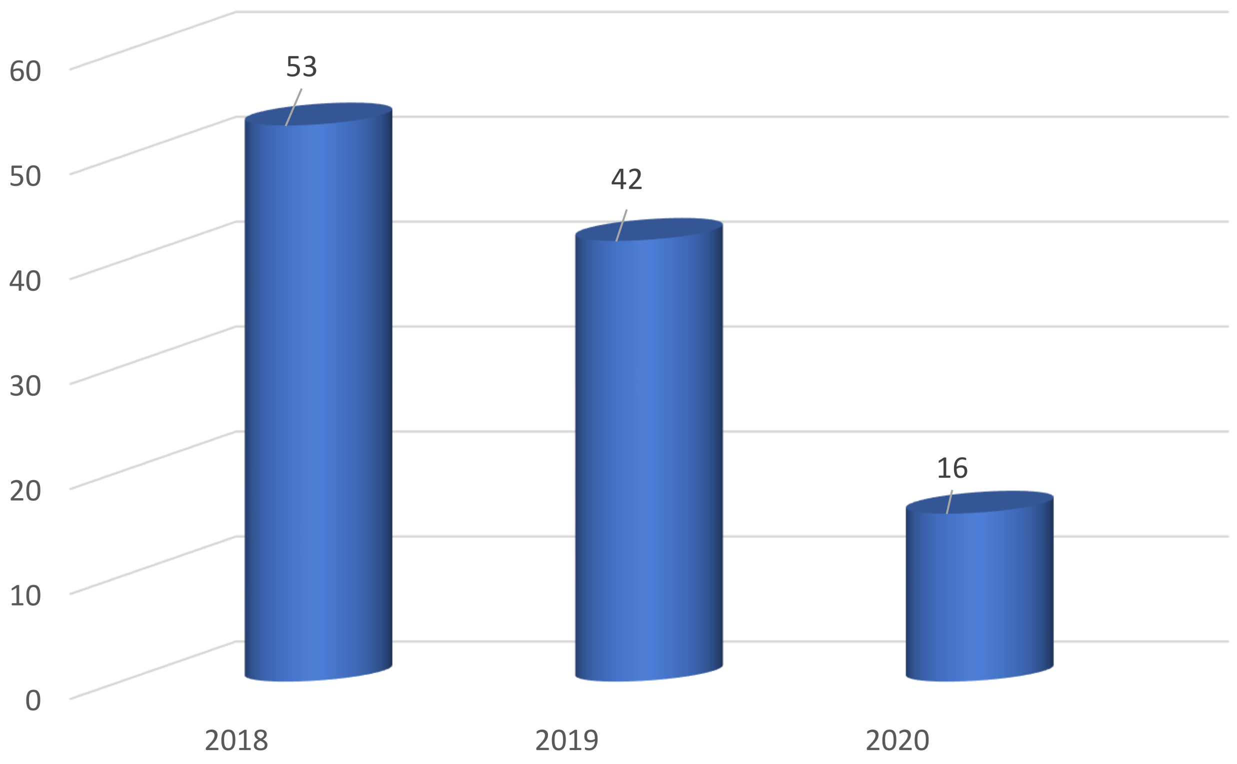


During the three-year time period, there were 129 reported crashes at this intersection. The majority of these crashes occurred on Thursdays and Fridays and most were during the lunch hour. 60 of those crashes were rear end crashes or roughly 47% of the total.





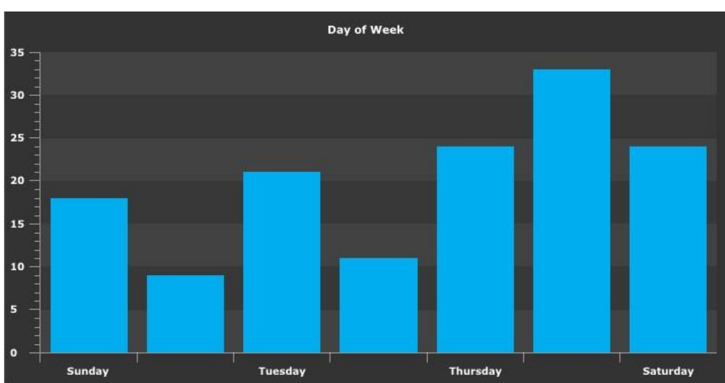
Novi Road and Twelve Mile Road

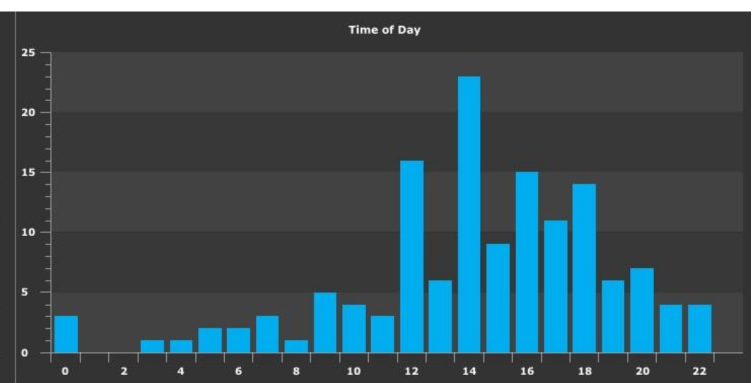


Total Crashes
January 1st to November 30th

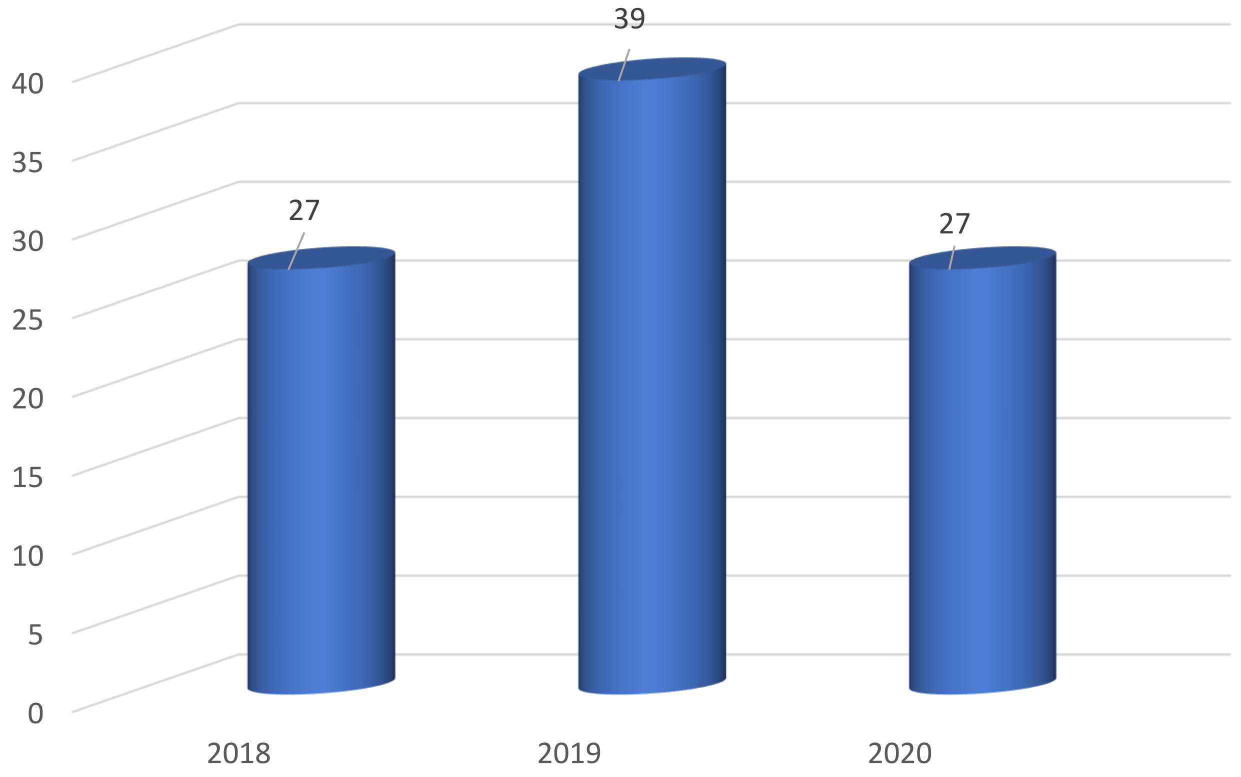
Novi Road and I-96

During the three-year time period, there were 142 reported crashes at this intersection. The majority of these crashes occurred on Thursdays, Fridays, and Saturdays and most were between 12pm and 3pm. 76 of those crashes were rear end crashes or roughly 54% of the total.





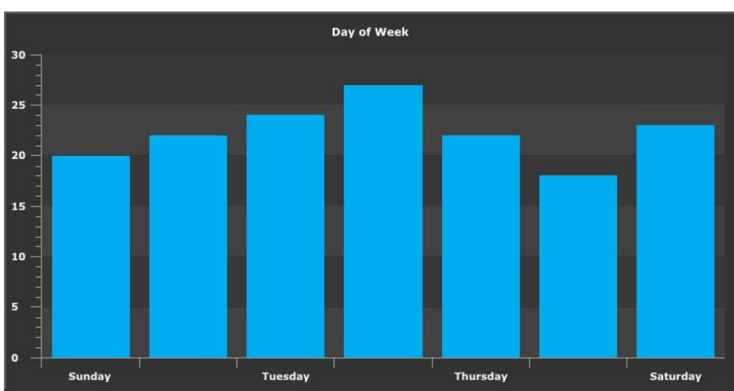
Novi Road and I-96

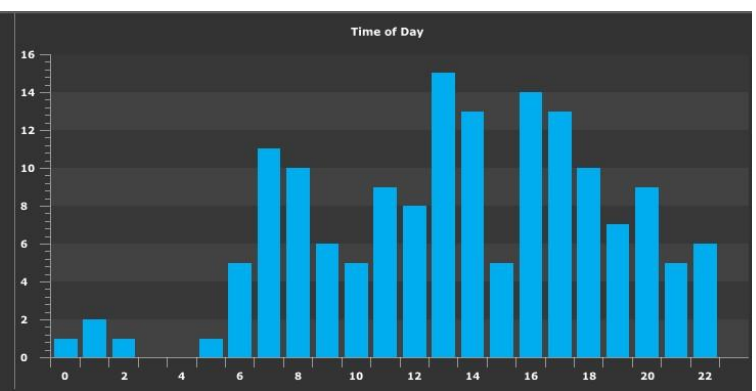


Total Crashes
January 1st to November 30th

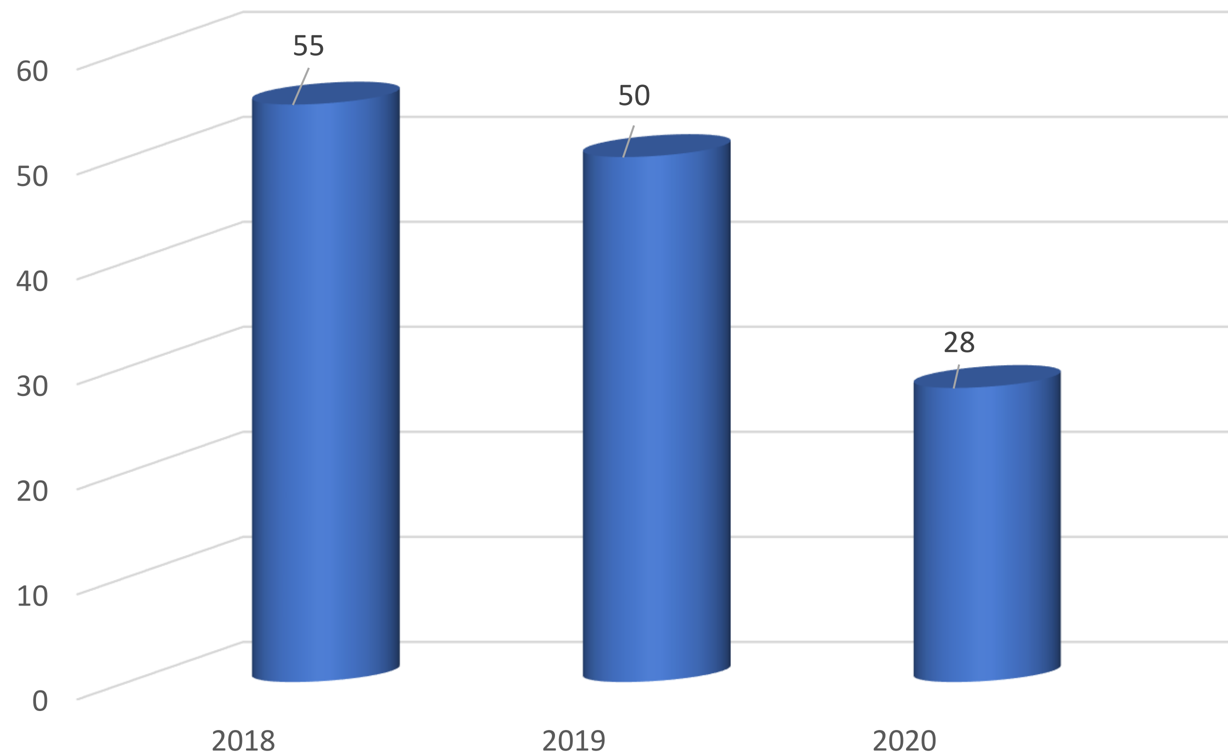
M-5 and Thirteen Mile Road

During the three-year time period, there were 159 reported crashes at this intersection. The majority of these crashes occurred on Tuesdays, Wednesdays, and Saturdays and most were between 1pm and 3pm and then between 4pm and 7pm. 92 of those crashes were rear end crashes or roughly 58% of the total.





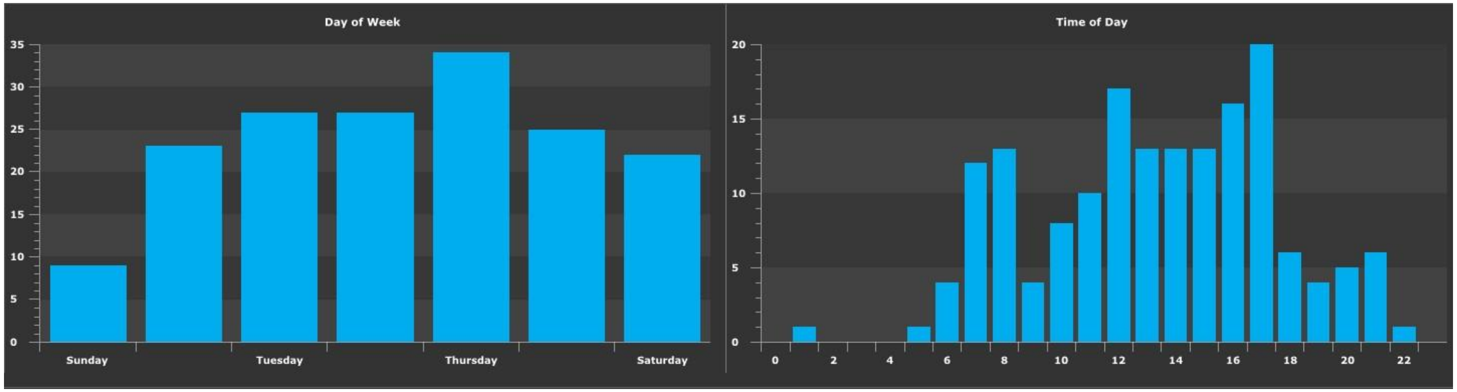
M-5 and Thirteen Mile Road



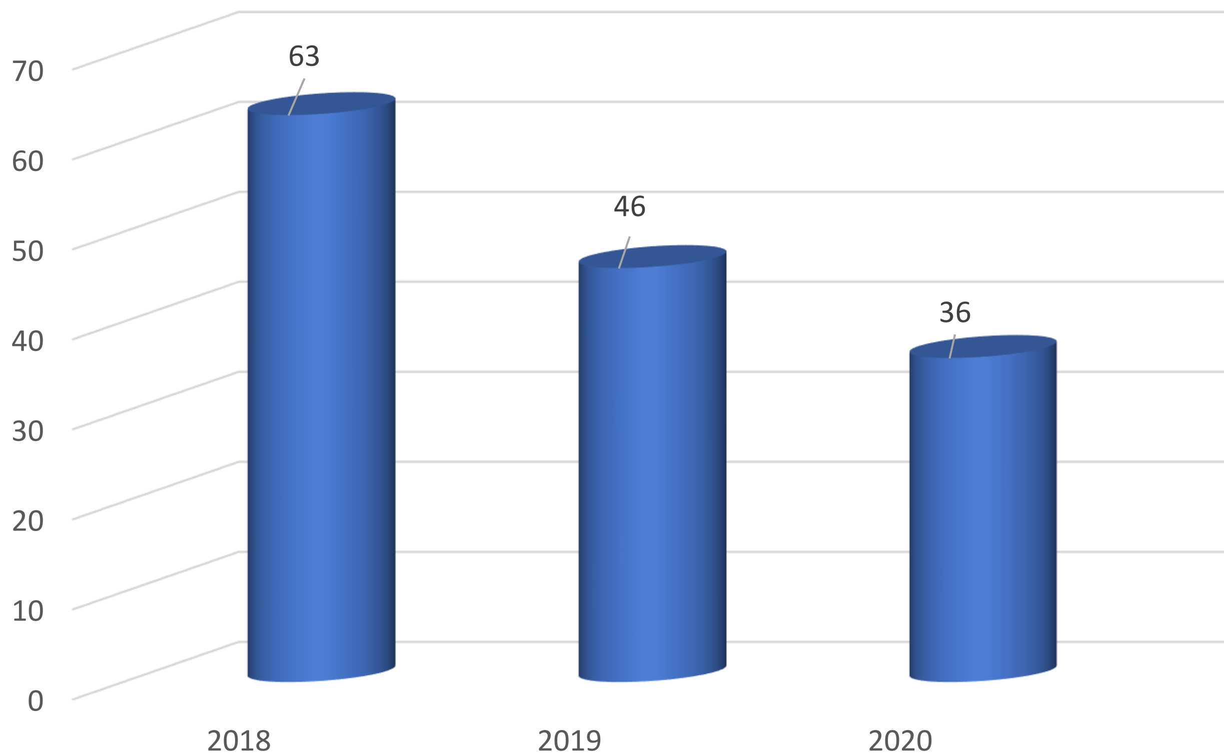
Total Crashes
January 1st to November 30th

Beck Road and Grand River Avenue

During the three-year time period, there were 171 reported crashes at this intersection. The majority of these crashes occurred on Thursdays and most were between 12pm and 7pm. 91 of those crashes were rear end crashes or roughly 53% of the total.



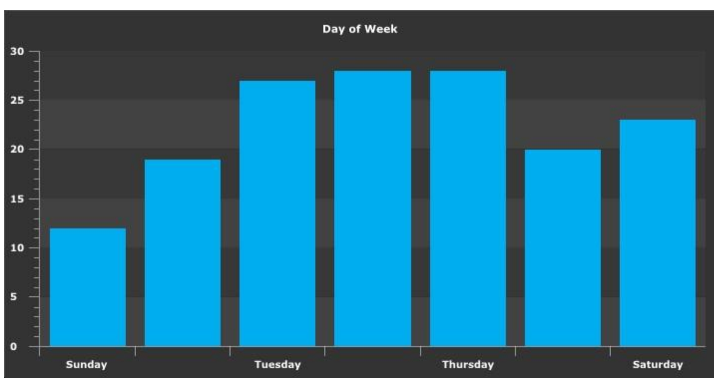
Beck Road and Grand River Avenue

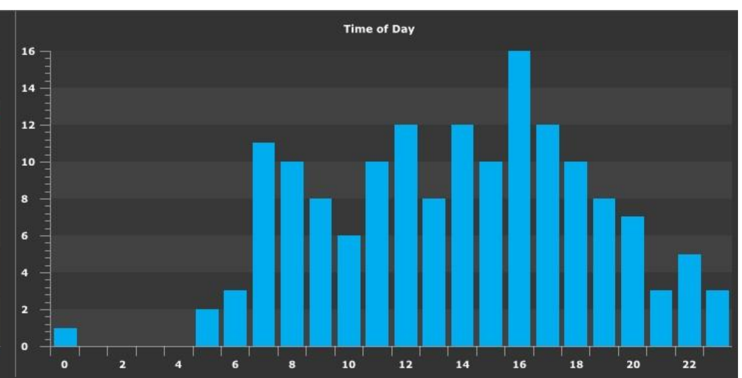


Total Crashes
January 1st to November 30th

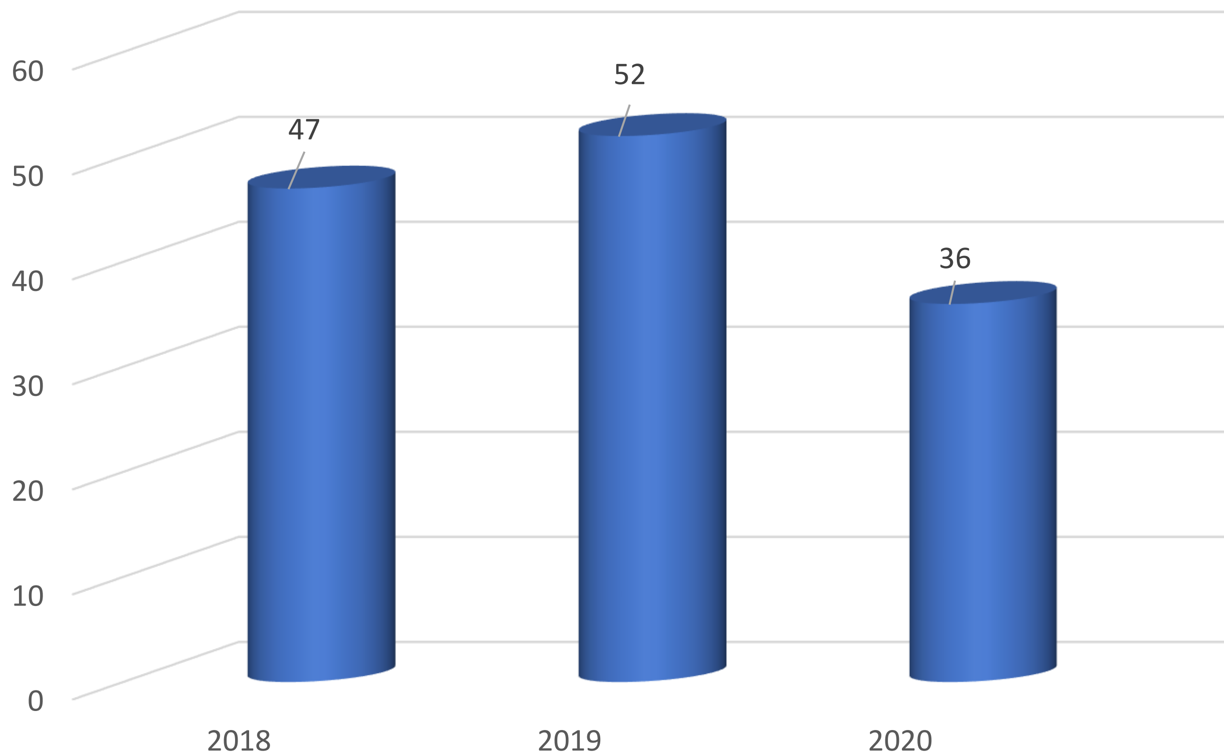
Beck Road and Pontiac Trail

During the three-year period, there were 162 reported crashes at this intersection. The majority of these crashes occurred on Tuesdays, Wednesdays, and Thursdays and most were between 2pm and 7pm. 40 of those crashes were rear end crashes or roughly 25% of the total.





Beck Road and Pontiac Trail



Total Crashes
January 1st to November 30th

Three Year Data

Pedestrian Crashes

Of the 4,158 crashes for the three years, only 22 involved a pedestrian or roughly 0.5% of all crashes.

Alcohol Related Crashes

Of the 4,158 crashes for the three years, 36 were alcohol related or roughly 0.9% of all crashes.

Three Year Data

Rear-End Crashes

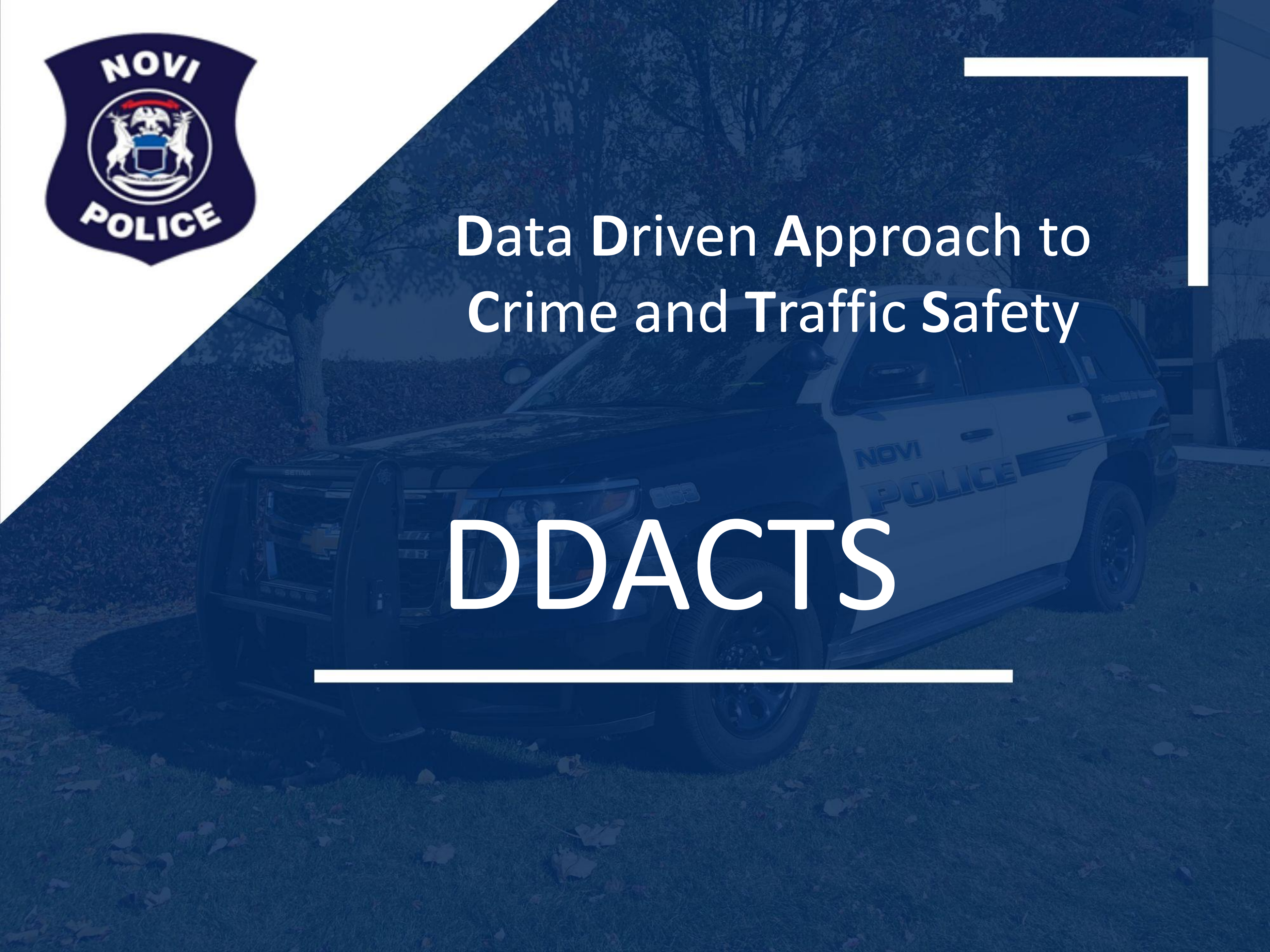
There were 1,643 rear end collisions during the three-year time period which accounts for 40% of all crashes.

Weather Related Crashes

347 of the crashes were determined to be due to inclement weather (rain, snow, etc.). That accounts for 8% of all crashes during the time frame.

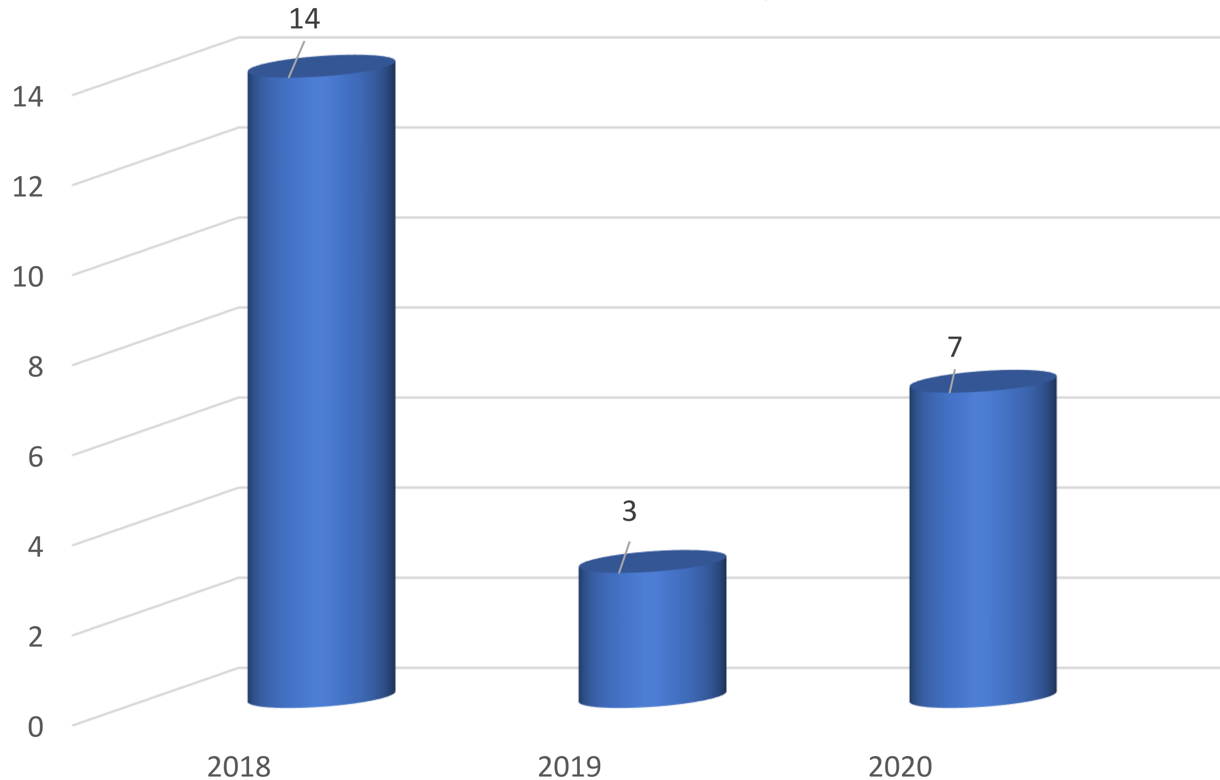
Data Driven Approach to Crime and Traffic Safety

DDACTS



DDACTS Activity – Beck and Grand River

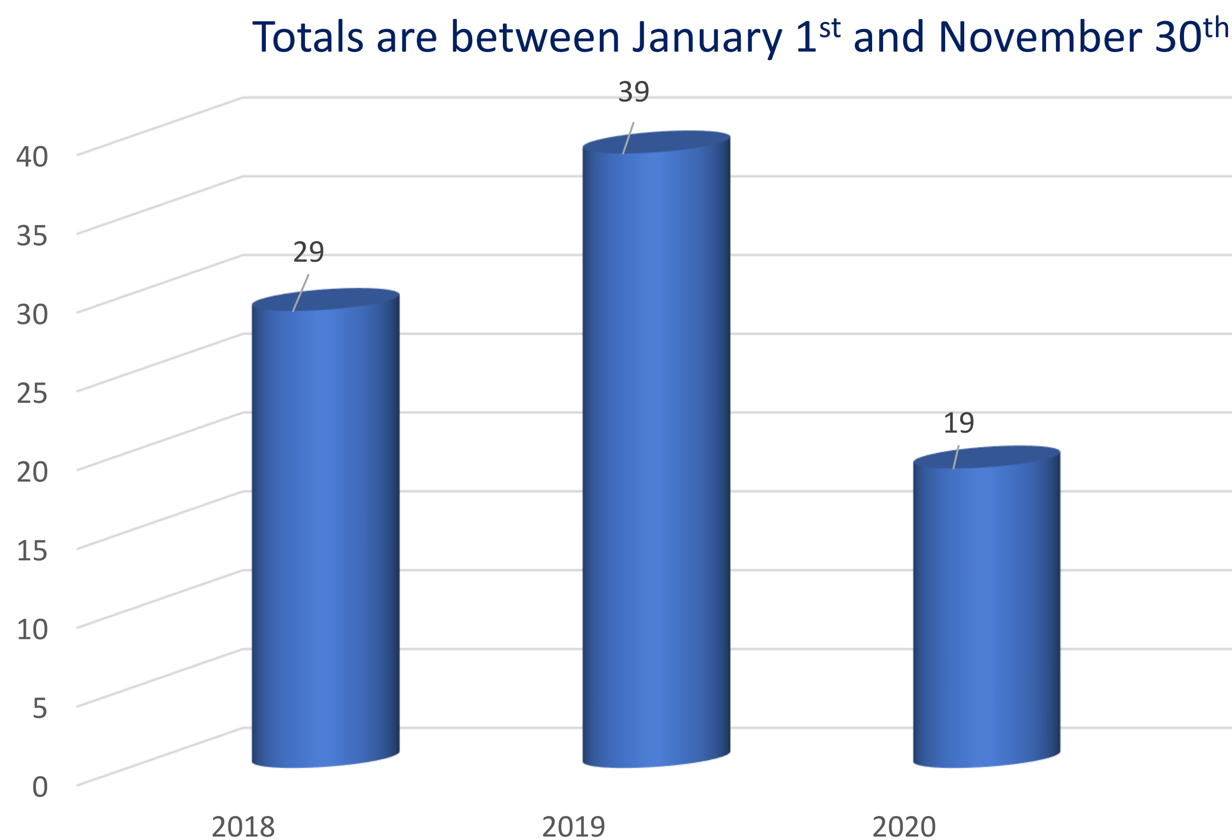
Totals are between January 1st and November 30th



There was a 50% reduction between 2018 and 2020.

DDACTS Zone
Wednesdays to Sunday
12pm to 2pm

DDACTS Activity – Novi Road and I-96



There was a 34% reduction between 2018 and 2020.

DDACTS Zone
Thursday to Saturday
2pm to 4pm

DDACTS Crash Zones

- Beck and Grand River
  - Wednesday 2p-6p
  - Thursday 12p-2p and 4p-6p
  - Saturday 1p-3p
- Novi Road and I-96
  - Tuesday 12p-3p
  - Wednesday 3p-7p
  - Thursday 3p-5p
  - Friday 12p-3p and 5p-7p

Questions?

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Appendix F

2012 OHM Road Asset and Funding Analysis Presentation

City of Novi

Road Asset Management & Funding Analysis

March 12, 2012

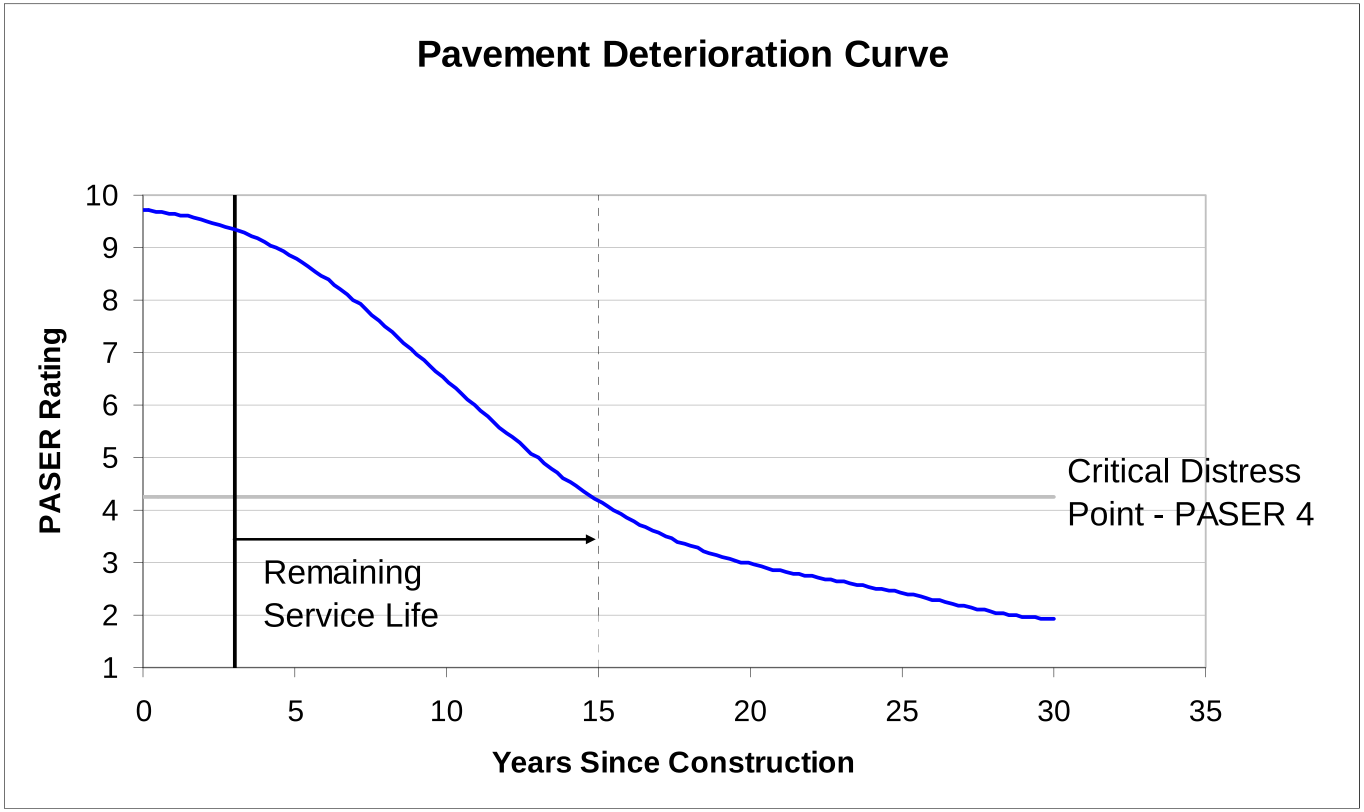
OHM Advancing Communities

Pavement Asset Management, RoadSoft-GIS, and the PASER System

- In 2002, Public Act 499 was signed into law defining asset management as “an ongoing process of maintaining, upgrading, and operating physical assets cost-effectively, based on a continuous physical inventory and condition assessment”
- RoadSoft software was introduced in 1993, and since that time, yearly funding from MDOT has enabled LTAP at Michigan Tech to continue to refine development and provide technical support.
- The Pavement Surface Evaluation and Rating (PASER) methodology is used to collect road surface condition data. PASER is a visual assessment system that rates the road surface on a scale of 1-10. Where 10 is new construction and 1 is totally failed.

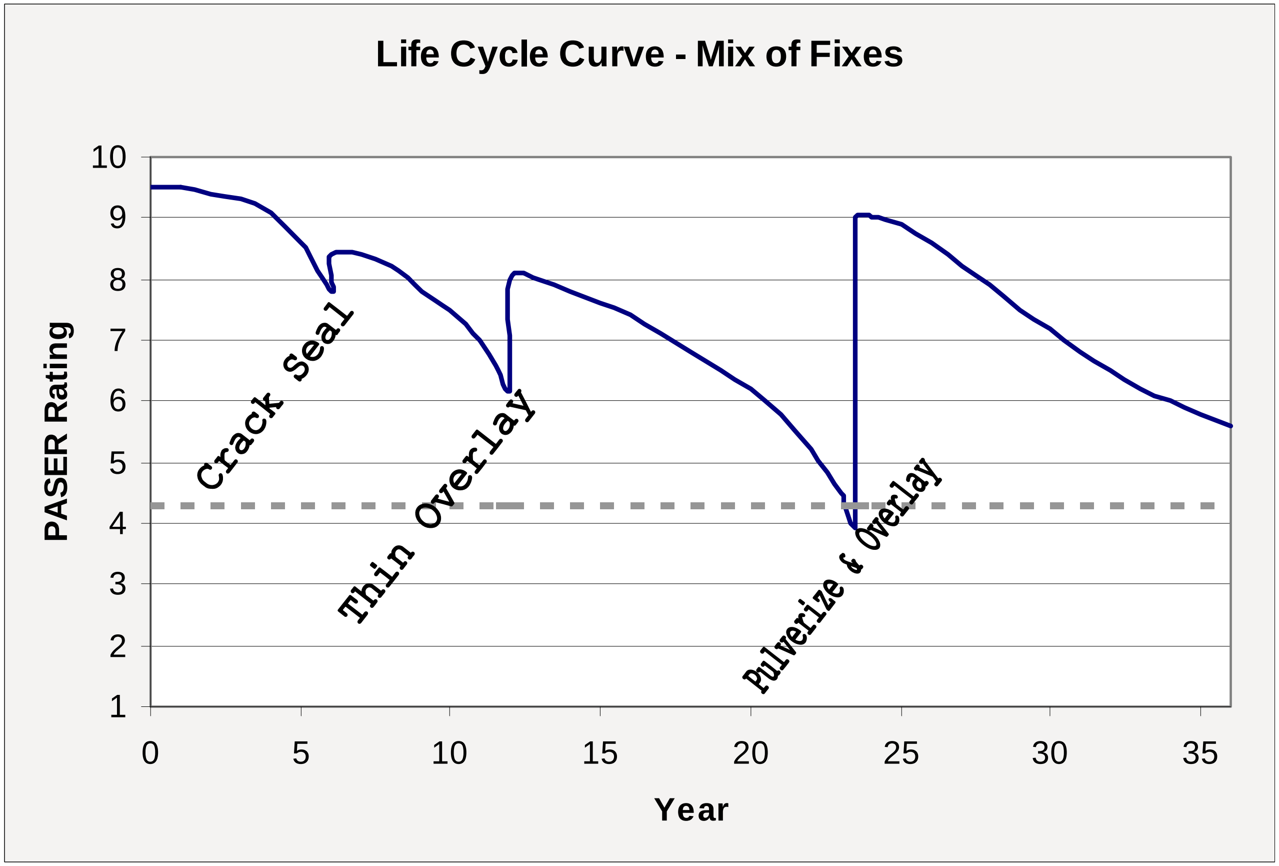
Maintaining An Asset

- The PASER rating, and subsequent classification to 'Good', 'Fair', & 'Poor', corresponds to an associated Remaining Service Life (RSL).
- It is much more cost effective to perform preventative maintenance while the condition is still good.



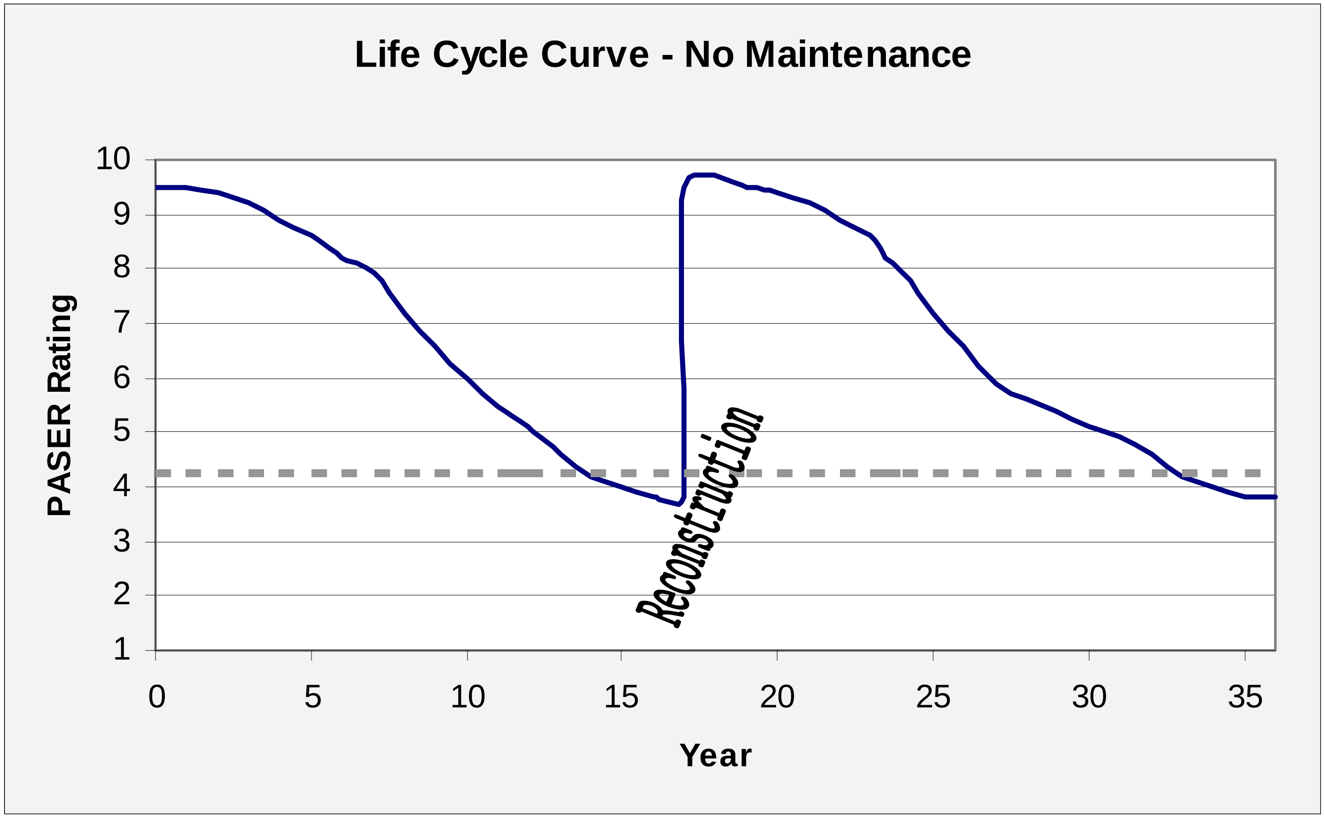
Pavement Life Cycle – Mix of Fixes

- $2.70/syd/year over life of pavement – 36 years
- Average condition rating = 7



Pavement Life Cycle – No Maintenance

- $3.30/syd/year over life of pavement – 36 years
- Average condition rating = 6



Road Network Condition Evaluation Process Steps

- Field Survey – Collect Data
- Database Creation / Data Quality Assurance
- Maintenance Alternative Selection and Cost Assignment
- Preliminary Network Analysis
- Identify Funding Level
- Refined Network Analysis – Selecting Segments/Neighborhoods
- Track Maintenance and Reconstruction Projects
- Update Database / Adjust Analysis

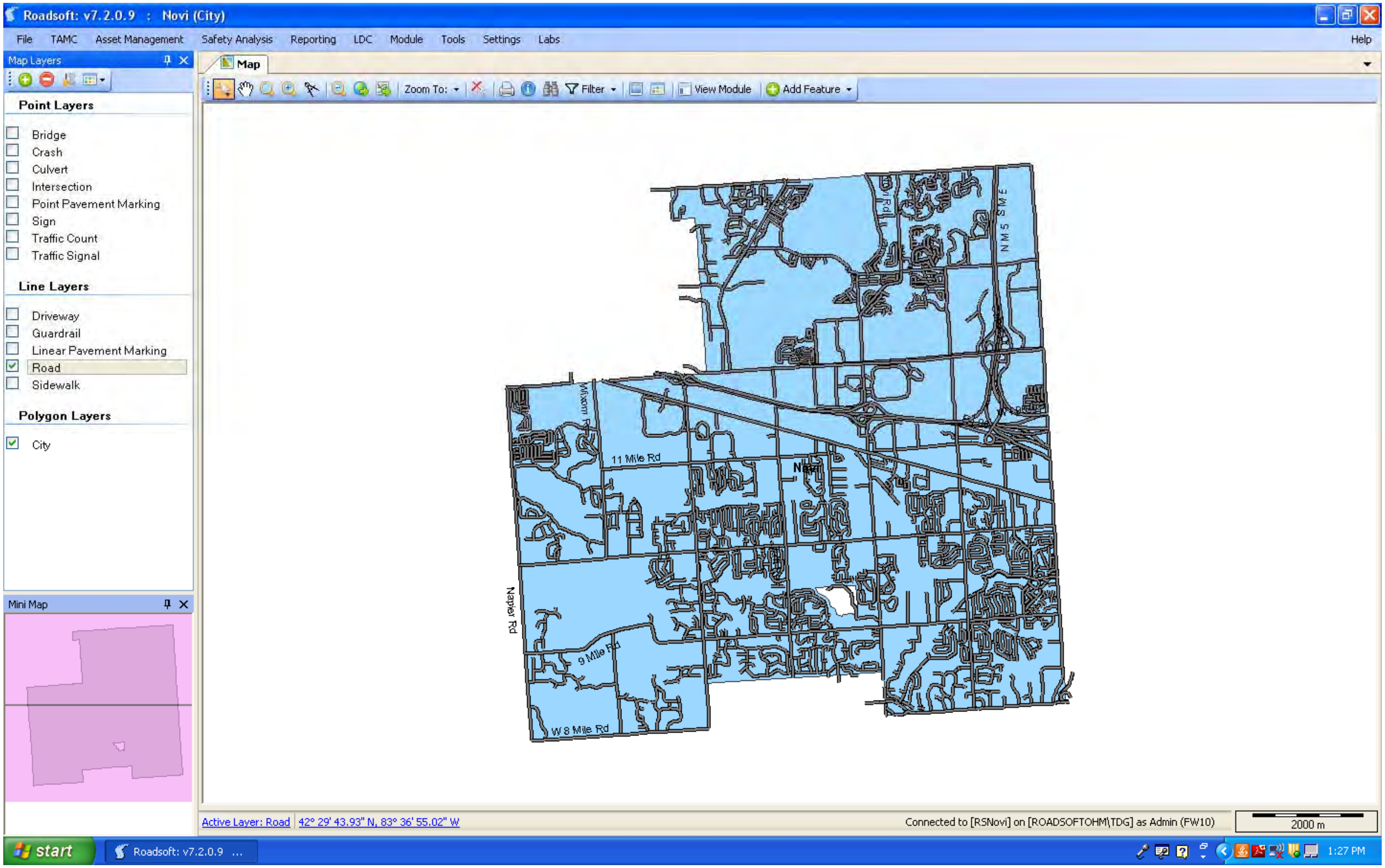
City Road Network Status

- Approximately 172 miles of City-owned roads
  - 100 Miles Asphalt
  - 70 Miles Concrete
  - 2 Miles Gravel
- Condition
  - 19 Miles Poor (PASER 1-3)
    - Reconstruction Candidates
  - 98 Miles Fair-Good (PASER 4-5)
    - Major Rehabilitation Candidates
  - 55 Miles Good-Very Good (Paser 6-10)
    - Light Preventative Maintenance Candidates

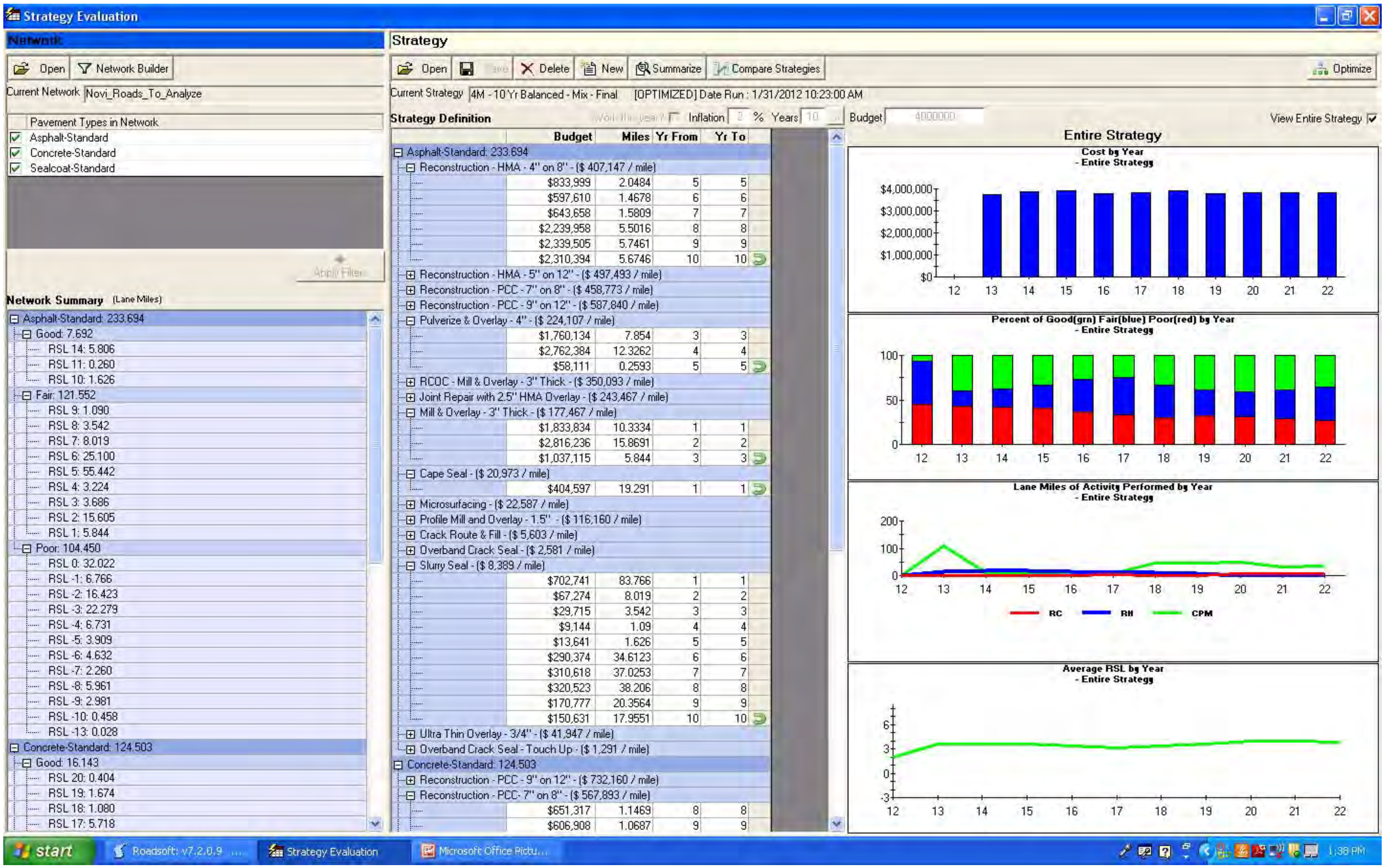
Strategy Evaluation and Optimization

- Roadsoft uses the following parameters to select the appropriate maintenance and capital procedures
  - Specific Preventative Maintenance, Rehabilitation, and Reconstruction alternatives
  - Costs for these alternatives
  - Expected deterioration curves (rates)
  - Budget
  - Duration (5-year plan, 10-year plan, etc)
- Roadsoft does not
  - Pick specific segments
  - Consider other capital projects (utility, etc)

Roadsoft Map Interface



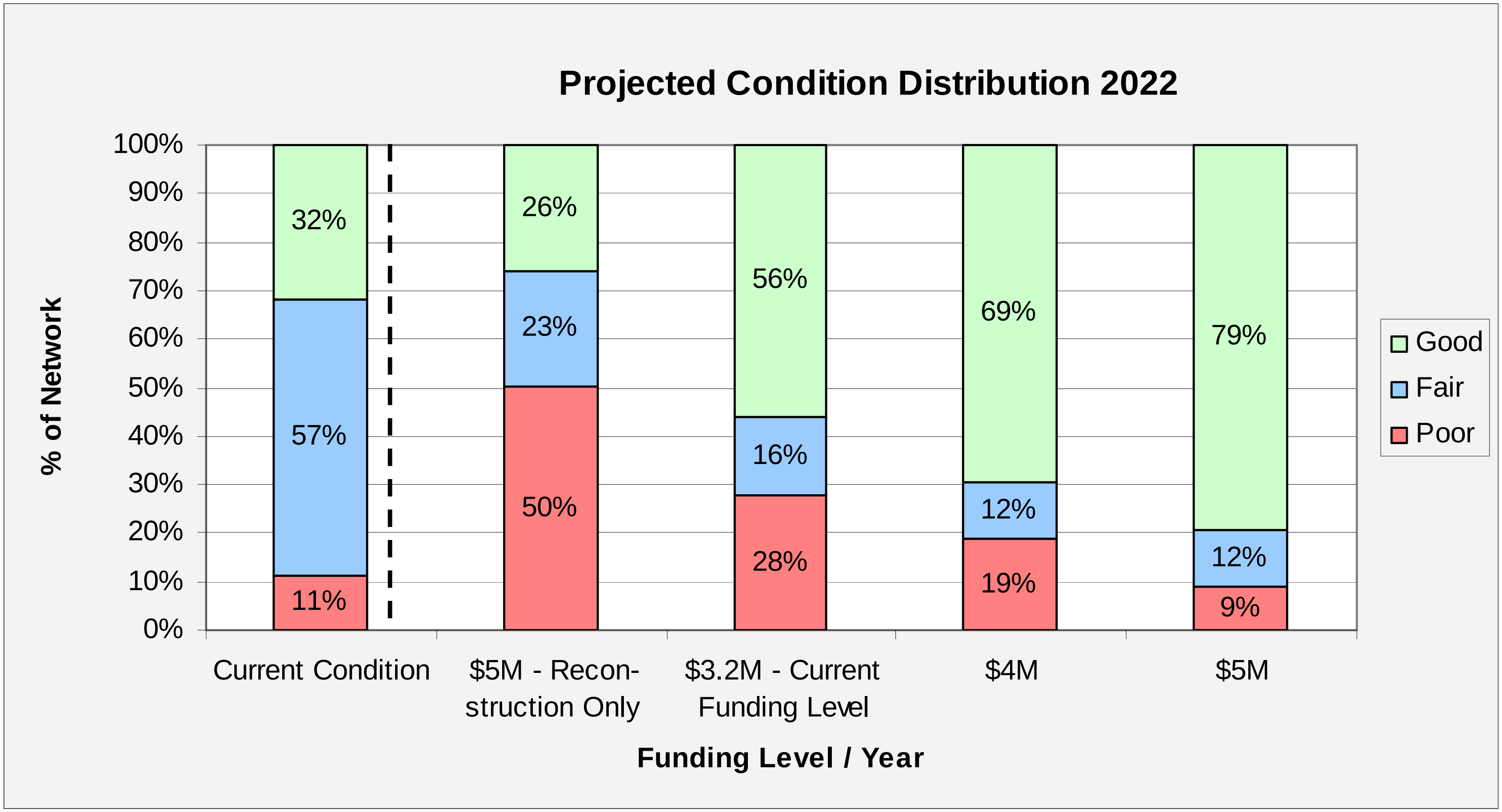
Roadsoft Optimization Engine



Results

- Analysis was performed at several funding levels
- Funding levels were evaluated for programs with consistent budgets, as well as ‘front loaded’
- The following graphs summarize the findings

Side-by-side Projected Condition Comparison



Side-by-side Projected PASER Comparison

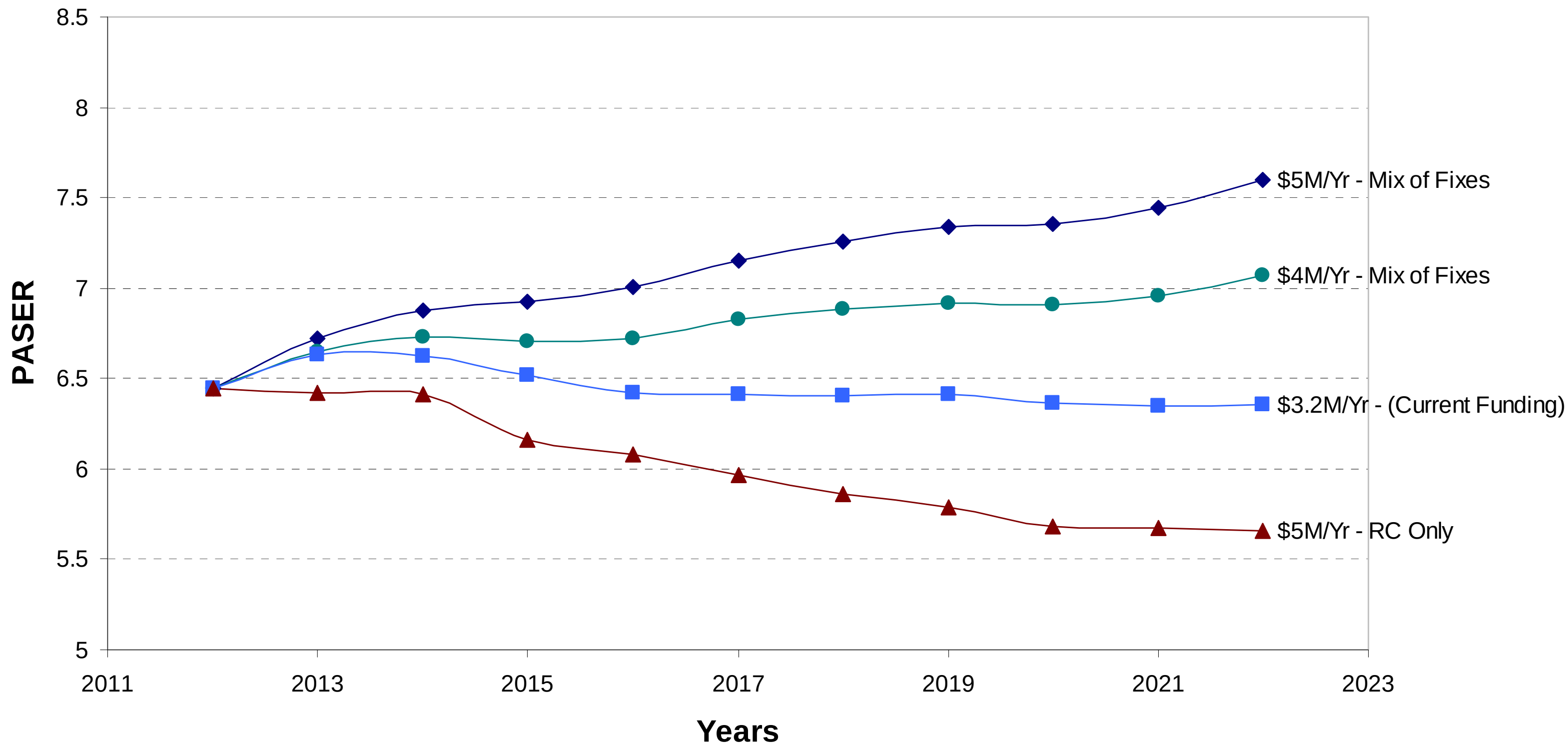


Figure 1: Projected Paser Rating At Various Funding Levels

Side-by-side Projected RSL Comparison

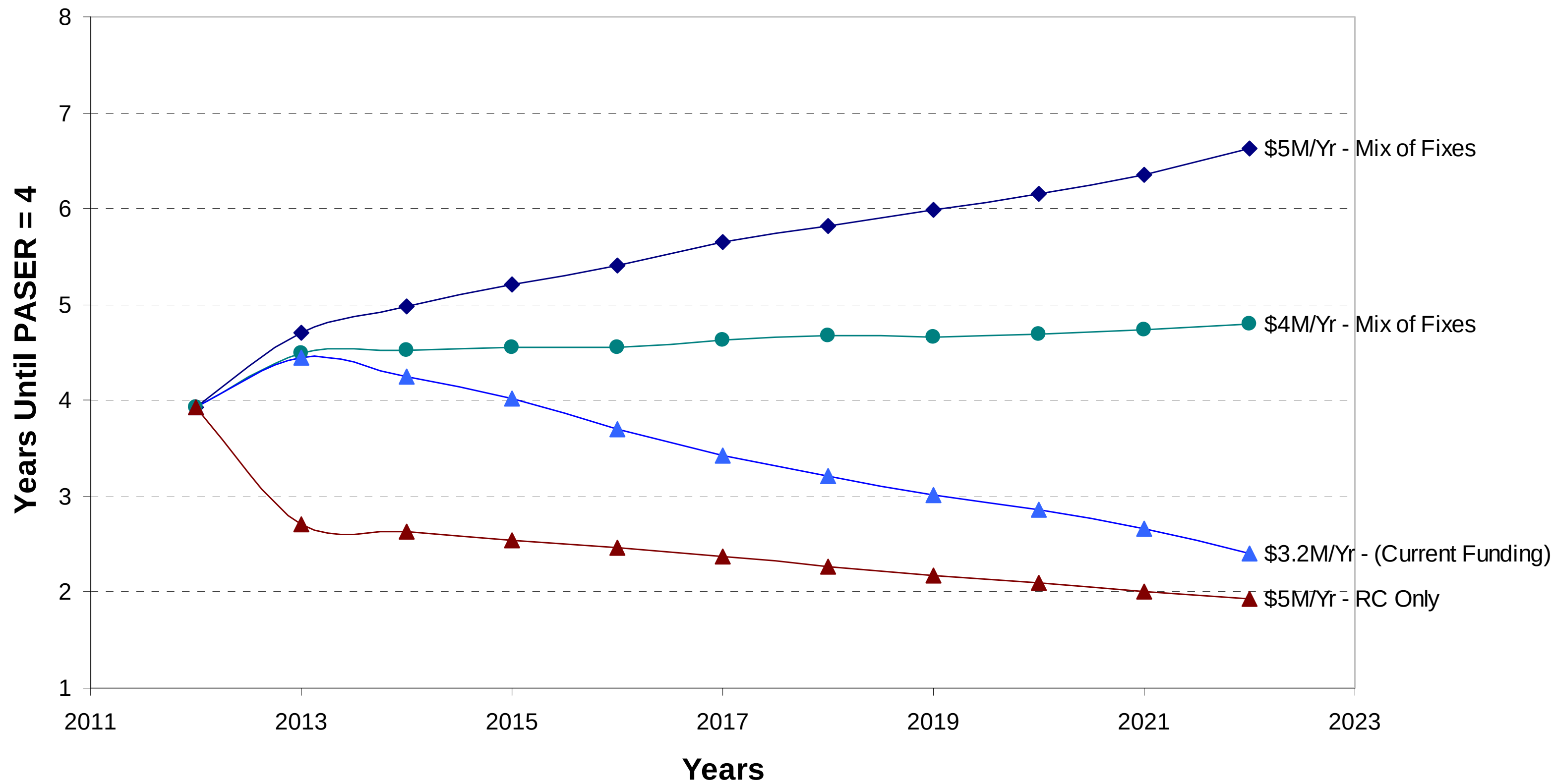


Figure 2: Projected Average years until PASER = 4

Centerline Miles Receiving Treatment

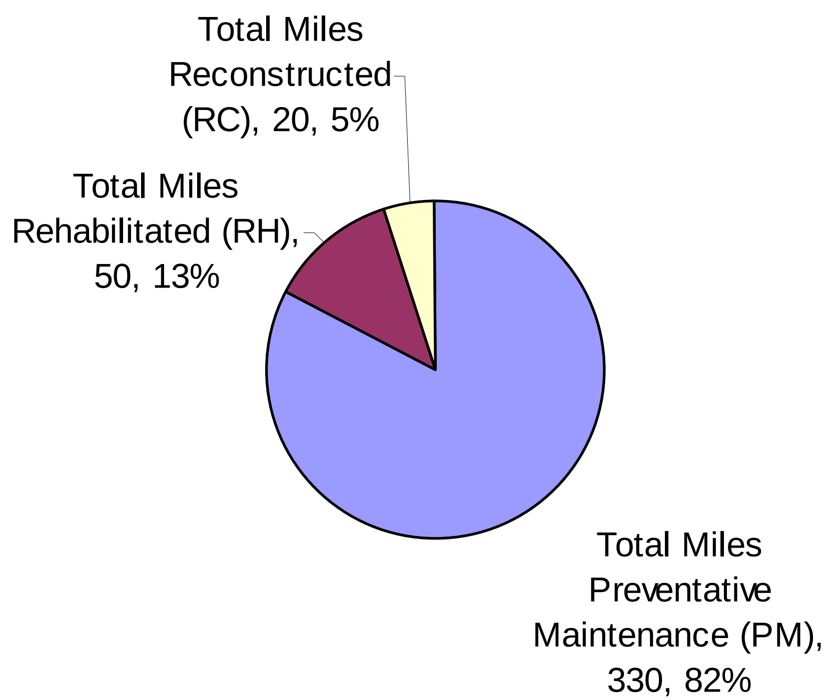


Figure 3: $5 Million / Year - 10 Year Program: Centerline Miles Receiving Treatment

Funding Allocation

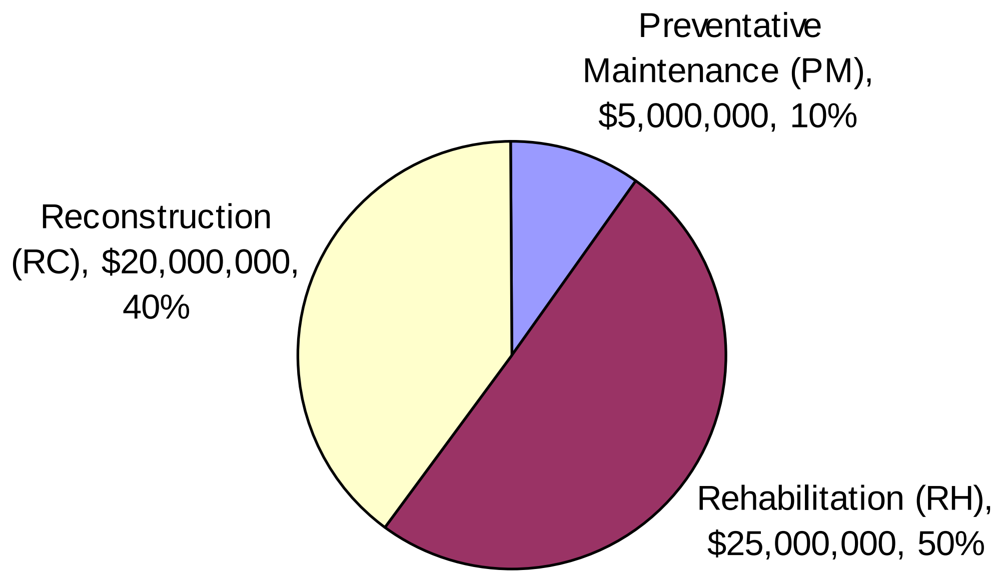


Figure 4: $5 Million / Year - 10 Year Program: Total $ Spent Over 10 Year Program

Conclusions

- Current Funding Level - $3,200,000 is not sufficient to maintain the average PASER condition over ten years.
- Funding the road program at $4,000,000 per year improves the average condition of the system, however more streets would be in poor condition
- An investment of $5,000,000 per year
  - Provides ample funding to maintain roads currently in good/fair condition (protect previous investments)
  - Provides ample funding for road program to incorporate a reconstruction component
  - Roads in ‘Poor’ category are slightly reduced over 10 year period
  - Provides improved overall average PASER rating of system (From 6.5 to 7.5) after 10 years

Road Network Condition Evaluation Process Steps

- Field Survey – Collect Data
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City of Novi

Road Asset Management & Funding Analysis

Questions / Discussion

Appendix G

Road Report

City of Novi

2020-2024 Road Program

Summary Report, Conditions and Recommendations

OHM
Advancing Communities®

TABLE OF CONTENTS

I. OVERALL EXECUTIVE SUMMARY

This report is the 1st annual road condition report compiled by OHM Advisors for the City of Novi. The report and the recommendations made are based upon the road survey conducted by OHM in the fall of 2018. All of the public streets in the City were ranked “1” (failed condition) through “10” (excellent condition) based upon the PASER (Pavement And Surface Evaluation Rating) criteria formulated by the Wisconsin Transportation Information Center, widely used by municipalities and agencies throughout Michigan as is mandated by the State government (every 2 years 100% of the road network must be rated). Each year, a visual survey and evaluation of the roads that had work performed the previous construction season will be completed and all maintained road ratings should be updated to reflect the work done on them. Based on PASER ratings, visual inspections and assessment of the defects and potential pavement defects, OHM has generated a plan to maintain the City roads over the next 5-year period. While the PASER system is useful for a high-level overview of a road network, road projects must be analyzed individually for the appropriate project type to be selected. The work recommended herein ranges from crack sealing, applying surface sealers, patching and totally reconstructing sections of roadway.

Within the City limits of Novi, approximately 187 miles of roadway are owned and maintained by the City. Of these 187 miles, approximately 123 (261 lane miles) miles are asphalt or sealcoated roadways, concrete roads make up approximately 62 (124 lane miles) miles and the remaining 3 (6 lane miles) miles are gravel roads.

TABLE I – Overall Network Conditions

Category	Rating					Total (centerline miles)
	Excellent (9-10)	Very Good (8)	Good (6-7)	Fair (4-5)	Poor (1-3)	
Major	5.36	1.64	4.24	18.95	2.91	33.09
Local	7.47	11.95	46.65	70.08	18.44	154.60
Total Mileage	12.8	13.6	50.9	89.0	21.3	187.7
% of network	7%	7%	27%	47%	11%	100%

As evident by the percentages listed above, the City is currently maintaining approximately 41% of its road network at a “good” quality or above. The overall goal of this program is not to have all City roads in “excellent” condition; rather a successful program will focus on allocating the available funds in such a way to create a consistent attainable budget from year to year.

As shown in Table I, a portion of the City’s road network (11%) has already degraded to a point where there is no option but to reconstruct those roads. Once a road has fallen into this category there is no lasting cost-effective repair for these roads other than to be completely reconstructed. Temporary fixes can be done to make the road traversable, however they will not perform well and the road will continue to be difficult to maintain until reconstructed. The total mileage of concrete in this portion is approximately 6.5 miles (at an estimated cost of $12 million). The remaining 14.8 miles are asphalt (at a cost of $18 million). Just above the roads that are currently considered “failing”, almost 50% of the City’s road network is in the “fair” range with the majority of the mileage being asphalt. The total mileage of asphalt pavement in “fair” range is approximately 59.5 miles (with an estimated cost of almost $65 million if left untouched until reconstruction is needed). The concrete roads in the “fair” range are 29 miles long (approximately $35 million dollars).

Roads typically remain in “fair” range for 3-8 years, depending on surface type, drainage and routine maintenance. Concrete roads tend to remain in the fair range much longer than asphalt. Due to this fact asphalt roads are focused on before concrete roads in planning future projects. It is possible to effectively extend the life of asphalt roads in the “fair” range for a relatively cheap cost through the use of surface sealers, crack filling, and minor patching. Concrete roads that have fallen to the “fair” range require extensive and expensive full depth patches that is typically inefficient from a cost per unit stand point. Eventually, every road will require a significant rehabilitation or reconstruction. The goal of a proactive asset management strategy is to delay that costly work as long as possible. If action is not taken, a large portion of the City’s road network that is maintainable today in a cost effective manner will cease to be maintainable and will require costly reconstructs to fix.

It is important to note that no two roads will deteriorate at exactly the same rate. Asphalt roads tend to age more quickly than concrete, but even two asphalt roads with the same cross section will degrade at different speeds. Traffic, drainage, and underlying soil conditions are only some of the factors that impact this. Because of this, a road that may have been a great candidate for a low cost life extending treatment one year may fall out of that category the next.

Details including specific roads and estimated program costs for a 5-year period can be found in Appendix A of this report. Roads not included in the program have been maintained or constructed recently and are not yet in need of repair or will be included in years past 2024. Table I demonstrates the dollar amount to be spent on road improvements each year. The summary includes the costs both in terms of present and future dollar amounts. This year’s report organizes the maintenance and rehabilitation/reconstruction projects for each year as well as classifying the improvements through major and local.

An overall map with all the streets included in the five-year plan can be found at the end of this summary. A breakdown of the overall program has been included in the form of individual maps for each year of the program in Section VIII.

This report earmarks between $7 to $8.5 million dollars per year for funding the pavement program over the next five years, though the overall roads budget may exceed this based upon large unique projects such as the proposed widening of Beck Road. This total amount is distributed into maintenance, asphalt and concrete rehabilitation/reconstruction programs based upon required work. Wherever possible projects have been grouped together based upon location and project type then inserted into the yearly program to maximize the efficiency of the City’s funds. Increased regular maintenance above what the City currently performs is strongly recommended as part of this program. The City has applied for and been approved to receive federal aid just under $2 million for the planned Wixom and Taft Road projects that are included in this program.

Terms

A number of terms will be repeated throughout this report in regards to road fixes and are as follows: **Maintenance**, or **Capital Preventative Maintenance (CPM)**, encompasses a wide variety of work including crack sealing, surface sealers, microsurfacing and minor patching. **Reconstruction** entails complete removal and replacement of the existing pavement surface and aggregate base. **Rehabilitation** encompasses crush and shapes, mill and fills and other similar fixes, where the existing base is typically left along with some of the existing pavement, and this is then added onto with new pavement for an increased cross section of greater strength.

Recommendation

We recommend that the City Roads Committee review the program as outlined in following pages, modify as necessary, and authorize the program for execution. While this program is the current recommendation of OHM, the program is flexible and can be modified each year to meet the needs of the City's budget, maintenance and other requirements. By implementing the plan, the City's investments in their roadway system will be preserved, and recently passed requirements of the Asset Management Council and the State Legislature will be met.

TABLE II - Preliminary Estimate of Capital Outlay/Operating Expense Projects

	2020	2021	2022	2023	2024
Major Roads Total:	$ -	$ -	$ 4,347,000.00	$ 4,963,000.00	$ 8,743,000.00
Recon/Rehab	$ -	$ -	$ 4,347,000.00	$ 4,963,000.00	$ 8,743,000.00
Maintenance	$ -	$ -	$ -	$ -	$ -
Local Roads Total:	$ 7,127,000.00	$ 8,200,000.00	$ 4,100,000.00	$ 4,000,000.00	$ 3,300,000.00
Recon/Rehab	$ 6,327,000.00	$ 7,400,000.00	$ 3,300,000.00	$ 3,200,000.00	$ 2,500,000.00
Maintenance*	$ 800,000.00	$ 800,000.00	$ 800,000.00	$ 800,000.00	$ 800,000.00
Total (in Future Dollars)	-	$ 8,610,000.00	$ 9,317,000.00	$10,380,000.00	$ 14,644,000.00
Total (in 2020 Dollars)	**$ 7,127,000.00**	**$ 8,200,000.00**	**$ 8,447,000.00**	**$ 8,963,000.00**	**$ 12,043,000.00**

(1) All final cost estimates have been rounded.
(2) Future dollars based on 5% annual inflation.
(3) Roads subject to change during yearly project evaluation based upon actual road condition
(4) Planned contributions to non-City owned assets are not included

Table III on the following page shows a possible projected road rating based upon an average annual budget. Based upon the City's desired direction, this report will be updated to reflect the approved funding level. It is important to note that the amount spent per year and the corresponding change in ratings is based upon an ideal mix of fixes from sealing cracks, to rehabilitations to reconstructions. For example, if the City were to spend $8 million solely on reconstructions with no money spent on maintenance, the average condition of the roads would decrease. Due to the cost of reconstructions, it is paramount that maintenance is performed periodically on the roads prior to the asset degrading to the point that a more costly fix is required.

Capital Preventative Maintenance (CPM)

The City currently has a program that performs preventative maintenance on roads throughout the City. Our recommendation is that the City significantly expand the CPM program going forward. At the core, maintenance programs will not directly give the City brand new roads. Maintenance fixes will take existing roads that are starting to show signs of wear but still structurally sound and for a relatively small cost per square yard significantly increase the overall lifespan of a road. Roads that may last approximately 15-20 years with little to no maintenance may instead be extended by 10 or more years with periodic maintenance treatments being applied. We recommend the City continue its practice of pursuing and evaluating new innovations in materials and technologies in order to provide as much additional value as possible to the City's residents. This will allow the City to delay and ultimately reduce the amount of costly reconstructions necessary.

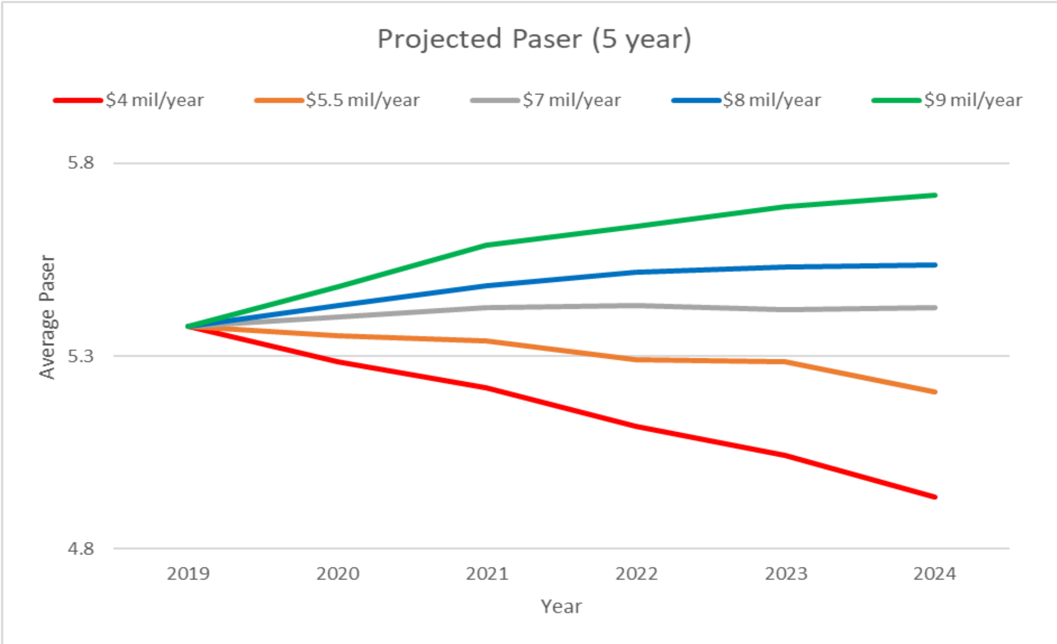
Neighborhood Road Program (NRP)

The goal of the Neighborhood Road Program is to use the City's local road millage as wisely as possible. Fixes range from full reconstruction to heavy maintenance and rehabilitation. Each road must be considered individually and fix selected based upon need and degree of deterioration.

Projected Rating

Table III below shows approximate future PASER rating changes based upon a yearly funding level. This should be used as an approximation only, and it should be noted that these projections are only accurate when $1 to $2 million is being spent annually on maintenance projects. Theoretically if the City had a total roads budget of $6.5 million and spent it all on reconstruction projects, the rating would look like the orange line on the graph below, and not hold steady at the City's current average PASER rating of 5.4.

TABLE III – Projected Rating by Funding Level



Note: The above graph is based upon an ideal mix of fixes.

II. INTRODUCTION

General

With an ever-changing climate and increasing amounts of traffic, paved roads are constantly subjected to traffic wear. In order to control the deterioration of the existing roadway infrastructure, the roads that are in the worst shape must be identified so that immediate action can be taken. Further, those roads that exhibit minor deterioration must be identified so that preventative maintenance can be undertaken to extend the service life of the existing pavement. This concept of "pay a little now rather than a lot later" is the driving force behind most pavement maintenance programs, including this one.

Purpose

Studies have shown that it costs less to maintain good roads than it does to reconstruct bad roads. Therefore, preventative maintenance is a key to a successful pavement maintenance program. This report identifies those roads that would benefit from preventative maintenance. By classifying roads into different rating levels, the overall make-up of the road system within the City can be determined. By knowing the rating level of each road and the mileage of roads in each rating level, the City can determine how much maintenance and repair is needed to maintain a given level of service. With this information, budgets can be outlined ahead of time and an annual road maintenance and replacement program can be established.

Work Plan

The work plan outlined below defines the systematic procedure used to evaluate the roads.

1. Perform Physical Survey (Completed in October-November 2018)

   Physically evaluate each City road with respect to certain criteria outlined in Section V of this report. Each road is rated from 1 (failed condition) to 10 (excellent condition). This survey is repeated every two years (as mandated by the State) that the maintenance report is published.

2. Update Roadway Database

   Update the database with the roads that were maintained or reconstructed in the time between the last survey to reflect the work completed.

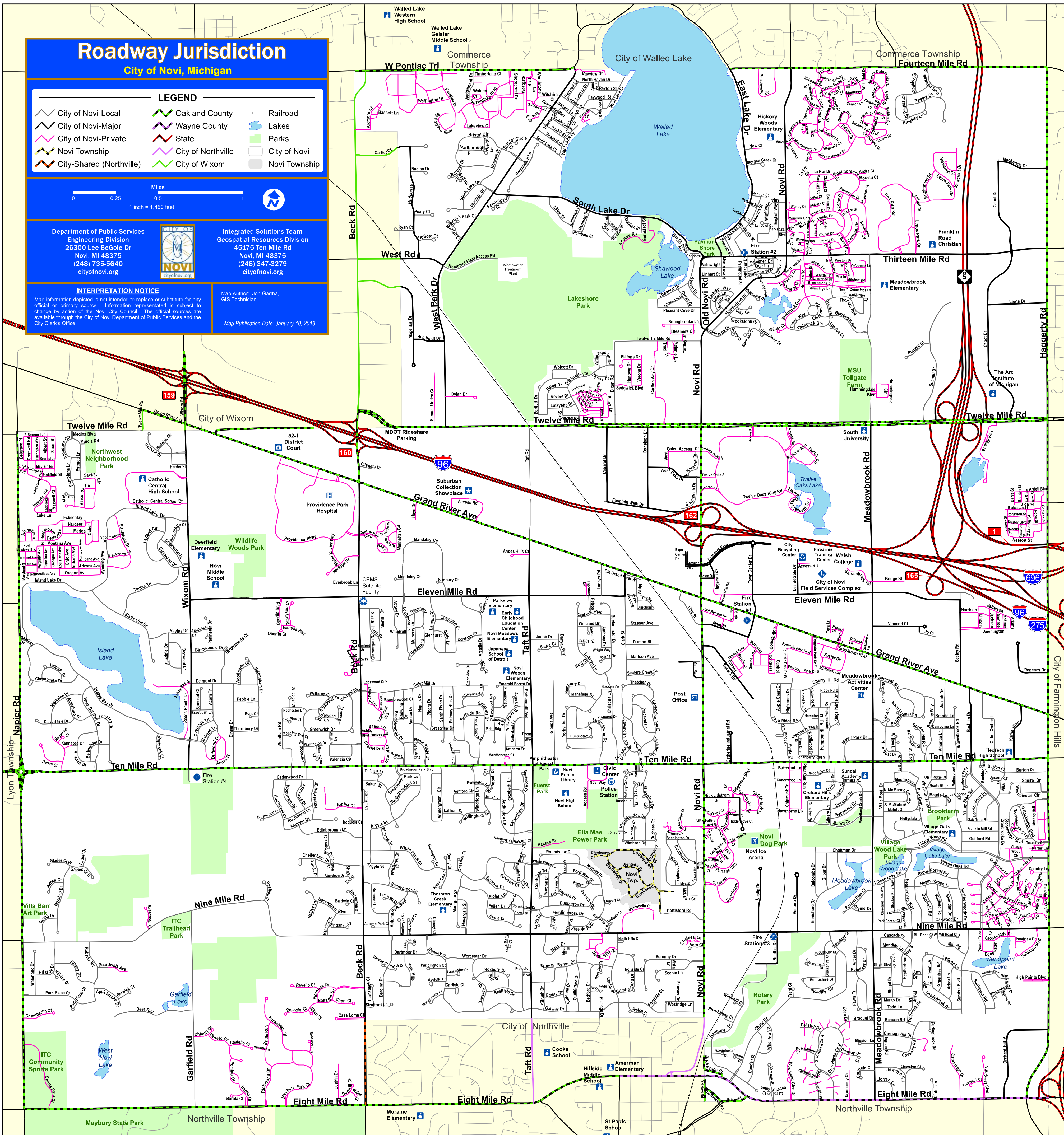
3. Recommend Possible Maintenance Alternatives

   The roadway database is used to sort roads by classification, rating, and location within the City's road network. Then individual roads are assigned to appropriate program years with suitable maintenance alternatives recommended for their improvement.

III. ROAD CLASSIFICATION MAP

A road classification map has been created using the National Function Classification System (NFC), developed by the Federal Highway Administration. The NFC categorizes all roads into one of thirteen (13) classifications or designates a road as a non-certified public roadway. The map, which can be found on the following page, categorizes all City owned streets into one of four (4) categories; the remaining nine (9) categories are not utilized within the City's network. The following table outlines the various categories and their associated characteristics:

Classification	**Right of Way Width**	**Pavement Width**	**Cross Section**	**Drainage**
Urban Local	60'-66'	20' to 30'	3" to 9" asphalt or 6" to 9" concrete	Ditches and/or Underground
Urban Collector	60' to 100'	22' to 60'	3" to 9" asphalt	Ditches and/or Underground
Urban Minor Arterial	100' to 120'	22' to 60'	4 ½" to 9" asphalt or 9" concrete	Ditches and/or Underground
Non-Freeway/Urban Other Principal Arterial	150' to 204'	Boulevard	9" concrete	Underground



Abbey Dr 21
Aberdeen Dr 29
Ackert Ct 24
Acorn Trl 20
Adams 24
Addington Ln 28
Adorne Dr 2
Aichebaun 18
Albatross Dr 20
Albert St 18
Alcott Cir 11
Algonquin Dr 27
Almafi Ct 30
Alpine Dr 29
Alton Ct 27
Amadora Cir 18
Amanda Ln 24
Amberlund Ct 28
Amesburg Dr 19
Amherst Dr 21
Amis Ave 3
Amy Dr 36
Anchorage Ct 18
Andes Hills Ct 16
Andover Dr 29
Andre Ct 2
Anna Maria Ct 33
Anthony Dr 22
Antler Dr 35
Apple Crest Dr 23
Applebrooke Dr 31
Arbor Ln 36
Arcadia Dr 21
Ardell Blvd 13
Arden Glen Ct 28
Ardmore Ct 4
Argyle St 28
Arizona Ave 18
Arlington Cir 2
Arro St 13
Arrowhead Dr 2
Ashbury Dr 35
Ashford Cir 28
Ashley Blvd 21
Aspen Dr 26
Augusta Cir 1
Austin Dr 10
Autumn Park Blvd 28
Autumn Park Ct 28
Avon Ct 21

B
Baker St 28
Balcombe Dr 26
Baldwin Ct 29
Balfour Ct 4
Balfour Dr 4
Bancroft Dr 3
Barcellos Ln 18
Barclay Ct 33
Barclay Dr 33
Barola Ct 32
Barola Dr 32
Barra St 13
Barrington Dr 2
Bartlett Dr 10
Bashian Dr 24
Bassett Ln 4
Bayview Dr 3
Beachwalk Dr 2
Beacon Rd 36
Beck Rd 4, 32
Beckenham Blvd 29
Beckenham Ct 29
Bedford Dr 34
Belden Cir 1
Belgrave Pl 18
Bellagio Ct 32
Bellagio Dr 32
Bellingham Dr 19
Belmont Dr 1
Benjamins Way 18
Bennington Dr 27
Berkshire Blvd 2
Bernstadt St 3
Bertram Dr 28
Berwick Ct 31
Bethany Way 24
Billenca Dr 19
Billings Dr 10
Birchwoods Ct 20
Birchwoods Dr 20
Blackberry Trl 18
Blair Dr 2
Blakeston St 13
Bloomfield Ct 24
Blueridge Dr 2
Boardwalk Ave 31
Boileau Dr 2
Bolingbrooke Ln 10
Bonnie Brook Dr 21
Borchart Dr 26
Border Hill Rd 24
Boulder Ct 26
Braeburn Ln 20
Bramblewood Ct 21
Bramblewood Dr 21
Branton St 13
Braydon Ct 28
Brenda Ln 24
Brentwood Ct 28
Briar Rdg 21
Brickscape Dr 35
Bridge St 13
Bridle Run 32
Brightwood Dr 1
Bristol Cir 4
Bristol Circle Ct 4
Bristol Ln 4
Brittany Ct 29
Broadmoor Park Blvd 28
Broadmoor Park Ln 28
Broadway 16
Brockshire St 35
Broken Stone Ct 26
Brompton 18
Brook Forest Rd 25
Brookstone Dr 11
Brooktown Blvd 23
Broquet Dr 35
Brownstone Dr 11
Brush Park Ct 4
Buckingham Ct 25
Buckminster Dr 22
Buffington Dr 3
Burlington Ct 28
Burntwood Ct 29
Burroughs Ave 11
Burton Ct 25
Burton Dr 25
Butler Ln 21
Butternut Ln 26
Byrne Ct 34
Byrne Dr 34

C
Cabaret Dr 15
Cabot Dr 1, 12
Calvert Isle Dr 19
Camborne Ln 24
Cambridge Dr 36
Canal Cir 11
Canal St 11
Cantebury Dr 2
Capitol 23
Capri Ct 32
Cardinal Way 26
Carlisle Ct 33
Carlton Way Dr 10
Carmela Ct 35
Carolina Ave 18
Carousel Dr 2
Carriage Hill Dr 36
Cartier Dr 4
Casa Loma Ct 32
Cascade Dr 36
Castello Ct 32
Castlewood Dr 27
Catherine Industrial Rd 23
Catholic Central School Dr 18
Cavendish Ave E 22
Cavendish Ave W 22
Cavendish Ct 22
Cedarwood Dr 29
Celeste Ct 2
Centennial Dr 2
Center St 34
Central Park Blvd 16
Chalet Dr 2
Chamberlin Ct 31
Chapman Dr 2
Charlemagne Dr 2
Charleston Ln 2
Charlotte St 3
Chase Dr 35
Chatsford St 1
Chattman Dr 26
Chelsea Ln 34
Cheltenham Dr 29
Cherry Hill Rd 23
Chesapeake Dr 19
Cheshire Ct 28
Chesterfield Ct 35
Chestnut Tree Way 25
Cheyenne Dr 21
Chianti Dr 32
Chipmunk Trl 26
Christina Ln 22
Churchill Blvd 22
Cider Mill Blvd 20
Cider Mill Dr 21
Citation 26
Citygate Dr 16
Clarinette Ct 2
Clark St 22
Clay Ct 11
Clearwater Ct 25
Clemens Cir 11
Clermont Ave 24
Cliffside Ct 26
Clinton Dr 1
Clover Ln 36
Club Ln 36
Clymer Dr 10
Cobblestone Dr 3
Cody Ln 21
Collingdale Dr 1
Colony Ct 28
Columbia Dr 1
Concord Dr 22
Congress 23
Connecticut Ave 18
Connemara Dr 34
Constitution 23
Copland Ln 22
Copper Ln 2
Coral Ln 24
Cordoba Dr 21
Cornell Dr 1
Cortes St 25
Cortland Blvd 27
Cottage Ct 25
Cottisford Rd 27
Cottonwood Ln 26
Country Ln 25
Courtview Trl 27
Coventry Rd 36
Coveside Cir 26
Cranbrooke Dr 25
Cranbrooke Ln 25
Crane Way 11
Creek Crossing 22
Crescent Blvd 14, 15
Crestview Dr 21
Crestwood Dr 18
Cromwell Rd 18
Crosswinds Dr 36
Crowe Dr 14
Crown Dr 10
Cumberland Dr 34
Cummings Ln 11
Cypress Way 1

D
Daleview Dr 33
Danberry Ln 25
Danyas Way 22
Darcey Ct 28
Daroca Ct 18
Dartmoor Dr 33
Davenport Ave 21
Declaration Dr 10
Deer Run 31
Deerfield Rd 25
Delaware Ave 18
Delmont Dr 20
Denali Ct 19
Denby Ct 28
DeSoto Ct 4
Devonshire Dr 28
Devron Ct 28
Dinser Dr 20
Dixon Rd 10
Dogwood Ln 19
Donelson Dr 15
Donnington Ct 29
Douglas Dr 11
Dover Blvd 21
Drakes Bay Dr 19
Driftwood Dr 20
Drocton Ct 27
Duana Ave 3
Duchess Ct 27
Dukesbury Ct 35
Dunbarton Ct 27
Dunbarton Dr 27, 28
Dundee Dr 35
Dunhill Ct 32
Dunhill Dr 32
Dunnabeck Ct 33
Dunston Rd 26
Durson St 22
Dylan Dr 9

E
E Bourne Ter 18
E Ellison Ln 11
E Le Bost Dr 25
Eagle Dr 1
East Lake Dr 2
Eastman Trl 11
Eaton Ct 27
Eckschtay 18
Eden Dr 35
Edgewater 36
Edgewood Ct N 21
Edgewood Ct S 21
Edgewood Dr 21
Edinborough Ln 29
Eight Mile Rd 32, 36
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Elizabeth Ln 28
Ellery Ln 10
Ellesmere Cir 10
Elliot Ln 11
Elm Ct 3
Emerald Forest Dr 21
Emerson Way 11
Emery Dr 34
Emily Ct 35
Empire Dr 16
Enchanted Dr 21
Endwell St 2
Energy Way 13
English Way 2
Ennishore Dr 26
Equestrian Trl 32
Erin Cir 33
Estrada Ln 18
Eubank St 3
Everbrook Ln 17
Evergreen Ct 30
Exeter Ct 27
Expo Center Dr 15

F
Fairway Hills Dr 21
Falmouth Ave 21
Faulkner Dr 11
Fawn Trl 35
Faywood St 3
Fenmore Way 25
Fenway Dr 34
Ferhoodle 18
Fieldstone Dr 18
Fireside Ct 25
Fitzgerald Blvd 11
Fleddermouse 18
Flint St 22
Florence Dr 32
Floyd Ln 10
Foothills Ct 34
Ford Way Dr 27
Forest Park Dr 29
Foster Dr 23
Fountain Park Dr E 23
Fountain Park Dr N 23
Fountain Park Dr S 23
Fountain Park Dr W 23
Fountain Walk Dr 15
Fourteen Mile Rd 1
Fox Run Rd 1
Foxmoor Dr 28
Foxton Dr 27
Franklin Mill Rd 25
Freemont Dr 21
Fuller Dr 28
Fulton Dr 11

G
Galway Dr 33, 34
Gardenbrook Rd 14
Garfield Rd 31
Gateway Rd 3
Gen Mar 22
Georgetown 23
Georgia Ave 18
Gilbar Dr 26
Gina Ct 21
Glades Ct E 30
Glades Ct W 30
Gladwin Dr 35
Glamorgan Dr 21
Glen Haven Cir E 35
Glen Haven Cir W 35
Glen Ridge Ct 25
Glenda Ave 22
Glenhurst 21
Glenmoor 21
Glenwood Dr 18
Glyme Dr 26
Golden Rdg 2
Gornada St 13
Graham Ln 20
Grand River Ave 16, 24
Grandview Ln 23
Greening Ct 27
Greening Dr 27
Greentree Rd 36
Greenview Dr 21
Greenwich Dr 20
Griswold 35
Grove Ct 25
Groveland 21
Guilford Rd 25
Gwinnett Loop 10

H
Hadlock Dr 19
Haggerty Rd 12
Halifax Ln 29
Hallfield St 18
Halston Ct 28
Hamlet Ln 23
Hampton Ct 23
Hampton Hill Rd 23
Hannah Ct 35
Hanover Dr 10
Harbor Cv 3
Harrier Pl 18
Harrington Way 18
Harrison 24
Hartwick Cir 18
Hartwick Dr 18
Harvest Ct 27
Harvest Dr 27
Hathaway Ln 11
Havergale St 28
Hawthorne Ln 26
Hazelton Ct 33
Hearthstone Dr 11
Heartwood Dr 29
Heatherbrae Way S 36
Heatherbrae Way 25
Heatherbrook Ln 25
Heathergreene Ct 25
Heatherwoode Dr 25
Hemingway Dr 11
Hempshire St 35
Henning Dr 3
Heritage Dr 17
Herman St 2
Heslip Dr 26
Hewes Ln 10
Heyn Dr 16
Hickory Grove Ct 27
Hickory Grove Ln 27
Hidden Cove Ct 26
High Pointe Blvd 36
Highlands Dr 23
High-Meadow Dr 27
Hillridge Dr 34
Hillsdale Dr 19
Hillside Ct 31
Hillside Dr 31
Hollydale 25
Holmes Rd 11
Holyoke Ct 20
Holyoke Ln 20
Homestead Ct 21
Hooper Cir 10
Hooper Ln 10
Hopkins Dr 10
Hudson Dr 4
Humboldt Dr 9
Hummingdale Blvd 12
Hummingdale Cir 12
Huntingcross Dr 27
Huntington Rd 22
Huron Cir 14

I
Idaho Ave 18
Independence Dr 2
Indiana Ave 18
Ingersol Dr 14
Ingram Rd 36
Inverness Ct 29
Ironside Ct 34
Iroquois Ct 29
Irvine Dr 28
Isabella Way 20
Island Lake Dr 18

J
J R Blvd 13
Jackson 24
Jacob Dr 22
Jamestowne Rd 22
Jaslyn Ln 28
Jason Ct 25
Jasper Rdg 2
Jefferson 24
Jo Dr 24
Joindre Dr 2
Joliet Ct 2
Jonathan Dr 27
Joseph Dr 24
Joyce Ln 11
Junction 22
Juniper Cir 2

K
Kali Ct 22
Karim Blvd 24
Kartar Ln 25
Katie Dr 36
Keenan Ct 22
Kelsey Bay Dr 19
Kenilworth Ln 2
Kennebee Dr 19
Kensington 29
Kent Ct 20
Kentucky Ave 18
Kerri Ct 22
Kilrush Dr 34
Kimberly Ct 28
Kings Pointe Dr 23
Kingsley Ct 1
Kingsley Ln 1
Kingswood Blvd 1
Kirkway Blvd 21
Kirkwood Dr 2
Knightsbridge Blvd 18
Knollwood Dr 23

L
La Chonce Rd 25
La Roi Cir 2
La Roi Dr 2
La Rose 13
Ladbroke St 18
Ladene Ln 36
Lafayette Dr 10
Lafleur Ct 2
Lagoon Dr 3
Lakeview Ct 4
Lamier Dr 2
Lancaster Ct 33
Lancelot Ct 2
Lanford Dr 1
Langley Dr 19
Lannys Rd 15
Laramie Dr 21
Larkspur Ln 3
Lashbrook St 2
Lathum Dr 28
Laurel Dr 30
Lawrence Dr 11
Le Bost Ct 24
Le Bost Dr 25
Le Grand Blvd 2
Lebenta St 3
Ledgeview Dr 11
Lee BeGole Dr 14
Leeds St 27
Lemay St 3
Lenox Park Dr 1
Lewis Dr 12
Leyland Cir 18
Liberte Dr 2
Lightfoot Ln 10
Lightsway Dr 27
Lilley Trl 3
Lincoln 24
Lindbergh Ln 3
Linhart St 11
Little Falls Blvd 26
Little Rapids Ct 26
Little Stones Ct 26
Livingston Dr 2
Llewelyn Ct 36
Llewelyn Rd 36
Llorrac Ln 36
Lochmoor Ln 21
Lochrisen Way 26
Lodge Ct 25
Loganberry Rdg N 23
Loganberry Rdg S 23
London Ct 11
Londonderry Dr 25
Long Point Way 26
Louisiana Ave 18
Louvert Ct 27
Lowery St 13
Ludlow Dr 3
Luke Ln 18
Lynwood Dr 20, 29

M
MacKenzie Dr 1
Mackinac Blvd 14
Madison 24
Magellan Dr 9
Magnolia Ct 2
Main St 23
Mallard Trl 20
Malott Dr 25, 26
Manchester Rd 11
Mandalay Cir 16
Mandalay Ct 16
Manhattan Cir 16
Manor Park Dr 23
Mansfield Dr 22
Mansion Ct 25
Mariga 18
Marks Dr 36
Marlborough Pl 4
Marlson Ave 22
Marquant Ct 2
Martell Ct 4
Martin Ave N 11
Maryland Ave 18
Maude-Lea Cir 25
Maudlin St 3
Maxwell Ct 18
Maybury Park Dr 32
Mayfair Ter 18
Mayo Ct 34
Mayo Dr 34
McLean Ct 27
Meadowbrook Rd 14, 36
Medina Blvd 18
Meeting Hall Ln 25
Melanie Ln 10
Meridian Ln 36
Middleton Dr 10
Midtown Cir 23
Midway Dr 27
Milan Ct 32
Mill Rd 36
Mill Road Ct E 36
Mill Road Ct W 36
Mill Stream Ln 24
Miquelon Ct 2
Mission Ln 35
Mitchell Rd 11
Mocking Bird Ct 20
Mondavi Dr 30
Monroe 24
Montana Ave 18
Montebello Ct 27
Monterey Dr 2
Monticello St 2
Montmorency Dr 2
Moorgate St 28
Mooringside Dr 25
Moreau Ct 2
Morgan Creek Ct 2
Muir Ln 11
Mulberry Ln 21
Murcia Rd 18
Myrtle Ct 23
Mystic Blvd 27
Mystic Forest Dr 27

N
N Ellison Ln 11
N Karevich Dr 15
N Le Bost Dr 24
N McMahon Cir 25
N Rockledge Blvd 25
Nadlan Dr 4
Nantucket Dr 20
Napier Rd 19
Naples Dr 21
Nardeer 18
Nepavine Ct 19
Nepavine Dr 19
Nesrus St 13
Neston St 13
New Ct 2
Newberry Dr 22
Nick Lidstrom Dr 26
Nilan Dr 25
Nine Mile Rd 25, 29
Norfolk Ct 33
Normandy Ct 35
North Haven Dr 3
North Hills Ct 34
North Hills Dr 34
Northumberland St 28
Norwich Dr 4
Nottingham Dr 20
Novi Meadows Blvd 18
Novi Rd 2, 34
Novi Way 27

O
Oak Tree Rd 25
Oakwood Dr 25
Oberlin Blvd 20
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Ohio Ave 18
O'Jaustin St 13
Old Baseline Rd 35
Old Grand River W 15
Old Novi Rd 11, 35
Olde Orchard St 24
Onaway Ct 35
Onaway Dr 35
Orchard Hill Pl 36
Oregon Ave 18
Orianna Ln 23
Overlook Trl 20
Owenton St 3
Oxford Ct 35

P
Paddington Ct 33
Paine Dr 10
Paisley Cir 1
Palace Ct 25
Palmer Dr 2
Pamplona Ln 18
Paramount St 2, 11
Park Forest Ct 25
Park Place Ct 31
Park Place Dr 31
Park Ridge Ct 23
Park Ridge Rd 23
Parklow St 2
Paul Bunyan Dr 23
Pavilion Dr 25
Peachtree 36
Peary Ct 4
Pebble Ln 20
Pellston Dr 35
Pembine St 3
Penhill St 3
Peninsula Dr 20
Pennington Ct 4
Pennington Ln 4
Pennsylvania Ave 23
Penton Rise Ct 26
Peppermill Ct 25
Perceval Ln 22
Perth Ct 33
Petros Blvd 22
Pheasant Run 26
Phillip Dr 36
Picadilly Cir 35
Picara Dr 21
Pickford St 3
Picnic Ct 25
Pierre Dr 2
Pine Crest Dr 23
Plaisance Blvd 27
Plateau Dr 2
Pleasant Cove Dr 10
Pomino Dr 32
Pondview Dr 36
Portage Way 26
Porter St 28
Portico Ln 23
Portside Dr 4
Portsmouth Ave 21
Potomac 23
Prestwick Ct 36
Primrose Dr 2
Princeton Blvd 33
Providence Pkwy 17
Purlingbrook Rd 36

Q
Quarry Ct 11
Queens Pointe Dr 23
Quince Dr 26

R
Raftingway Ct 26
Randall Ct 28
Rathlone Dr 34
Ravello Ct 32
Ravine Dr 19
Red Pine Ct 20
Redwing Dr 21
Reeds Pointe Dr 19
Regency Dr 24
Reindeer Dr 35
Remington Ln 28
Renford Dr 25
Revere Dr 10
Rexton St 3
Richmond Dr 32
Ridge Rd E 23
Ridge Rd W 23
Ridgeview Blvd 26
Ripple Creek Rd 25
Riverbridge Ct 35
Riverview Ln 21
Roberts Rd 31
Robin Ct 21
Rochester Dr 20
Rock Hill Ln 25
Roethel Dr 35
Rolling Grove Dr 2
Roma Ridge Dr 21
Ronayton St 13
Roric St 13
Rosaron St 13
Roscommon Dr 35
Rosewood Ct 32
Rossdale Ct 34
Rotunda Ct 25
Roundview Dr 27
Rousseau Cir 2
Rousseau Dr 2
Roxbury Dr 33
Rushwood Ln 29
Russet Ln 27
Ruston Blvd 13
Rutledge Ln 10
Ryan Ct 4

S
S Karevich Dr 15
S McMahon Cir 25
Sagebrush 26
Salem Ct 20
Samoset Ct 20
Samuel Linden Ct 9
Sandalwood Cir 2
Sandpiper Ct 20
Sandpoint Way 36
Sandstone Dr 11
Sanford Dr 21
Sarah Flynn Dr 21
Sarnia Dr 29
Savannah Ct 1
Savoie Rd 36
Saybrook Ct 19
Scarborough Ln 24
Scarlet Ct 21
Scarlet Dr N 21
Scarlet Dr S 21
Scenic Ln 34
Seaglen Dr 19
Sedgwick Blvd 10
Sedra Ct 22
Seeley Rd 24
Seminole Ct 26
Seminole Trl 26
Senate Pl 23
Seneca Ln 2
Serenity Dr 34
Settlers Creek Ct 22
Sevilla Cir 18
Shadow Pine Way 25
Shadybrook Dr 36
Shamrock Hl 10
Shawood Dr 10
Sheffield Dr 33
Sheri Dr 2
Sheridan Dr 25
Shilo Ct 29
Shilo Dr 29
Shore Line Dr 19
Shorecrest Dr 4
Siegal Ct 36
Siegal Dr 36
Sierra Dr 21
Silverdale Dr 2
Silvery Ln 26
Simmons Dr 21
Singh Blvd 36
Sister Xavier Way 17
Sixth Gate 23
Sleepy Hollow Dr 2
Sloan St 18
Solomon Blvd 36
Somerset Ct 28
South Lake Ct 3
South Lake Dr 3, 4
Southwyck Ct 28
Sports Park Dr 31
Springlake Blvd 4
Springwell Ct 25
Squire Dr 25
Stassen Ave 22
Steeple Path 27
Steinbeck Gln 11
Sterling Dr 4
Still Creek Ct 26
Stockton Dr 10
Stone Rd 22
Stonehenge Blvd 25
Stonewall Ct 11
Stratford Ln 33
Strath Haven Dr 21
Strawberry Ct 25
Streamwood Dr 18
Sudbury Ct 35
Sullivan Ln 22
Summer House Ct 25
Summer Ln 28
Summerlin Blvd 3
Summit Ct 12
Summit Dr 12
Sunbury Ct 16
Sunday Dr 31
Sunflower Rd 36
Sunnybrook Ln 28
Sunrise Blvd 36
Surfside Rd 21
Sussex Dr 22
Sutherland Dr 21
Sutton Ct 20
Sycamore Dr 26

T
Taft Rd 16, 33
Talford St 25
Tamara Dr 26
Tanglewood Dr 2
Ten Mile Rd 19, 24
Tennyson Ct 20
Tera Ln 23
Terra Del Mar Dr 19
Terrace Ct 25
Thatcher Ct 22
Thatcher Dr 22
Thirteen Mile Rd 12
Thoreau Rdg 11
Thornbury Dr 20
Thornton Ln 15
Timber Trl 18
Timberlane Ct 4
Tiverton Dr 3
Todd Ln 36
Torino Dr 30
Tottenham Ct 28
Tower Ct 25
Town Center Dr 14
Traci Trl 10
Trafalgar Ct 28
Trailside Ct 25
Trans X Rd 23
Treatment Plant Access Rd 9
Trent Ct 35
Trestle 22
Trillium Dr 25
Trillium Loop 25
Turnberry Blvd 36
Tuscany Ct 25
Twain Pl 11
Twelve 1/2 Mile Rd 10
Twelve Mile Rd 10, 18
Twelve Oaks Crescent Dr 14
Twelve Oaks N 14
Twelve Oaks Ring Rd 14
Twelve Oaks S 14

U
Upland Hill Dr 23

V
Valencia Cir 20
Valley Starr Rd 25
Vasilios Ct 29
Venetian Ct 21
Veneto Dr 32
Venice Ct 21
Venice Dr 21
Venture Dr 26
Veranda Dr 35
Vermont Ave 18
Vero Ct 34
Verona Dr 10
Victoria Rd 18
Viewcrest Ct 1
Viewcrest Dr 1
Village Lake Rd 25
Village Oaks Rd 25
Village Wood Cir 25
Village Wood Ln 25
Village Wood Rd 25
Vincenti Ct 24
Vine Ct 2
Violet Ln 28
Virginia Ave 18
Vista Ln 34

W
W Le Bost Dr 25
W Pontiac Trl 4
Wainwright St 11
Wakefield Dr 2
Walden Ct 4
Wales Ct 32
Wall St 16
Walnut Ln 32
Warley Ct 2
Warrington Ct 20
Warrington Dr 20
Warwick Ct 2
Washington 24
Waterbury Blvd 2
Waterland Dr 31
Waverly Dr 2
Waycroft Dr 27
Weathervane Ct 21
Webster Ct 2
Wedgewood Dr 4
Welch Rd 34
Wellesley Ct 20
Wellington Dr 4
Wendingo Ct 27
West Lake Dr 3
West Oaks Access Dr 15
West Oaks Dr 15
West Park Dr 9
West Rd 4
Westchester Ct 35
Westgate Blvd 4
Westminster Cir 25
Westmont Ct 28
Westmont Dr 28
Weston Dr 11
Westridge Ln 34
Wexford Blvd 2
Wharton Ct 2
Wheaton Ln 35
Whipple 15
Whispering Ln 36
Whistler Dr 11
Whitcomb Rd 36
White Pines Dr 27, 28
White Plains Dr 21
Whitehall Dr 28
Whitman Way 11
Whittler Trl 11
Wilder Ct 11
Williams Dr 22
Willingham Dr 28
Willow Ln 24
Willowbrook Dr 25
Willowbrook Rd 24
Wilshire Ct 3
Wimbleton Way 2
Windermere Ct 33
Winding Trl 3
Windmill Ct 35
Windridge Ln 28
Windsor Ct 2
Winfield Rd 25
Winnsborough Dr 27
Wintergreen Cir 28
Winthrop Ct 27
Winthrop Dr 27
Witherspoon Dr 10
Wixom Rd 18
Wolcott Dr 10
Wolfe Pass 11
Woodglen Dr 26
Woodham Rd 20, 29
Woodland Creek Dr 26
Woodland Glen Dr 35
Woodruff 21
Woodshire Ct 25
Woodside Ct 34
Woodstone Ln 3
Woodworth Dr 20
Woolsey Dr 25
Worcester Dr 33
Worthington Ct 2
Wright Way 22
Wyoming Ave 18

Y
Yardley Dr 10
Yeats Dr 11
York Mills Cir 33
Yorkshire Dr 22

Z
Zisette Dr 36

IV. DISTRESS TYPES

The PASER rating system is separated into categories, based on concrete and asphalt pavement types, which have different distresses that are common in road management. Examples of common pavement distresses are illustrated in the PASER Asphalt Roads and PASER Concrete Roads Manuals located in the electronic copy of this report on the CD attached to the back cover (Walker, 2002 & Walker, 1989). The key to a useful evaluation is identifying different types of pavement distress and linking them to a cause. Understanding the cause for current conditions is extremely important in selecting an appropriate maintenance or rehabilitation technique.

There are four major categories of common asphalt and common concrete distresses; they include the following:

1. ASPHALT SURFACE DISTRESS (see illustrations on the enclosed CD)

   a. *Surface Defects* - Raveling, Flushing, and Polishing

   b. *Surface Deformation* - Rutting, Distortion (including Rippling and Shoving, Settling, and Frost Heave)

   c. *Cracks* - Transverse, Reflection, Slippage, Longitudinal, Block, and Alligator cracks

   d. *Patches and Potholes*

2. CONCRETE SURFACE DISTRESS (see illustrations on the enclosed CD)

   a. *Surface Defects* - Wearing and Polishing, Map Cracking, Pop-outs, Scaling, Shallow Reinforcing, and Spalling

   b. *Joint Failure* - Longitudinal and Transverse

   c. *Pavement Cracks* - Transverse Slab Cracks, D-cracking, Corner Cracking and Meander Cracking

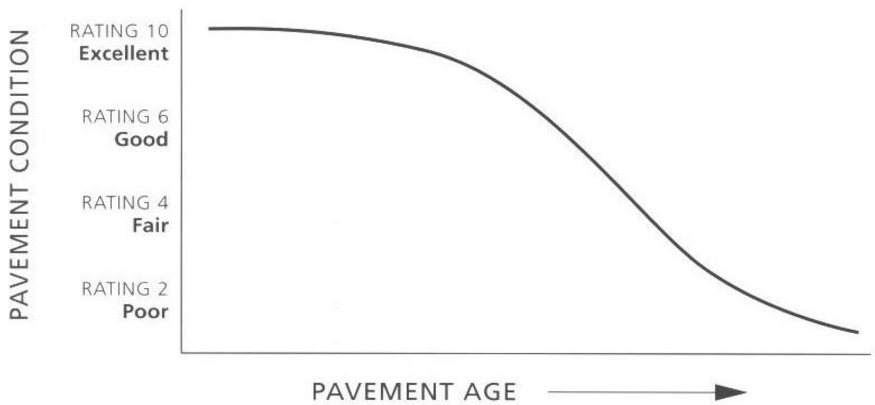
   d. *Pavement Deformation* - Blow-ups, Faulting, Pavement Settlement or Heave, Utility Repairs, Patches and Potholes, Manhole and Inlet Cracking, and Curb or Shoulder Deformation.

V. PHYSICAL SURVEY

The main portion of this study was to perform a field survey (completed in 2018) of the existing conditions of the roads. The survey completed in 2018 utilized RoadSoft GIS, a program developed by Michigan Tech Transportation Institute in conjunction with Michigan's Local Technical Assistance Program, which has been customized through user feedback since its inception in 1994.

Each Road Data Report is separated into 3 sections: inventory segment, surface type segment and rating segment. In the inventory segment, you can find information as to the location, physical attributes (including curb & gutter and shoulder information) and traffic counts (if available) of the roadway. The second section is where the surface type is designated as well as the cross section information is input if available. The third section contains the maintenance and rating history of the roadway.

The overall rating system used is based on a number value assigned to each street between 1 (failed condition) and 10 (excellent condition). Below is a chart representing the various ratings and the related maintenance or repair that is affiliated with the rating (Walker, 2002). Repair alternatives are described in greater detail in Section VII of this report.



In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

Rating 9 & 10	No maintenance required
Rating 8	Little or no maintenance
Rating 7	Routine maintenance, cracksealing and minor patching
Rating 5 & 6	Preservative treatments (sealcoating)
Rating 3 & 4	Structural improvement and leveling (overlay or recycling)
Rating 1 & 2	Reconstruction

The above descriptions and possible maintenance alternatives are general. Each road will require an individual alternative or combination of alternatives to provide the desired ride-ability and design life. It should be noted that the road surface is only as good as the base and drainage below. If the road is in a poorly drained area, any maintenance or repair should be considered short term. The existing conditions will occur again if water is not able to drain properly. Much consideration should be given to improving the existing drainage problem prior to pavement repair for these roads.

Shown below are project costs associated with those repair alternatives described above. The costs are based on a length of 100 lineal feet of roadway. These dollar amounts are estimates based on averages; individual road estimates will vary. The estimates below take into account removal of old pavement, placement of a new roadway, installation of subgrade underdrain, and design & construction services. They do not account for constructing storm sewer or replacement of an existing system. The higher end dollar amount usually corresponds to concrete road construction or a larger roadway width, whereas the lower end correlates to asphalt road construction. The figures shown are intended to be used only for preliminary budgeting and prioritization purposes.

Road Category	**Residential** **22 ft. Wide to 36 ft. Wide**	**Industrial** **36 ft. Wide to Boulevard**
Ratings 7-8	$1,000 to $4,000	$2,300 to $8,000
Ratings 4-6	$8,000 to $16,000	$15,000 to $20,000
Ratings 1-3	$30,000 to $45,000	$45,000 to $60,000

Costs are per 100 linear feet of roadway

VI. DATABASE DEVELOPMENT

The physical survey was conducted with the Roadsoft database. The City utilized the Michigan Local Technical Assistance Program, Roadsoft, a graphically-designed, integrated-roadway management system developed for Michigan's local agency engineers and managers to use in the analysis and reporting of roadway inventory, safety, and condition data. Roadsoft uses the Michigan Accident Location Index (MALI) as a reference base. The following is a sample of the information found in the database:

City of Novi Road Program Sample Database

Road	Act 51 Class.	Length (feet)	Surface Type	Rating
Taft Rd (Grand River Ave to 11 Mile Rd)	Major	1747	Asphalt	10
Cherry Hill Rd (Meadowbrook Rd to Kings Pointe)	Local	1077	Concrete	7
W Park Dr (Humbolt Dr to 12 Mile Rd)	Minor Arterial	2676	Asphalt	4
Cabot Dr (Lewis Dr to 13 Mile Rd)	Local	1970	Concrete	3

The queries can be performed on the database to compile many different report types. Appendix A is the database sorted alphabetically and Appendix B is the same information sorted by the rating.

This database also contains other items such as pavement thickness, width and area. The database records the maintenance history of each street segment along with the upcoming proposed maintenance in accordance with this report. In addition, most street segments have a "birth" date noted for the year of original construction or of complete reconstruction.

ASPHALT/COMPOSITE ROAD MAINTENANCE TREATMENTS

Treatment	Description	Reason for Use	Considerations	Average Cost (Construction)
Overband Crack Seal	Localized treatment of pavement cracks involving cleaning of the existing crack and placing sealant into & over the crack.	• Seal existing pavement cracks • Longitudinal, transverse, or minor block cracking • Prevent water intrusion into existing cracks	• Need good preparation work for OCS to be effective • Needs to be redone every few years to maintain seal • Aesthetic appearance of roadway once completed, especially in residential areas	$1.00 / syd of roadway area
Slurry Seal	Mixture of fines, asphalt emulsion, water, & mineral filler that is spread over pavement surface. Treatment uses the thermal break process, which takes 2-8 hours depending on heat/humidity.	• Seal existing pavement surface • Seal small cracks in pavement • Oxidized pavement • Improved surface friction	• Should not be used in areas with structural failure or extensive cracking • To be applied as minor surface cracking first develops or pavement oxidizes • Type I for lower traffic, Type II for higher • Aesthetic appearance can be an issue after weathering	$5.50 / syd
Microsurfacing	Mixture of fines, polymer-modified emulsified asphalt, mineral filler, & water that is applied in similar process to slurry seal. Uses chemically-controlled curing process instead of thermal break process.	• Seal existing pavement surface • Seal small cracks in pavement • Oxidized pavement • Improved surface friction • Rut filling • Retard pavement raveling	• Should not be used in areas with structural failure or extensive cracking • To be applied as minor surface cracking first develops or pavement oxidizes • Fills minor rutting • No aesthetic issues like slurry seal • Specialized equipment, need to do a large quantity to be cost-effective	$8.00 / syd (large volume) $15.00/ syd (small volume)
Chip Seal	Asphalt emulsion applied to the pavement surface followed by the application of aggregate chips, which are rolled to imbed them.	• Seal existing pavement surface • Seal small cracks in pavement • Improved surface friction • Preventative maintenance	• Should not be used in areas with structural failure or extensive cracking • Loose aggregate chips & dust issues after application • Provides a "rough" surface – not desirable for neighborhood street. • Doesn't perform well on high volume or high truck traffic roads • 2nd chip seal can be applied – "Double Chip"	$3.50 / syd (Single) $5.50 / syd (Double)
Cape Seal	Combines the processes of chip seal and slurry seal or microsurfacing to form a single, more durable surface. Chip seal is applied followed by a slurry seal.	• Provide new pavement surface • Seal minor cracking in pavement • Improved surface friction • Rut filling	• Should not be used in areas with structural failure or extensive cracking • Provides more "structure" than slurry or chip seal, but not as much as HMA overlay • Final surface is "rougher" than traditional HMA – not as desirable for some neighborhood streets where a lot of pedestrian use of the roadway	$11.00 / syd (Slurry) $18.00 / syd (Microsurface)
HMA Ultra-Thin	High performance HMA mixture applied over existing pavement in thicknesses between ¾" & 1½".	• Provide new pavement surface • Repair minor surface cracking • Deteriorated pavement with solid underlying structure	• Should not be used in areas with underlying structural problems in the pavement • Reflective cracking from significant underlying cracks is an issue • Surface prep by milling and crack sealing/repairs • Provides smooth surface – ideal for neighborhoods	$13.00 / syd (includes prep)

ASPHALT/COMPOSITE ROAD REHABILITATION TREATMENTS

Treatment	Description	Reason for Use	Considerations	Average Cost (Construction)
Hot-in-Place Recycling	Existing pavement surface is heated, rejuvenated, scarified, and re-compacted by a convoy of specialized equipment. Typical recycle depth is 2”-3”. The surface needs to be capped with another treatment.	• Repair surface cracking • Deteriorated pavement with solid underlying structure • Faster process, less traffic disturbance time • “Greener” process	• Should not be used in areas with underlying structural problems in the pavement • Comparable treatment to 2” mill & overlay • Specialized equipment, need to do a large quantity to be cost-effective • Need to apply surface treatment for final wearing course • Can raise grade depending on surface treatment, which can cause issues with existing curb/gutter	$12.00 / syd (HIP Recycle Only) $20.00 / syd (w/1” Overlay)
Mill & Overlay	Top section of existing pavement is removed by milling. New HMA pavement is placed to restore the roadway to its previous grade.	• Provide new pavement surface • Repair surface cracking • Deteriorated pavement with stable underlying structure • Provide longer useful life of roadway than maintenance treatment	• Areas with underlying structural problems can be patched after milling • Provides “new road” surface • Does not raise grade – good for roads with curb/gutter	$40.00 / syd (3” Overlay) $48.00 / syd (4” Overlay)
Pulverize & Overlay	The existing pavement is crushed and mixed with some of the underlying aggregate to form the new base material for future pavement. New HMA is placed over the crushed surface to form the new roadway. Areas of poor subgrade are addressed with undercuts.	• Significant pavement deterioration/failure • Drainage/profile corrections • Provide longer useful life of roadway	• Pulverized pavement becomes a thickened base section and increases the structure of the roadway • Areas of poor subgrade can be addressed • Provides “new road” surface • Allows for profile, cross-slope, drainage corrections • Raises grade, not for use with curb/gutter unless being replaced • Significant maintenance of traffic required due to removal of pavement surface and time of construction	$40.00 / syd (3” Overlay) $48.00 / syd (4” Overlay)
Remove & Replace HMA w/added Base	Complete HMA removal with placement of additional aggregate base where needed. Areas of poor subgrade are addressed with undercuts.	• Structural pavement failure • Underlying subgrade issues • Drainage/profile corrections • Provide longer useful life of roadway	• Areas of poor subgrade can be addressed • Provides “new road” surface • Allows for profile, cross-slope, drainage corrections • Does not raise grade – can be used for roads with curb/gutter • Significant maintenance of traffic required due to removal of pavement surface and time of construction	$132.00 / syd (4” HMA Pavement)

CONCRETE ROAD MAINTENANCE TREATMENTS

Treatment	Description	Reason for Use	Considerations	Average Cost (Construction)
Crack & Joint Sealing	Localized treatment of pavement joints & cracks involving cleaning and routing the joint/crack and filling with hot rubber sealant.	• Seal existing pavement joints & cracks • Prevent water intrusion into existing joints &cracks	• Need good preparation work for sealing to be effective • Needs to be redone every few years to maintain seal • Aesthetic appearance of roadway once completed, especially in residential areas	$2.50 / syd of roadway area
Corner, Joint, & Isolated Slab Repair/Patch	Full-depth removal & replacement of concrete sections that are cracked, broken, vaulted, etc. Can saw cut for small areas or replace full panels.	• Cracked, broken, or vaulted concrete slabs • Deteriorated joints • Improve ride quality	• Need to seal joints around repair – typically combined with joint seal repairs • Smaller repair areas cost more per square yard than larger areas • Underlying base issues can be addressed prior to pavement replacement. • Significant maintenance of traffic required for pavement removal, placement, & cure.	$65.00 / syd of area to be repaired
Diamond Grinding	Thin layer (1/8" – 1/4") of concrete surface is removed using closely spaced diamond saw blades to restore rideability and improve surface.	• Improved surface friction • Remove surface irregularities • Remove small joint/crack faulting • Reduce pavement/tire noise	• Does not address pavement cracking • Needs to be combined with joint/crack sealing • Grinding slurry needs to be contained & disposed of • Specialized equipment, need to do a large quantity to be cost-effective	$8.00 / syd (large volume) $12.00/ syd (small volume)
Crack & Seat w/HMA Overlay	Existing concrete pavement is fractured (cracked) in preparation for a flexible pavement overlay.	• Provide new pavement surface • Deteriorated concrete	• Provides "new road" surface • Does not repair underlying pavement issues – movement will cause reflective cracking • Should be used in areas where concrete is deteriorated beyond where patching is cost-effective • Raises pavement grade, which can cause drainage issues • Install HMA surface, which will require continued maintenance	$55.00 / syd (3" Overlay)
Concrete Overlay	The existing concrete pavement is used as base material for a concrete overlay. A thin layer of HMA is applied as a "bond breaker" before a 4" – 6" concrete layer.	• Provide new pavement surface • Deteriorated concrete • Provide longer useful life of roadway	• Provides "new road" surface • Existing concrete pavement should be stable – movement will cause cracks in the new overlay • Isolated areas of poor soil/movement can be addressed prior to placing the overlay • Roadway grade is significantly increased, all driveway and sidewalk ramps need to be reconstructed	$65.00 / syd (4" Overlay)

APPENDIX A

Road Program & Maps
(by budget year)

2020 Road Projects

Road	Rating	Estimated Project Cost	Proposed Maintenance Type

Road Maintenance

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
Capital Preventative Maintenance	Varies	$ 800,000.00	Surface Seal
	Total Cost:	**$ 800,000.00**	**Locals 2020**

Major Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
	Total Cost:	**$ -**	**Majors 2020**

Local Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
Aberdeen Dr	3	$ 391,000.00	Rehabillitation
Bedford Dr	3	$ 603,000.00	Reconstruct - 7" Conc on 8" Agg
Brentwood Ct	4	$ 228,900.00	Reconstruct - 7" Conc on 8" Agg
Cheltenham Dr	6	$ 253,900.00	Rehabillitation
Cidermill	5	$ 53,400.00	Rehabillitation
Cranbrooke Dr	4	$ 2,600,000.00	Reconstruct - 7" Conc on 8" Agg
Graham Ct	3	$ 36,200.00	Rehabillitation
Greenwich Dr	3	$ 429,200.00	Rehabillitation
Holyoke Ct	4	$ 33,500.00	Rehabillitation
Holyoke Ln	3	$ 201,500.00	Rehabillitation
Jo Dr	2	$ 269,230.00	Reconstruct
Kali Ct	3	$ 114,450.00	Reconstruct - 7" Conc on 8" Agg
Kerri Ct	3	$ 114,450.00	Reconstruct - 7" Conc on 8" Agg
Nantucket Dr	3	$ 456,000.00	Rehabillitation
Purlingbrook Rd	3	$ 60,016.00	Reconstruct
Randall Ct	4	$ 76,200.00	Reconstruct - 7" Conc on 8" Agg
Salem Ct	4	$ 77,700.00	Rehabillitation
Shilo Ct	4	$ 30,800.00	Rehabillitation
Wellesley Ct	5	$ 100,900.00	Rehabillitation
White Pines Dr	5	$ 196,000.00	Reconstruct - 7" Conc on 8" Agg
Cheltenham Dr (Entrance)	3	$ 80,500.00	Rehabillitation
	Total Cost:	**$ 6,326,346.00**	**Locals 2020**
	HMA NRP:	**$ 2,393,346.00**	
	Concrete NRP:	**$ 1,333,000.00**	

Major Roads:	**$ -**
Local Roads:	**$ 6,326,346.00**
2020 Total:	**$ 7,126,346.00**

2021 Road Projects

Road	Rating	Estimated Project Cost	Proposed Maintenance Type

Road Maintenance

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Capital Preventative Maintenance	Varies	$	800,000.00	Surface Seal
	Total Cost:	**$**	**800,000.00**	**Locals 2021**

Major Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
	Total Cost:	**$**	**-**	**Majors 2021**

Local Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Duchess Ct	**3**	$	48,600.00	Rehabillitation
Greening Dr	**6**	$	454,200.00	Rehabillitation
Harvest Dr	**3**	$	219,600.00	Rehabillitation
Hickory Grove Ct	**4**	$	27,900.00	Rehabillitation
Hickory Grove Ln	**4**	$	542,500.00	Rehabillitation
Highmeadow Dr	**3**	$	269,500.00	Rehabillitation
Jonathan Dr	**3**	$	37,200.00	Rehabillitation
Lee BeGole	**2**	$	1,135,000.00	Asphalt - Reconstruct
Norwich Dr	**4**	$	340,000.00	Reconstruct - 7" Conc on 8" Agg
Park Ridge Rd	**3**	$	530,000.00	Reconstruct - 7" Conc on 8" Agg
Russet Ln	**3**	$	87,200.00	Rehabillitation
Sterling Dr	**4**	$	190,000.00	Reconstruct - 7" Conc on 8" Agg
Winthrop Ct	**4**	$	83,700.00	Rehabillitation
Winthrop Dr	**3**	$	219,600.00	Rehabillitation
Cranbrooke Dr (S)	**3**	$	2,900,070.00	Reconstruct - 7" Conc on 8" Agg
S Lake Dr (Conc)	**5**	$	380,000.00	Reconstruct - 7" Conc on 8" Agg
	Total Cost:	**$**	**7,465,070.00**	**Locals 2021**
	HMA NRP:	**$**	**1,990,000.00**	
	Concrete NRP:	**$**	**1,440,000.00**	

Major Roads:	**$**	**-**
Local Roads:	**$**	**7,465,070.00**
2021 Total:	**$**	**8,265,070.00**

2022 Road Projects

Road	Rating	Estimated Project Cost	Proposed Maintenance Type

Road Maintenance

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Capital Preventative Maintenance	Varies	$	800,000.00	Surface Seal
	Total Cost:	**$**	**800,000.00**	**Locals 2022**

Major Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
10 Mile Rd Rehab (City Share)	Varies	$	772,500.00	Reconstruct
11 Mile Rd (Meadowbrook to Seeley)	3	$	585,000.00	GLWA Route Reconstruct
Meadowbrook Rd (11 Mile to I-96)	4	$	516,000.00	GLWA Route Reconstruct
Meadowbrook Rd (12 Mile to 13 Mile)	4	$	449,000.00	GLWA Route Reconstruct
13 Mile Rd (Meadowbrook to M-5)	3	$	1,258,000.00	GLWA Route Reconstruct
Wixom Rd (10 Mile to 11 Mile)	4	$	383,000.00	Mill and Overlay - 4"
Wixom Rd (11 Mile to City Limits)	3	$	383,000.00	Mill and Overlay - 4"
Grand Total				
	Total Cost:	**$**	**4,346,500.00**	**Majors 2022**

Local Road Recon/Rehab

Row Labels	LastRating		Estimated Project Cost	Scheduled Activity
Neighborhood Road Program 2022	Varies	$	3,300,000.00	Rehabillitation
	Total Cost:	**$**	**3,300,000.00**	**Locals 2022**

Major Roads:	**$**	**4,346,500.00**
Local Roads:	**$**	**3,300,000.00**
2022 Total:	**$**	**8,446,500.00**

2023 Road Projects

Road	Rating	Estimated Project Cost	Proposed Maintenance Type

Road Maintenance

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Capital Preventative Maintenance	**Varies**	$	800,000.00	Surface Seal
	Total Cost:	**$**	**800,000.00**	**Locals 2023**

Major Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
11 Mile Rd (Beck to Taft)	**3**	$	2,156,000.00	Mill and Overlay - 4"
Meadowbrook Rd (Cherry Hill to Gr River)	**4**	$	623,500.00	Crush and Shape w/5" Overlay
Taft Rd (10 Mile to City Limit)	**2**	$	1,246,000.00	Mill and Overlay - 4"
Meadowbrook Rd (11 Mile to Gr River)	**4**	$	936,830.00	Mill and Overlay - 4"
	Total Cost:	**$**	**4,962,330.00**	**Majors 2023**

Local Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost		Scheduled Activity
Neighborhood Road Program 2023	**Varies**	$	3,200,000.00	Rehabillitation
	Total Cost:	**$**	**3,200,000.00**	**Locals 2023**

Major Roads:	**$**	**4,962,330.00**
Local Roads:	**$**	**3,200,000.00**
2023 Total:	**$**	**8,962,330.00**

2024 Road Projects

Road	Rating	Estimated Project Cost	Proposed Maintenance Type

Road Maintenance

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
Capital Preventative Maintenance	**Varies**	$ 800,000.00	Surface Seal
	Total Cost:	**$ 800,000.00**	**Locals 2024**

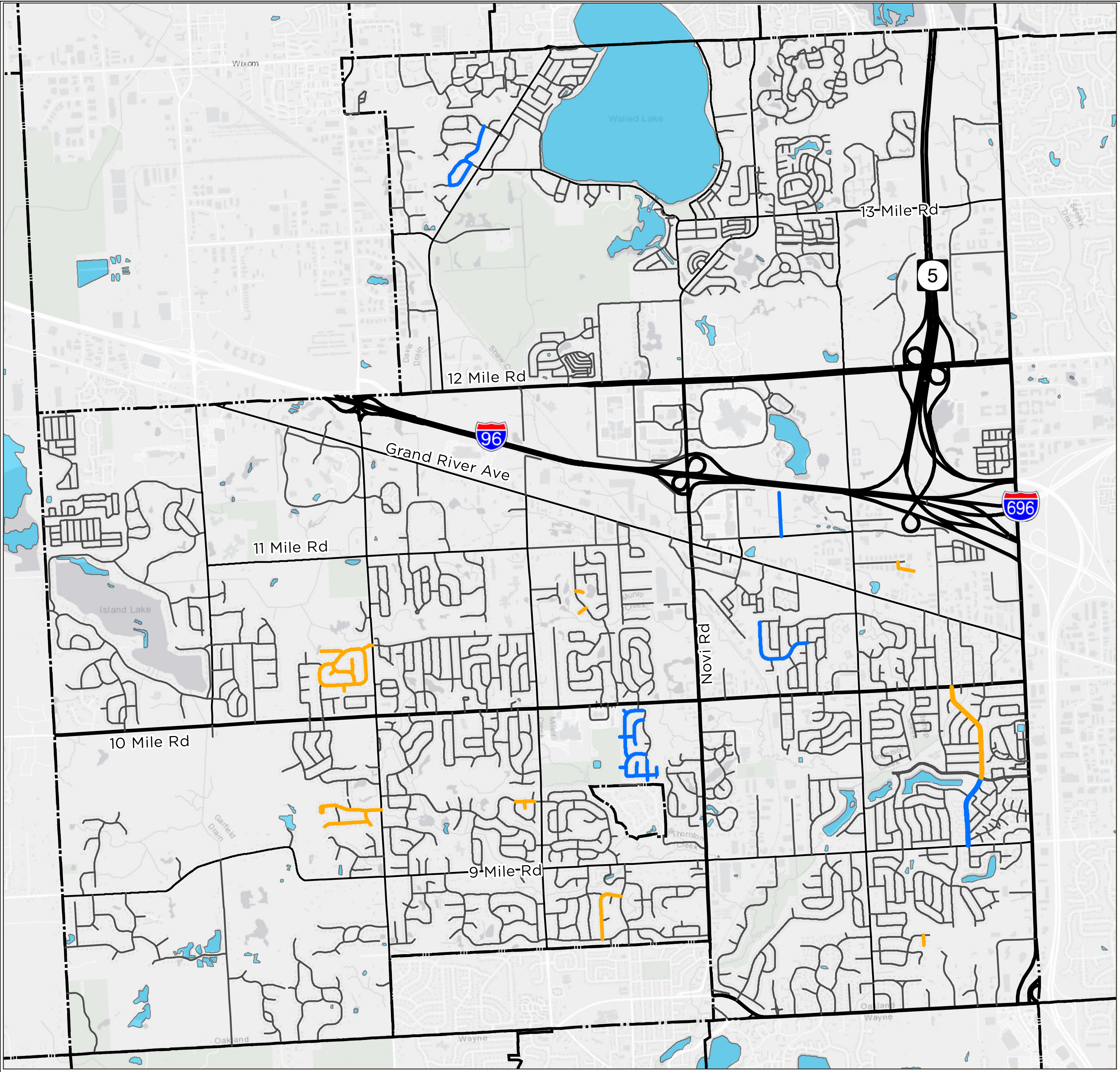
Major Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
Cabaret Dr	**4**	$ 304,075.20	Mill and Overlay - 3"
Donelson	**4**	$ 551,179.20	Mill and Overlay - 3"
E Lake Dr	**4**	$ 1,040,277.33	Crush and Shape w/3" Overlay
Fountain Walk Ave	**4**	$ 185,328.00	Mill and Overlay - 3"
Humbolt Dr	**3**	$ 234,672.53	Crack, Seat & Overlay, 4" HMA
Magellan Dr	**3**	$ 637,894.40	Crack, Seat & Overlay, 4" HMA
Main St	**4**	$ 347,318.40	Mill and Overlay - 4"
Novi Rd (13 mile to 14 mile)	**5**	$ 2,679,000.00	Asphalt - Reconstruct
W Oaks Dr	**4**	$ 254,730.67	Mill and Overlay - 3"
W Park Dr	**4**	$ 2,508,000.00	Crush and Shape w/5" Overlay
	Total Cost:	**$ 8,742,475.73**	**Majors 2024**

Local Road Recon/Rehab

Row Labels	LastRating	Estimated Project Cost	Scheduled Activity
Neighborhood Road Program 2024	**Varies**	$ 2,500,000.00	Rehabillitation
	Total Cost:	**$ 2,500,000.00**	**Locals 2024**

Major Roads:	**$ 8,742,475.73**
Local Roads:	**$ 2,500,000.00**
2024 Total:	**$ 12,042,475.73**



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2020 & 2021 Planned Projects

Roads

- Other Principal Arterial; Interstate or Other Freeway
- Minor Arterial; Major Collector
- Minor Surface Road
- 2020 Projects
- 2021 Projects

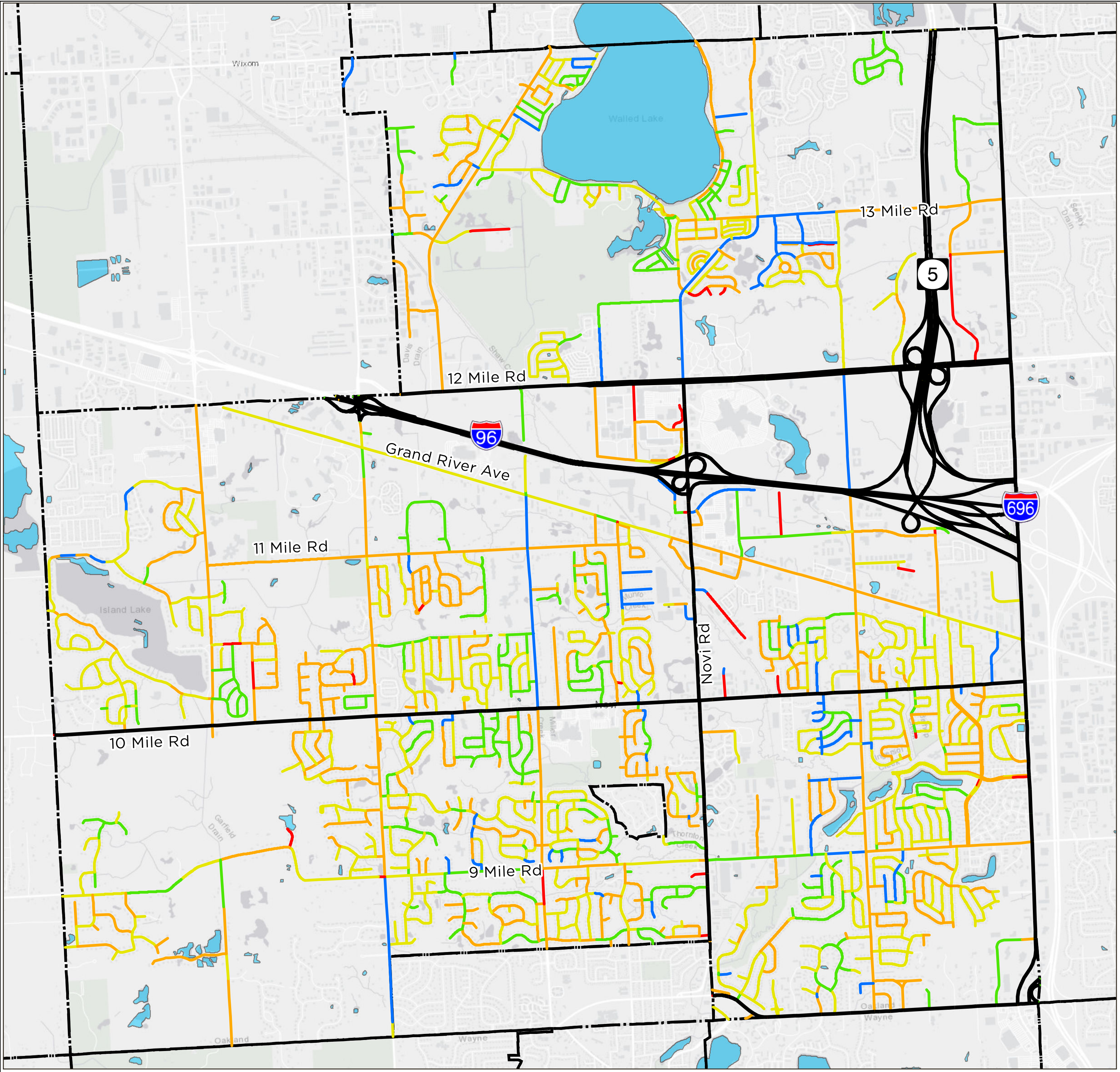
N

0 4,500 9,000
Feet
1″ = 4,500 ′

Source: Data provided by State of Michigan, SEMCOG and Roadsoft. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: August 1, 2020



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2018 Paser Ratings

- 9-10
- 7-8
- 5-6
- 3-4
- 1-2

Roads

- Other Principal Arterial; Interstate or Other Freeway
- Minor Arterial; Major Collector
- Minor Surface Road

N

0 4,500 9,000
Feet
1" = 4,500 '

Source: Data provided by State of Michigan, SEMCOG and Roadsoft. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: July 10, 2020

Appendix G (a)

PASER 2018 Summary

Surface Rating Mileage Summary For A Range of Years

Rating Year: 2018

Surface Subtype	PASER Rating 10	9	8	7	6	5	4	3	2	1	Total Centerline Mileage	APR*
Asphalt-Standard	3.595	3.916	2.918	4.004	10.628	12.270	23.582	7.420	1.351	0.000	**69.684**	5.266
Concrete - Curb & Gutter	0.000	0.592	0.697	2.360	1.962	3.657	3.361	2.677	0.867	0.059	**16.232**	4.975
asphalt Curb & Gutter	0.000	0.014	0.054	0.227	0.119	0.698	0.241	0.000	0.201	0.000	**1.554**	4.966
Gravel-Standard	0.000	0.000	0.803	0.000	1.459	0.000	0.439	0.000	0.040	0.000	**2.741**	6.207
Asphalt - CG	0.000	0.000	0.000	0.000	0.136	0.058	0.429	0.071	0.000	0.000	**0.694**	4.373
Concrete - Local C&G	0.000	0.000	0.042	0.304	0.000	0.152	0.185	0.221	0.000	0.000	**0.904**	5.118
Asphalt w/conc Curb & Gutter	0.598	1.164	3.392	2.301	11.594	9.366	11.046	3.756	1.045	0.000	**44.262**	5.278
Sealcoat-Standard	0.000	0.497	3.153	1.088	0.616	0.879	0.545	0.216	0.290	0.000	**7.284**	6.701
Concrete-Standard	0.810	1.173	4.420	8.409	5.394	12.142	9.592	2.395	0.000	0.000	**44.335**	5.673
Asphalt Open Ditch	0.000	0.472	0.366	0.277	0.023	0.252	0.000	0.339	0.127	0.000	**1.856**	6.349
Total Centerline Mileage	**5.003**	**7.828**	**15.845**	**18.970**	**31.931**	**39.474**	**49.420**	**17.095**	**3.921**	**0.059**	**189.546**	**5.412**

*APR=Average Paser Rating calculated by weighting the mileage with the paser value

Appendix G (b)

PASER 2020 Summary

Surface Rating Mileage Summary For A Range of Years

Rating Year: 2020

Surface Subtype	PASER Rating 10	9	8	7	6	5	4	3	2	1	Total Centerline Mileage	APR*
Asphalt-Standard	0.377	5.581	4.844	6.527	12.846	12.695	21.303	6.424	0.964	0.000	**71.561**	5.386
Concrete - Curb & Gutter	0.339	2.581	0.646	3.515	1.895	3.687	2.425	1.246	0.030	0.000	**16.364**	6.092
asphalt Curb & Gutter	0.000	0.370	0.054	0.227	0.000	0.289	0.769	0.000	0.000	0.000	**1.709**	5.776
Asphalt - CG	0.000	0.071	0.000	0.000	0.136	0.058	0.429	0.000	0.000	0.000	**0.694**	4.987
Concrete - Local C&G	0.015	0.000	0.163	0.152	0.183	0.000	0.185	0.206	0.000	0.000	**0.904**	5.502
Asphalt w/conc Curb & Gutter	1.998	2.012	2.407	5.234	11.831	9.330	8.742	2.307	0.942	0.000	**44.803**	5.700
Sealcoat-Standard	0.000	0.686	3.264	2.318	0.300	0.320	0.293	0.025	0.000	0.078	**7.284**	7.309
Concrete-Standard	2.707	1.840	4.784	9.182	7.333	11.217	5.646	1.254	0.337	0.000	**44.300**	6.169
Asphalt Open Ditch	0.000	0.583	0.366	0.300	0.252	0.000	0.000	0.228	0.127	0.000	**1.856**	6.856
Total Centerline Mileage	**5.436**	**13.724**	**16.528**	**27.455**	**34.776**	**37.596**	**39.792**	**11.690**	**2.400**	**0.078**	**189.475**	**5.795**

*APR=Average Paser Rating calculated by weighting the mileage with the paser value

Appendix H

10 Mile Corridor Study

CITY OF NOVI

10 MILE CORRIDOR STUDY

JUNE 2019

OHM
Advancing Communities®

EXECUTIVE SUMMARY

OHM developed this study on behalf of the City of Novi and in conjunction with the Road Commission for Oakland County (RCOC) to assess the present and anticipated operational and safety performance of 10 Mile within the city limits. Under existing conditions, the majority of the intersections within the study area operate with moderate delay. While the overall average intersection delay is often within the acceptable range at these locations, many individual approaches operate with more substantial delay during the peak periods. With background growth and planned future developments expected to increase traffic volumes, it will be necessary to monitor any further degradation of operations at these intersections. While adjustments in signal timing and phasing will relieve the some of the pressure, more substantial improvements will likely be necessary at locations throughout the corridor.

The variable number of lanes throughout the corridor has led to operational, safety and access concerns. Two segments east of Novi Road were identified as high crash locations, with crash data indicating strong patterns related to lane merges and the lack of a center left turn lane. The addition of a center left turn lane throughout the corridor would reduce these crash patterns, improve access and reduce traffic flow obstructions in the corridor.

In the future, the more congested intersections expected to see long delays with approach and overall intersection LOS expected to operate outside with unacceptable amounts of delay, particularly in the PM Peak period. Many of these intersections have already undergone substantial road widening and signal timing adjustments to attempt to minimize delays. At each location, additional widening and signal operational changes can offer some relief. In many cases this relief will be modest with delays remaining just barely acceptable. Alternatively, construction of a roundabout intersection at some or all of these intersections offers greater reduction in delay and commensurate improvement in safety. This type of improvement is also more substantial than the addition of a turn lane and implementation would require coordinating and planning.

Analyzed intersection alternatives are summarized below.

Table: Intersection Improvement Analysis 2040 PM Peak Summary

	Analyzed Improvement	Change in Delay (Sec.)
10 Mile Rd. & Wixom Rd.	Signal - Add SB right turn lane, adjust signal phasing	-16.0
	Roundabout - Single lane with second EB lane	-42.1
10 Mile Rd. & Beck Rd.	Signal – Widen Beck to 5 lanes	-36.1
	Roundabout – Two lane	-75.8
10 Mile Rd. & Taft Rd.	Signal - Add SB right turn lane, adjust signal phasing	-3.5
	Roundabout - Two lane with one lane NB and SB approaches	-34.1
10 Mile Rd. & Novi Rd.	Signal – Add dual left turns EB/WB, add right turn lane NB/SB/WB, adjust phasing	-6.9
	Roundabout – Two lane	-40.1
10 Mile Rd. & Meadowbrook Rd.	Signal – Add dual left turns NB/SB, adjust signal phasing	-2.5
	Roundabout – Two lane with one lane NB and SB approaches	-31.4
10 Mile Rd. & Haggerty Rd.	Signal – Add dual left turns EB/WB, add right turn lane NB/SB/EB, adjust phasing	-18.1
	Roundabout – Two lane	-45.7

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INTRODUCTION

10 Mile Road is a minor arterial roadway within the city limits of Novi in Oakland County. Recurrent congestion on 10 Mile Road prompted the city to commission a corridor study to assess the present and anticipated operational and safety performance of 10 Mile within the city limits. OHM developed this study on behalf of the City of Novi and in conjunction with the Road Commission for Oakland County (RCOC). For modeling purposes, the study area extended beyond the City boundaries and consists of 10 Mile Road and all signalized intersections between the South Lyon East High School driveway / Lyon Ridge Drive at the west end and Research Drive just east of I-275 on the east end.

PUBLIC INVOLVEMENT

A public open house meeting was held on April 29, 2019 in order to identify user experiences with the 10 Mile Corridor and help incorporate this study with the City planning process. This highly attended meeting provided multiple ways for road users to provide feedback, including a formal comment form, handwritten notes left on aerial images and conversations with representatives from the study team, the City of Novi and the RCOC. Community members who were unable to attend continued to reach out to study team members to provide additional feedback.

Aerial images at the meeting provided the opportunity for the identification of unique concerns with the existing corridor. Concerns raised on the western half of the corridor include sidewalk gaps between Wixom and Beck, the lack of a consistent center left turn lane, sight distance concerns near Terra Del Mar Dr., high speeds and truck traffic. There were also numerous comments on the new roundabout at Napier Rd., including compliments on the congestion relief and concerns on the reduction of gaps for driveways near the roundabout. Similar comments on speed, truck traffic and a lack of a consistent center left turn lane were noted on the eastern half of the corridor. Other concerns in this portion of the study area include congestion at major intersections, safety concerns where auxiliary lanes are merging and difficulty turning in and out of side streets. Concerns noted near the high school include high speeds and inexperienced drivers causing a perceived safety concern. A summary of comments from the aerial images is included in the appendix.

Comment forms, received both during the meeting and thereafter, provided additional space for more general comments applying to the whole corridor. Many of the respondents indicated that they lived either on 10 Mile or in adjacent neighborhoods with access to 10 Mile. Safety was a major theme of these comments with many forms noting high speeds, high volumes and lack of turn lanes as concerns. Another theme was mobility including comments on lack of adequate lanes, difficulty turning in or out of driveways, lack of nonmotorized facilities and subdivision cut through traffic. A summary of comments from the comment forms is included in the appendix.

SAFETY ANALYSIS

A crash analysis of the study area was preformed to review the historical safety performance of the corridor and identify patterns and trends in the crash date. Collision data was obtained from the Traffic Improvement Association's (TIA) Traffic Crash Analysis Tool (TCAT) for a three-year period, encompassing 2015 through 2017. The analysis looked at crash data at each of the thirteen signalized intersections. In addition, the segments of roadway between these intersections was analyzed to identify additional data patterns. Appendix A contains the TIA crash summary reports as well as the individual UD-10 crash reports for crashes resulting in serious injuries. The crash data is summarized in Tables 1a and 1b.

Crash rates for intersections are expressed in terms of crashes per million entering vehicles. For roadway segments, the crash rates are expressed as crashes per hundred million vehicle miles of travel. The spot critical crash rate represents a calculated rate using an average crash rate determined by four characteristics which include area type, functional class, number of lanes, and traffic control. The average crash rates were determined and published by the Southeast Michigan Council of Governments (SEMCOG) in its Traffic and Safety Manual using crash data from southeast Michigan from 2009 to 2011. When the observed crash rate exceeds the spot critical crash rate, the location is identified as a high-crash location. Seven of the thirteen study intersections were identified as high crash intersections, as indicated in Table 1a. Two of the twelve study segments were also identified as high crash segments.

During the 3-year analysis period a total of 782 crashes occurred in the study area. ***There were no fatal crashes during the analysis period.*** Injuries occurred in 23% of the crashes. 7 of the injury crashes resulted in incapacitating Type A injuries. These crashes are discussed in greater detail below. There were also 51 non-incapacitating Type B injuries and 120 possible Type C injuries in the study period. Ten crashes involved either a bicyclist or a pedestrian, all of which occurred at intersections or driveways along the road. Most of these crashes occurred as a result of drivers failing to yield to bicyclists or pedestrians in the crosswalk.

High-Crash Intersections

The observed crash rate exceeded the spot critical crash rate at 7 signalized intersections within the study area. The highest crash rate to spot critical crash rate ratio occurred at the 10 Mile Road at Napier Road intersection. One A injury crash involved a collision between a semi-truck and a passenger vehicle at this location. The passenger vehicle failed to stop at a red light leading to a collision where both vehicles landed in a nearby ditch. The crash data at this location covered the time period prior to the construction of a roundabout in late 2017. Crash patterns and trends after the roundabout construction are anticipated to be substantially different from the data collected when this location was a signalized intersection.

Table 1a: 10 Mile Road Corridor Crash Summary - Intersections

Intersection	Crash Type									Injuries					Crash Rate	Spot Critical Crash Rate
	Single Vehicle	Head-On	Head-On Left-Turn	Sideswipe	Rear End	Angle	Backing	Other	TOTAL	Fatal	A	B	C	O		
10 Mile & Lyon Ridge	1	0	1	1	10	0	0	0	13	0	0	1	1	11	0.740	1.032
10 Mile & Napier	5	0	3	5	16	24	3	1	57	0	1	4	4	48	2.776	1.004
10 Mile & Oak Point	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0.063	1.053
10 Mile & Wixom	2	0	7	1	10	3	0	0	23	0	0	3	4	16	0.956	1.025
10 Mile & Beck	0	1	11	6	64	4	1	0	87	0	1	4	13	69	2.517	0.960
10 Mile & Taft	4	0	2	0	27	2	0	0	35	0	0	4	2	29	1.288	1.006
10 Mile & Novi Way (West)	1	0	0	0	13	1	0	0	15	0	0	1	3	11	0.936	1.050
10 Mile & Churchill	2	0	2	0	13	1	0	0	18	0	0	1	4	13	0.990	1.026
10 Mile & Novi	0	0	7	15	49	30	0	0	101	0	0	2	19	80	2.431	0.937
10 Mile & Meadowbrook	1	0	2	10	24	12	2	0	51	0	0	2	8	41	1.750	0.996
10 Mile & Cranbrooke	1	0	0	2	7	0	0	0	10	0	0	1	4	5	0.645	1.057
10 Mile & Haggerty	5	3	13	13	40	20	2	0	96	0	3	5	9	79	2.332	0.938
10 Mile & Research Dr	1	0	0	2	13	4	1	0	21	0	0	4	3	14	1.261	1.042
Sub-Total	**23**	**4**	**48**	**55**	**287**	**101**	**9**	**1**	**528**	**0**	**5**	**32**	**74**	**417**		
Sub-Total %	**4%**	**1%**	**9%**	**10%**	**54%**	**19%**	**2%**	**0%**	**100%**	**0%**	**1%**	**6%**	**14%**	**79%**		

Table 1b: 10 Mile Road Corridor Crash Summary - Segments

Segment	Crash Type									Injuries					Crash Rate	Spot Critical Crash Rate
	Single Vehicle	Head-On	Head-On Left-Turn	Sideswipe	Rear End	Angle	Backing	Other	TOTAL	Fatal	A	B	C	O		
Lyon Ridge to Napier	1	1	1	0	11	10	0	0	24	0	0	4	4	16	**184.3**	**303.0**
Napier to Oak Point	2	0	1	1	2	0	0	0	6	0	0	1	1	4	**51.4**	**307.3**
Oak Point to Wixom	1	0	0	0	2	0	0	0	3	0	0	0	2	1	**15.5**	**340.8**
Wixom to Beck	5	1	0	2	14	2	0	0	24	0	0	1	3	20	**146.1**	**294.6**
Beck to Taft	4	0	1	2	21	7	0	0	35	0	0	1	7	27	**243.7**	**299.3**
Taft to Novi Way (West)	1	0	0	0	13	2	0	0	16	0	0	3	0	13	**263.7**	**339.5**
Novi Way (West) to Churchill	1	0	0	0	13	2	0	0	16	0	0	3	0	13	**194.9**	**343.9**
Churchill to Novi	1	0	0	0	10	5	0	0	16	0	0	1	0	15	**204.5**	**292.0**
Novi to Meadowbrook	7	0	1	9	36	15	0	0	68	0	**2**	3	17	46	**408.7**	**262.3**
Meadowbrook to Cranbrooke	2	0	0	1	10	1	0	0	14	0	0	0	2	12	**142.7**	**281.7**
Cranbrooke to Haggerty	1	0	1	2	14	7	0	0	25	0	0	4	4	17	**312.9**	**291.0**
Haggerty to Research	1	1	0	0	7	3	0	0	12	0	0	1	4	7	**172.4**	**297.8**
Sub-Total	**26**	**3**	**5**	**17**	**150**	**53**	**0**	**0**	**254**	**0**	**2**	**19**	**46**	**187**		
Sub-Total %	**10%**	**1%**	**2%**	**7%**	**59%**	**21%**	**0%**	**0%**	**100%**	**0%**	**1%**	**7%**	**18%**	**74%**		
Grand Total	**49**	**7**	**53**	**72**	**437**	**154**	**9**	**1**	**782**	**0**	**7**	**51**	**120**	**604**		
Grand Total %	**6%**	**1%**	**7%**	**9%**	**56%**	**20%**	**1%**	**0%**	**100%**	**0%**	**1%**	**7%**	**15%**	**77%**		

The intersection of 10 Mile Road and Beck Road had the second highest crash rate to spot critical crash rate ratio. One A injury crash occurred at this intersection involving a motorcycle struck by a passenger vehicle turning left during permissive left turn signal phasing. A high number of rear end crashes were recorded at this intersection. A significant contributing factor in many of these crashes were long queues due to congestion. Signal phasing and timing parameters are also potential factors in the observed crash patterns.

The intersection of 10 Mile and Taft is also considered a high crash intersection with a high number of rear end and single vehicle crashes. The diagonal span signal configuration may be impacting signal head visibility and contributing to some of the crashes at this intersection. There were two crashes involving bicyclists at this intersection. In both cases the cyclist was crossing in a marked crosswalk against the pedestrian signal indications and was struck.

The intersection of 10 Mile and Novi experienced the highest total number of crashes during the study period. The most prominent crash types at the intersection were rear end and angle crashes. Many of the angle crashes are related to commercial driveways located close to the intersection. Snowy or icy road conditions contributed to the number of rear end crashes occurring in the signal queue. The majority of crashes occurred during heavily congested time periods, where lane changes and adjacent driveway turning movements fall within the signal queue.

The intersection of 10 Mile and Meadowbrook is considered a high crash location with rear end, angle and sideswipe crashes being the prominent crash types. A high number of crashes occurred approximately 200 feet west of the intersection near multiple commercial driveways and the westbound merge to transition out of the 5-lane section at the roadway. The diagonal span signal configuration may be impacting signal head visibility and contributing to some of the crashes at this intersection. There was one crash involving a pedestrian at this intersection. The pedestrian was crossing in a marked crosswalk against the pedestrian signal indications when struck.

The intersection of 10 Mile and Haggerty is a high crash rate intersection. The number of head-on left turn and angle crashes are especially high at this location. Three Type A injury crashes occurred at the intersection of 10 Mile Road and Haggerty Road during the three year study period. All three Type A injuries occurred in head-on left turn crashes. The majority of the head-on left turn crashes at this intersection occur during the permissive left turn phase, especially towards the end of the permissive phase. Adjusting the clearance intervals at this intersection and considering moving the protected left turn phasing to lagging may help address some of this crash pattern.

The intersection of 10 Mile and Research Drive is another high crash rate intersection. Rear end crashes were the prominent crash type. The rear end crashes occurred on approach to the signal within the queue.

High-Crash Segments

The 10 Mile Road segment between Novi Road and Meadowbrook Road experienced the worst crash rate to spot critical crash rate ratio of all study segments. Contributing factors to many of the crashes in this segment include the inconsistent number of lanes, a lack of a center left turn lane and the high traffic volumes on this segment of roadway. Another factor in the high number of angle crashes at his intersection is the prevalence of commercial property access points. Two separate rear-end crashes resulting in A-level injuries occurred in the segment of 10 Mile Road between Novi Road and Meadowbrook Road. Both Type A injury crashes were rear-end collisions occurring near the intersection with Pheasant Run. In both cases, the lane configuration, congestion and lack of a center left turn lane contributed to the crashes.

The 10 Mile Road segment between Cranbrooke and Haggerty was the other high-crash segment in the study area. The most prominent crash type in this segment were rear-end collisions. Contributing factors to many of the crashes in this segment include the inconsistent number of lanes, a lack of a center left turn lane and high traffic volumes. No fatalities or Type A injuries occurred in this segment during the study period.

TRAFFIC ANALYSIS

To obtain more detailed information for the analysis, traffic data was collected by Traffic Data Collection, LLC (TDC) on May 16 of 2018 at the study locations. The south leg of the roundabout at Napier Road was closed to through traffic due to road construction during data collection. The expected approach and turning movement volumes in the absence of a road closure were estimated based on existing traffic patterns in the study area. The morning peak period occurs between 7:30 AM and 9:00 AM, and the afternoon peak period occurs between 4:30 PM and 6:00 PM. The traffic volume data collected by TDC can be found in Appendix B.

Intersection Analysis Methodology

The study intersections were analyzed according to the methodologies published in the Highway Capacity Manual, 2010 edition. For this project, Synchro Version 10 was used to conduct the analysis for traditional signalized and un-signalized intersections. The intersection of 10 Mile Road and the Oak Point Church driveway was modeled as a two-way STOP-controlled intersection as the signal operates in flash mode during both peak periods. Existing and proposed roundabout intersections were analyzed using RODEL™ software. Software printouts for the evaluations of intersections have been included in Appendix C for Synchro and Appendix D for Rodel. These software package 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, 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 shorter delays. 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.

Table 2: 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 through lights. Short traffic delays.
C	> 20 to 35	Significant numbers of vehicles stop, although many pass through 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.

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, and others. LOS is expressed as a letter grade, in a range from A through 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. Tables 2 and 3 identify level of service criteria and descriptions for signalized and un-signalized intersections, respectively.

Table 3: 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

SOURCE: Transportation Research Board, Highway Capacity Manual 2010.

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, with most residing within the city limits of Novi and all being inside the southeast Michigan urban boundary, LOS D was utilized as the study goal.

EXISTING CONDITIONS

Capacity analysis under existing conditions was performed at each of the study intersections. While LOS D will be used as the level of service threshold under future mitigated conditions, an intersection which operates at LOS D under existing conditions is expected to operate at LOS E or LOS F under future unmitigated conditions. Thus, for the purpose of analysis under existing conditions, those intersections which operate at an overall LOS D or poorer are considered "locations of concern". The analysis of the locations operating at LOS C or better are considered to be of "moderate delay" and are discussed next. The remaining intersections are discussed further under locations of concern.

Projected Background Traffic

In order to provide operational analysis in future years, regional traffic growth must be added to the field counted volumes. Growth rates were selected in coordination with SEMCOG, RCOC and with City of Novi. Between 2018 and 2030 a background growth rate totaling 2% was used. Between 2018 and 2040 a background growth rate totaling 3% was used. This increase in traffic reflects regional development and changes in travel patterns.

Development Trip Generation

Much of the study area can be considered already developed. However, there are some available parcels in the western portion of the study area. In addition, there is the potential for some developed parcels to be further improved to increase density. Much of the traffic related to this type of development is included in the background growth. However, it is thought that a key parcel was not accounted for in the SEMCOG forecasting and needs to be added to the background growth values. There is a strong potential that the current Links of Novi golf course will redevelop within the analysis period. Pervious plans for this property have included various types of residential housing. Potential traffic generated by a residential development on the Links of Novi property was determined using procedures outlined in the Institute of Transportation Engineers (ITE) publication, Trip Generation Handbook. The data set used is the ITE Trip Generation Manual – 10th Edition.

Table 4: Links of Novi Summary of Development Generated Traffic

ITE Land Use	Size	AM Peak			PM Peak		
		Total	In	Out	Total	In	Out
210 - Residential Single Family	450 Units	333	83	250	446	281	165

During the AM Peak Hour, the redevelopment of the Links of Novi property is anticipated to add 333 trips to the existing traffic. During the PM Peak Hour, the redevelopment of the Links of Novi property is anticipated to add 446 trips.

Development Trip Distribution

The potential residential development at the Links of Novi property is expected to be similar in use and character to the numerous other residential developments along Novi road. With this understanding, the projected residential development is expected to be reflective of the existing residential uses in the development vicinity. The development generated trips were routed through the study intersections utilizing existing traffic patterns. These trips were then added to the background traffic volumes to develop the future year traffic volumes for the 2030 and 2040 traffic analysis.

LOCATIONS OF MODERATE DELAY

Table 5 shows the intersection LOS and corresponding delays during the AM Peak hour. Table 6 shows the intersection LOS and corresponding delays during the PM Peak hour. Under existing conditions, the study intersections of moderate delay experience average overall intersection vehicle delays which correspond with a LOS A, LOS B or LOS C during both the AM and PM Peak periods. However, northbound and southbound approach delay and level of service values are shown to fall outside the acceptable range at numerous locations. With the addition of future development traffic and background growth, congestion throughout the study corridor is expected to increase, leading to further degradation of LOS.

Table 5: Locations of Moderate Delay: AM Peak Delay and Level of Service

	Analysis Year	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
10 Mile Rd. & Lyon Ridge Dr.	2018	**42.0**	**D**	34.5	C	21.2	C	34.3	C	27.2	C
	2030	**53.7**	**D**	**37.7**	**D**	21.2	C	34.6	C	28.6	C
	2040	**53.5**	**D**	**37.6**	**D**	22.4	C	39.0	D	30.6	C
10 Mile Rd. & Napier Rd.	2018	5.7	A	4.9	A	8.0	A	4.5	A	6.8	A
	2030	5.9	A	5.1	A	8.4	A	5.0	A	7.1	A
	2040	5.9	A	5.1	A	8.5	A	5.0	A	7.2	A
10 Mile Rd. & Oak Pointe Church Dwy.	2018	NA	NA	10.8	B	0.00	A	FREE	FREE	0.0	A
	2030	NA	NA	11.5	B	0.00	A	FREE	FREE	0.0	A
	2040	NA	NA	11.6	B	0.00	A	FREE	FREE	0.0	A
10 Mile Rd. & Novi Way (West)	2018	32.8	C	NA	NA	29.5	C	9.5	A	21.1	C
	2030	**39.2**	**D**	NA	NA	23.2	C	6.0	A	17.1	B
	2040	**39.1**	**D**	NA	NA	23.6	C	6.3	A	17.4	B
10 Mile Rd. & Churchill Blvd. / Courtland Blvd.	2018	25.2	C	**38.3**	**D**	2.9	A	12.3	B	11.7	B
	2030	26.3	C	**39.1**	**D**	2.5	A	9.3	A	10.3	B
	2040	26.3	C	**39.0**	**D**	2.6	A	9.4	A	10.4	B
10 Mile Rd. & Bashian Dr. / Cranbrooke Dr.	2018	**45.1**	**D**	**39.4**	**D**	14.7	B	4.0	A	14.5	B
	2030	**46.8**	**D**	**40.2**	**D**	14.1	B	0.8	A	13.4	B
	2040	**46.5**	**D**	**40.2**	**D**	14.6	B	0.8	A	13.6	B
10 Mile Rd. & Research Dr.	2018	29.7	C	NA	NA	3.2	A	3.7	A	5.0	A
	2030	**38.8**	**D**	NA	NA	3.2	A	3.2	A	5.3	A
	2040	**38.8**	**D**	NA	NA	3.2	A	3.3	A	5.3	A

Table 6: Locations of Moderate Delay: PM Peak Delay and Level of Service

	Analysis Year	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
10 Mile Rd. & Lyon Ridge Dr.	2018	23.6	C	**39.5**	**D**	7.4	A	23.8	C	19.5	B
	2030	25.5	C	**39.5**	**D**	11.3	B	32.1	C	24.9	C
	2040	25.4	C	**39.5**	**D**	11.5	B	33.3	C	25.5	C
10 Mile Rd. & Napier Rd.	2018	9.0	A	7.6	A	6.5	A	6.2	A	7.7	A
	2030	9.8	A	8.1	A	6.9	A	6.4	A	8.3	A
	2040	6.4	A	8.2	A	7.0	A	9.9	A	8.4	A
10 Mile Rd. & Oak Pointe Church Dwy.	2018	NA	NA	19.3	C	0.00	A	FREE	FREE	0.3	A
	2030	NA	NA	24.1	C	0.00	A	FREE	FREE	0.3	A
	2040	NA	NA	24.3	C	0.00	A	FREE	FREE	0.3	A
10 Mile Rd. & Novi Way (West)	2018	**48.9**	**D**	NA	NA	28.6	C	6.4	A	17.6	B
	2030	**63.5**	**E**	NA	NA	12.6	B	3.4	A	10.0	A
	2040	**63.5**	**E**	NA	NA	12.9	B	3.5	A	10.1	B
10 Mile Rd. & Churchill Blvd. / Courtland Blvd.	2018	27.8	C	**37.4**	**D**	5.2	A	5.9	A	7.7	A
	2030	31.8	C	**41.0**	**D**	11.0	B	6.7	A	10.5	B
	2040	31.8	C	**41.0**	**D**	11.1	B	6.8	A	10.6	B
10 Mile Rd. & Bashian Dr. / Cranbrooke Dr.	2018	**56.8**	**E**	30.4	C	2.5	A	16.7	B	14.8	B
	2030	**60.1**	**E**	31.0	C	1.9	A	9.8	A	10.5	B
	2040	**60.5**	**E**	31.3	C	1.9	A	10.0	B	10.7	B
10 Mile Rd. & Research Dr.	2018	**36.6**	**D**	NA	NA	7.6	A	9.0	A	14.5	B
	2030	**40.0**	**D**	NA	NA	12.5	B	7.9	A	16.1	B
	2040	**40.2**	**D**	NA	NA	12.6	B	8.0	A	16.2	B

LOCATIONS OF CONCERN

The effects of the current level of congestion are more pronounced at the remaining study intersections. These locations currently experience lengthy delays, long queues and a poor level-of-service on one or more approaches. These existing deficiencies are expected to worsen with background and future development traffic growth. Intersection LOS and corresponding delays during the AM Peak Hour and PM Peak Hour can be seen in Tables 7 and 8.

Table 7: Locations of Concern: AM Peak Delay and Level of Service

	Analysis Year	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
10 Mile Rd. & Wixom Rd.	2018	27.7	C	**74.8**	**E**	10.2	B	8.6	A	18.8	B
	2030	35.0	C	**47.7**	**D**	16.8	B	15.5	B	20.5	C
	2040	35.0	C	**47.8**	**D**	17.4	B	15.5	B	20.9	C
10 Mile Rd. & Beck Rd.	2018	**46.5**	**D**	**38.8**	**D**	**38.1**	**D**	22.7	C	**38.4**	**D**
	2030	**78.9**	**E**	**52.8**	**D**	**45.4**	**D**	**35.4**	**D**	**55.8**	**E**
	2040	**83.1**	**F**	**53.8**	**D**	**46.4**	**D**	**35.7**	**D**	**57.8**	**E**
10 Mile Rd. & Taft Rd.	2018	**47.0**	**D**	**60.8**	**E**	16.7	B	13.8	B	31.4	C
	2030	**49.8**	**D**	**68.5**	**E**	16.1	B	12.8	B	32.7	C
	2040	**49.9**	**D**	**69.2**	**E**	16.5	B	13.4	B	33.2	C
10 Mile Rd. & Novi Rd.	2018	**35.9**	**D**	33.6	C	32.6	C	34.7	C	34.2	C
	2030	**35.8**	**D**	30.8	C	**53.0**	**D**	**44.8**	**D**	**42.2**	**D**
	2040	**36.2**	**D**	31.2	C	**54.3**	**D**	**44.1**	**D**	**42.7**	**D**
10 Mile Rd. & Meadowbrook Rd.	2018	**45.1**	**D**	**41.9**	**D**	13.4	B	22.2	C	26.4	C
	2030	**41.3**	**D**	**42.1**	**D**	14.7	B	16.5	B	24.6	C
	2040	**48.7**	**D**	**45.9**	**D**	14.0	B	15.9	B	26.3	C
10 Mile Rd. & Haggerty Rd.	2018	**46.9**	**D**	32.4	C	**47.8**	**D**	**50.1**	**D**	**45.1**	**D**
	2030	**69.1**	**E**	**36.2**	**D**	**43.0**	**D**	**60.2**	**E**	**54.5**	**D**
	2040	**73.2**	**E**	**36.5**	**D**	**43.0**	**D**	**60.9**	**E**	**56.2**	**E**

Table 8: Locations of Concern: PM Peak Delay and Level of Service

	Analysis Year	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
10 Mile Rd. & Wixom Rd.	2018	15.4	B	**42.6**	**D**	15.8	B	25.8	C	28.3	C
	2030	26.4	C	**123.1**	**F**	14.1	B	17.4	B	**51.5**	**D**
	2040	26.4	C	**126.4**	**F**	15.1	B	17.9	B	**53.0**	**D**
10 Mile Rd. & Beck Rd.	2018	**74.2**	**E**	**56.0**	**E**	34.5	C	**66.3**	**E**	**59.2**	**E**
	2030	**124.2**	**F**	**70.8**	**E**	27.3	C	**93.8**	**F**	**82.4**	**F**
	2040	**127.6**	**F**	**72.9**	**E**	27.6	C	**95.9**	**F**	**84.5**	**F**
10 Mile Rd. & Taft Rd.	2018	**53.7**	**D**	**64.7**	**E**	**36.3**	**D**	31.9	C	**42.4**	**D**
	2030	**78.9**	**E**	**70.1**	**E**	15.6	B	30.4	C	**42.5**	**D**
	2040	**80.1**	**F**	**71.5**	**E**	15.6	B	31.0	C	**43.2**	**D**
10 Mile Rd. & Novi Rd.	2018	**64.4**	**E**	**55.1**	**E**	**43.5**	**D**	27.8	C	**48.7**	**D**
	2030	**58.3**	**E**	**37.0**	**D**	**38.2**	**D**	**62.2**	**E**	**49.6**	**D**
	2040	**61.1**	**E**	**37.5**	**D**	**38.6**	**D**	**65.4**	**E**	**51.5**	**D**
10 Mile Rd. & Meadowbrook Rd.	2018	**54.8**	**D**	**41.6**	**D**	29.8	C	28.2	C	**35.9**	**D**
	2030	**57.0**	**E**	**44.3**	**D**	31.8	C	**35.7**	**D**	**40.3**	**D**
	2040	**56.8**	**E**	**49.9**	**D**	31.1	C	34.7	C	**41.0**	**D**
10 Mile Rd. & Haggerty Rd.	2018	34.1	C	**75.8**	**E**	**53.2**	**D**	**65.7**	**E**	**59.0**	**E**
	2030	**75.8**	**E**	**43.3**	**D**	**49.1**	**D**	**68.5**	**E**	**60.2**	**E**
	2040	**77.5**	**E**	**44.3**	**D**	**49.6**	**D**	**71.1**	**E**	**61.8**	**E**

10 Mile Road and Wixom Road
10 Mile Road and Wixom Road currently operates at an overall acceptable level of service during both peak periods. The southbound Wixom Road approach operates at a LOS E in the AM and a LOS D in the PM. The signalized intersection has a dedicated left turn lane for each approach and short auxiliary right turn lanes for the 10 Mile Road approaches. The northbound approach to the intersection is the driveway for the City of Novi Fire Station Number 4. 10 Mile Road is a two-lane, two-way roadway in the vicinity of the intersection. Wixom Road has a three-lane section for a short stretch north of the intersection. For the future year analysis, increases in traffic volumes lead to lengthy queues and delays for the Wixom Road approach during the PM Peak period. As the Wixom Road approach delay increases, the overall intersection operates at a LOS D during the PM peak period.

10 Mile Road and Beck Road
10 Mile Road and Beck Road exhibits intersection traffic operations at a LOS D or LOS E in the AM and PM Peak periods, respectively. The signalized intersection has one dedicated lane for right turn, through and left turn movements on every approach. The existing cross section is a two-lane, two-way road on each approach except the westbound approach which has a center two-way left turn lane. The Synchro LOS reports indicate that the northbound left turn storage and/or split may not be adequate to service the traffic demand as modeled queue lengths (337 feet and 406 feet in the AM and PM Peak periods, respectively) exceed the given turn bay length (300 feet). Additionally, the eastbound and westbound through movements operate at LOS E in the respective AM and PM Peak periods. As these are the dominant movements in each peak period, there are likely inadequacies in either signal timing or lane capacity.

10 Mile Road and Taft Road
The 10 Mile Road and Taft Road intersection is shown to operate at LOS D in the PM Peak period. The signalized intersection has a single dedicated lane for each movement on every approach except the southbound approach which shares the right turn and through movements on a single lane with a dedicated left turn lane. The roadway cross section is a three-lane roadway with a center left turn lane on each approach except the southbound approach with is a two-way, two-lane roadway. The southbound approach operates at LOS E, and both the northbound and southbound through movements operate at LOS E. This result indicates that the phase split and/or lane capacity for the northbound and southbound approaches may be inadequate.

10 Mile Road and Novi Road
10 Mile Road and Novi Road is expected to operate at LOS D in the PM Peak period. The signalized intersection has a dedicated left turn lane, a single through only lane, and a shared through and right turn lane on each approach. The existing cross section is a balanced five-lane roadway with a center left turn lane on each approach. The southbound and northbound approaches each operate at LOS E (the northbound left turn movement operates at LOS F). Additionally, the eastbound left turn movement operates at LOS E. Given that Novi Road handles the dominant traffic flow at the intersection, the northbound/southbound phase split may not be sufficient to handle the traffic demand.

10 Mile Road and Meadowbrook Road
10 Mile Road and Meadowbrook Road displays a LOS D during the PM Peak period. The signalized intersection has a single dedicated lane for each movement on the northbound and southbound approaches. The existing cross section on the northbound approach is a two-lane, two-way roadway that widens out to two approach lanes near the intersection with 10 Mile Road.

The existing cross section on the southbound approach is two lanes southbound and one lane northbound with a center left turn lane. On the eastbound and westbound approaches, the intersection has a dedicated left-turn lane, a through only lane, and a shared through and right turn lane. The existing cross section on the eastbound approach is two lanes eastbound and one lane westbound that widens out to include a second westbound lane and a center left turn lane in the vicinity of Meadowbrook Road. The existing cross section on the westbound approach is a two-lane, two-way roadway that widens out to include an additional approach and departing lane with a center left turn lane near the intersection. During the PM Peak period, the northbound approach exhibits the poorest performance with an overall approach LOS D (LOS E for the through and left turn movements). Similar to the other intersections of concern, it is possible that the northbound/southbound phase split does not meet the traffic demand during this period.

10 Mile Road and Haggerty Road

10 Mile Road and Novi Road is expected to operate at LOS D and LOS E in the AM Peak and PM Peak respectively. The signalized intersection has a dedicated left turn lane, a single through only lane, and a shared through and right turn lane on each approach. Haggerty Road has a five-lane section north of the intersection and transitions to a four-lane section south of the intersection. 10 Mile Road transitions to a four-lane section east of the intersection and a two-lane section to the west. The left turn lane storage provided by the variable cross sections is as little as 150' feet on the northbound approach. The high traffic volumes experienced on both roadways at this location result in lengthy delays and poor level of service on multiple approaches during both peak periods. Projected traffic growth at this location will further deteriorate the traffic conditions as shown by the 2030 and 2040 analysis.

ALTERNATIVE ANALYSIS

Upon review of the safety and operational performance of the existing roadway geometry, it is likely that some amount of roadway improvement may be necessary in the future. Potential alternatives were evaluated where crash data and/or existing operational data identified concerns.

10 Mile Road and Wixom Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes widening to provide an auxiliary southbound right turn lane with protected right turns overlapping with the protected left turn phasing on 10 Mile. The roundabout alternative consists of a single circulating lane except for eastbound where a second lane is provided. Heavy westbound and southbound right turn volumes are accommodated by providing right-turn bypass lanes.

Table 9: 10 Mile and Wixom Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	35.0	C	**47.7**	**D**	16.8	B	15.5	B	20.5	C
	Improved Signal	31.7	C	**40.2**	**D**	24.5	C	12.5	B	23.2	C
	Roundabout	0.1	A	5.2	A	11.0	B	8.3	A	9.5	A
2040 AM Peak	Existing	35.0	C	**47.8**	**D**	17.4	B	15.5	B	20.9	C
	Improved Signal	31.3	C	**39.9**	**D**	25.8	C	14.0	B	24.3	C
	Roundabout	0.1	A	5.2	A	11.1	B	8.4	A	9.6	A
2030 PM Peak	Existing	26.4	C	**123.1**	**F**	14.1	B	17.4	B	**51.5**	**D**
	Improved Signal	20.1	C	**48.9**	**D**	31.5	C	26.9	C	**35.5**	**D**
	Roundabout	4.8	A	11.6	B	6.9	A	13.3	B	10.7	B
2040 PM Peak	Existing	26.4	C	**126.4**	**F**	15.1	B	17.9	B	**53.0**	**D**
	Improved Signal	20.1	C	**49.6**	**D**	**33.6**	**D**	28.7	C	**37.0**	**D**
	Roundabout	4.8	A	11.8	B	7.0	A	13.6	B	10.9	B

The existing intersection experiences lengthy delays for the southbound approach during both peak periods. As traffic volumes increase, it is anticipated that the level of service for this approach will continue to deteriorate. With the southbound approach expected to operate at a LOS F during the PM Peak in both 2030 and 2040 analysis years.

The improved signal alternative provides a marginal improvement in operations during the future analysis years. The additional lane for the southbound approach reduces the delay for this approach during both peak hours and is especially impactful during the PM Peak. The signal phasing and timing changes allow for more balanced delay between the approaches and the overall intersection delay is slightly reduced in the PM Peak.

The roundabout alternative greatly reduces the southbound approach delay. This alternative demonstrates reduced and balanced delays for all approaches during both peak hours. The overall intersection is expected to operate at a LOS A in the AM Peak and a LOS B in the PM Peak in both 2030 and 2040.

10 Mile Road and Beck Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes the widening of Beck Road to a five-lane section through the intersection. This widening is in the early stages of planning with potential construction occurring prior to this studies future analysis years. The roundabout alternative consists of a two-lane roundabout.

Table 10: 10 Mile and Beck Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	78.9	E	52.8	D	45.4	D	35.4	D	55.8	E
	Improved Signal	30.7	C	24.2	C	44.1	D	53.6	D	36.9	D
	Roundabout	8.7	A	6.2	A	8.6	A	6.4	A	7.8	A
2040 AM Peak	Existing	83.1	F	53.8	D	46.4	D	35.7	D	57.8	E
	Improved Signal	32.8	C	32.0	C	34.8	C	39.7	D	34.3	C
	Roundabout	8.8	A	6.3	A	8.7	A	6.4	A	7.8	A
2030 PM Peak	Existing	124.2	F	70.8	E	27.3	C	93.8	F	82.4	F
	Improved Signal	46.5	D	31.8	C	34.6	C	79.6	E	48.2	D
	Roundabout	9.1	A	8.5	A	8.4	A	8.4	A	8.6	A
2040 PM Peak	Existing	127.6	F	72.9	E	27.6	C	95.9	F	84.5	F
	Improved Signal	52.7	D	34.0	C	40.5	D	64.7	E	48.4	D
	Roundabout	9.2	A	8.6	A	8.5	A	8.5	A	8.7	A

The existing intersection experiences lengthy delays on multiple approaches during both peak periods. As traffic volumes increase, it is anticipated that the level of service will continue to deteriorate. With the overall intersection expected to operate at a LOS E during the AM Peak and a LOS F in the PM Peak in both 2030 and 2040 analysis years.

The improved signal alternative provides improvement in operations during the future analysis years. The additional lanes on Beck Road reduces the delay for these approaches during both peak hours. These changes also allow for more green time to be assigned to the 10 Mile Road approaches, providing slight reductions in delay. While the anticipated operations are much improved, the westbound approach is still anticipated to operate at at LOS E during the PM Peak in both 2030 and 2040 analysis years.

The roundabout alternative greatly reduces the delay experienced at this intersection. This alternative demonstrates reduced and balanced delays for all approaches during both peak hours. The overall intersection is expected to operate at a LOS A for both peak periods in 2030 and 2040.

10 Mile Road and Taft Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes widening to provide an auxiliary southbound right turn lane. Protected right turn overlap phasing would also be added to all approaches. The roundabout alternative consists of two-lanes for the 10 Mile approaches and one-lane for the Taft Road approaches.

Table 11: 10 Mile and Taft Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	**49.8**	**D**	**68.5**	**E**	16.1	B	12.8	B	32.7	C
	Improved Signal	**43.8**	**D**	**55.8**	**E**	23.2	C	18.0	B	32.5	C
	Roundabout	12.3	B	8.9	A	7.0	A	6.1	A	8.1	A
2040 AM Peak	Existing	**49.9**	**D**	**69.2**	**E**	16.5	B	13.4	B	33.2	C
	Improved Signal	**43.7**	**D**	**55.6**	**E**	25.6	C	18.7	B	33.6	C
	Roundabout	12.5	B	8.9	A	7.1	A	6.1	A	8.2	A
2030 PM Peak	Existing	**78.9**	**E**	**70.1**	**E**	15.6	B	30.4	C	**42.5**	**D**
	Improved Signal	**53.8**	**D**	**54.8**	**D**	31.3	C	30.8	C	**39.1**	**D**
	Roundabout	11.7	B	12.4	B	6.0	A	8.2	B	9.0	A
2040 PM Peak	Existing	**80.1**	**F**	**71.5**	**E**	15.6	B	31.0	C	**43.2**	**D**
	Improved Signal	**54.2**	**D**	**54.9**	**D**	31.5	C	31.8	C	**39.7**	**D**
	Roundabout	11.8	B	12.6	B	6.0	A	8.3	A	9.1	A

The existing intersection experiences lengthy delays on the Taft Road approaches during both peak periods. As traffic volumes increase, it is anticipated that the level of service will continue to deteriorate. With the overall intersection expected to operate at a LOS D during the PM Peak in both 2030 and 2040 analysis years.

The improved signal alternative provides a marginal improvement in operations during the future analysis years. The additional lane for the southbound approach reduces the delay for this approach during both peak hours and is especially impactful during the PM Peak. The signal phasing and timing changes allow for a slight reduction in overall intersection delay in the PM Peak.

The roundabout alternative greatly reduces the delay experienced at this intersection. This alternative demonstrates reduced and balanced delays for all approaches during both peak hours. The overall intersection is expected to operate at a LOS A for both peak periods in 2030 and 2040.

10 Mile Road and Novi Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes widening on all four approaches. The 10 Mile road approaches would be widened to provide dual left turn lanes. Additional widening is used to provide auxiliary right turn lanes for both Novi road approaches and the westbound 10 Mile Road approach. The dual left turn lane approaches would be revised to only allow left turns during a protected phase. Protected right turn overlap phasing would be added to the approaches with designated right turn lanes. Switching the signal phasing on 10 Mile to split phase the left turns is also included in this alternative. The roundabout alternative consists of a two-lane roundabout.

Table 12: 10 Mile and Novi Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	35.8	D	30.8	C	53.0	D	44.8	D	42.2	D
	Improved Signal	33.3	C	29.6	C	39.9	D	32.4	C	34.8	C
	Roundabout	10.8	B	5.4	A	9.1	A	7.0	A	8.7	A
2040 AM Peak	Existing	36.2	D	31.2	C	54.3	D	44.1	D	42.7	D
	Improved Signal	33.5	C	29.7	C	40.2	D	32.8	C	35.1	D
	Roundabout	11.1	B	5.5	A	9.2	A	7.1	A	8.9	A
2030 PM Peak	Existing	58.3	E	37.0	D	38.2	D	62.2	E	49.6	D
	Improved Signal	50.4	D	35.3	D	37.5	D	52.0	D	44.2	D
	Roundabout	8.9	A	13.4	B	8.2	A	13.4	B	11.1	B
2040 PM Peak	Existing	61.1	E	37.5	D	38.6	D	65.4	E	51.5	D
	Improved Signal	51.3	D	35.5	D	37.9	D	52.1	D	44.6	D
	Roundabout	9.0	A	13.8	B	8.3	A	13.8	B	11.4	B

The existing intersection experiences lengthy delays on multiple approaches during both peak periods. As traffic volumes increase, it is anticipated that the level of service will continue to deteriorate. Individual approaches are expected to operate at a LOS E during the PM Peak for both 2030 and 2040 analysis years.

The improved signal alternative provides improvement in operations during the future analysis years. Some of the reduction in left turn delay from the dual turn lanes is offset by the change to protected only turn phasing, limiting the measurable improvement. The additional right turn lanes reduce the delay for these approaches during both peak hours. The anticipated operations of this alternative include acceptable LOS D operations for all approaches as well as the overall intersection during the peak hours in both 2030 and 2040.

The roundabout alternative greatly reduces the delay experienced at this intersection. This alternative demonstrates reduced and balanced delays for all approaches during both peak hours. The overall intersection is expected to operate at a LOS A in the AM Peak and a LOS B in the PM Peak in 2030 and 2040.

10 Mile Road and Meadowbrook Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes widening on the Meadowbrook approaches to provide dual left turn lanes. The dual left turn lane approaches would be revised to only allow left turns during a protected phase. Protected right turn overlap phasing would be added to the approaches with designated right turn lanes. The roundabout alternative consists of two-lanes for the 10 Mile approaches and one-lane for the Meadowbrook Road approaches. An additional right turn bypass lane will be provided for the heavy southbound right turn volumes.

Table 13: 10 Mile and Meadowbrook Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	**41.3**	**D**	**42.1**	**D**	14.7	B	16.5	B	24.6	C
	Improved Signal	**36.6**	**D**	33.2	C	20.7	C	**41.0**	**D**	30.6	C
	Roundabout	11.7	B	5.4	A	6.0	A	5.4	A	7.0	A
2040 AM Peak	Existing	**48.7**	**D**	**45.9**	**D**	14.0	B	15.9	B	26.3	C
	Improved Signal	**36.4**	**D**	33.1	C	20.9	C	**41.1**	**D**	30.7	C
	Roundabout	11.8	B	5.4	A	6.0	A	5.5	A	7.1	A
2030 PM Peak	Existing	**57.0**	**E**	**44.3**	**D**	31.8	C	**35.7**	**D**	**40.3**	**D**
	Improved Signal	**54.1**	**D**	**37.9**	**D**	32.0	C	**35.2**	**D**	**38.2**	**D**
	Roundabout	9.2	A	13.3	B	6.5	A	8.9	A	9.4	A
2040 PM Peak	Existing	**56.8**	**E**	**49.9**	**D**	31.1	C	34.7	C	**41.0**	**D**
	Improved Signal	**54.0**	**D**	**38.2**	**D**	32.0	C	**35.8**	**D**	**38.5**	**D**
	Roundabout	9.3	A	13.6	B	6.6	A	9.0	A	9.6	A

The existing intersection experiences lengthy delays on the Meadowbrook Road approaches during both peak periods. In addition, there are substantial delays on westbound 10 Mile in the PM Peak. As traffic volumes increase, it is anticipated that the level of service will continue to deteriorate. The northbound Meadowbrook approach is expected to operate at a LOS E during the PM Peak for both 2030 and 2040 analysis years.

The improved signal alternative provides improvement in operations during the future analysis years. Some of the reduction in left turn delay from the dual turn lanes is offset by the change to protected only turn phasing, limiting the measurable improvement. The anticipated operations of this alternative include acceptable LOS D operations for all approaches as well as the overall intersection during the peak hours in both 2030 and 2040.

The roundabout alternative greatly reduces the delay experienced at this intersection. This alternative demonstrates reduced and balanced delays for all approaches during both peak hours. The overall intersection is expected to operate at a LOS A during both peak hours in 2030 and 2040.

10 Mile Road and Haggerty Road

Alternatives developed for this intersection include both an improved signalized intersection and a roundabout intersection. The signal-controlled alternative includes widening on the 10 Mile approaches to provide dual left turn lanes. The dual left turn lane approaches would be revised to only allow left turns during a protected phase. Additional widening is used to provide auxiliary right turn lanes for both Haggerty Road approaches and the eastbound 10 Mile Road approach. Signal phasing changes include the addition of protected right turn overlap phasing for the designated right turn lanes and split phasing for the 10 Mile approaches. The roundabout alternative consists of a two-lane roundabout.

Table 14: 10 Mile and Haggerty Road Alternative Delay and Level of Service

	Alternative	NB		SB		EB		WB		Overall	
		Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
2030 AM Peak	Existing	**69.1**	**E**	**36.2**	**D**	**43.0**	**D**	**60.2**	**E**	**54.5**	**D**
	Improved Signal	26.6	C	25.1	C	29.9	C	**54.9**	**D**	32.1	C
	Roundabout	10.8	B	5.5	A	8.3	A	8.9	A	8.8	A
2040 AM Peak	Existing	**73.2**	**E**	**36.5**	**D**	**43.0**	**D**	**60.9**	**E**	**56.2**	**E**
	Improved Signal	26.9	C	25.3	C	30.3	C	**54.9**	**D**	32.4	C
	Roundabout	11.1	B	5.6	A	8.4	A	9.0	A	9.0	A
2030 PM Peak	Existing	**75.8**	**E**	**43.3**	**D**	**49.1**	**D**	**68.5**	**E**	**60.2**	**E**
	Improved Signal	**37.3**	**D**	**46.7**	**D**	**37.7**	**D**	**46.0**	**D**	**42.9**	**D**
	Roundabout	7.2	A	**27.5**	**D**	8.5	A	12.1	B	15.1	C
2040 PM Peak	Existing	**77.5**	**E**	**44.3**	**D**	**49.6**	**D**	**71.1**	**E**	**61.8**	**E**
	Improved Signal	**37.5**	**D**	**48.6**	**D**	**37.6**	**D**	**46.6**	**D**	**43.7**	**D**
	Roundabout	7.2	A	**30.1**	**D**	8.6	A	12.4	B	16.1	C

The existing intersection experiences lengthy delays on all approaches during both peak periods. As traffic volumes increase, it is anticipated that the level of service will continue to deteriorate. The northbound and westbound approaches are expected to operate at a LOS E during both Peak hours I nboth 2030 and 2040. The overall intersection is expected to operate at a LOS E during the PM Peak Hour in 2030 and in both peak hours in 2040.

The improved signal alternative provides improvement in operations during the future analysis years. Some of the reduction in left turn delay from the dual turn lanes is offset by the change to protected only turn phasing, limiting the measurable improvement. The additional right turn lanes provide some reduction in delay for those approaches. The anticipated operations of this alternative include acceptable LOS D operations for all approaches as well as the overall intersection during the peak hours in both 2030 and 2040.

The roundabout alternative greatly reduces the delay experienced at this intersection. This alternative demonstrates reduced delays for all approaches during both peak hours. During the PM Peak, this alternative is expected to experience more moderate delay, operating at a LOS D, for the southbound approach. Although this approach delay is higher than the proposed roundabouts at other locations, it represents a reduction in delay over the existing and improved signal alternatives. If additional operational improvements are desired, additional lanes beyond a two-lane roundabout will be necessary. These would most likely take the form of one or more partial by-pass lanes. The overall intersection is expected to operate at a LOS A during the AM Peak and a LOS C during the PM Peak in 2030 and 2040.

10 Mile Road segment between Novi Road and Meadowbrook Road

Concerns about this segment were raised both in the safety analysis and in many public comments. Without consistency in the number of lanes, road users have difficulty navigating the roadway with left turns being especially problematic. Congestion on this portion of the corridor is high during the peak travel times. The congestion related to side streets and driveway movements adds to the high volumes and substantial queues at the major intersections on either end of the segment.

Improvements at the Novi Road and Meadowbrook Road intersections would provide some queue reduction at each end of the segment. In conjunction with any improvements to these intersections, the downstream merge tapers should be evaluated and lengthened if necessary to provide smooth transition in the number of lanes on 10 Mile. Signing and pavement markings may also need adjustment to provide consistent messaging where lanes are ending.

Apart from the intersections, the most substantial concern for this segment is the lack of a continuous center left turn lane. The widening of the roadway to provide a center left turn lane is expected to address many of the safety concerns in this segment and provide limited congestion relief. In some locations, a left turn passing lane has been provided in lieu of a center left turn lane. Where auxiliary lanes have been provided on the right side of the road additional analysis is needed to identify the need for the additional pavement before the pavement widening is designed.

10 Mile Road segment between Cranbrooke and Haggerty

As with the previous segment, concerns about this segment were also first identified in the safety analysis and in many public comments. The concerns on this segment are similar to the Novi to Meadowbrook segment, with road users have difficulty navigating the roadway safely. Congestion on this portion of the corridor is high during the peak travel times. The congestion related to side streets and driveway movements adds to the high volumes and substantial queues at the major Haggerty intersection.

Improvements at the Haggerty Road intersection would provide some queue reduction at that end of the segment. In conjunction with any improvements to this intersection, the downstream merge tapers should be evaluated and lengthened if necessary to provide smooth transition in the number of lanes on 10 Mile. Signing and pavement markings may also need adjustment to provide consistent messaging where lanes are ending.

Apart from this intersection, the most substantial concern for this segment is also the lack of a continuous center left turn lane. The widening of the roadway to provide a center left turn lane is expected to address many of the safety concerns in this segment and provide some congestion relief. In some locations, a left turn passing lane has been provided in lieu of a center left turn lane. Where auxiliary lanes have been provided on the right side of the road additional analysis is needed to identify the need for the additional pavement before the pavement widening is designed.

10 Mile Road Corridor

In addition to the road segments noted above, there are operational and safety concerns throughout the 10 Mile corridor. Many of the road segments have a similar variable number of lanes and a lack of a center left turn lane. The portions of the corridor with more lane consistency and a center left turn lane experience improved operations and safety compared to the segments discussed above. While other segments are not currently classified as high crash rate segments, potential improvements to add a continuous center turn lane should be considered throughout.

CONCLUSION

Under existing conditions, the majority of the intersections within the study area operate with moderate delay. While the overall average intersection delay is often within the acceptable range at these locations, many individual approaches operate at LOS D or LOS E during peak periods.

As traffic volumes are expected to increase throughout the 10 Mile Road study corridor with background growth and planned future developments, it will be necessary to monitor any further degradation of LOS at these intersections. While adjustments in signal timing and phasing will relieve the pressure somewhat at many locations, more substantial improvements will likely be necessary at locations throughout the corridor.

The variable number of lanes throughout the corridor has led to operational, safety and access concerns. Review of crash data indicates crash patterns related to the lack of a center left turn lane in multiple locations throughout the corridor. Two segments were identified as high crash locations, both of these segments saw strong patterns related to lane merges and the lack of a center left turn lane. The addition of a center left turn lane throughout the corridor would reduce these crash patterns, improve access for driveways and side streets and reduce traffic flow obstructions in the corridor.

In the future, the six intersections identified as locations of concern are expected to see long delays with approach and overall intersection LOS expected to be at a ‘E’ or ‘F’, particularly in the PM Peak period. Many of these intersections have already undergone substantial road widening and signal timing adjustments to attempt to minimize delays. At each location, additional widening and signal operational changes can offer some relief. In many cases this relief will be modest with delays remaining just barely acceptable. Alternatively, construction of a roundabout intersection at some or all of these intersections offers greater reduction in delay and commensurate improvement in safety. This type of improvement is also more substantial than the addition of a turn lane and implementation would likely need to be prioritized.

Appendix I

Beck Road Scoping Study

Beck Road Scoping Study Update

Prepared For:

CITY OF NOVI

December 7, 2018

Prepared By:

AECOM

DETROIT – SOUTHFIELD – GRAND RAPIDS – TRAVERSE CITY

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EXECUTIVE SUMMARY

Purpose and Background

Beck Road is a major thoroughfare in the City of Novi. The portion of Beck Road that is encompassed by this study is from 8 Mile Road to Grand River Avenue. The roadway connects M-14 to the south in Plymouth Township with I-96 just north of Grand River Avenue. Traffic along Beck Road includes local traffic with destinations in the area and also regional traffic. The roadway within the study area is generally two lanes wide with additional right-turn and left-turn lanes at the major intersections and at most subdivision intersections.

A detailed Scoping Study for the Beck Road corridor between 8 Mile Road and Grand River Avenue was completed for the City of Novi in 2006 by Fishbeck, Thompson, Carr, and Huber (FTCH). This report is attached as **Appendix B**.

The original report included a traffic capacity analysis, a crash analysis and identified alternative improvements in the corridor. The improvements identified included both long-term improvements and short-term improvements. A complete geotechnical analysis and report as well as construction cost estimates were also completed as part of the original study.

This report is an update of the original Scoping Study and includes:

- Updated Traffic Capacity Analysis
- Updated Crash Analysis
- Updated Cost Estimates
- Recommendations for Long-Term Improvements
- Recommendations for Short-Term Improvements
- An updated geotechnical analysis and report

Implementation of the improvements, potential funding sources, right-of-way acquisition, permitting, maintenance and utility issues are also discussed.

Improvements and Recommended Actions

The existing pavement is in overall poor condition in the corridor, excepting for the section between 8 Mile Road and 9 Mile Road, which was recently rehabilitated. PASER Ratings are included for the corridor in **Appendix D**. The pavement condition on a scale of 1 to 10 (with 1 being poor and 10 excellent) ranges from 2 to 4 from 9 Mile Road to Central Park Boulevard. Between Central Park Blvd. and Grand River Avenue the pavement has a PASER rating of 7. There also are short sections with PASER ratings of 6 and 7 in the corridor which reflect recent widenings and overlays at intersections for new developments.

The pavement will continue to deteriorate and rehabilitation will be needed to extend the life of the roadways until the long-term improvements can be constructed. An HMA pavement preservation overlay could be done to extend the life of the pavement between 9 Mile Road and Central Park Boulevard. The pavement preservation overlay would include cold milling where needed to match existing curbs and driveways and a 2 inch HMA overlay.

The cost for the short-term pavement preservation overlays and turn lane extension work outlined above is summarized below. The estimates were divided into one mile segments, correlating to the long-term improvements. An estimate is not included for the section from 8 Mile Road to 9 Mile Road, as this section was rehabilitated in 2017.

Short-Term Rehabilitation Work	
9 Mile to 10 Mile	$ 884,686.37
10 Mile to 11 Mile	$ 867,902.19
11 Mile to Central Park	$ 690,864.68
TOTAL	**$ 2,443,453.24**

The original study included the widening of Beck Road to five lanes or the addition of a 20 Ft median for the long-term improvements. An additional alternative has also been added for a boulevard with a twenty-five foot wide median which was not included in the original study. A summary of the costs for the long-term improvements follows.

Long-Term Improvements				
	Five Lanes	**20 Ft Median**	**25 Ft Median**	**ROW Parcels**
8 Mile to 9 Mile	$ 7,902,013.69	$ 7,968,081.08	$ 8,009,367.33	26
9 Mile to 10 Mile	$ 7,904,230.52	$ 7,970,297.91	$ 8,011,584.16	14
10 Mile to 11 Mile	$ 8,489,438.41	$ 8,555,505.80	$ 8,596,792.05	4
11 Mile to Grand River	$ 5,180,779.12	$ 5,267,013.17	$ 5,293,281.62	8
TOTAL	**$ 29,476,461.74**	**$ 29,760,897.96**	**$ 29,911,025.16**	**52**

Several improvements have been made to the intersections since 2006 but there are still some short-term improvements that include lengthening storage lanes or adjusting signal timing. The following summary shows the improvement of the signalized intersections with both short-term and long-term improvements.

Signalized Intersection	Weekday AM Peak-hour			Weekday PM Peak-hour		
	Ex. LOS	Short-Term LOS	Long-Term LOS	Ex. LOS	Short-Term LOS	Long-Term LOS
Beck Rd / 8 Mile Rd	**E**	D	C	D	D	C
Beck Rd / 9 Mile Rd	B	B	B	B	B	B
Beck Rd / 10 Mile Rd	D	D	C	**E**	D	D
Beck Rd / Cider Mill Dr	B	B	A	A	A	A
Beck Rd / 11 Mile Rd	D	D	C	B	B	B
Beck Rd / Central Park Blvd	B	B	A	C	C	B
Beck Rd / Grand River Ave	D	D	D	D	D	D

Refer to the Traffic Capacity Analysis section of the study for detailed intersection information.

ENGINEERING ANALYSIS

Long-Term Improvements

The updated traffic capacity analysis and crash analysis reveals that the corridor has the same problems which were identified in the 2006 Scoping Study. The corridor experiences heavy congestion during both the weekday morning (7:00 to 9:00 AM) and weekday afternoon (4:00 to 6:00 PM) peak periods. Crash rates are higher than average compared to other roadways in the SEMCOG region with similar traffic volumes, particularly rear-end collisions which are typically associated with higher levels of congestion.

The limits for the widening recommended in the previous study were from 8 Mile Road to Central Park Boulevard. The roadway is already five lanes wide and would not require further widening from Central Park Boulevard to Grand River Avenue, except for intersection improvements as noted below.

The long-term recommendations for widening Beck Road (from 8 Mile Road to Central Park Boulevard) to a five-lane roadway or a four-lane boulevard roadway in the previous study remain valid (Typical Roadway Cross Sections are provided in **Figure 1**). The three viable options (in no particular order) are as follows:

- **Five-Lane Roadway** with narrow (11 foot wide) median areas where left-turns are not needed and dedicated right-turn lanes where needed at signalized intersections.

- **Boulevard with 20 Foot Median** with dedicated right-turn lanes (where needed) and directional median crossovers. The median width is defined as the distance between the edge of travelled way of the inside lanes. The alternative in the original study included the median only for the segment between 9 Mile Road and 10 Mile Road and the segment between 10 Mile Road and 11 Mile Road. For this update, the median has been extended to include the entire corridor from Eight Mile Road to Central Park Boulevard. Direct-left turns would be allowed at each of the Mile Roads and at the signalized intersections at Cider Mill Road and Central Park Boulevard with this alternative. The original study did not include additional right of way or pavement widening opposite the median crossovers to allow turning vehicles larger than a passenger car. This has been added for this update.

  The 20 foot wide median will allow U-turn movements for passenger vehicles provided that the crossover lines up with a subdivision entrance or a right turn lane. If the crossovers do not line up with a subdivision entrance or a right turn lane, a widening of approximately 7 feet would be required opposite the crossover to accommodate passenger car U-turns. To accommodate a school bus making a U-turn, substantial widening and additional right of way is required, as shown in **Figure 2**.

  For purposes of the estimate, two school bus compatible crossovers are included for each segment between signalized intersections. These would be placed just prior to the signalized intersections. For example, there would be one just north of 8 Mile Road for southbound traffic and one just south of 9 Mile Road for northbound traffic.

- **Boulevard with 25 Foot Median** is very similar to the second option, excepting that the median would be twenty five feet wide instead of twenty feet. The additional pavement widening needed to accommodate passenger car U-turns where there is no right turn lane or subdivision entrance pavement available reduces to approximately 2 feet with this option. The widening and additional right-of-way needed to accommodate school bus U-turns is also reduced as shown in **Figure 3**. This option was not included in the previous study.

  As shown in the typical Roadway Cross Section, there is a 14 foot wide greenbelt between the back of curb and the eight foot wide pathway with the 25 foot wide median option. Where there is a right turn lane for an approach to an intersection, the greenbelt reduces to 3 feet, which is the minimum needed for placing traffic signs. A 25 foot wide median could be considered the widest feasible median within the right of way for this reason.

For each of the boulevard options, the median width could remain consistent even through the signalized intersections. This would reduce the “hourglass” effect of narrowing the roadway at the signalized intersections. The left turn lanes for the signalized intersections would be more than a lane wide and line up directly opposite each other. The additional width would be a striped island between the left turn lane and the adjacent through lane.

Note that **Figure 2** and **Figure 3** show the additional right of way to accommodate a standard school bus making a U-turn. Consideration should be given to widening the crossovers an additional five to seven feet. This would allow for single unit trucks and/or WB-50 semi-trucks to make the U-turns also. Additional study is needed to determine the appropriate design vehicle for the crossovers and the exact location of the crossovers before right-of-way requirements are finalized.

Improvements at the Grand River Avenue/Beck Road intersection are included in each of the long-term options. They include:

- Adding a dual left turn lane for the westbound Grand River Avenue to southbound Beck Road. A second 180-foot left turn lane can be added in the available hatched space with pavement marking changes and minor modifications to the traffic signal.
- Adding a dedicated right turn lane for northbound Beck Road to eastbound Grand River Avenue.

For all of the options, the new roadway would feature:

- Continuous curb and gutter in lieu of the existing shoulders.

- Removal and replacement of the existing aggregate base. The alternative in the November 2018 geotechnical report for the project (**Appendix E**) which includes selective undercuts and a layer of Geogrid on the subgrade is assumed.

- An enclosed storm sewer system in lieu of ditches except where permitting requires ditch retention. The storm sewer would run on the outside of the roadway for the five lane option. The storm sewer could be either on the outside or in the median for the boulevard options. The storm sewer would outlet in the same locations as the existing ditches so that the existing drainage patterns are retained.

- Edge drains are included to drain the subgrade and maximize pavement life.

- Relocation of all water main and sanitary sewers within the Beck Road right-of-way.

- A continuous 8-foot wide HMA pathway on the west side.

- Removal and replacement of all boardwalks within the corridor and new boardwalks where new pathways cross wetland areas.

- A continuous 6-foot wide concrete sidewalk on the east side.

Detailed cost estimates are included in **Appendix A** for each of the alternatives. The estimates are divided into mile long segments. Securing funding and constructing the improvements in mile long sections is anticipated.

Note: A 120-foot wide right-of-way is required for each of the options. Additional right of way beyond the 120 foot wide right-of-way is required to accommodate school bus U-turn crossovers, as shown in **Figure 2** and **Figure 3**.

The cost estimates are based upon total reconstruction of the roadway and include right-of-way acquisition and all other anticipated costs including engineering, inspection and testing. Replacing all of the sanitary sewer and water main in the corridor is also included.

The estimates include the sidewalks and non-motorized pathways outlined in the City of Novi Non-Motorized Master Plan. Boardwalks are included where needed to minimize impacts to wetland areas.

New mast arm traffic signals similar to those along Grand River Avenue are included for each signalized intersection.

Street lighting and landscaping are not included in the estimates but could be added if desired.

Short-Term Improvements

Given the high cost of the long-term improvements, and uncertainty as to when they can be completed, short-term improvements were also identified. The short-term improvements identified in the 2006 Scoping Study have largely already been completed. These included the addition of dedicated turn lanes at the signalized intersections to improve operations. Based on the updated traffic capacity and crash analysis herein we have identified areas where the existing turn lanes could be extended to improve operations. These include:

- Beck Rd/9 Mile Rd: Extend the northbound right-turn lane storage to 300 feet.
- Beck Rd/9 Mile Rd: Extend the southbound left-turn lane storage to 300 feet.
- Beck Rd/10 Mile Rd: Extend the northbound left-turn lane storage to 400 feet.

- Beck Rd/8 Mile Rd: Add a 250-foot long northbound right-turn lane, with overlapping green arrow. ***(This improvement falls within Northville Township, not the City of Novi)***
- Beck Rd/8 Mile Rd: Extend the northbound left-turn lane storage to 250 feet. ***(This improvement falls within Northville Township, not the City of Novi)***

The existing traffic signal at 11 Mile Road has a diagonal span configuration. Other signals in the corridor have a box span configuration. This traffic signal should be upgraded to a box span configuration with flashing yellow arrow displays for all four left-turn movements to improve safety and operations. Signal replacement is included in the construction estimate.

In addition, signal timings could be adjusted to improve operations throughout the corridor. This should be discussed with the Road Commission for Oakland County (RCOC). Beneficial signal timing adjustments along the corridor are:

- Beck Road/8 Mile Road: Shift a small portion of green time from the north/south through movements to the east/west through movements.
- Beck Road/10 Mile Road: Shift a small portion of green time from the north/south through movements to the north/south left-turn movements.
- Beck Road/11 Mile Road: Shift some green time from the north/south through movements to the east/west through movements, and (to a lesser extent) all four left-turn movements.

Dedicated right-turn lanes and left-turn lanes are present at the signalized intersections in the corridor. For the major subdivision entrances there are typically either left-turn lanes or passing lanes to allow turning movements without impeding the heavy through traffic movements. Two exceptions are at Beck Road/Ashley Road and Beck Road/Sanford Road. A passing lane for Sanford Road and a left-turn lane for Ashley Road are recommended.

Right-of-Way

The long-term improvements will require a 120-foot wide right-of-way. The existing right-of-way width varies between the statutory 66-foot easement and 120-foot wide dedicated right-of-way. **Appendix C** provides maps of the right-of-way takes required by parcel for the entire corridor. The maps are divided into one mile long segments.

The required roadway for the long-term improvements total 563,484 square feet from 52 different parcels. The total estimated cost for the right-of-way acquisition is $1,030,974.12. Right-of-way costs are included in the estimates for the long-term improvements along with all other costs. No additional right-of-way is required for the short-term rehabilitation work.

Landscaping/Maintenance

The City of Novi may consider including landscaping and irrigation along Beck Road. The landscaping will require regular mowing, weeding and trimming. Any irrigation lines installed will require annual maintenance and clearing before winter months. Although the option to beautify the corridor may be appealing the long-term feasibility should be analyzed prior to any decisions.

Utilities

There are existing City-owned water mains and sanitary sewers within the corridor. The short-term improvements outlined should not impact these facilities, excepting that structure cover adjustments and hydrant relocations will be needed.

The widening for the long-term improvements will impact the existing water mains and sanitary sewers. The existing water mains and sanitary sewers are located at varying offsets from the centerline of the roadway. Much of this existing infrastructure will be located under the pavement or curb lines if not relocated. Conflicts with the new storm sewer system also are likely and relocation could be needed because of these conflicts. These facilities also may be nearing their useful design life and due for replacement. Relocating to a consistent utility corridor under greenbelt areas or under sidewalks near the right of way line also makes future maintenance much easier.

Costs for replacing all of the water mains and sanitary sewers within the corridor are included in the estimates. During detailed design it may be determined that some of the existing water main and sanitary sewer can remain which would reduce project costs.

Privately owned utilities (electric, gas, CATV, telephone) will need to be relocated to accommodate the widened roadway and this work will need to be coordinated. These costs are typically the responsibility of the utility owners and are not reflected in the estimates.

TRAFFIC CAPACITY ANALYSIS

Existing Conditions

AECOM conducted a high-level capacity analysis for the Beck Road corridor from 8 Mile Road to Grand River Avenue. The capacity analysis was based on new traffic data collected during March 2018. Weekday morning and afternoon peak-hour turning movement counts were collected by Transportation Improvement Association (TIA) personnel. In addition, the latest signal timings were provided by the RCOC for the seven signalized intersections within the study area.

Utilizing the turning movement counts and signal timing data, existing condition traffic models were created for the Beck Road corridor, for the weekday morning and afternoon peak-hours. The traffic models were created using the *Synchro 9.0* analysis software.

In order to quantify intersection traffic operations at the study-area intersections, existing level-of-service (LOS) values were determined using the industry-standard methodology presented in the Highway Capacity Manual (2010), published by the Transportation Research Board (TRB).

The term "level-of-service" (LOS) denotes how well (or poorly) a traffic movement operates under given traffic demands, lane configurations, and traffic controls. Each level is determined by the average amount of control delay per vehicle. Control delay is the total delay associated with stopping for a traffic signal or stop sign, and includes four components: deceleration delay, queue move up time, stopped delay, and final acceleration delay.

As shown in **Table 1**, LOS "A" indicates small average control delays (less than ten seconds per vehicle) whereas LOS "F" indicates intersection failure, resulting in extensive vehicular queues and long delays (over 80 seconds per vehicle at a signalized intersection). LOS "D" (or better) is typically considered acceptable performance and low LOS values are tolerable for short time periods or during peak-hours when heavier traffic volumes are expected.

Table 1. Level-of-Service (LOS) Criteria at Intersections

LOS	Signalized Intersections Control Delay (sec/veh)	Unsignalized Intersections Control Delay (sec/veh)
A	⩽10	⩽10
B	10 - 20	10 - 15
C	20 - 35	15 - 25
D	35 - 55	25 - 35
E	55 - 80	35 - 50
F	>80	>50

Source: Highway Capacity Manual (2010)

Table 2 summarizes the existing (2018) overall intersection LOS values. As shown in Table 2, two Beck Road intersections currently operate with a poor LOS during the weekday peak-hours – 8 Mile Road during the morning peak and 10 Mile Road during the afternoon peak each operate at LOS E.

Table 2. Existing (2018) Overall Intersection LOS

Signalized Intersection	Weekday AM Peak-hour			Weekday PM Peak-hour		
	LOS	Delay (sec/veh)	V/C Ratio	LOS	Delay (sec/veh)	V/C Ratio
Beck Rd / 8 Mile Rd	**E**	**60.2**	0.98	D	41.0	0.85
Beck Rd / 9 Mile Rd	B	10.5	0.50	B	13.2	0.53
Beck Rd / 10 Mile Rd	D	36.2	0.88	**E**	**57.0**	**1.05**
Beck Rd / Cider Mill Dr	B	10.1	0.50	A	7.1	0.47
Beck Rd / 11 Mile Rd	D	52.9	0.86	B	14.6	0.65
Beck Rd / Central Park Blvd	B	10.7	0.60	C	24.4	0.65
Beck Rd / Grand River Ave	D	48.9	0.86	D	51.4	0.87

Source: AECOM, August 2018

Several individual turning movements currently operate with a poor LOS during the weekday morning and afternoon peak-hours. These poorly operating movements are concentrated at the 11 Mile Road and Grand River Avenue intersections during the morning peak-hour. They are also concentrated at the 10 Mile Road and Grand River Avenue intersections during the afternoon peak-hour. A summary of the poorly operating turning movements is provided in **Table 3**.

As shown in Table 3, several movements are barely operating above the LOS E threshold, with volume-to-capacity (V/C) ratios well under 1.0. The side-street movements at Cider Mill Drive and Central Park Boulevard are relatively low-volume movements and do not represent capacity concerns. There are currently no poorly operating traffic movements at the 9 Mile Road intersection.

Table 3. Existing (2018) Poorly Operating Traffic Movements

Signalized Intersection	Weekday AM Peak-hour			Weekday PM Peak-hour		
	LOS	Delay (sec/veh)	V/C Ratio	LOS	Delay (sec/veh)	V/C Ratio
Beck Rd / 8 Mile Rd:						
- Eastbound Thru	F	138.9	**1.17**			
- Westbound Thru				F	86.6	**1.00**
- Westbound Left	F	92.8	0.96			
Beck Rd / 10 Mile Rd:						
- Eastbound Thru	E	56.1	0.87			
- Westbound Thru				E	72.5	0.95
- Northbound Left	E	68.1	0.94	F	131.9	**1.16**
- Southbound Thru				E	64.8	0.80
Beck Rd / Cider Mill Dr:						
- Eastbound Left/Thru/Right	E	61.1	0.55	E	55.1	0.08
- Westbound Left/Thru/Right				E	55.1	0.09
Beck Rd / 11 Mile Rd:						
- Eastbound Left	E	75.0	0.82			
- Eastbound Thru/Right	F	146.2	**1.14**	E	55.0	0.36
- Westbound Left	E	57.1	0.37			
- Westbound Thru/Right	F	101.3	0.97			
- Southbound Left	E	55.3	0.17			
Beck Rd / Central Park Blvd:						
- Eastbound Left	E	64.0	0.62	E	65.5	0.74
Beck Rd / Grand River Ave:						
- Eastbound Left	E	55.0	0.78	F	98.1	**1.03**
- Westbound Left				E	55.3	0.58
- Northbound Left	E	68.0	0.60	E	62.1	0.66
- Northbound Thru/Right	E	57.5	0.91			
- Southbound Left	F	97.2	0.99	E	55.1	0.67

Source: AECOM, August 2018

Short-Term Improvements

The high-level capacity analysis focused on improving the poorly operating turning movements listed in Table 3. The previous study (conducted in 2006) identified several short-term capacity improvements that could be implemented. At that time, short-term improvements were recommended at the 8 Mile Road, 9 Mile Road, 10 Mile Road, and 11 Mile Road intersections. The following recommended capacity improvements were subsequently implemented at 8 Mile Road and 10 Mile Road (no improvements were implemented at 9 Mile Road and 11 Mile Road):

- Beck Rd/8 Mile Rd: Add a dedicated right-turn lane to the southbound approach.
- Beck Rd/10 Mile Rd: Add dedicated right-turn lanes to the northbound, southbound, and eastbound approaches.
- Beck Rd/10 Mile Rd: Extend the westbound right-turn lane.
- Beck Rd/10 Mile Rd: Upgrade the traffic signal.

Based on the new traffic data and capacity analysis, AECOM recommends the following short-term capacity improvements:

- Beck Rd/9 Mile Rd: Extend the northbound right-turn lane storage to 300 feet.
- Beck Rd/9 Mile Rd: Extend the southbound left-turn lane storage to 300 feet.
- Beck Rd/10 Mile Rd: Extend the northbound left-turn lane storage to 400 feet.
- Beck Rd/11 Mile Rd: Upgrade the traffic signal to a box-span or mast arm layout, with flashing yellow arrow displays for all four left-turn movements.
- General: Adjust signal timing splits as necessary to optimize operations.
- Beck Rd/8 Mile Rd: Add a 250-foot long northbound right-turn lane, with overlapping green arrow. ***(This improvement falls within Northville Township, not the City of Novi)***
- Beck Rd/8 Mile Rd: Extend the northbound left-turn lane storage to 250 feet. ***(This improvement falls within Northville Township, not the City of Novi)***

These recommended short-term improvements would only be implemented if long-term improvements could not be implemented within a certain number of years, as defined by the City of Novi. These improvements could be implemented as part of lower cost roadway improvement projects, such as a pavement resurfacing or pavement preservation overlay (which is a common construction method used by the RCOC). Implementation of these recommended improvements would improve many of the current poorly-operating areas.

A summary of the overall intersection LOS values, with recommended short-term capacity improvements in place, is provided in **Table 4**. As shown in Table 4, all intersections are projected to operate with an acceptable LOS D or better if the above-bulleted short-term improvements are implemented. All intersections are projected to operate with a V/C ratio of less than 1.0.

Table 4. Projected (2018) Overall Intersection LOS (with Short-Term Improvements)

Signalized Intersection	Weekday AM Peak-hour			Weekday PM Peak-hour		
	LOS	Delay (sec/veh)	V/C Ratio	LOS	Delay (sec/veh)	V/C Ratio
Beck Rd / 8 Mile Rd	D	50.7	0.97	D	37.4	0.82
Beck Rd / 9 Mile Rd	B	11.3	0.50	B	13.2	0.53
Beck Rd / 10 Mile Rd	D	36.8	0.87	D	54.2	0.99
Beck Rd / Cider Mill Dr	B	10.6	0.50	A	7.1	0.47
Beck Rd / 11 Mile Rd	D	38.9	0.84	B	14.0	0.66
Beck Rd / Central Park Blvd	B	11.2	0.60	C	24.0	0.65
Beck Rd / Grand River Ave	D	47.8	0.84	D	49.9	0.84

Source: AECOM, August 2018

It should be noted that some of the Beck Road/Grand River Avenue intersection was reconstructed in 2014 and 2015 with dual left-turn lanes on the eastbound approach and a lengthened right-turn lane on the westbound approach.

No short-term capacity recommendations are recommended at the Beck Road/Grand River Avenue intersection. However, the addition of a 340-foot long northbound-to-eastbound right-turn lane is recommended (with overlapping right-turn green arrow) to improve the operation of this approach. Also, the addition of dual left-turn lanes on the northbound and westbound approaches are recommended. These improvements are not critical in the short-term, and should be considered as part of any long-term Beck Road widening project.

Long-Term Improvements

AECOM also reviewed the long-term capacity needs of the corridor. The Beck Road corridor will require, at a minimum, a five-lane cross-section throughout the study area. The biggest capacity issues are currently at 8 Mile Road and 10 Mile Road intersections, and to a lesser extent at the 11 Mile Road intersection during the morning peak-hour. Two northbound and two southbound through lanes are needed along Beck Road at all three intersections. Although there are currently no capacity issues at 9 Mile Road, it is not recommended to reduce the number of north/south through lanes along Beck Road at this intersection, only to introduce additional through lanes again to the north and south.

Numerous driveways and intersecting streets also make a five-lane section desirable along Beck Road, by removing left-turning vehicles from the through lanes of traffic. ***From through capacity standpoint, a five-lane cross-section or a four-lane boulevard are essentially the same.***

In order to evaluate the operational impact of long-term improvements, existing (2018) traffic volumes were grown ten years into the future to the year 2028. An annual traffic growth rate was used to estimate growth on the study area roadway network based on information provided by the Southeastern Michigan Council of Governments (SEMCOG). SEMCOG population projections for Novi are only showing a 0.6% per year growth in population from 2015 to 2030. Based on the information, an annual growth rate of 0.5% was applied to existing (2018) traffic volumes to determine future (2028) traffic volumes.

Future (2028) peak-hour traffic volumes were input into the traffic models to produce a long-term capacity analysis. The widening of Beck Road would improve the operation of the signalized intersections along the corridor under future conditions. A summary of the overall intersection LOS values, with recommended long-term capacity improvements in place, is provided in **Table 5**. As shown in Table 5, all intersections are projected to operate with an acceptable LOS D or better.

Table 5. Projected (2028) Overall Intersection LOS (with Long-Term Improvements)

Signalized Intersection	Weekday AM Peak-hour			Weekday PM Peak-hour		
	LOS	Delay (sec/veh)	V/C Ratio	LOS	Delay (sec/veh)	V/C Ratio
Beck Rd / 8 Mile Rd	C	34.3	0.77	C	30.1	0.64
Beck Rd / 9 Mile Rd	B	11.2	0.33	B	11.8	0.36
Beck Rd / 10 Mile Rd	C	28.6	0.74	D	40.5	0.83
Beck Rd / Cider Mill Dr	A	6.7	0.30	A	4.9	0.27
Beck Rd / 11 Mile Rd	C	29.1	0.62	B	10.2	0.43
Beck Rd / Central Park Blvd	A	8.8	0.38	B	16.3	0.43
Beck Rd / Grand River Ave	D	46.0	0.85	D	46.5	0.87

Source: AECOM, November 2018

CRASH ANALYSIS

Traffic crash data for a four-year period from May 1, 2014 to May 1, 2018 was supplied by the Transportation Improvement Association (TIA) Traffic Crash Analysis Tool (TCAT) 2.0. Crashes were reviewed at five intersections and four roadway segments along Beck Road from 8 Mile Road to Grand River Avenue.

Beck Road Intersections

1. Beck Road at 8 Mile Road
2. Beck Road at 9 Mile Road
3. Beck Road at 10 Mile Road
4. Beck Road at 11 Mile Road
5. Beck Road at Grand River Avenue

Beck Road Segments

1. Beck Road north of 8 Mile Road to south of 9 Mile Road
2. Beck Road north of 9 Mile Road to south of 10 Mile Road
3. Beck Road north of 10 Mile Road to south of 11 Mile Road
4. Beck Road north of 11 Mile Road to south of Grand River Avenue

Intersection Crashes

Total crashes for the four-year period for each of the five intersections varied greatly, ranging from 32 to 134 crashes. No fatalities and three “A” level injury crashes were reported during the four-year period at the five study area intersections. “A” level injury crashes include individuals who sustained incapacitating injuries, such as broken limbs or paralysis.

A breakdown of crashes for each intersection by crash type are depicted in **Table 6**.

Table 6. Beck Road Intersections - Traffic Crash History (05/01/2014 thru 05/01/2018)

Intersection	Crash Type										Injuries		Crash Rate (1)
	TOTAL	Animal	Fixed Object	Misc Single Vehicle	Head-On	Head-On LT	Angle	Rear-End	Side-swipe	Other	Total	"A" Injury	
Beck Rd/ 8 Mile Rd	**134**	3	1	1	1	6	9	108	3	2	30	1	**3.02**
Percent	**100%**	**2%**	**1%**	**1%**	**1%**	**4%**	**7%**	**81%**	**2%**	**1%**			
Beck Rd/ 9 Mile Rd	**33**	0	3	1	0	1	0	25	2	1	8	1	**1.07**
Percent	**100%**	**0%**	**9%**	**3%**	**0%**	**3%**	**0%**	**76%**	**6%**	**3%**			
Beck Rd/ 10 Mile Rd	**111**	0	0	1	1	7	12	80	6	4	22	1	**2.28**
Percent	**100%**	**0%**	**0%**	**1%**	**1%**	**6%**	**11%**	**72%**	**5%**	**4%**			
Beck Rd/ 11 Mile Rd	**32**	2	0	1	0	0	5	23	1	0	5	0	**1.00**
Percent	**100%**	**6%**	**0%**	**3%**	**0%**	**0%**	**16%**	**72%**	**3%**	**0%**			
Beck Rd/ Grand River Ave	**132**	1	1	0	0	1	6	94	22	7	22	1	**1.80**
Percent	**100%**	**1%**	**1%**	**0%**	**0%**	**1%**	**5%**	**71%**	**17%**	**5%**			

Source: Crash Data - Traffic Crash Analysis Tool 2.0, Transportation Improvement Association
Source: Crash Rates - Crash Analysis Process, SEMCOG, Appendix A, Table 1.4, January 2016
(1) Crashes per million entering vehicles.
Note: Intersection crashes include those within a 200-foot buffer.
No fatal crashes were reported for the 4-year study period.

Less than 35% above average crash rate
More than 100% above average crash rate

SEMCOG AVERAGE RATES -
SIGNALIZED INTERSECTIONS

Entering ADT	Crash Rate
1 - 10,000	1.55
10-20,000	0.87
20-30,000	0.96
30-40,000	1.07
40-50,000	1.14
50-60,000	1.35

All five intersections had crash rates above the SEMCOG average. However, three intersections (in darker orange in Table 6) had crash rates much higher than the average rate. It is likely the high level of traffic volumes and resultant congestion contribute to the high crash rates at the five Beck Road intersections. Hazardous actions were also likely contributors to crash causation as the incidence of hazardous actions was very high at every intersection. For the five Beck Road intersections, hazardous actions occurred in 80% to 88% of the crashes. A vast majority of the crashes with hazardous actions were failure to stop in an assured clear distance.

A robust rear-end crash pattern occurred at all five intersections - ranging from 71% to 81% of all crashes by intersection. Beck Road is a heavily congested corridor, contributing to the high number of rear-end crashes. In addition, I-275 was closed in 2016 and while Beck Road was not a designated detour route, Beck Road was utilized as an alternative route, which likely was a contributor toward a spike in Beck Road intersection crashes in 2016 compared to intersection crashes in 2015 and 2017.

The prevalence of rear-end crashes at the five intersections, based on a review of UD-10s indicate that traffic congestion and back-ups at the signals contributed to the pattern of rear-end crashes. Another factor in rear-end crashes was the prevalence of rear-end crashes that included the driver at fault being noted on UD-10s for failure to stop in an assured clear distance.

Angle crashes were most common at the Beck Road/11 Mile Road intersection (16% of intersection crashes) and the Beck Road/10 Mile road intersection (11%). Angle crashes were much less prevalent at the other intersections (7% or less of total intersection crashes).

Side-swipe crashes ranged from 2% to 17% per intersection, with the Beck Road/Grand River Avenue intersection having the highest percentage of side-swipe crashes. The higher percentage of side-swipe crashes at the Beck Road/Grand River Avenue intersection may be at least in part due to the high volume of left-turning and right-turning traffic at the intersection, particularly at the eastbound and southbound approaches, which had 15 of the 22 side-swipe crashes. Most side-swipe crashes occurred during the morning peak-hours (7 crashes from 7:00 to 9:00 AM), after school (4 crashes from 2:30 to 4:00 PM), or the afternoon peak-hours (5 crashes from 4:00 to 6:00 PM).

Segment Crashes

Beck Road segmental crashes ranged from between 50 and 60 crashes on three segments: 8 Mile Road to 9 Mile Road, 9 Mile Road to 10 Mile Road and 10 Mile Road to 11 Mile Road. The 11 Mile Road to Grand River Avenue segment had 84 crashes reports. Amongst the four segments, one fatal crash and one “A” injury crash were reported during the four-year period.

Fatal Crash - The fatal crash was a head-on crash that occurred on November 19, 2017 (Sunday) at 9:16 AM, on Beck Road 650 feet south of 9 Mile Road. A witness stated that they saw Vehicle 1 driving erratically on southbound Beck Road. Vehicle 1 crossed the centerline and struck a northbound vehicle (Vehicle 2). The driver of Vehicle 1 suffered fatal injuries and the driver of Vehicle 2 suffered “A” level injuries. The crash occurred under wet surface conditions in snowy weather. Alcohol was not a factor in the crash. The UD-10 noted a hazardous action by the driver of Vehicle 1 – drove left of center.

Pedestrian Crash - The pedestrian crash occurred on August 21, 2015 (Friday) at 4:57 PM, at the Beck Road/Providence Drive/Central Park Boulevard intersection. The driver of Vehicle 1 was eastbound on Providence Drive and turned left onto northbound Beck Road. A pedestrian was in the Beck Road crosswalk on the north leg of the intersection. The driver of Vehicle 1 failed to yield and struck the pedestrian. The pedestrian suffered minor injuries. The crash occurred under dry surface conditions in clear weather. Alcohol was not a factor in the crash. The driver was cited for failure to yield.

A breakdown of all study area segmental crashes by crash type along Beck Road is depicted in **Table 7**.

Table 7. Beck Road Segments – Traffic Crash History (05/01/2014 thru 05/01/2018)

Segment	Length (miles)	Crash Type: TOTAL	Animal	Fixed Object	Misc Single Vehicle	Head-On	Head-On LT	Angle	Rear-End	Side-swipe	Other	Injuries: Total	"A" Injury
Beck Rd – 8 Mile Rd to 9 Mile Rd (1)	0.93	54	7	3	2	1	0	1	37	1	2	14	0
Percent		**100%**	**13%**	**6%**	**4%**	**2%**	**0%**	**2%**	**69%**	**2%**	**4%**		
Beck Rd - 9 Mile Rd to 10 Mile Rd (2)	0.93	52	8	1	3	1	1	5	29	2	2	17	1
Percent		**100%**	**15%**	**2%**	**6%**	**2%**	**2%**	**10%**	**56%**	**4%**	**4%**		
Beck Rd - 10 Mile Rd to 11 Mile Rd (3)	0.92	58	4	2	0	1	1	1	47	2	0	14	0
Percent		**100%**	**7%**	**3%**	**0%**	**2%**	**2%**	**2%**	**81%**	**3%**	**0%**		
Beck Rd - 11 Mile Rd to Grand River Ave (4)	0.60	84	2	1	0	0	0	3	68	7	3	20	0
Percent		**100%**	**2%**	**1%**	**0%**	**0%**	**0%**	**4%**	**81%**	**8%**	**4%**		

Source: Traffic Crash Analysis Tool 2.0, Transportation Improvement Association
(1)From 200 feet north of 8 Mile Road to 200 feet south of 9 Mile Road
(2)From 200 feet north of 9 Mile Road to 200 feet south of 10 Mile Road
(3)From 200 feet north of 10 Mile Road to 200 feet south of 11 Mile Road
(4)From 200 feet north of 11 Mile Road to 200 feet south of Grand River Avenue
NOTE: 1 fatal crash was reported over the four-year study period (Beck Road between 8 Mile Road and 9 Mile Road).
1 pedestrian crash was reported over the four-year study period (Beck Road between 11 Mile Road and Grand River Avenue).

All four segments had a marked rear-end crash pattern, ranging from 56% to 81% amongst the segments. As with the above Beck Road intersection crashes, the I-275 closure in 2016 likely contributed to a spike in Beck Road segmental crashes in 2016, compared to segmental crashes in 2015 and 2017.

The prevalence of rear-end crashes along the four segments, based on a review of UD-10s indicate that traffic congestion and back-ups along Beck road contributed to the pattern of rear-end crashes. Another factor in rear-end crashes was the prevalence of rear-end crashes that included the driver at fault being noted on UD-10s for failure to stop in an assured clear distance.

Animal crashes were somewhat common within the 8 Mile Road to 9 Mile Road segment (13%) and the 9 Mile Road to 10 Mile Road segment (15%). The higher frequency of animal (deer) crashes on these two segments of Beck Road are likely due to the lower density of development along Beck Road between 8 Mile Road and 10 Mile Road compared to segments north of 10 Mile Road.

The only segment with another crash type of 10% or more was angle crashes (10%) within the 9 Mile Road to 10 Mile Road segment. Three of the five angle crashes in this segment of Beck Road involved a vehicle turning into or out of Baker Street and failing to yield to a northbound through vehicle on Beck Road. Traffic backups on northbound Beck Road were a factor in two of these three angle crashes. The other two angle crashes involved a northbound left-turning vehicle at Iroquois Court failing to yield to a southbound Beck Road through vehicle, and an eastbound private residence drive vehicle turning left onto Beck Road (500 feet south of 10 Mile Road) and failing to yield to a southbound Beck Road through vehicle.

Segment Hot Spots

There were six (6) hot spots along Beck Road in the study area. Each cluster revealed a strong pattern of rear-end crashes, as 57 of the 75 total crashes in the six hot spot areas (76%) were comprised of rear-end crashes. Crashes during peak-hours, defined as 7:00 to 9:00 AM and 4:00 to 6:00 PM, were common amongst rear-end crashes. Following is a description of each hot spot.

Beck Road from 200 feet north of 8 Mile Road to 500 feet north of 8 Mile Road - 16 crashes in a 300-foot segment

Thirteen of the sixteen crashes were rear-end and three were single vehicle. Most of the rear-end crashes occurred on southbound Beck Road approaching 8 Mile Road (between 250 feet and 500 feet north of 8 Mile Road). UD-10s for these crashes noted that traffic back-ups on southbound Beck Road as contributing to the pattern of rear-end crashes at this hot spot. Five of the thirteen rear-end crashes occurred during the peak-hour (7:00 to 9:00 AM – 2 crashes, and 4:00 to 6:00 PM – 3 crashes) and five occurred after dark. Three rear-end crashes occurred on a slippery road surface. One of the three single vehicle crashes involved alcohol.

Beck Road from 500 feet south of 8 Mile Road to 200 feet south of 8 Mile Road - 14 crashes in a 300-foot segment

Ten of the fourteen crashes were rear-end, three single vehicle, and one angle. Most of the rear-end crashes occurred on northbound Beck Road approaching 9 Mile Road (between 200 feet and 500 feet south of 9 Mile Road). UD-10s for these crashes noted that traffic back-ups on northbound Beck Road as contributing to the pattern of rear-end crashes at this hot spot. Six (4 morning, 2 afternoon) of the ten rear-end crashes occurred during the peak-hour and two occurred after dark. One rear-end crash occurred on a slippery road surface.

Beck Road from 470 feet south of 10 Mile Road to 200 feet south of 10 Mile Road - 16 crashes in a 270-foot segment

Eleven of the sixteen crashes were rear-end, three angle, one head-on left-turn, one sideswipe-same, and one other. Most of the rear-end crashes occurred on northbound Beck Road approaching 10 Mile Road (between 200 feet and 470 feet south of 10 Mile Road). UD-10s for these crashes noted that traffic back-ups on northbound Beck Road as contributing to the pattern of rear-end crashes at this hot spot. Four of the eleven rear-end crashes occurred during the peak-hour (1 morning, 3 afternoon), two occurred after dark, and two occurred on a slippery road surface. Five of the sixteen crashes occurred at the intersection of Beck Road/Baker Street (all three of the angle crashes noted above occurred at the intersection).

Beck Road from 530 feet south of 11 Mile Road to 250 feet south of 11 Mile Road - 13 crashes in a 280-foot segment

Twelve of the thirteen crashes were rear-end and one was a single vehicle. Most of the rear-end crashes occurred on northbound Beck Road approaching 11 Mile Road (between 200 feet and 480 feet south of 11 Mile Road). UD-10s for these crashes noted that traffic back-ups on northbound Beck Road as contributing to the pattern of rear-end crashes at this hot spot. Three of the twelve rear-end crashes occurred during the peak-hour (2 morning, 1 afternoon), none occurred after dark, and two occurred on a slippery road surface.

Beck Road from 200 feet north of 11 Mile Road to 300 feet north of 11 Mile Road - 10 crashes in a 100-foot segment

Seven of the ten crashes were rear-end, two were side-swipe, and one was a single vehicle. Most of the rear-end crashes occurred on southbound Beck Road approaching 11 Mile Road (between 200 feet and 300 feet north of 11 Mile Road). UD-10s for these crashes noted that traffic back-ups on southbound Beck Road as contributing to the pattern of rear-end crashes at this hot spot. Two of the seven rear-end crashes occurred during the peak-hour, two occurred after dark, and four occurred on a slippery surface. The two side-swipe crashes occurred during the peak-hour (both afternoon).

Beck Road from 1,750 feet south of Grand River Ave to 1,620 feet south of Grand River Ave - 16 crashes in a 130-foot segment

Eleven of the sixteen crashes were rear-end, three angle, one single vehicle, and one other. All sixteen hot spot crashes occurred at the Beck Road/Providence Drive/Central Park Boulevard intersection. All eleven rear-end crashes occurred on Beck Road (7 northbound, 4 southbound). All of the rear-end crashes, based on a review of UD-10s, occurred when a trailing vehicle struck a stopped or slowing vehicle on one of the Beck Road approaches to the intersection. Five of the eleven rear-end crashes occurred during the peak-hour (1 morning, 4 afternoon), one occurred after dark, and two occurred on a slippery road surface.

IMPLEMENTATION

For the long-term improvements, preparation of an Environmental Assessment would be required if federal funding is used. Much of the information required for the Environmental Assessment has already been developed. Approval of the Environmental Assessment would be required before construction using federal funds can begin.

The long-term improvements also would likely require permits from the Michigan Department of Environmental Quality. The estimates include the cost of boardwalks in anticipation that these would be required by MDEQ to reduce impacts to wetland areas. The MDEQ also may require providing detention to offset the increased runoff which will result from additional impervious pavement area resulting from the widening. Detention, if required, is not accounted for in the estimates.

Permits from the Oakland County Water Resource Commissioner's Office and from the RCOC also will be required. There should be no major issues in obtaining these needed permits.

Each of the roadway segments identified for short-term and long-term improvements could be considered as a separate project. In addition, the City may wish to pursue the right-of-way acquisition and the preparation of an Environmental Assessment for the ultimate improvements for the entire corridor as separate projects and set budgets and schedules for them.

Funding

Completing the long-term widening and reconstruction outlined is needed to address deficiencies in the corridor. The City should pursue obtaining funding for the improvements. Possible sources of funding include:

Michigan Department of Transportation (MDOT) / SEMCOG funding:
This program is the normal Federal Aid highway funding source. The corridor segments have been added to the SEMCOG 2040 RTP, in order to be in line for funding. This type of funding would be most appropriate for funding the improvements in the corridor.

BUILD Funds:
Similar to the TIGER Funds, which have been discontinued, these funds are competitive grants administered by MDOT. The grants are awarded on merit based upon safety, economic competitiveness, innovation, partnership, and the ability to leverage non-federal funds. These funds could potentially be used for the long-term improvements outlined.

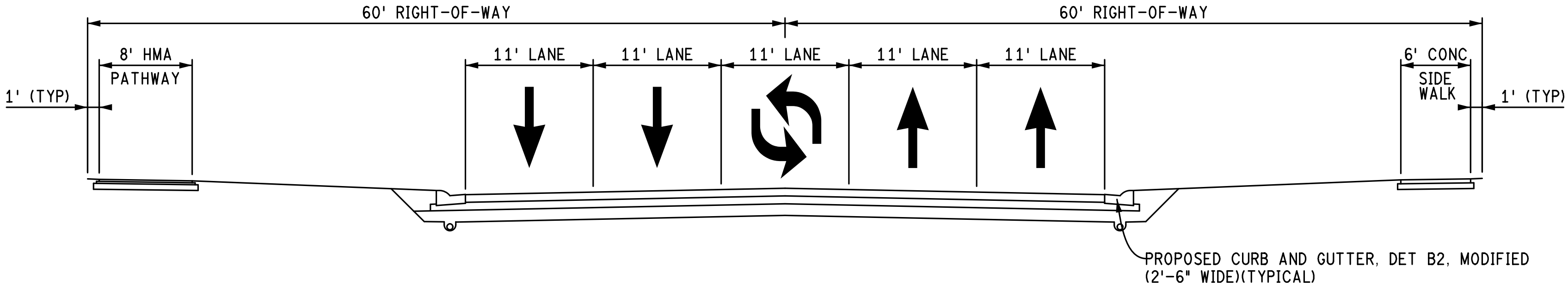
Congestion Mitigation and Air Quality (CMAQ) Funds:
These funds are awarded through MDOT and are for congestion mitigation and air quality improvements. Typically these funds are used for traffic signal improvements and spot intersection turn lane additions. Portions of the short-term improvements proposed could be eligible for these funds.

Safety Funds:
These grants are also awarded by MDOT. Intersection improvements and other measures specifically aimed at reducing crash rates typically are funded through this source. Because the short-term intersection improvements recommended in the original study have largely been completed, this funding source may no longer be available except for possibly for the turn lane improvements included as part of the short-term improvements.

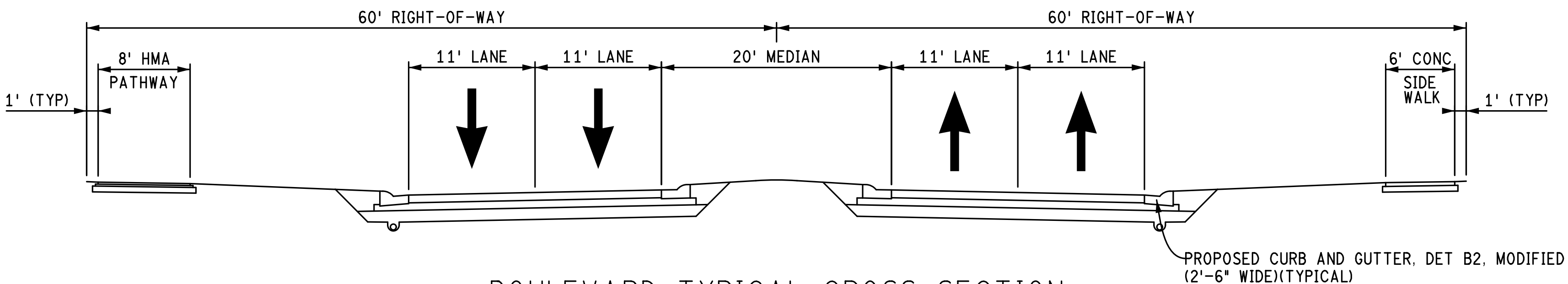
Transportation Enhancement Activity (TAP) Grants:
These MDOT administered competitive grants are typically used for pathways and aesthetic improvements. Pathways and landscaping improvements included as part of the improvements could be eligible for these funds. Storm water quality improvement projects also are eligible to receive these funds. If major detention facilities are required by the MDEQ for the widening of the corridor, then this funding source may be available for that purpose also.

Transportation Economic Development Fund (TEDF Grants):
These competitive grant funds are also administered by MDOT and are for transportation projects that support economic development and job creation. This could be a viable source for funding in the corridor if a new commercial/industrial development or expansion of an existing development is planned. The criteria for selection includes the number of jobs created and the importance of the transportation improvement toward the new jobs.

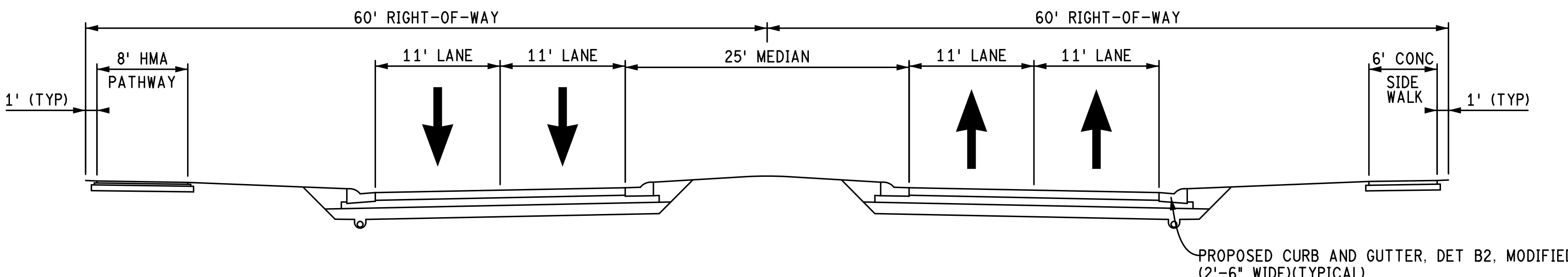
AECOM has assisted numerous agencies in obtaining funds through each of the sources listed above and can assist in preparation of competitive grant applications to maximize the probability of receiving the funds.



FIVE LANE TYPICAL CROSS SECTION



BOULEVARD TYPICAL CROSS SECTION
(20 FOOT MEDIAN)



BOULEVARD TYPICAL CROSS SECTION
(25 FOOT MEDIAN)

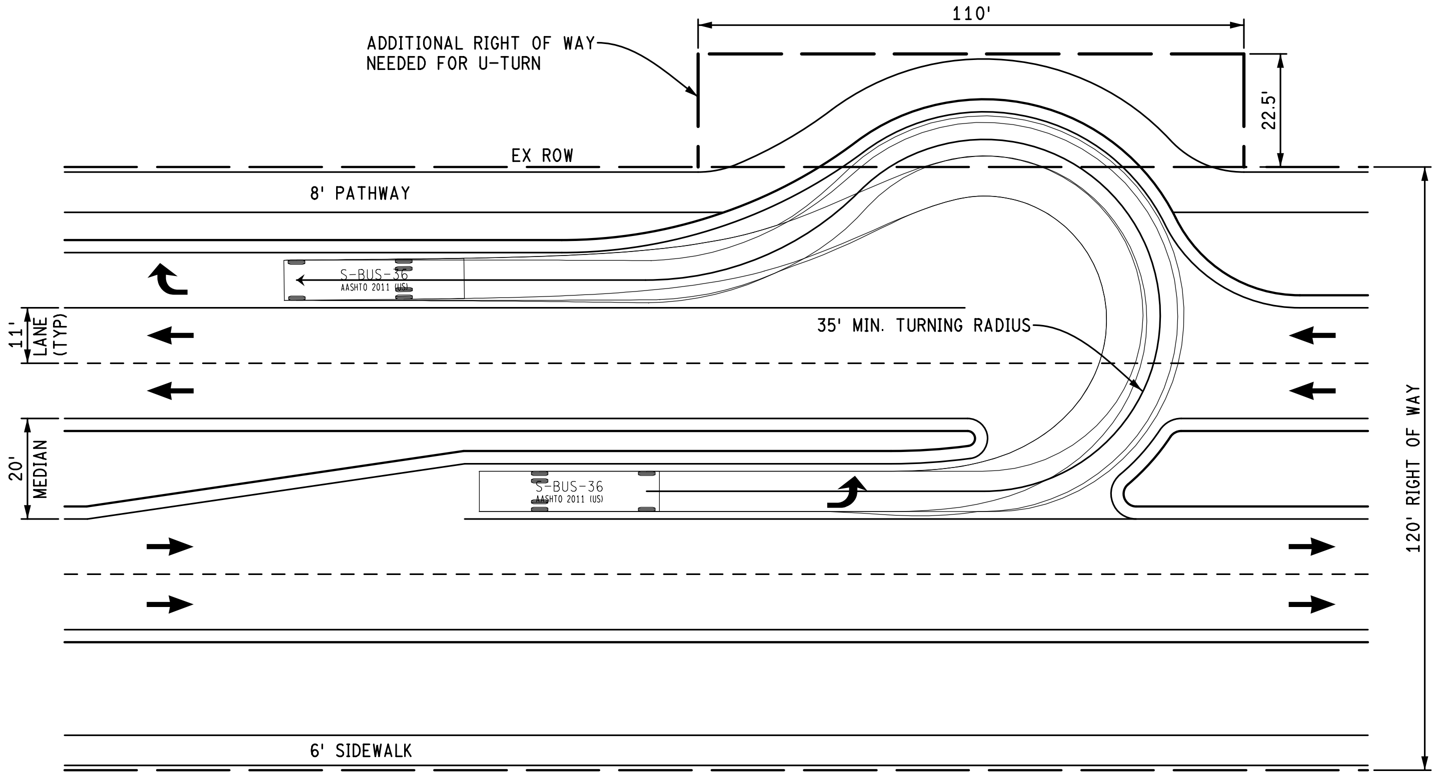
CITY OF NOVI AECOM

CITY OF NOVI - 2018 BECK ROAD SCOPING STUDY UPDATE

TYPICAL ROADWAY CROSS SECTIONS

FIGURE

1



BOULEVARD (20' MEDIAN) TYPICAL U-TURN SCHEMATIC

FOR THE SCHOOL BUS DESIGN VEHICLE (S-BUS-36)

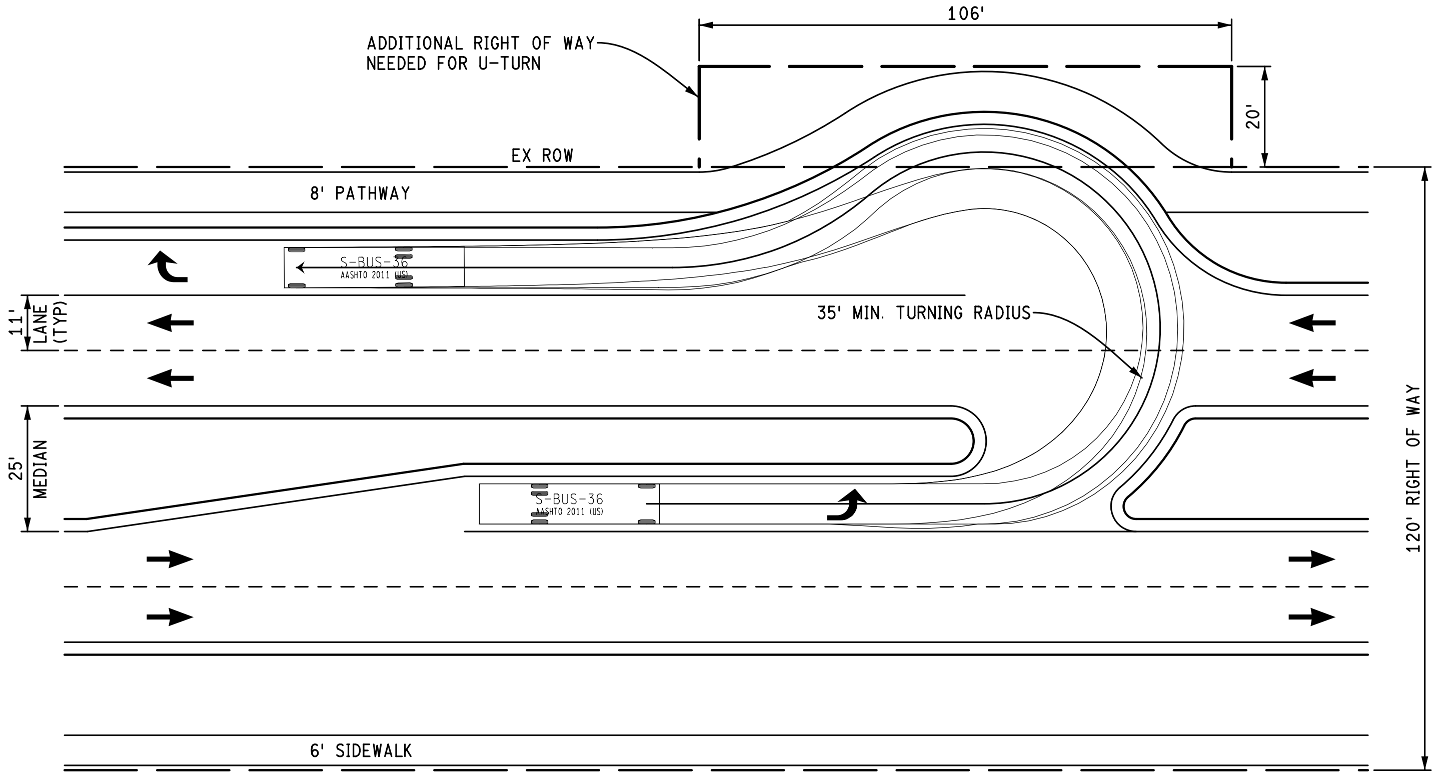
CITY OF NOVI

AECOM

CITY OF NOVI - 2018 BECK ROAD SCOPING STUDY UPDATE

TYPICAL U-TURN FOR SCHOOL BUS DESIGN VEHICLE WITH 20 FOOT MEDIAN

FIGURE 2



BOULEVARD (25' MEDIAN) TYPICAL U-TURN SCHEMATIC

FOR THE SCHOOL BUS DESIGN VEHICLE (S-BUS-36)

CITY OF NOVI / AECOM	CITY OF NOVI - 2018 BECK ROAD SCOPING STUDY UPDATE TYPICAL U-TURN FOR SCHOOL BUS DESIGN VEHICLE WITH 25 FOOT MEDIAN	FIGURE 3

APPENDIX A

PRELIMINARY COST ESTIMATES

City of Novi
Beck Road from 9 Mile to 10 Mile
Pavement Preservation Overlay and Turn Lane Improvements
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
1	Mobilization (10%)	LS	1	$ 63,705.43	$ 63,705.43
2	Pre-Construction Audio-Visual	LS	1	$ 3,500.00	$ 3,500.00
3	HMA Surface, Rem	Syd	667	$ 8.00	$ 5,333.33
4	Cold Milling HMA Surface	Syd	21,483	$ 5.00	$ 107,416.67
5	Trenching and Grading (Widening Areas)	Sta	20.0	$ 2,000.00	$ 40,000.00
6	Subgrade Undercutting	Cyd	100	$ 50.00	$ 5,000.00
7	Soil Erosion Control	LS	1	$ 3,500.00	$ 3,500.00
8	Aggregate Base, 21AA Limestone, 8 inch (Widening)	Syd	1,617	$ 13.00	$ 21,016.67
9	Shoulder, Cl 2, 6 inch (Widening)	Syd	1,111	$ 8.00	$ 8,888.89
10	HMA, 5E3	Ton	2,795	$ 100.00	$ 279,510.00
11	HMA, 3E3 (Widening)	Ton	267	$ 95.00	$ 25,341.25
12	HMA, 3E3 (Patching)	Ton	365	$ 100.00	$ 36,547.50
13	Drainage Improvements	LS	1	$ 5,000.00	$ 5,000.00
14	Underdrain, Subbase, 6 inch	Ft	2,000	$ 8.00	$ 16,000.00
15	Permanent Signing	LS	1	$ 5,000.00	$ 5,000.00
16	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
17	Maintaining Traffic	LS	1	$ 50,000.00	$ 50,000.00
18	Surface Restoration	LS	1	$ 5,000.00	$ 5,000.00
19	Traffic Signal Work	LS	1	$ -	$ -
	Total Construction Cost				**$ 700,759.74**
	Permitting and Mitigation	LS	1		$ -
	Right of Way Acquisition	LS	1		$ -
	Design Engineering	LS	1	6.25%	$ 43,797.48
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 8,759.50
	Contract Administration	LS	1	4.25%	$ 29,782.29
	Inspection (Crew Days)	Day	30	$ 700.00	$ 21,000.00
	Construction Contingency	LS	1	10%	$ 70,075.97
	Materials Testing	LS	1	1.5%	$ 10,511.40
	TOTAL COST				**$ 884,686.37**

Estimate Assumptions:

Estimate includes intersection of Beck and 9 Mile Road

City of Novi
Beck Road from 10 Mile to 11 Mile
Pavement Preservation Overlay and Turn Lane Improvements
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
1	Mobilization (10%)	LS	1	$ 62,467.43	$ 62,467.43
2	Pre-Construction Audio-Visual	LS	1	$ 3,500.00	$ 3,500.00
3	HMA Surface, Rem	Syd	667	$ 8.00	$ 5,333.33
4	Cold Milling HMA Surface	Syd	19,083	$ 5.00	$ 95,416.67
5	Trenching and Grading (Widening Areas)	Sta	20.0	$ 2,000.00	$ 40,000.00
6	Subgrade Undercutting	Cyd	100	$ 50.00	$ 5,000.00
7	Soil Erosion Control	LS	1	$ 3,500.00	$ 3,500.00
8	Aggregate Base, 21AA Limestone, 8 inch (Widening)	Syd	2,417	$ 13.00	$ 31,416.67
9	Shoulder, Cl 2, 6 inch (Widening)	Syd	1,111	$ 8.00	$ 8,888.89
10	HMA, 5E3	Ton	2,602	$ 100.00	$ 260,150.00
11	HMA, 3E3 (Widening)	Ton	399	$ 95.00	$ 37,881.25
12	HMA, 3E3 (Patching)	Ton	326	$ 100.00	$ 32,587.50
13	Drainage Improvements	LS	1	$ 5,000.00	$ 5,000.00
14	Underdrain, Subbase, 6 inch	Ft	2,000	$ 8.00	$ 16,000.00
15	Permanent Signing	LS	1	$ 5,000.00	$ 5,000.00
16	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
17	Maintaining Traffic	LS	1	$ 50,000.00	$ 50,000.00
18	Surface Restoration	LS	1	$ 5,000.00	$ 5,000.00
19	Traffic Signal Work	LS	1	$ -	$ -
	Total Construction Cost				**$ 687,141.74**
	Permitting and Mitigation	LS	1		$ -
	Right of Way Acquisition	LS	1		$ -
	Design Engineering	LS	1	6.25%	$ 42,946.36
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 8,589.27
	Contract Administration	LS	1	4.25%	$ 29,203.52
	Inspection (Crew Days)	Day	30	$ 700.00	$ 21,000.00
	Construction Contingency	LS	1	10%	$ 68,714.17
	Materials Testing	LS	1	1.5%	$ 10,307.13
	TOTAL COST				**$ 867,902.19**

Estimate Assumptions:

Estimate includes intersection of Beck and 10 Mile Road

City of Novi
Beck Road from 11 Mile Rd to Central Park Blvd
Pavement Preservation Overlay and 11 Mile/Beck Traffic Signal Replacement
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
1	Mobilization (10%)	LS	1	$ 49,151.00	$ 49,151.00
2	Pre-Construction Audio-Visual	LS	1	$ 2,000.00	$ 2,000.00
3	Cold Milling HMA Surface	Syd	15,550	$ 5.00	$ 77,750.00
4	Soil Erosion Control	LS	1	$ 1,000.00	$ 1,000.00
5	HMA, 5E3	Ton	1,796	$ 100.00	$ 179,602.50
6	HMA, 3E3 (Patching)	Ton	257	$ 100.00	$ 25,657.50
7	Permanent Signing	LS	1	$ 3,000.00	$ 3,000.00
8	Permanent Pavement Markings	LS	1	$ 12,500.00	$ 12,500.00
9	Maintaining Traffic	LS	1	$ 40,000.00	$ 40,000.00
10	Traffic Signal Work	LS	1	$ 150,000.00	$ 150,000.00
	Total Construction Cost				**$ 540,661.00**
	Permitting and Mitigation	LS	1	$ -	$ -
	Right of Way Acquisition	LS	1	$ -	$ -
	Design Engineering	LS	1	6.25%	$ 33,791.31
	Geotechnical Study and Borings (Complete)	LS	1		$ -
	Design Contingency	LS	1	20%	$ 6,758.26
	Contract Administration	LS	1	4.25%	$ 22,978.09
	Inspection (Crew Days)	Day	35	$ 700.00	$ 24,500.00
	Construction Contingency	LS	1	10%	$ 54,066.10
	Materials Testing	LS	1	1.5%	$ 8,109.92
	TOTAL COST				**$ 690,864.68**

Estimate Assumptions:

Estimate includes intersection of Beck and 11 Mile Road

Estimate includes traffic signal replacement at Beck and 11 Mile Road

City of Novi
Beck Road from 8 Mile to 9 Mile
Five-Lane Roadway
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 448,141.00	$ 448,141.00
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,500	$ 4.00	$ 78,000.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	3,000	$ 45.00	$ 135,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	610	$ 25.00	$ 15,250.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,400	$ 9.50	$ 22,800.00
12	Detectable Warning Surface	Ft	200	$ 45.00	$ 9,000.00
13	Tensar TX-5 Geogrid	Syd	40,010	$ 3.50	$ 140,035.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	40,010	$ 15.00	$ 600,150.00
15	HMA Approach	Ton	120	$ 150.00	$ 18,000.00
16	Driveway, Conc, 6 inch	Syd	275	$ 70.00	$ 19,250.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,500	$ 40.00	$ 180,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	3,075	$ 100.00	$ 307,500.00
26	HMA, 3E3 / HMA, 4E3	Ton	9,675	$ 95.00	$ 919,125.00
27	Curb and Gutter, Conc, Det F2	Ft	11,560	$ 20.00	$ 231,200.00
28	Permanent Signing	LS	1	$ 10,000.00	$ 10,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 50,000.00	$ 50,000.00
32	Conc Sidewalk, 6 feet	Ft	2,650	$ 40.00	$ 106,000.00
33	HMA Pathway, 8 feet	Ft	2,650	$ 40.00	$ 106,000.00
34	Boardwalk, 12 feet	Ft	200	$ 650.00	$ 130,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 4,929,551.00**
	Public Utilities				
1	Mobilization	LS	1	$ 85,267.00	$ 85,267.00
2	Water Main	Ft	3,526	$ 120.00	$ 423,120.00
3	Water Main Services	Ea	16	$ 1,500.00	$ 24,000.00
4	Sanitary Sewer	Ft	4,330	$ 85.00	$ 368,050.00
5	Sanitary Sewer Services	Ea	25	$ 1,500.00	$ 37,500.00
	Public Utilities Cost				**$ 937,937.00**
	Total Construction Cost				**$ 5,867,488.00**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 293,374.40
	Right of Way Acquisition	LS	1	$ 220,285.45	$ 220,285.45
	Design Engineering	LS	1	6.25%	$ 366,718.00
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 73,343.60
	Contract Administration	LS	1	4.75%	$ 278,705.68
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 586,748.80
	Materials Testing	LS	1	2%	$ 117,349.76
	TOTAL COST				**$ 7,902,013.69**

Estimate Assumptions:

Estimate includes intersection of Beck and 11 Mile Road

Estimate includes traffic signal at Beck and 11 Mile Road

Widening ends at Central Park Boulevard except for widening for dual left turn lane on Grand River Avenue ffor WB to SB movement

Traffic signals at Grand River Avenue should not require modification and are not included

Water and sanitary sewer per foot costs include hydrants, valves and manholes

12 inch average size for water main and sanitary sewers used

Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.

City of Novi
Beck Road from 9 Mile to 10 Mile
Five-Lane Roadway
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 474,966.00	$ 474,966.00
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	22,150	$ 4.00	$ 88,600.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	3,000	$ 45.00	$ 135,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	500	$ 10.00	$ 5,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	40,010	$ 3.50	$ 140,035.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	40,010	$ 15.00	$ 600,150.00
15	HMA Approach	Ton	150	$ 150.00	$ 22,500.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,500	$ 40.00	$ 180,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	3,075	$ 100.00	$ 307,500.00
26	HMA, 3E3 / HMA, 4E3	Ton	9,675	$ 95.00	$ 919,125.00
27	Curb and Gutter, Conc, Det F2	Ft	11,560	$ 20.00	$ 231,200.00
28	Permanent Signing	LS	1	$ 10,000.00	$ 10,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 50,000.00	$ 50,000.00
32	Conc Sidewalk, 6 feet	Ft	500	$ 40.00	$ 20,000.00
33	HMA Pathway, 8 feet	Ft	4,900	$ 40.00	$ 196,000.00
34	Boardwalk, 12 feet	Ft	600	$ 650.00	$ 390,000.00
35	Remove Boardwalk	Ft	300	$ 50.00	$ 15,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,224,626.00**
	Public Utilities				
1	Mobilization	LS	1	$ 70,057.00	$ 70,057.00
2	Water Main	Ft	4,975	$ 120.00	$ 597,000.00
3	Water Main Services	Ea	5	$ 1,500.00	$ 7,500.00
4	Sanitary Sewer	Ft	1,042	$ 85.00	$ 88,570.00
5	Sanitary Sewer Services	Ea	5	$ 1,500.00	$ 7,500.00
	Public Utilities Cost				**$ 770,627.00**
	Total Construction Cost				**$ 5,995,253.00**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 299,762.65
	Right of Way Acquisition	LS	1	$ 57,366.02	$ 57,366.02
	Design Engineering	LS	1	6.25%	$ 374,703.31
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 74,940.66
	Contract Administration	LS	1	4.75%	$ 284,774.52
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 599,525.30
	Materials Testing	LS	1	2%	$ 119,905.06
	TOTAL COST				**$ 7,904,230.52**

Estimate Assumptions:

Estimate includes intersection of Beck and 9 Mile Road
Estimate includes traffic signal at Beck and 9 Mile Road
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.

City of Novi
Beck Road from 10 Mile to 11 Mile
Five-Lane Roadway
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 476,956.00	$ 476,956.00
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,750	$ 4.00	$ 79,000.00
4	Curb and Gutter, Rem	Ft	700	$ 10.00	$ 7,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	3,000	$ 45.00	$ 135,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	750	$ 10.00	$ 7,500.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	40,010	$ 3.50	$ 140,035.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	40,010	$ 15.00	$ 600,150.00
15	HMA Approach	Ton	160	$ 150.00	$ 24,000.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,500	$ 40.00	$ 180,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	3,075	$ 100.00	$ 307,500.00
26	HMA, 3E3 / HMA, 4E3	Ton	9,675	$ 95.00	$ 919,125.00
27	Curb and Gutter, Conc, Det F2	Ft	11,560	$ 20.00	$ 231,200.00
28	Permanent Signing	LS	1	$ 10,000.00	$ 10,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 50,000.00	$ 50,000.00
32	Conc Sidewalk, 6 feet	Ft	4,200	$ 40.00	$ 168,000.00
33	HMA Pathway, 8 feet	Ft	5,100	$ 40.00	$ 204,000.00
34	Boardwalk, 12 feet	Ft	400	$ 650.00	$ 260,000.00
35	Remove Boardwalk	Ft	250	$ 50.00	$ 12,500.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,246,516.00**
	Public Utilities				
1	Mobilization	LS	1	$ 95,345.00	$ 95,345.00
2	Water Main	Ft	5,430	$ 120.00	$ 651,600.00
3	Water Main Services	Ea	4	$ 1,500.00	$ 6,000.00
4	Sanitary Sewer	Ft	3,410	$ 85.00	$ 289,850.00
5	Sanitary Sewer Services	Ea	4	$ 1,500.00	$ 6,000.00
	Public Utilities Cost				**$ 1,048,795.00**
	Total Construction Cost				**$ 6,295,311.00**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 314,765.55
	Right of Way Acquisition	LS	1	$ 254,748.94	$ 254,748.94
	Design Engineering	LS	1	6.25%	$ 393,456.94
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 78,691.39
	Contract Administration	LS	1	4.75%	$ 299,027.27
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 629,531.10
	Materials Testing	LS	1	2%	$ 125,906.22
	TOTAL COST				**$ 8,489,438.41**

Estimate Assumptions:

Estimate includes intersection of Beck and 10 Mile Road
Estimate includes traffic signal at Beck and 10 Mile Road
Traffic signal at Cider Mill assumed to not require modifications
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.

City of Novi
Beck Road from 11 Mile Rd to Grand River Avenue
Five-Lane Roadway
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	281,084.00	$ 281,084.00
2	Pre-Construction Audio-Visual	LS	1	3,000.00	$ 3,000.00
3	HMA Surface, Rem	Syd	15,550	$ 5.00	$ 77,750.00
4	Curb and Gutter, Rem	Ft	1,350	$ 10.00	$ 13,500.00
5	Roadway Grading	Sta	24.0	$ 10,000.00	$ 240,000.00
6	Subgrade Undercutting	Cyd	1,500	$ 45.00	$ 67,500.00
7	Silt Fence	Ft	5,000	$ 2.00	$ 10,000.00
8	Curb and Gutter Inlet Filter	Ea	30	$ 150.00	$ 4,500.00
9	Driveway Opening, Conc, Det M	Ft	400	$ 25.00	$ 10,000.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,000	$ 9.50	$ 19,000.00
12	Detectable Warning Surface	Ft	100	$ 40.00	$ 4,000.00
13	Tensar TX-5 Geogrid	Syd	18,600	$ 3.50	$ 65,100.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	18,600	$ 13.00	$ 241,800.00
15	HMA Approach	Ton	75	$ 150.00	$ 11,250.00
16	Driveway, Conc, 6 inch	Syd	150	$ 70.00	$ 10,500.00
17	Dr Structure Cover	Ea	24	$ 750.00	$ 18,000.00
18	Dr Structure	Ea	24	$ 1,500.00	$ 36,000.00
19	Storm Sewer, 12 inch	Ft	1,800	$ 40.00	$ 72,000.00
20	Storm Sewer, 18 inch	Ft	300	$ 50.00	$ 15,000.00
21	Storm Sewer, 24 inch	Ft	150	$ 60.00	$ 9,000.00
22	Storm Sewer, 30 inch	Ft	150	$ 90.00	$ 13,500.00
23	Dr Structure Tap, 6 inch	Ea	2	$ 250.00	$ 500.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	4,800	$ 14.00	$ 67,200.00
25	HMA, 5E3	Ton	1,490	$ 100.00	$ 149,000.00
26	HMA, 3E3 / HMA, 4E3	Ton	4,392	$ 95.00	$ 417,240.00
27	Curb and Gutter, Conc, Det F2	Ft	4,900	$ 20.00	$ 98,000.00
28	Permanent Signing	LS	1	$ 7,000.00	$ 7,000.00
29	Permanent Pavement Markings	LS	1	$ 17,500.00	$ 17,500.00
30	Maintaining Traffic	LS	1	$ 160,000.00	$ 160,000.00
31	Surface Restoration	LS	1	$ 35,000.00	$ 35,000.00
32	Conc Sidewalk, 6 feet	Ft	1,350	$ 40.00	$ 54,000.00
33	HMA Pathway, 8 feet	Ft	2,300	$ 40.00	$ 92,000.00
34	Boardwalk, 12 feet	Ft	1,000	$ 500.00	$ 500,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 235,000.00	$ 235,000.00
37	Miscellaneous Items	LS	1	$ 25,000.00	$ 25,000.00
	Road and Drainage Cost				**$ 3,091,924.00**
	Public Utilities				
1	Mobilization	LS	1	$ 41,350.00	$ 41,350.00
2	Water Main	Ft	1,900	$ 120.00	$ 228,000.00
3	Water Main Services	Ea	8	$ 1,500.00	$ 12,000.00
4	Sanitary Sewer	Ft	1,900	$ 85.00	$ 161,500.00
5	Sanitary Sewer Services	Ea	8	$ 1,500.00	$ 12,000.00
	Public Utilities Cost				**$ 454,850.00**
	Total Construction Cost				**$ 3,546,774.00**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 177,338.70
	Right of Way Acquisition	LS	1	$ 498,573.72	$ 498,573.72
	Design Engineering	LS	1	6.25%	$ 221,673.38
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 44,334.68
	Contract Administration	LS	1	4.75%	$ 168,471.77
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 354,677.40
	Materials Testing	LS	1	2%	$ 70,935.48
	TOTAL COST				**$ 5,180,779.12**

Estimate Assumptions:

Estimate includes intersection of Beck and 11 Mile Road
Estimate includes traffic signal at Beck and 11 Mile Road
Widening ends at Central Park Boulevard except for NB to EB right-turn lane at Grand River Avenue
Traffic signal at Grand River Avenue requires minor modifications for additional turn lanes, but not replacement
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.

City of Novi
Beck Road from 8 Mile to 9 Mile
20 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 451,917.50	$ 451,917.50
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,500	$ 4.00	$ 78,000.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,000	$ 45.00	$ 180,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	610	$ 25.00	$ 15,250.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,400	$ 9.50	$ 22,800.00
12	Detectable Warning Surface	Ft	200	$ 45.00	$ 9,000.00
13	Tensar TX-5 Geogrid	Syd	39,150	$ 3.50	$ 137,025.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,150	$ 15.00	$ 587,250.00
15	HMA Approach	Ton	120	$ 150.00	$ 18,000.00
16	Driveway, Conc, 6 inch	Syd	275	$ 70.00	$ 19,250.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,800	$ 40.00	$ 192,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,575	$ 100.00	$ 257,500.00
26	HMA, 3E3 / HMA 4E3	Ton	8,080	$ 95.00	$ 767,600.00
27	Curb and Gutter, Conc, Det F2	Ft	21,120	$ 20.00	$ 422,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	2,650	$ 40.00	$ 106,000.00
33	HMA Pathway, 10 feet	Ft	2,650	$ 40.00	$ 106,000.00
34	Boardwalk, 14 feet	Ft	200	$ 650.00	$ 130,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 4,971,092.50**
	Public Utilities				
1	Mobilization	LS	1	$ 85,267.00	$ 85,267.00
2	Water Main	Ft	3,526	$ 120.00	$ 423,120.00
3	Water Main Services	Ea	16	$ 1,500.00	$ 24,000.00
4	Sanitary Sewer	Ft	4,330	$ 85.00	$ 368,050.00
5	Sanitary Sewer Services	Ea	25	$ 1,500.00	$ 37,500.00
	Public Utilities Cost				**$ 937,937.00**
	Total Construction Cost				**$ 5,909,029.50**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 295,451.48
	Right of Way Acquisition	LS	1	$ 220,285.45	$ 220,285.45
	Additional ROW for Crossovers	Sft	4,950	$ 2.50	$ 12,375.00
	Design Engineering	LS	1	6.25%	$ 369,314.34
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 73,862.87
	Contract Administration	LS	1	4.75%	$ 280,678.90
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 590,902.95
	Materials Testing	LS	1	2%	$ 118,180.59
	TOTAL COST				**$ 7,968,081.08**

Estimate Assumptions:

Estimate includes intersection of Beck and 8 Mile Road
Estimate includes traffic signal at Beck and 8 Mile Road
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 9 Mile to 10 Mile
20 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 478,742.50	$ 478,742.50
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	22,150	$ 4.00	$ 88,600.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,000	$ 45.00	$ 180,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	500	$ 10.00	$ 5,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	39,150	$ 3.50	$ 137,025.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,150	$ 15.00	$ 587,250.00
15	HMA Approach	Ton	150	$ 150.00	$ 22,500.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,800	$ 40.00	$ 192,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,575	$ 100.00	$ 257,500.00
26	HMA, 3E3 / HMA 4E3	Ton	8,080	$ 95.00	$ 767,600.00
27	Curb and Gutter, Conc, Det F2	Ft	21,120	$ 20.00	$ 422,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	500	$ 40.00	$ 20,000.00
33	HMA Pathway, 10 feet	Ft	4,900	$ 40.00	$ 196,000.00
34	Boardwalk, 14 feet	Ft	600	$ 650.00	$ 390,000.00
35	Remove Boardwalk	Ft	300	$ 50.00	$ 15,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,266,167.50**
	Public Utilities				
1	Mobilization	LS	1	$ 70,057.00	$ 70,057.00
2	Water Main	Ft	4,975	$ 120.00	$ 597,000.00
3	Water Main Services	Ea	5	$ 1,500.00	$ 7,500.00
4	Sanitary Sewer	Ft	1,042	$ 85.00	$ 88,570.00
5	Sanitary Sewer Services	Ea	5	$ 1,500.00	$ 7,500.00
	Public Utilities Cost				**$ 770,627.00**
	Total Construction Cost				**$ 6,036,794.50**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 301,839.73
	Right of Way Acquisition	LS	1	$ 57,366.02	$ 57,366.02
	Additional ROW for Crossovers	Sft	4,950	$ 2.50	$ 12,375.00
	Design Engineering	LS	1	6.25%	$ 377,299.66
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 75,459.93
	Contract Administration	LS	1	4.75%	$ 286,747.74
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 603,679.45
	Materials Testing	LS	1	2%	$ 120,735.89
	TOTAL COST				**$ 7,970,297.91**

Estimate Assumptions:

Estimate includes intersection of Beck and 9 Mile Road
Estimate includes traffic signal at Beck and 9 Mile Road
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 10 Mile to 11 Mile
20 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 480,732.50	$ 480,732.50
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,750	$ 4.00	$ 79,000.00
4	Curb and Gutter, Rem	Ft	700	$ 10.00	$ 7,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,000	$ 45.00	$ 180,000.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	750	$ 10.00	$ 7,500.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	39,150	$ 3.50	$ 137,025.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,150	$ 15.00	$ 587,250.00
15	HMA Approach	Ton	160	$ 150.00	$ 24,000.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,800	$ 40.00	$ 192,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,575	$ 100.00	$ 257,500.00
26	HMA, 3E3 / HMA 4E3	Ton	8,080	$ 95.00	$ 767,600.00
27	Curb and Gutter, Conc, Det F2	Ft	21,120	$ 20.00	$ 422,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	4,200	$ 40.00	$ 168,000.00
33	HMA Pathway, 8 feet	Ft	5,100	$ 40.00	$ 204,000.00
34	Boardwalk, 12 feet	Ft	400	$ 650.00	$ 260,000.00
35	Remove Boardwalk	Ft	250	$ 50.00	$ 12,500.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,288,057.50**
	Public Utilities				
1	Mobilization	LS	1	$ 95,345.00	$ 95,345.00
2	Water Main	Ft	5,430	$ 120.00	$ 651,600.00
3	Water Main Services	Ea	4	$ 1,500.00	$ 6,000.00
4	Sanitary Sewer	Ft	3,410	$ 85.00	$ 289,850.00
5	Sanitary Sewer Services	Ea	4	$ 1,500.00	$ 6,000.00
	Public Utilities Cost				**$ 1,048,795.00**
	Total Construction Cost				**$ 6,336,852.50**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 316,842.63
	Right of Way Acquisition	LS	1	$ 254,748.94	$ 254,748.94
	Additional ROW for Crossovers	Sft	4,950	$ 2.50	$ 12,375.00
	Design Engineering	LS	1	6.25%	$ 396,053.28
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 79,210.66
	Contract Administration	LS	1	4.75%	$ 301,000.49
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 633,685.25
	Materials Testing	LS	1	2%	$ 126,737.05
	TOTAL COST				**$ 8,555,505.80**

Estimate Assumptions:

Estimate includes intersection of Beck and 10 Mile Road
Estimate includes traffic signal at Beck and 10 Mile Road
Traffic signal at Cider Mill assumed to not require modifications
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 11 Mile to Grand River Avenue
20 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	286,278.94	$ 286,278.94
2	Pre-Construction Audio-Visual	LS	1	3,000.00	$ 3,000.00
3	HMA Surface, Rem	Syd	15,550	$ 5.00	$ 77,750.00
4	Curb and Gutter, Rem	Ft	1,350	$ 10.00	$ 13,500.00
5	Roadway Grading	Sta	24.0	$ 10,000.00	$ 240,000.00
6	Subgrade Undercutting	Cyd	1,800	$ 45.00	$ 81,000.00
7	Silt Fence	Ft	5,000	$ 2.00	$ 10,000.00
8	Curb and Gutter Inlet Filter	Ea	30	$ 150.00	$ 4,500.00
9	Driveway Opening, Conc, Det M	Ft	400	$ 25.00	$ 10,000.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,000	$ 9.50	$ 19,000.00
12	Detectable Warning Surface	Ft	100	$ 40.00	$ 4,000.00
13	Tensar TX-5 Geogrid	Syd	18,856	$ 3.50	$ 65,996.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	18,856	$ 13.00	$ 245,128.00
15	HMA Approach	Ton	75	$ 150.00	$ 11,250.00
16	Driveway, Conc, 6 inch	Syd	150	$ 70.00	$ 10,500.00
17	Dr Structure Cover	Ea	24	$ 750.00	$ 18,000.00
18	Dr Structure	Ea	24	$ 1,500.00	$ 36,000.00
19	Storm Sewer, 12 inch	Ft	1,825	$ 40.00	$ 73,000.00
20	Storm Sewer, 18 inch	Ft	300	$ 50.00	$ 15,000.00
21	Storm Sewer, 24 inch	Ft	150	$ 60.00	$ 9,000.00
22	Storm Sewer, 30 inch	Ft	150	$ 90.00	$ 13,500.00
23	Dr Structure Tap, 6 inch	Ea	2	$ 250.00	$ 500.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	4,800	$ 14.00	$ 67,200.00
25	HMA, 5E3	Ton	1,480	$ 100.00	$ 148,040.00
26	HMA, 3E3 / HMA 4E3	Ton	4,341	$ 95.00	$ 412,425.40
27	Curb and Gutter, Conc, Det F2	Ft	6,200	$ 20.00	$ 124,000.00
28	Permanent Signing	LS	1	$ 10,000.00	$ 10,000.00
29	Permanent Pavement Markings	LS	1	$ 17,500.00	$ 17,500.00
30	Maintaining Traffic	LS	1	$ 160,000.00	$ 160,000.00
31	Surface Restoration	LS	1	$ 45,000.00	$ 45,000.00
32	Conc Sidewalk, 6 feet	Ft	1,350	$ 40.00	$ 54,000.00
33	HMA Pathway, 8 feet	Ft	2,300	$ 40.00	$ 92,000.00
34	Boardwalk, 12 feet	Ft	1,000	$ 500.00	$ 500,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 235,000.00	$ 235,000.00
37	Miscellaneous Items	LS	1	$ 25,000.00	$ 25,000.00
	Road and Drainage Cost				**$ 3,149,068.34**
	Public Utilities				
1	Mobilization	LS	1	$ 41,350.00	$ 41,350.00
2	Water Main	Ft	1,900	$ 120.00	$ 228,000.00
3	Water Main Services	Ea	8	$ 1,500.00	$ 12,000.00
4	Sanitary Sewer	Ft	1,900	$ 85.00	$ 161,500.00
5	Sanitary Sewer Services	Ea	8	$ 1,500.00	$ 12,000.00
	Public Utilities Cost				**$ 454,850.00**
	Total Construction Cost				**$ 3,603,918.34**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 180,195.92
	Right of Way Acquisition	LS	1	$ 498,573.72	$ 498,573.72
	Additional ROW for Crossovers	Sft	4,950	$ 2.50	$ 12,375.00
	Design Engineering	LS	1	6.25%	$ 225,244.90
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 45,048.98
	Contract Administration	LS	1	4.75%	$ 171,186.12
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 360,391.83
	Materials Testing	LS	1	2%	$ 72,078.37
	TOTAL COST				**$ 5,267,013.17**

Estimate Assumptions:

Estimate includes intersection of Beck and 11 Mile Road
Estimate includes traffic signal at Beck and 11 Mile Road
Widening ends at Central Park Boulevard except for NB to EB right-turn lane at Grand River Avenue
Traffic signal at Grand River Avenue requires minor modifications for additional turn lanes, but not replacement
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 8 Mile to 9 Mile
25 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 454,946.25	$ 454,946.25
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,500	$ 4.00	$ 78,000.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,500	$ 45.00	$ 202,500.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	610	$ 25.00	$ 15,250.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,400	$ 9.50	$ 22,800.00
12	Detectable Warning Surface	Ft	200	$ 45.00	$ 9,000.00
13	Tensar TX-5 Geogrid	Syd	39,225	$ 3.50	$ 137,287.50
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,225	$ 15.00	$ 588,375.00
15	HMA Approach	Ton	120	$ 150.00	$ 18,000.00
16	Driveway, Conc, 6 inch	Syd	275	$ 70.00	$ 19,250.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,875	$ 40.00	$ 195,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,580	$ 100.00	$ 258,000.00
26	HMA, 3E3 / HMA 4E3	Ton	8,100	$ 95.00	$ 769,500.00
27	Curb and Gutter, Conc, Det F2	Ft	21,170	$ 20.00	$ 423,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	2,650	$ 40.00	$ 106,000.00
33	HMA Pathway, 10 feet	Ft	2,650	$ 40.00	$ 106,000.00
34	Boardwalk, 14 feet	Ft	200	$ 650.00	$ 130,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,004,408.75**
	Public Utilities				
1	Mobilization	LS	1	$ 85,267.00	$ 85,267.00
2	Water Main	Ft	3,526	$ 120.00	$ 423,120.00
3	Water Main Services	Ea	16	$ 1,500.00	$ 24,000.00
4	Sanitary Sewer	Ft	4,330	$ 85.00	$ 368,050.00
5	Sanitary Sewer Services	Ea	25	$ 1,500.00	$ 37,500.00
	Public Utilities Cost				**$ 937,937.00**
	Total Construction Cost				**$ 5,942,345.75**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 297,117.29
	Right of Way Acquisition	LS	1	$ 220,285.45	$ 220,285.45
	Additional ROW for Crossovers	Sft	4,240	$ 2.50	$ 10,600.00
	Design Engineering	LS	1	6.25%	$ 371,396.61
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 74,279.32
	Contract Administration	LS	1	4.75%	$ 282,261.42
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 594,234.58
	Materials Testing	LS	1	2%	$ 118,846.92
	TOTAL COST				**$ 8,009,367.33**

Estimate Assumptions:

Estimate includes intersection of Beck and 8 Mile Road
Estimate includes traffic signal at Beck and 8 Mile Road
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 9 Mile to 10 Mile
25 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 481,771.25	$ 481,771.25
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	22,150	$ 4.00	$ 88,600.00
4	Curb and Gutter, Rem	Ft	500	$ 10.00	$ 5,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,500	$ 45.00	$ 202,500.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	500	$ 10.00	$ 5,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	39,225	$ 3.50	$ 137,287.50
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,225	$ 15.00	$ 588,375.00
15	HMA Approach	Ton	150	$ 150.00	$ 22,500.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,875	$ 40.00	$ 195,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,580	$ 100.00	$ 258,000.00
26	HMA, 3E3 / HMA 4E3	Ton	8,100	$ 95.00	$ 769,500.00
27	Curb and Gutter, Conc, Det F2	Ft	21,170	$ 20.00	$ 423,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	500	$ 40.00	$ 20,000.00
33	HMA Pathway, 10 feet	Ft	4,900	$ 40.00	$ 196,000.00
34	Boardwalk, 14 feet	Ft	600	$ 650.00	$ 390,000.00
35	Remove Boardwalk	Ft	300	$ 50.00	$ 15,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,299,483.75**
	Public Utilities				
1	Mobilization	LS	1	$ 70,057.00	$ 70,057.00
2	Water Main	Ft	4,975	$ 120.00	$ 597,000.00
3	Water Main Services	Ea	5	$ 1,500.00	$ 7,500.00
4	Sanitary Sewer	Ft	1,042	$ 85.00	$ 88,570.00
5	Sanitary Sewer Services	Ea	5	$ 1,500.00	$ 7,500.00
	Public Utilities Cost				**$ 770,627.00**
	Total Construction Cost				**$ 6,070,110.75**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 303,505.54
	Right of Way Acquisition	LS	1	$ 57,366.02	$ 57,366.02
	Additional ROW for Crossovers	Sft	4,240	$ 2.50	$ 10,600.00
	Design Engineering	LS	1	6.25%	$ 379,381.92
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 75,876.38
	Contract Administration	LS	1	4.75%	$ 288,330.26
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 607,011.08
	Materials Testing	LS	1	2%	$ 121,402.22
	TOTAL COST				**$ 8,011,584.16**

Estimate Assumptions:

Estimate includes intersection of Beck and 9 Mile Road
Estimate includes traffic signal at Beck and 9 Mile Road
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 10 Mile to 11 Mile
25 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	$ 483,761.25	$ 483,761.25
2	Pre-Construction Audio-Visual	LS	1	$ 4,000.00	$ 4,000.00
3	HMA Surface, Rem	Syd	19,750	$ 4.00	$ 79,000.00
4	Curb and Gutter, Rem	Ft	700	$ 10.00	$ 7,000.00
5	Roadway Grading	Sta	52.1	$ 10,000.00	$ 521,000.00
6	Subgrade Undercutting	Cyd	4,500	$ 45.00	$ 202,500.00
7	Silt Fence	Ft	10,000	$ 1.50	$ 15,000.00
8	Curb and Gutter Inlet Filter	Ea	60	$ 150.00	$ 9,000.00
9	Driveway Opening, Conc, Det M	Ft	600	$ 25.00	$ 15,000.00
10	Sidewalk, Rem	Syd	750	$ 10.00	$ 7,500.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	1,350	$ 9.50	$ 12,825.00
12	Detectable Warning Surface	Ft	125	$ 45.00	$ 5,625.00
13	Tensar TX-5 Geogrid	Syd	39,225	$ 3.50	$ 137,287.50
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	39,225	$ 15.00	$ 588,375.00
15	HMA Approach	Ton	160	$ 150.00	$ 24,000.00
16	Driveway, Conc, 6 inch	Syd	200	$ 70.00	$ 14,000.00
17	Dr Structure Cover	Ea	54	$ 750.00	$ 40,500.00
18	Dr Structure	Ea	54	$ 1,500.00	$ 81,000.00
19	Storm Sewer, 12 inch	Ft	4,875	$ 40.00	$ 195,000.00
20	Storm Sewer, 18 inch	Ft	900	$ 50.00	$ 45,000.00
21	Storm Sewer, 24 inch	Ft	500	$ 60.00	$ 30,000.00
22	Storm Sewer, 30 inch	Ft	500	$ 90.00	$ 45,000.00
23	Dr Structure Tap, 6 inch	Ea	4	$ 250.00	$ 1,000.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	10,560	$ 10.00	$ 105,600.00
25	HMA, 5E3	Ton	2,580	$ 100.00	$ 258,000.00
26	HMA, 3E3 / HMA 4E3	Ton	8,100	$ 95.00	$ 769,500.00
27	Curb and Gutter, Conc, Det F2	Ft	21,170	$ 20.00	$ 423,400.00
28	Permanent Signing	LS	1	$ 12,000.00	$ 12,000.00
29	Permanent Pavement Markings	LS	1	$ 20,000.00	$ 20,000.00
30	Maintaining Traffic	LS	1	$ 200,000.00	$ 200,000.00
31	Surface Restoration	LS	1	$ 55,000.00	$ 55,000.00
32	Conc Sidewalk, 6 feet	Ft	4,200	$ 40.00	$ 168,000.00
33	HMA Pathway, 8 feet	Ft	5,100	$ 40.00	$ 204,000.00
34	Boardwalk, 12 feet	Ft	400	$ 650.00	$ 260,000.00
35	Remove Boardwalk	Ft	250	$ 50.00	$ 12,500.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 50,000.00	$ 50,000.00
	Road and Drainage Cost				**$ 5,321,373.75**
	Public Utilities				
1	Mobilization	LS	1	$ 95,345.00	$ 95,345.00
2	Water Main	Ft	5,430	$ 120.00	$ 651,600.00
3	Water Main Services	Ea	4	$ 1,500.00	$ 6,000.00
4	Sanitary Sewer	Ft	3,410	$ 85.00	$ 289,850.00
5	Sanitary Sewer Services	Ea	4	$ 1,500.00	$ 6,000.00
	Public Utilities Cost				**$ 1,048,795.00**
	Total Construction Cost				**$ 6,370,168.75**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 318,508.44
	Right of Way Acquisition	LS	1	$ 254,748.94	$ 254,748.94
	Additional ROW for Crossovers	Sft	4,240	$ 2.50	$ 10,600.00
	Design Engineering	LS	1	6.25%	$ 398,135.55
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 79,627.11
	Contract Administration	LS	1	4.75%	$ 302,583.02
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 637,016.88
	Materials Testing	LS	1	2%	$ 127,403.38
	TOTAL COST				**$ 8,596,792.05**

Estimate Assumptions:

Estimate includes intersection of Beck and 10 Mile Road
Estimate includes traffic signal at Beck and 10 Mile Road
Traffic signal at Cider Mill assumed to not require modifications
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

City of Novi
Beck Road from 11 Mile to Grand River Avenue
25 Foot Median Boulevard
APPENDIX A Preliminary Estimate of Cost
12/7/2018

Item No.	Item Description	Unit	Quantity	Unit Price	Cost
	Roadway and Drainage				
1	Mobilization (10%)	LS	1	288,251.40	$ 288,251.40
2	Pre-Construction Audio-Visual	LS	1	3,000.00	$ 3,000.00
3	HMA Surface, Rem	Syd	15,550	$ 5.00	$ 77,750.00
4	Curb and Gutter, Rem	Ft	1,350	$ 10.00	$ 13,500.00
5	Roadway Grading	Sta	24.0	$ 10,000.00	$ 240,000.00
6	Subgrade Undercutting	Cyd	2,000	$ 45.00	$ 90,000.00
7	Silt Fence	Ft	5,000	$ 2.00	$ 10,000.00
8	Curb and Gutter Inlet Filter	Ea	30	$ 150.00	$ 4,500.00
9	Driveway Opening, Conc, Det M	Ft	400	$ 25.00	$ 10,000.00
10	Sidewalk, Rem	Syd	200	$ 10.00	$ 2,000.00
11	Sidewalk Ramp, Conc, 6 inch	Sft	2,000	$ 9.50	$ 19,000.00
12	Detectable Warning Surface	Ft	100	$ 40.00	$ 4,000.00
13	Tensar TX-5 Geogrid	Syd	19,056	$ 3.50	$ 66,696.00
14	Aggregate Base, 21AA Limestone, 8 inch	Syd	19,056	$ 13.00	$ 247,728.00
15	HMA Approach	Ton	75	$ 150.00	$ 11,250.00
16	Driveway, Conc, 6 inch	Syd	150	$ 70.00	$ 10,500.00
17	Dr Structure Cover	Ea	24	$ 750.00	$ 18,000.00
18	Dr Structure	Ea	24	$ 1,500.00	$ 36,000.00
19	Storm Sewer, 12 inch	Ft	1,875	$ 40.00	$ 75,000.00
20	Storm Sewer, 18 inch	Ft	300	$ 50.00	$ 15,000.00
21	Storm Sewer, 24 inch	Ft	150	$ 60.00	$ 9,000.00
22	Storm Sewer, 30 inch	Ft	150	$ 90.00	$ 13,500.00
23	Dr Structure Tap, 6 inch	Ea	2	$ 250.00	$ 500.00
24	Underdrain, Subgrade, Open-Graded, 6 inch	Ft	4,800	$ 14.00	$ 67,200.00
25	HMA, 5E3	Ton	1,485	$ 100.00	$ 148,500.00
26	HMA, 3E3 / HMA 4E3	Ton	4,362	$ 95.00	$ 414,390.00
27	Curb and Gutter, Conc, Det F2	Ft	7,100	$ 20.00	$ 142,000.00
28	Permanent Signing	LS	1	$ 10,000.00	$ 10,000.00
29	Permanent Pavement Markings	LS	1	$ 17,500.00	$ 17,500.00
30	Maintaining Traffic	LS	1	$ 160,000.00	$ 160,000.00
31	Surface Restoration	LS	1	$ 45,000.00	$ 45,000.00
32	Conc Sidewalk, 6 feet	Ft	1,350	$ 40.00	$ 54,000.00
33	HMA Pathway, 8 feet	Ft	2,300	$ 40.00	$ 92,000.00
34	Boardwalk, 12 feet	Ft	1,000	$ 500.00	$ 500,000.00
35	Remove Boardwalk	Ft	200	$ 50.00	$ 10,000.00
36	Traffic Signal	LS	1	$ 220,000.00	$ 220,000.00
37	Miscellaneous Items	LS	1	$ 25,000.00	$ 25,000.00
	Road and Drainage Cost				**$ 3,170,765.40**
	Public Utilities				
1	Mobilization	LS	1	$ 41,350.00	$ 41,350.00
2	Water Main	Ft	1,900	$ 120.00	$ 228,000.00
3	Water Main Services	Ea	8	$ 1,500.00	$ 12,000.00
4	Sanitary Sewer	Ft	1,900	$ 85.00	$ 161,500.00
5	Sanitary Sewer Services	Ea	8	$ 1,500.00	$ 12,000.00
	Public Utilities Cost				**$ 454,850.00**
	Total Construction Cost				**$ 3,625,615.40**
	Miscellaneous Items				
	Permitting and Mitigation	LS	1	5%	$ 181,280.77
	Right of Way Acquisition	LS	1	$ 498,573.72	$ 498,573.72
	Additional ROW for Crossovers	Sft	4,240	$ 2.50	$ 10,600.00
	Design Engineering	LS	1	6.25%	$ 226,600.96
	Geotechnical Study and Borings (Complete)	LS	1	$ -	$ -
	Design Contingency	LS	1	20%	$ 45,320.19
	Contract Administration	LS	1	4.75%	$ 172,216.73
	Inspection (Crew Days)	Day	140	$ 700.00	$ 98,000.00
	Construction Contingency	LS	1	10%	$ 362,561.54
	Materials Testing	LS	1	2%	$ 72,512.31
	TOTAL COST				**$ 5,293,281.62**

Estimate Assumptions:

Estimate includes intersection of Beck and 11 Mile Road
Estimate includes traffic signal at Beck and 11 Mile Road
Widening ends at Central Park Boulevard except for NB to EB right-turn lane at Grand River Avenue
Traffic signal at Grand River Avenue requires minor modifications for additional turn lanes, but not replacement
Water and sanitary sewer per foot costs include hydrants, valves and manholes
12 inch average size for water main and sanitary sewers used
Miscellaneous Items icludes tree removals, drainage removals, utility adjustments,mailboxes, guardrail, etc.
Additonal ROW for bus compatible crossovers based on two locations per detail in report

APPENDIX B

Scoping Study
Beck Road
Eight Mile Road to Grand River Avenue

Prepared for:
City of Novi Engineering Department

December 2006
Project No. G06496

ftc&h
Fishbeck, Thompson, Carr & Huber
engineers • scientists • architects • constructors

ftc&h

SCOPING STUDY

BECK ROAD

EIGHT MILE ROAD TO GRAND RIVER AVENUE

PREPARED FOR:
CITY OF NOVI ENGINEERING DEPARTMENT
NOVI, MICHIGAN

DECEMBER 1, 2006
PROJECT NO. G06496

Fishbeck, Thompson, Carr & Huber, Inc. Engineers • Scientists • Architects • Constructors
39255 Country Club Drive, Suite B-25, Farmington Hills, MI 48331 Telephone: 248-324-2090

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*included on compact disc in PDF file format

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FREQUENTLY USED ABBEVIATIONS AND ACRONYMS

ADT	average daily traffic
Birchler-Arroyo	Birchler-Arroyo Associates
City	City of Novi
CMAQ	Congestion Mitigation and Air Quality Improvement Program
Council	Novi City Council
DPS	Department of Public Services
DPW	Department of Public Works
EB	eastbound
FTC&H	Fishbeck, Thompson, Carr & Huber, Inc.
FY	fiscal year
Grand River	Grand River Avenue
HMA	hot-mix asphalt
MDEQ	Michigan Department of Environmental Quality
MDOT	Michigan Department of Transportation
mph	miles per hour
NB	northbound
NE	northeast
NW	northwest
PASER	Pavement Surface Evaluation and Rating
RCOC	Road Commission for Oakland County
RFP	Request for Proposals
ROW	right-of-way
RTP	*Regional Transportation Plan*
SB	southbound
SE	southeast
SEMCOG	Southeast Michigan Council of Governments
SW	southwest
TIP	Transportation Improvement Program
VPD	vehicles per day
WB	westbound

1.0 EXECUTIVE SUMMARY

1.1 PURPOSE AND GOALS OF SCOPING STUDY

In August, 2006, FTC&H was selected to perform the *Beck Road Scoping Study* based on a proposal in response to the Request for Proposals (RFP) issued by the City of Novi. The stated purpose of the project is to provide Council with options for potential future improvements on Beck Road from Eight Mile Road to Grand River Avenue. The scope of services included review, estimates, and geotechnical services to be used in the planning, budgeting, and engineering of future work on the Beck Road corridor.

Services completed as a part of this study include:

- Pavement cores and soil borings and a full geotechnical report with recommendations.
- Locating and identifying type of wetland and woodland areas within the influence of Beck Road.
- Review of several alternatives for condition and capacity improvements.
- Incorporating non-motorized pathways.
- Presenting preliminary and developed information to the public at two open meetings.
- Reviewing of traffic counts, growth forecasts, and accident information.
- Developing of potential typical cross sections and layout options.
- Determining potential ROW impacts.
- Preparing cost estimates for each alternative.
- Conducting several meetings and communicating with a scoping committee comprised of City staff.

1.2 BACKGROUND INFORMATION

During the initial stages of the study, it was determined that Beck Road should be evaluated from a regional perspective. The roadway is a direct connection between M-14 to the south and the new interchange at I-96 and Grand River Avenue. The study area, as well as the areas directly north and south of the City limits, is still experiencing growth and development. The portion of Beck Road south of Six Mile Road in Northville Township has been reconstructed to a four-lane boulevard and, according to the Regional Transportation Plan (RTP) prepared by the Southeast Council of Governments (SEMCOG), the portion of Beck Road from Six Mile Road to Eight Mile Road is slated to be a five-lane section, as is the portion of Beck Road north of Grand River Avenue in the City of Wixom. The RTP covers the anticipated needs of the region to 2030 and, according to the plan, the expansion of Beck Road outside Novi is planned to occur during the next 10 to 20 years.

Within the City, Beck Road's current pavement condition ranges from a PASER rating of 3 to 9 (10 being new). In the areas where pavement condition is poor, excessive noise is generated by trucks passing over the cracked and pot-holed surface. Several areas of Beck are adjacent to wetland areas, making it likely that subgrade soils are poor. As part of this study, 39 pavement cores and soil borings were collected and evaluated; and an additional 9 borings were obtained outside the existing roadway to evaluate soils in areas where widening could occur. In 18 of the 48 borings, fill soils considered unsuitable for the support of pavement were encountered; 13 of these were within the existing paved roadway.

Traffic counts and observations indicate that during peak periods, most intersections along Beck Road back up with motorists experiencing moderate to long delays. Increasing the capacity of Beck Road to handle the current and projected demands will require planning to ensure that project budgeting and scheduling align with the RTP, as well as the needs and desires of the City and its residents.

At an October 3, 2006, public information meeting, residents were presented with several short- and long-term options to improve the capacity of the roadway. The residents in attendance were asked to provide feedback on the long-term options presented.

At the second public meeting on November 2, 2006, the preferred short- and long-term options were presented and more clearly detailed. It was emphasized that the short-term options may occur during the next one to six years, and the long-term options would depend on actual growth. Many residents were interested in the potential scope of the work and expressed an interest in being involved and informed in the process. Any changes to the Beck Road corridor will need to balance the needs of neighboring residents with the recognition that the vast majority of users are primarily passing through this noncommercial area.

The following pages present an area-specific summary of the options and staging for potential projects. The following sections contain detailed descriptions and items of concern for each area of Beck Road.

1.3 SHORT-TERM CAPACITY IMPROVEMENTS

At each mile road intersection along Beck Road there is a traffic signal and various accommodations for turning movements. For example, lack of a NB right-turn lane at Ten Mile leads to delays for both through traffic and turning vehicles during peak periods. If Beck Road were to be widened, there would likely be a minimum of two lanes each NB and SB, in addition to a center left-turn lane at each intersection. In the interim, congestion relief at the intersections can be realized by adding or upgrading turn lanes. Table 1 summarizes the recommended intersection improvements that will increase capacity and should be implemented prior to considering expansion along the entire corridor.

Based on comments received during the public meetings, upgrading the intersections prior to considering expanding the rest of Beck Road is very favorably viewed since current congestion can be mitigated by intersection improvements. After intersection improvements are implemented, the effect of the improvements can be reviewed, and a more accurate assessment of the time frame for further potential expansion of Beck Road can be performed. The proposed intersection modifications will align with future widening of Beck Road if or as it occurs.

Table 1 - Short-Term Intersection Capacity Improvements

Intersection	Time Frame (years)	Improvements	Estimate (2006 dollars)	Notes
10 Mile	1 – 4	Add dedicated right-turn lanes to NB, SB, and EB legs; extend WB right-turn and EB left-turn lanes. Replace traffic signal.	$405,600	ROW impacts in all four quadrants; four parcels affected
9 Mile	2 – 5	Extend existing dedicated NB right-turn lane.	$36,000	ROW impact on two parcels
11 Mile	5 – 10	Add dedicated right-turn lanes to EB and WB legs.	$238,000	ROW impact in SW quadrant
8 Mile	5 – 15	Add dedicated right-turn lane to SB leg.	$216,000	To coordinate with section south of 8 Mile

For future-year inflation factor estimates refer to Appendix 7.
Estimate includes approximate cost of ROW acquisition.
Refer to Short-Term Capacity Improvements in Section 5 for detailed information.

1.4 SHORT-TERM CONDITION IMPROVEMENTS

Based on the assumption that any expansion of Beck Road within the City will be coordinated with the timing of improvements in Northville Township and/or the City of Wixom (in 15 to 20 years), preservation of the existing roadway will be required. The exact type of rehabilitation of each roadway segment will need to be evaluated closer to the time at which the work will be performed, however, for planning purposes, Table 2 provides a summary of short-term (1 to 6 years) condition improvements.

Table 2 - Short-Term Condition Improvements

Segment	Time Frame (years)	Work Type	Estimate (2006 dollars)	Notes
11 Mile to Grand River	1 – 4	Mill and overlay	$218,000	Replace wearing course from 10 Mile to new pavement near Providence Hospital.
10 to 11 Mile	1 – 4	Repair and overlay	$466,000	Existing pavement is thin; overlay will result in longer life section.
9 to 10 Mile	2 – 5	Mill and overlay	$495,000	North half is in good condition; aggregate shoulder requires grading to flatten in locations
8 to 9 Mile	3 – 6	Repair and overlay	$464,000	Thin pavement, poor base; overlay to thicken section.

For future-year inflation factor estimates refer to Appendix 7.
Refer to Short-Term Condition Improvements in Section 6 for detailed information.

1.5 LONG-TERM CAPACITY IMPROVEMENTS

According to the SEMCOG 2030 RTP, it is planned that Beck Road be five lanes at the northern and southern borders of the City, within the City of Wixom and Northville Township, respectively (Appendix 5). The portion of Beck Road within the City is not currently in the 2030 RTP, however, the City engineering department is working with SEMCOG to add this and other roadways to the regional plan. As part of updating the City's master plan, Birchler-Arroyo performed studies in 1992 and 1998; all City roadways were examined. The reports recommended that Beck Road be upgraded to a four-lane divided section or a five-lane roadway throughout the corridor at "build-out" conditions, which, at the time the reports were written, was expected to occur between 2010 and 2020. An excerpt of the 1992 Birchler-Arroyo study is included as Appendix 2; an excerpt of the 1998 study is included as Appendix 3.

Based on Novi's traffic count predictions and the plans for the surrounding communities, Beck Road will need two lanes in each direction to convey the traffic coming from beyond the City limit, as well as to serve the residents as a major north-south road in conjunction with Novi, Haggerty, and Napier Roads, which are arterials spaced every other mile. This need for this widening appears to be 15 years distant and, depending when Beck is improved outside the City and the results of intersection capacity improvements, may be as much as 20 to 25 years in the future.

In contemplating the potential widening of Beck Road, consideration was given to the fact that along several segments, successful access management and planning have resulted in very few minor road intersections and private driveways. These segments are candidates for a narrow (20-foot) boulevard section resulting in a four-lane divided roadway, which would allow for the addition of some landscaping to the corridor. Table 3 summarizes the recommended option for each segment.

Table 3 - Long-Term Capacity Improvements

Segment	Cross Section	Estimate (2006 dollars)	Parcels Affected (ROW needs)	Notes
8 to 9 Mile	5 lanes	$3,215,000	28	The eastern half of the southern half mile is in the City of Northville
9 to 10 Mile	5 lanes at the mile roads, with a 4-lane boulevard for middle 3,200 feet	$3,153,500	18	
10 to 11 Mile	5 lanes at the mile roads, with a 4-lane boulevard for the middle 3,500 feet	$3,418,000	6	
11 Mile to Grand River	5 lanes	$1,826,000	13	

For future-year inflation factor estimates refer to Appendix 7.
Estimates include the approximate cost of ROW acquisitions.
Refer to Long-Term Capacity Improvements in Section 7 for detailed information.

1.6 RECOMMENDED ACTIONS

The short-term condition and capacity improvements should be implemented within the next one to six years. A new wearing surface will help prevent damage from failing pavement and will greatly reduce the noise from trucks, which is a common resident complaint. Among the first steps is to get Beck Road listed on the 2030 RTP with the Oakland County Federal Aid Committee and SEMCOG to ensure the timing of upgrades is coordinated with surrounding areas. The described intersection improvements can be funded 80/20 (80% grant, 20% match) or better through the Congestion Mitigation and Air Quality Improvement Program (CMAQ) which is funding earmarked to reduce congestion and the corresponding pollution and ozone impacts; however, the application must be made through SEMCOG. Also, responding to the RCOC 2010-11 *Call for Projects* will put Beck Road “in line” for 80/20 federal funding for intersection improvements.

Requesting that SEMCOG add Beck Road to the 2030 RTP will ensure that as funding becomes available, it is considered in turn with other projects of merit. Grants received can be used for all aspects of roadway improvements, including ROW acquisition.

This scoping report can be the background for initial funding requests and may be expanded in the future. The proposed work in this study should be examined in the future, as standards may have changed; the estimates should also be reviewed based on construction material trends, real estate costs, and general inflation.

2.0 REGIONAL AND LOCAL BACKGROUND AND PERSPECTIVE

At the initial kickoff meeting for the scoping and engineering study, the discussion turned from existing capacity issues to a review of what has been done on Beck Road outside the study area. North of Grand River Avenue, the interchange with I-96 has been improved and reopened as a single-point urban interchange, increasing capacity to/from the freeway. Grand River Avenue has been upgraded to five lanes, and Providence Hospital is continuing to expand at Grand River Avenue. North of I-96, Beck Road is within the City of Wixom and, other than improvements related to the interchange reconstruction, has not been widened beyond two lanes.

South of Eight Mile, Beck Road is within Northville Township and under the jurisdiction of the Wayne County DPS. M-14 has an interchange with Beck Road south of Five Mile. From M-14 to Five Mile, Beck Road is five lanes, and from Five Mile to Six Mile it is four lanes with a narrow (20-foot) boulevard. The section of Beck Road from Six Mile to Eight Mile Road is two lanes with passing flares and turn lanes, similar to the sections in the City.

Further south, Beck Road crosses M-153 (Ford Road), and US-12 (Michigan Avenue). Beck Road is the only non-freeway route that is continuous from south of US-12 to north of I-96. The location of Beck Road in relation to these other roadways is depicted on Figure 1.

2.1 TRAFFIC VOLUMES AND ACCIDENTS

Currently, motorists traveling Beck Road experience delays at most intersections during peak periods (Monday through Friday, 7-9 a.m. and 4-6 p.m.) Traffic counts were obtained at the intersections from Eight Mile Road through Grand River Avenue. At Eight Mile Road, the counts were obtained by City DPW traffic collectors for a week in late August 2006. The other intersections have signals that are monitored under the RCOC FAST-TRAC system which utilizes camera-like sensors to detect traffic flow and adjusts the signal timing accordingly. These sensors are able to count vehicles; the RCOC supplied data for a week in May 2006. After reviewing the counts, Thursday was selected as being representative of a typical week. The counts were summarized by intersection with daily and peak-hour flows depicted on Figure 2. Raw traffic data are included in Appendix 13.

Directional traffic (just NB or SB) on Beck Road ranges from approximately 8,000 VPD to more than 12,000 VPD. The peak-hour flows are generally higher for NB traffic, with hourly totals exceeding 1,000 vehicles at NB Nine, Ten, and Eleven Mile Road and at SB Eleven Mile Road. The traffic counting devices are only able to distinguish between through and turning vehicles at locations where there is an existing turn lane. Nine Mile Road, for example, has right-turn lanes both NB and SB, while Ten Mile Road does not. Traffic counts at Nine Mile Road indicate that during peak periods, as many as to 300 vehicles per hour (of 1,000 total for the hour) make a right turn from Beck Road. Based on field observations during peak and off-peak travel times, NB Beck Road at Ten Mile Road experiences similar right-turn volume as a percentage of total traffic. However, at Ten Mile Road the right-turning vehicles impede through movement and most right-turning vehicles are unable to proceed on a red traffic signal as they can at Nine Mile Road, leading to longer backups at Ten Mile Road. Once a vehicle entered the queue, delays of 4 to 5 minutes to clear the intersection were observed.

Based on the recent traffic counts, the total ADT for Beck Road ranges from 17,000 to 24,000 VPD. Although this portion of Beck Road is primarily residential and developed, it can be assumed that traffic will continue to increase as development occurs north and south of the corridor. A traffic impact study for Providence Hospital by Tetra-Tech MPS, Inc., in January 2005, indicated an anticipated annual traffic increase of 4%. Data provided by SEMCOG indicates that traffic is expected to increase at a 1% annual rate (see Appendix 1 for the SEMCOG letter). The Providence study is useful for the area in immediately proximity to the hospital and is based on short-term projections through 2010, while the SEMCOG numbers reflect a regional perspective and are applicable over a longer term. For the purposes of this study, an annual growth rate of 1% was assumed, as recommended by SEMCOG. A summary of historical and current traffic counts, as well as estimates based on 1% and 4% growth factors are presented in Table 4.

Table 4 - 8 Mile to Grand River Two-Way ADT Counts and Projections

Year	Count/Projection	Source
1991	5,000 – 8,500	1992 Birchler/Arroyo Associates study
1997	13,500 – 17,000	1998 Birchler/Arroyo Associates study
2006	17,000 – 24,000	RCOC and City traffic counts
2010	18,000 – 25,000 (at 1%) 20,000 – 28,000 (at 4%)	
2020	19,500 – 28,000 (at 1%)	
2030	21,500 – 30,500 (at 1%)	

For an excerpt of the 1992 Birchler/Arroyo Study refer to Appendix 2.
For an excerpt of the 1998 Birchler/Arroyo Study refer to Appendix 3.

With assistance of the Novi Police Department, accident and citation data for a 12-month period (August 2005 through July 2006) were reviewed and are summarized in Figure 3. The accident information broken down by hour is presented in Figure 4. The data indicates a concentration of accidents near the Ten Mile Road intersection. The individual accident information sheets (UD-10 forms) were reviewed for this area and the majority of accidents (21 of 35) involved a rear-end collision. The reasons given by drivers and officers for hitting the car ahead of them varied, however, in many cases, the following vehicle did not stop in time when the leading vehicle slowed to turn right or slowed to stop for the signal. No geometric factors (curves, crests of hills, etc.) appear to contribute to the accidents.

2.2 CITY PLANNING INFORMATION

In 2005, the Novi City Council set several short- and long-term goals. In the fourth priority ranking of long-term goals is “Set Timetable for Beck Road Improvement - 8 Mile to Grand River.” The goal does not list what sorts of improvements are sought. Based upon discussions with the City Engineering Department, there is no specific cross-section or plan in mind, however, it was felt that Beck Road needed to be managed and planned to avoid issues that have occurred on other roads in the City and around the region.

In Novi, Beck Road is designated “major arterial”, indicating it is considered a principal route through the City. The City receives Act 51 funding from the State of Michigan which can be used for maintenance of any roadway within the City, provided that “major” roadways receive the highest priority. The funding does not dictate how many lanes a road will have, speed limit, or any other aspect of managing a road, other than that it shall be maintained in such a manner that costly repairs are not due to a lack of maintenance.

The City has established a “thoroughfare plan” as part of the Master Plan for Land Use. The plan describes the requirements and rationale for non-motorized pathways, access management, and driveway regulations. As portions of Beck Road were developed before the thoroughfare plan was in place, there are areas that lack access control and pathways, while areas developed later exhibit good access control as well as pathways, as described in the plan. The thoroughfare plan and associated figures from the current City Master Plan are included for reference in Appendix 4.

2.3 REGIONAL PLANNING INFORMATION

SEMCOG is the major regional planning organization in SE Michigan. The counties included in SEMCOG are: Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne. Membership in SEMCOG is open to all counties, cities, villages, townships, community colleges, and public universities within these counties. The group is primarily focused on the areas of regional economic development, environmental issues, and transportation planning, with the intent that shared goals can be achieved with mutual benefit.

Regarding transportation planning, SEMCOG compiles and maintains traffic count data, pavement condition surveys, and lists of current, planned, and potential roadway projects. The TIP is a listing of currently approved and potential projects intended for short-term funding and construction (2 to 5 years). SEMCOG also created and maintains a long-range RTP, currently the *2030 Regional Transportation Plan for Southeast Michigan*. The projects listed in the RTP have intended time frames divided into five-year increments, ranging from 2006 to 2010 to 2026 to 2030. It contains $41 billion in federal, state, and local funding for road and transit projects for FYs 2005 to 2030, as well as policies and initiatives designed to guide the region forward.

SEMCOG acts as a gatekeeper and sets the requirements to be considered for funding as well as initially reviewing and ranking the projects before requests are submitted to the Federal Aid Taskforce. The Federal Aid Taskforce determines whether a project is funded; the projects are administered through MDOT. This provides the greatest benefit to the region as a whole, with SEMCOG helping to allocate the limited funding among the member counties while allowing communities to set realistic time frames and determine local match requirements.

Appendix 5 contains an excerpt from the 2030 RTP, as well as copies of web pages listing three specific projects for Beck Road in Northville Township and the City of Wixom. For example, from page 39 of the RTP, the project with ID No. 1167 is Beck Road from I-96 to Pontiac Trail in the City of Wixom. It shows a Time Code of 4, which is defined as occurring in the FY range of 2016 to 2020. The web page lists details of the project; it is indicated to have an estimated total cost of $13.3 million, with 80% federal funding requested, and 20% non-federal (a blend of state and local funds).

Beck Road in the City of Novi is not listed in the 2030 RTP or current TIP. Determining what improvements may be needed and being placed on the RTP, even if the projects never actually occur, is an important step in ensuring that the City gets a fair shot at available funding should Beck Road need to be widened in the future.

3.0 RESIDENT INPUT AND FEEDBACK

There were two public informational sessions held during the preparation of this report. An open-house style meeting was held on October 3, 2006, at the Police Training Center; a more formal presentation was given on November 2, 2006, in the Council Chambers. During the first meeting, a slideshow was presented detailing the current and predicted traffic counts, as well as potential short- and long-term geometric configurations being considered for Beck Road.

At the October 3, 2006 meeting, feedback was solicited regarding which long-term cross sections were most appealing to the residents. FTC&H and the City received feedback, input, insightful comments, and recommendations from residents. In general, it was felt that pavement condition and intersection improvement should be carried out over the next several years, with any major widening of Beck Road to be evaluated in the future, after the effect of intersection improvements and actual growth were better known.

Figures 5, 6, and 7, as well as Appendix 9 include information from the October 3, 2006, public meeting.

The November 2, 2006, meeting presented more detailed short- and long-term options, with paving and intersection upgrades emphasized as the preferred short-term recommendation, while the long-term capacity improvements (adding lanes between intersections) were presented as potential options to be reexamined in the future, after the short-term improvement impacts are gauged and actual area growth known. The time frame for the short-term improvements was given as 1 to 6 years, and the long-term options as 15 to 25 years. Several concerns were raised regarding impact the long-term improvements would or might have on the residents in the area; these concerns are summarized in Figure 8. Overall, residents are in favor of short-term condition and capacity improvements as presented.

Sections 5 through 7 of this report detail the short-term condition recommendations, short-term capacity recommendations, and long-term capacity options.

4.0 ENGINEERING EVALUATION

The long-term roadway cross sections listed in Table 3 are referred to as options, as they are some of several possibilities proposed to improve capacity. They are listed as the preferred options because, within the framework of this study, they make the most sense from an engineering and planning perspective: a section with two through lanes in each direction offers greater capacity per dollar spent than other options reviewed.

The short term condition and capacity options presented are known as "3R" work by MDOT and SEMCOG, which stands for resurfacing, restoration, and rehabilitation. Full reconstruction that modifies the cross section of the roadway, such as adding lanes, is known as "4R" work; 4R is not an acronym; rather it stands for the "4^{th} R", reconstruction. All short- and long-term improvements listed are eligible for funding; a funding application must be submitted, and it can take time to receive the funds.

During the preliminary stages of the study, the scoping committee met and various potential options for the future of Beck Road were discussed and evaluated. Major options reviewed were also presented at the October 3, 2006, public information meeting. The residents in attendance reported that while congestion was bad at times, they desired that options other than expansion be explored as well. Options such as: finding ways to reduce traffic, reducing the speed limit, eliminating trucks, noise reduction, and other quality of life items were posed at the meeting. These are goals that can be explored, although the purpose of this study is long-range planning and assumes that current trends and traffic needs on Beck Road will continue. A reduction of vehicles would be dependant on shifting traffic to other roadways, which would require a separate study and evaluation of the residents along that corridor.

4.1 SHORT-TERM CAPACITY EVALUATION

In the earliest discussions, intersection improvements were part of the long-term capacity options. The scoping committee determined that the short- and long-term options be considered separately, which would allow for a staged implementation of the improvements. This would spread the costs over several years, and allow for improvements to be made in the interim without waiting until the full sections were needed in 15 to 25 years.

The primary benefit of intersection improvements is an increase in overall capacity through the intersection; turning movements as well as through vehicles clear the intersection faster. The improvements considered the intersection as a whole; not just Beck Road. By providing a right-turn lane on the intersecting street (e.g., Eleven Mile), traffic from the side road clears the intersection faster, allowing for increased green traffic signal time on Beck Road, which in turn further increases the capacity of the Beck legs of the intersection.

4.2 LONG-TERM CAPACITY EVALUATION

To narrow the range of options and possible iterations of this study for the long-range options, the intent was clarified: “plan for providing the needed capacity on Beck Road before congestion becomes so great the community is forced to make unplanned changes.” This does not mean that other options should not be explored, however, those investigations are beyond the limits of this study. The desired end result of this study is to present possible long-term capacity options, plan for potential funding, and be prepared for future changes. Whether or not the long-term options presented herein are implemented, the information presented can be used in future decision-making discussions.

The congestion on Beck Road during peak periods is becoming excessive; trends indicate the congestion will continue to worsen. If forecasted trends transpire, Beck Road will have an ADT at the current levels of Grand River Avenue, Novi Road, and Haggerty Road; delays due to congestion will become excessive. South and north of the City, the roadway will be widened to five lanes in approximately 15 to 25 years.

There are sections of Beck Road for which a 3- or 4-lane segment would be viable; ultimately, however, these segments would be restrictive if adjoining sections of Beck Road were improved to 5 lanes or a 4-lane boulevard. As this study is envisioning the eventual widening of the corridor, sections with two through lanes and either a center turn lane or median were developed schematically and estimates prepared. The schematic drawings were developed depicting 12-foot-wide lanes, which is desired but not required under current guidelines; 11-foot lanes are acceptable and, while not a major reduction in cross section impact or expense, could be considered as they maintain the same capacity while generally at a lower speed. Table 5 summarizes the process used in evaluating the various long-term cross sections.

Table 5 – Comparative Analysis of Long-Term Capacity Sections

Cross Section	Capacity	Implementation	Cost ($)
No Change	No improvement	None	Maintain existing
3 lanes (center turn)	No gain in through capacity; reduce left-turn passing flares.	Can likely construct road within existing ROW, pathways will require additional ROW.	Moderate
4 lanes	Improvement in through capacity, but left-turning vehicles present a hazard.	Requires additional ROW to accommodate road and pathways, public support is moderate.	Moderate-High
5 lanes	Greatest increase in through capacity, clears left-turning vehicles.	Requires most additional ROW, lowest public support.	High
4-lane boulevard	Same through capacity as 5 lanes, limited application; median requires turn islands.	Requires most additional ROW, slightly better public support.	Highest

4.3 ROW IMPACTS

It is understood that the City's long-range plan is to have pathways on both sides of Beck Road. If any widening of the roadway occurs, additional ROW will be needed across several parcels. In reviewing the potential ROW impacts, the final desired ROW width was assumed to be 120 feet total. For most parcels impacted, this would affect a relatively small portion of the front yard, although for other parcels the take is a relatively large percentage of the total property. The relative impacts were not evaluated as part of this study, however, the impact on the use or overall value of a property would be required in performing a property assessment.

The necessary steps in obtaining ROW can be summarized as follows:

1. Determine the ROW requirements.
2. Survey the area, if necessary.
3. Prepare the easement/ROW descriptions and exhibits.
4. Draft the legal documents (attorney input required).
5. Negotiate with the property owners.
6. Convey/purchase the property.
7. File the recorded documents.

This can be a very long process as owner support or resistance can determine whether a project proceeds. Once it has been determined that ROW will be needed, the process should be initiated as quickly as possible.

4.4 UTILITY INFORMATION

Utility information was requested and received from known aboveground and underground utility companies with facilities in the area. There are electric, cable television, and telephone utilities with facilities mounted on poles, and natural gas and telephone utilities underground within or adjacent to the Beck Road ROW. Refer to Appendix 10 for a listing of known utility companies, sample information request correspondence, and information received from each company.

Based on the information received, it appears that a majority of the utilities that would be impacted by proposed work are within the existing ROW. This is important to consider because if a company is required (or wishes) to relocate their utility due to roadway construction or expansion, and the utility is located within the public ROW, the relocation is generally at the utility's expense. If the utility is located outside of the existing ROW in an easement, and is required to be relocated, the expense would be the responsibility of the City.

Any utility relocation requires extensive planning on the part of the City and the utility involved. Involving the utility companies as early as possible in the design phase of any project helps to establish a timeline for relocation and ensure the project can proceed without delays.

4.5 GEOTECHNICAL INFORMATION

As part of this scoping study, pavement corings and soil borings were obtained by SOMAT Engineering, Inc., and a geotechnical report was prepared. The report was referenced in preparing the cost estimates in this study, and will be utilized for future design and estimating purposes.

In general, the existing aggregate base, subbase, and subgrade do not meet guidelines for new construction, but should be adequate for reconstruction provided areas of poor soils are replaced as they are encountered during construction, and underdrains are added to any widened areas. This area is characterized by silty and clayey soils, which perform poorly when not drained. Specific comments are provided in the long-term capacity improvement section of this report, as well as in the geotechnical report in Appendix 11.

The following sections present a discussion of the preferred short- and long-term condition and capacity options for Beck Road from Eight Mile Road to south of Grand River Avenue. Cost estimates can be found in Appendix 6; Figures 9 through 16A present schematic drawings of the potential capacity improvements.

5.0 SHORT-TERM CAPACITY IMPROVEMENTS

The recommended intersection improvements will help alleviate the backups currently experienced during morning and evening peaks. This will result in less delay, reduced driver frustration, and fewer accidents by separating turning vehicles from the through lanes.

For each intersection, the existing lane configuration is different – some have a combined through and right-turn lane, and others have separate right-turn lanes. All intersections currently have a left-turn lane. The recommended improvements presented in Table 2 are repeated in Table 6 below.

The figures for each intersection depict the approximate lane configurations and ROW impacts, and the estimates list the anticipated work items and current year costs.

Table 6 - Short-Term Intersection Capacity Improvements

Intersection	Time frame (years)	Improvements	Estimate (2006 dollars)	Notes
10 Mile	1-4	Add dedicated right-turn lanes to NB, SB, and EB legs; extend WB right-turn and EB left-turn lanes.	$405,600	ROW impacts in all four quadrants.
9 Mile	2-5	Extend existing dedicated NB right-turn lane.	$36,000	ROW impact on two parcels.
11 Mile	5-10	Add dedicated right-turn lanes to EB and WB legs.	$238,000	ROW impact in SW quadrant.
8 Mile	5-15	Add dedicated right-turn lane to SB leg.	$216,000	To coordinate with section south of 8 Mile.

For future-year inflation factor estimates refer to Appendix 7.
Estimate includes approximate cost of ROW acquisition.

5.1 EIGHT MILE ROAD INTERSECTION

The west half of the north leg of the Eight Mile Road intersection is within the City; the eastern half within the City of Northville, and the leg south of Eight Mile Road within Northville Township. The City of Northville has previously been receptive to participating in improvements to the portion of Beck Road that lies within their jurisdiction; however, the level of participation will need to be confirmed in the future once a project scope has been approved.

Beck Road south of Eight Mile Road is under the control of the Wayne County DPS. In the SEMCOG 2030 RTP, Beck Road south of Eight Mile Road is indicated to become five lanes. This was discussed with Mr. Ken Kucel of the Wayne County DPS and the proposed plan was confirmed. The timeline of this expansion is unknown, other than to be more than 10 years in the future. There are significant ROW needs and some challenging terrain that will have to be addressed before the roadway is designed and issued for construction.

Eight Mile Road itself is under the control of the RCOC; any improvements to this road will be completed under their authority. The upgrades within the City should be discussed and coordinated with the RCOC and the City of Northville. As this is a shared jurisdiction, the costs for upgrades can be shared as well.

The proposed improvements to the north leg of the intersection include adding a SB right-turn lane, and increasing the radius of the NE quadrant. Traffic counts obtained for this intersection did not include turning movements; however, based on observations, SB backups at Eight Mile Road are primarily due to through vehicles, not turning movements.

Refer to Figure 9 for a schematic of the proposed intersection improvements and traffic movements.

5.2 NINE MILE ROAD INTERSECTION

NB and SB Beck Road at Nine Mile Road already have dedicated right-turn lanes. The EB and WB legs are three lanes without dedicated right-turn lanes.

Based on traffic counts and observation, Beck Road flows fairly well through Nine Mile Road; however, the NB right-turn lane is very short, causing some delay, and should be extended. Based on MDOT Geometric Guidelines, the turn lane should be 250 feet with a 130-foot taper.

Based on observation, vehicles on the EB and WB legs of Nine Mile Road primarily turn north or south. The addition of a dedicated right-turn lane does not appear warranted.

Refer to Figure 10 for a schematic of the proposed intersection improvements and traffic movements.

5.3 TEN MILE ROAD INTERSECTION

The Ten Mile Road and Beck Road intersection has high volume for both north-south and east-west traffic. Only the WB leg has a dedicated right-turn lane and backups occur during peak as well as non-peak periods, primarily on the north and south legs of the intersection.

The three legs that do not have right-turn lanes (NB, SB, and EB) should have full-length turn lanes and tapers added. The existing right-turn lane on the WB leg has a short taper due to a commercial drive just east of the intersection. This turn lane should be extended through the commercial drive entrance to allow for greater storage.

The signal at the intersection will need to be relocated due to the widening of three quadrants and should be replaced with a controller and heads providing exclusive left- and right-turning signals. Improvements at this location would achieve a significant reduction in delay through the intersection, however, the increase in flow may require signal modifications at adjacent intersections to accommodate larger groups of vehicles at a time.

Refer to Figure 11 for a schematic of the proposed intersection improvements and traffic movements.

5.4 ELEVEN MILE ROAD INTERSECTION

On average, the EB and WB movements through the Beck Road at Eleven Mile Road intersection are not as heavy as at Ten Mile Road. The morning and evening peak periods, however, are significant, particularly in the WB direction, through traffic and right-turning vehicles queue for several minutes.

The NB and SB legs have existing right-turn lanes, but the EB and WB legs do not. Dedicated right-turn lanes should be added to the EB and WB lanes to alleviate congestion and reduce wait times.

Refer to Figure 12 for a schematic of the proposed intersection improvements and traffic movements.

6.0 SHORT-TERM CONDITION IMPROVEMENTS

Based on the likelihood that any expansion of Beck Road inside or outside the City will not occur for 10 to 15 years, the existing road surface must be repaired and maintained. The work necessary for each section will need to be evaluated at the time the work is proposed to occur. The work type and estimates presented in Table 2 (on page 4of this report) are sorted based upon current pavement condition and expected work.

Beck Road from Eight to Nine Mile Road has a PASER rating of 2 (poor) and has relatively thin (3- to 4-inch) pavement in poor condition with poor underlying base material. The northern half of this section received a thin overlay in 2005, which improved the appearance and reduced noise levels, but a useful life of only 5 years is expected. Beck Road from Ten Mile to Eleven Mile Road has a similar pavement section and has a PASER rating of 2-3 for the southern 0.75 mile, and a rating of 7 for the northern portion, which was paved within the last 5 years. Surface repairs and a full depth overlay should be performed for these sections of Beck Road, resulting in a 15 to 20 year lifespan, provided regular maintenance is performed.

The remaining sections, Nine to Ten Mile Road, and Eleven to Grand River Avenue are generally in better condition, have been recently improved, and/or have thicker (4- to 6-inch) pavement sections. These sections can be milled and overlaid with good results expected to last 15-20 years.

7.0 LONG-TERM CAPACITY IMPROVEMENTS

Within the City, continual development and growth has lead to the point where the City is approaching “build-out”, where much less growth is possible due to most of the available land having been developed for commercial or residential uses. At build-out, increased traffic on Beck Road would not be due to changes within the City, but rather growth occurring in other communities and a result of commuter and pass-through traffic. If Beck Road is widened to five lanes in communities north and south of the City to meet the demand, it can be assumed that demands within the City will also increase, regardless of development within Novi.

For the purposes of this study, is was assumed that, at some point, it will be desired for the capacity of Beck Road to be increased, and various options were reviewed. Other options, such as reducing capacity or improving other corridors could also be evaluated, but are beyond the focus of this study. For planning purposes, sections that provided two through lanes in each direction were developed with schematic plans and estimates prepared. This information can be used to establish Beck Road with the City on the SEMCOG 2030 RTP.

Table 3 from the Executive Summary is repeated below as Table 7 and summarizes the recommended option for each segment.

Table 7 - Long-Term Capacity Improvements

Segment	Section	Estimate (2006 dollars)	Parcels affected (ROW needs)	Notes
8 to 9 Mile	5 lanes	$3,215,000	28	The eastern half of the southern half mile is in the City of Northville
9 to 10 Mile	5 lanes at the mile roads, a 4-lane boulevard for the middle 3,200 feet	$3,153,500	18	
10 to 11 Mile	5 lanes at the mile roads, a 4-lane boulevard for the middle 3,500 feet	$3,418,000	6	
11 Mile to Grand River	5 lanes	$1,826,000	13	

For future-year inflation factor estimates refer to Appendix 7.
Estimates include the approximate cost of ROW acquisitions.

The following sections present a discussion of each portion of Beck Road from Eight Mile Road to south of Grand River Avenue. Cost estimates can be found in Appendix 6 and Figures 13A through 16 present schematic drawings of the preferred long-range options.

7.1 EIGHT MILE ROAD TO NINE MILE ROAD

This portion of Beck Road is characterized by flat to gently rolling terrain; it is generally open with few trees adjacent to the roadway. The eastern portion of the southern half mile is within the City of Northville; approximately 25% of the estimated cost may be shared with Northville depending on the work proposed and agreements between the cities. The pavement in the southern portion is very poor with a 2004 PASER rating of 3. The northern half mile received a thin overlay by the Novi DPW in the fall of 2005. The overlay is performing well and the roadway appears to be stable despite the poor base material encountered in the geotechnical review.

7.1.1 ROADWAY SECTION

There are several (approximately 20) private drives and 2 subdivision entrances along Beck Road. The number and spacing of drives would make for a choppy boulevard section; therefore, a continuous 5-lane section is recommended.

7.1.2 ENVIRONMENTAL CONCERNS

There were three areas identified as wetlands within the project limits. It appears that at least two areas could be affected by roadway reconstruction, all three could be affected if pathway construction is considered. Refer to the schematic drawings for locations and Appendix 8 for descriptions of the wetland areas.

7.1.3 GEOTECHNICAL INFORMATION

The soil borings for this portion of Beck Road generally show 3 to 4 inches of HMA over compacted base material. The base material is not a typical road base material (crushed stone, sand, and small amounts of silt), rather, it is native or imported material with concentrations of silt, clay, and organic material (topsoil or peat) considered too high for road base material. This material holds excessive moisture; several borings indicate moisture content (percentage of total weight) in the vicinity of 20%, more than double what is considered the high end of acceptable.

There are also some areas with organic material at the bottom of the boring which is likely to have originated from native material left in place. In general, it is recommended that the existing base material be removed and replaced with 8-inches of MDOT 22A (or similar), and the subgrade removed and replaced with embankment, and with 18-inches of subbase in areas where organic materials are present or water content is very high. Refer to the full geotechnical report in Appendix 11.

Near Nine Mile Road, there is a wetland area on the west side that will be of concern during design and construction. Full-depth subgrade undercut (4 to 5 feet in depth) and backfill should be assumed for this area.

7.1.4 ROW IMPACTS

Approximately 28 parcels will be impacted. The ROW adjacent to unplatted areas is generally 33 feet from the section line (66 feet total); the ROW adjacent to platted areas is 60 foot (120 feet total). To obtain the desired 120-feet-total-width for all areas, a 27-foot-wide strip would need to be acquired from most affected parcels. Approximate areas of affected parcels are shown on the schematic drawings, and an analysis of the existing ROW can be found in Appendix 12.

7.1.5 PATHWAYS

On the west side of the roadway, the 8-foot-wide pathway would be built primarily in acquired ROW. There are several areas of landscaping and wooded areas which may require some alignment shifts. It is assumed that the 5-foot pathway will not be constructed on the Northville portion of Beck Road. There is existing pathway along the southern half of the remaining 0.5 mile; the remainder would be constructed in acquired ROW.

7.1.6 DESIGN AND CONSTRUCTION CONCERNS

There is a series of three cross culverts just south of Stratford Lane, which is just north of the halfway point between Eight Mile Road and Nine Mile Road. The culverts appear to be 2-foot by 3-foot corrugated metal; however, they were buried in such a manner that positive measurement was impossible. These culverts will need to be replaced; based on their proximity to wetland areas, an MDEQ wetlands permit may be required. It appears these are equalization culverts and not flowing at most times, so a hydraulic study may not be required.

Because the existing section is two lanes with a narrow shoulder, maintaining traffic while working will require a lane closures and potentially detours. Deep undercut areas will be safety concerns, and dust generated by vehicles may be an nuisance to adjacent homeowners. Noise and lack of access will be a concern to residents as well.

7.2 NINE MILE ROAD TO TEN MILE ROAD

This portion of Beck Road is characterized by rolling terrain and varies from open with few trees adjacent to the roadway, to wooded areas close by. The pavement in the southern 0.75 mile is poor with a 2004 PASER rating of 3; most of the remainder is in good condition with a PASER of 7.

7.2.1 ROADWAY SECTION

There are approximately eight private drives and seven subdivision entrances along Beck Road. The private drives are fairly close together in the center portion of this section and could be served by one or two crossovers, therefore, this section is considered a candidate for a narrow (20-foot) median boulevard section. The boulevard would begin north of the Beckenham Boulevard subdivision entrance and continue north to just south of Totenham Court. This allows for free access to the subdivisions served by those roads, and for the left-turn tapers and lanes at the mile roads.

7.2.2 ENVIRONMENTAL CONCERNS

There were four areas identified as wetlands which may potentially be impacted within the project limits. It appears at least two of the areas could be affected by roadway reconstruction as well as pathway construction. Refer to the schematic drawings for locations and Appendix 8 for descriptions of the wetland areas.

7.2.3 GEOTECHNICAL INFORMATION

The soil borings for this portion of Beck Road generally show 4 to 6 inches of HMA over compacted base material. It appears engineered fill was used as base material in most locations, but is typically placed directly over native dense clay base material. This section of the roadway is likely trapping water in some locations, although with adequate underdrain, the existing base material can perform well. It should be anticipated that the top 6 to 8 inches of base material will be removed and replaced with subbase undercuts in areas of organic concentration. Refer to the full geotechnical report in Appendix 11.

There are several wetland areas near or within the proposed ROW area. Full-depth subgrade undercut and swamp backfill should be assumed for the widening in these areas.

7.2.4 ROW IMPACTS

Approximately 18 parcels will be impacted. The ROW adjacent to unplatted areas is generally 33 feet from the section line; the ROW adjacent to platted areas is 60 feet. To obtain the desired 60 feet for all areas, a 27-foot-wide strip would need to be acquired from most affected parcels. Approximate areas of affected parcels are detailed on the schematic drawings, and an analysis of the existing ROW can be found in Appendix 12.

7.2.5 PATHWAYS

On the west side of Beck Road, the existing 8-foot-wide pathway ends approximately 0.25 mile north of Nine Mile Road. The remaining portion would be constructed across several acquired parcels and adjacent to or over two wetland areas (likely to be boardwalks). The 5-foot-pathway on the east side is almost complete for the entire mile, the only gap being the northernmost 250 feet. This portion would be constructed in acquired ROW.

7.2.6 DESIGN AND CONSTRUCTION CONCERNS

Maintaining traffic will be a challenge and will require several stages to construct the widened areas of the roadway first, removing the existing roadway to form the median last. Areas of undercut, while not expected to be as extensive as those south of Nine Mile Road, will need to be brought back close to grade before traffic can operate without requiring concrete barrier. Noise and lack of access will be a concern to residents as well.

7.3 TEN MILE ROAD TO ELEVEN MILE ROAD

This portion of Beck Road is characterized by gently rolling terrain and varies from open with few trees adjacent to the roadway, to wooded areas close by. The pavement in the southern 0.75 mile is poor, with a 2004 PASER rating of 3; most of the remainder is in good condition with a PASER of 7.

7.3.1 ROADWAY SECTION

There are approximately 12 private drives, 5 subdivision entrances, and 2 commercial drives along Beck Road. The private drives are fairly close together in the northern portion of this section and could be served by one or two crossovers; therefore, this section is considered a candidate for a narrow (20-foot) median boulevard section. The boulevard would begin north of the Ashley Boulevard subdivision entrance and continue north to just south of Sierra Drive. This allows for free access to the subdivisions served by those roads and for the left-turn tapers and lanes at the mile roads.

7.3.2 ENVIRONMENTAL CONCERNS

There were three individual areas identified as wetlands within the project limits. One connects to a larger wetland on the west side of Beck Road and the remaining two are part of wetland areas larger than five acres. It appears at least two areas could be affected by roadway reconstruction; all four could be affected if pathway construction is considered. Refer to the schematic drawings for locations and Appendix 8 for descriptions of the wetland areas.

7.3.3 GEOTECHNICAL INFORMATION

The borings for this portion of Beck Road generally show 3.5 to 4 inches of HMA over compacted base material. It appears that engineered fill was used as base and subbase material in most locations. The existing aggregate base and subbase can mostly remain in place, with widening adjacent to the existing roadway section. It should be anticipated that there will be subbase undercuts in areas of organic concentration. Refer to the full geotechnical report in Appendix 11.

There are several wetland areas near or within the proposed ROW area. Full-depth subgrade undercut and swamp backfill should be assumed for the widening in these areas.

7.3.4 ROW IMPACTS

Approximately 6 parcels will be impacted; most are large parcels and not individual houses. The ROW adjacent to unplatted areas is generally 33 feet from the section line; the ROW adjacent to platted areas is 60 feet. To obtain the desired 60 feet for all areas, a 27-foot-wide strip would need to be acquired from most affected parcels. Approximate areas of affected parcels are detailed on the schematic drawings, and an analysis of the existing ROW can be found in Appendix 12.

7.3.5 PATHWAYS

The west side of Beck Road has a partially-constructed 8-foot-wide pathway. There is an 800-foot-gap at Ten Mile Road; a 400-foot break in the middle, due to wetland and ROW conflicts; and the northern 1,300 feet is incomplete due to a lack of ROW. The proposed path would be built in acquired ROW. It should be noted that a portion of an existing boardwalk would need to be removed and reconstructed to clear the proposed widening.

7.3.6 DESIGN AND CONSTRUCTION CONCERNS

Maintaining traffic will be a challenge and will require several stages to construct the widened areas of the roadway first, removing the existing roadway to form the median last. A partial or complete detour will likely be required during undercut operations or construction adjacent to wetland areas. Noise and lack of access will be a concern to residents as well.

7.4 ELEVEN MILE ROAD TO SOUTH OF GRAND RIVER AVENUE

This portion of Beck Road is flat and open adjacent to the roadway. From Eleven Mile Road to Grand River Avenue is approximately 3,500 feet; the northern 1,100 feet has been newly widened to five or more lanes due to construction at the Providence Hospital site and the construction of the interchange with I-96. The pavement in the southern 2,400 feet of Beck Road is fair to poor with a 2004 PASER rating of 4.

7.4.1 ROADWAY SECTION

This portion of Beck Road is fairly short and, after allowing for turning movements at Eleven Mile Road and the influence of development at Providence Park, any boulevard section would be very short. A continuous 5-lane section is recommended.

7.4.2 ENVIRONMENTAL CONCERNS

There were five wetland areas identified; it appears two wetland areas on the west side of Beck Road could be potentially impacted within the project limits. It appears both of the areas could be affected by roadway reconstruction as well as pathway construction. Refer to the schematic drawings for locations and Appendix 8 for descriptions of the wetland areas.

7.4.3 GEOTECHNICAL INFORMATION

The soil borings for this portion of Beck Road generally show 4 to 7 inches of HMA over compacted base material. It appears engineered fill was used as base and subbase material in most locations. The existing aggregate base and subbase can mostly remain in place, with widening adjacent to the existing roadway section. Refer to the full geotechnical report in Appendix 11.

There are several wetland areas near or within the proposed ROW area. Full-depth subgrade undercut and swamp backfill should be assumed for the widening in these areas.

7.4.4 ROW IMPACTS

Approximately 13 parcels will be impacted. The ROW is generally 33 feet from the section line on both sides of the road, with the exception of several adjacent parcels near Eleven Mile Road. To obtain the desired 60 feet for all areas, a 27-foot-wide strip would need to be acquired from most affected parcels. Approximate areas of affected parcels are detailed on the schematic drawings, and an analysis of the existing ROW can be found in Appendix 12.

7.4.5 PATHWAYS

On the west side of Beck Road, the proposed 8-foot-pathway would be constructed across several acquired parcels and adjacent to or over two wetland areas (likely to be boardwalks). The 5-foot pathway on the east side is incomplete with the southern 1,300 feet not constructed. This portion would be constructed in acquired ROW.

7.4.6 DESIGN AND CONSTRUCTION CONCERNS

Maintaining traffic will not be as significant a concern as some of the other segments. The existing roadway base appears stable and should not require many undercuts or removals; additionally, there are not as many residents along this area. However, dust and delays will still be a concern and should be planned for during design.

8.0 IMPLEMENTATION PLAN

8.1 SHORT-TERM ACTIVITIES

The first step includes getting Beck Road on the RTP with the Oakland County Federal Aid Committee and SEMCOG to ensure the timing of upgrades are coordinated with surrounding areas. The short-term condition and capacity improvements should be explored immediately. Paving the existing roadway is a maintenance issue; in the interest of preserving the existing roadbed and in response to resident complaints should occur as soon as possible.

A safety upgrade that could be considered for most sections of Beck Road is to add a 3-foot-wide paved shoulder. In many locations the lane line is at the edge of the pavement. Adding a paved shoulder will contribute to the overall stability of the roadway, and enhance the safety for slightly errant vehicles.

The intersection improvements described can be funded 80/20 (80% grant, 20% local match) through the CMAQ. This funding is earmarked to reduce congestion, as well as the corresponding pollution and ozone impacts; however, the application must be made through SEMCOG. Another initial step is to respond to the RCOC 2010-11 Call for Projects, which will put Beck Road "in line" for 80/20 federal funding. These grants can be used for all aspects of the roadway improvements, including ROW acquisition.

This scoping report can be the background for initial funding requests, and may be expanded in the future. The proposed work in this study should be examined in the future, as standards may have changed; the estimates should also be reviewed based on construction material trends, real estate costs, and general inflation.

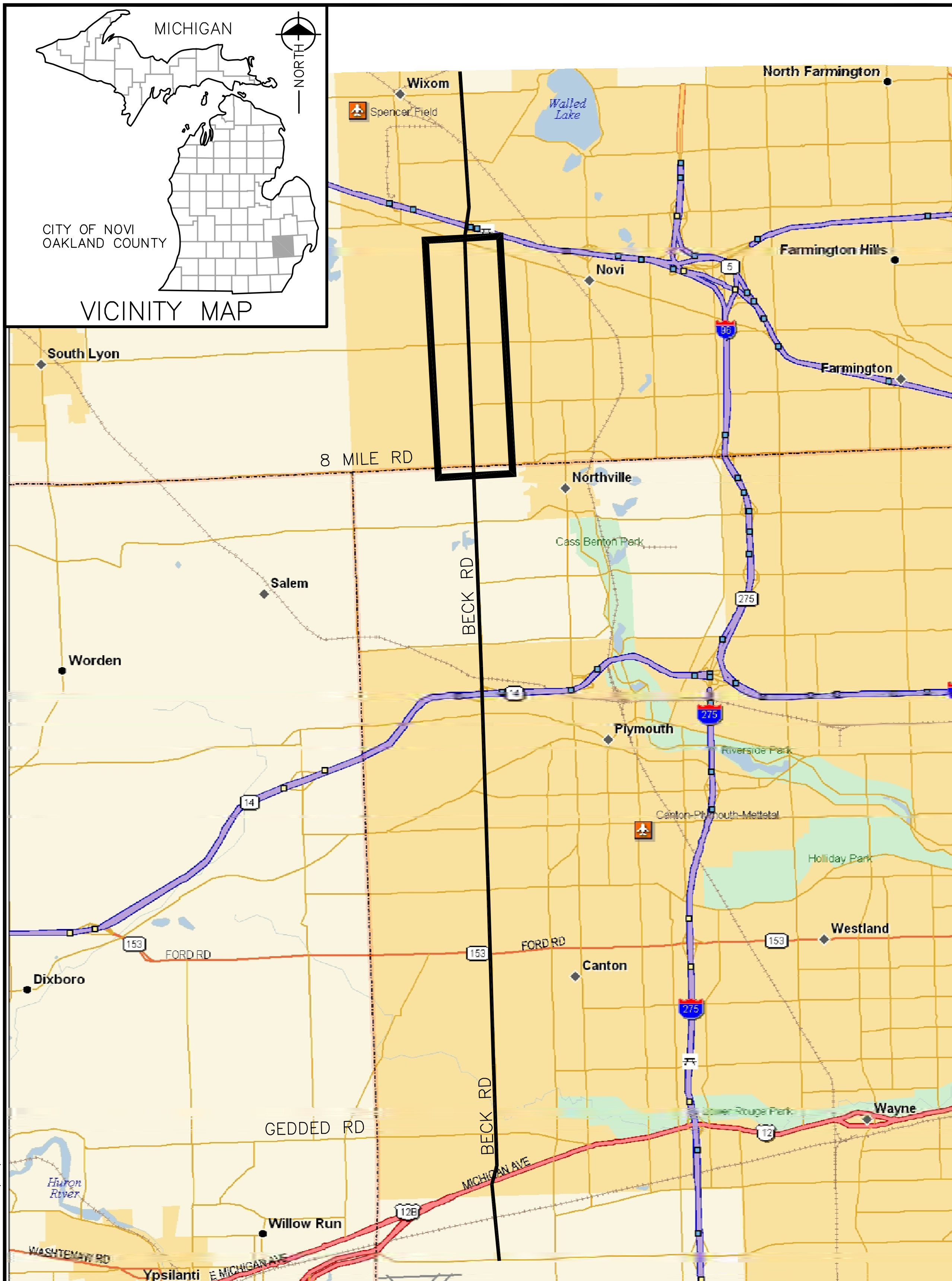
8.2 LONG-TERM

Assuming that the short-term intersection improvements are implemented, congestion at intersections during peak periods will be reduced; however, the effect will diminish over time as more traffic uses Beck Road. When it is felt that the overall capacity of the Beck Road corridor may need to be increased, a full traffic impact study should be performed. This will evaluate Beck Road in relation to other surrounding roads, growth trends in and around the City, and potential improvements that could be performed elsewhere to alleviate some of the Beck Road congestion.

Keeping the corridor on the long-range RTP is critical. If the time frame for potential improvements changes, the roadway plan in the RTP should be updated every five years, or as directed by SEMCOG. At regular intervals, the performance of previous improvements should be monitored and reflected in the

SEMCOG RTP, as well as in City budgeting sessions. Keeping the road in the planning documents ensures that other communities are aware of what the City is considering and keeps the project(s) in line for available funding. This study should be referenced in the future, updated, and kept as current as possible to reflect the current position and opinion of the Engineering Department, City Council, and residents of Novi.

Figures



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constructors

City of Novi
Novi, Michigan

Beck Road Scoping Project

0 2000 4000
Scale: 1" = 2000'

REFERENCE:
DeLORME STREET ATLAS
USA – 2006

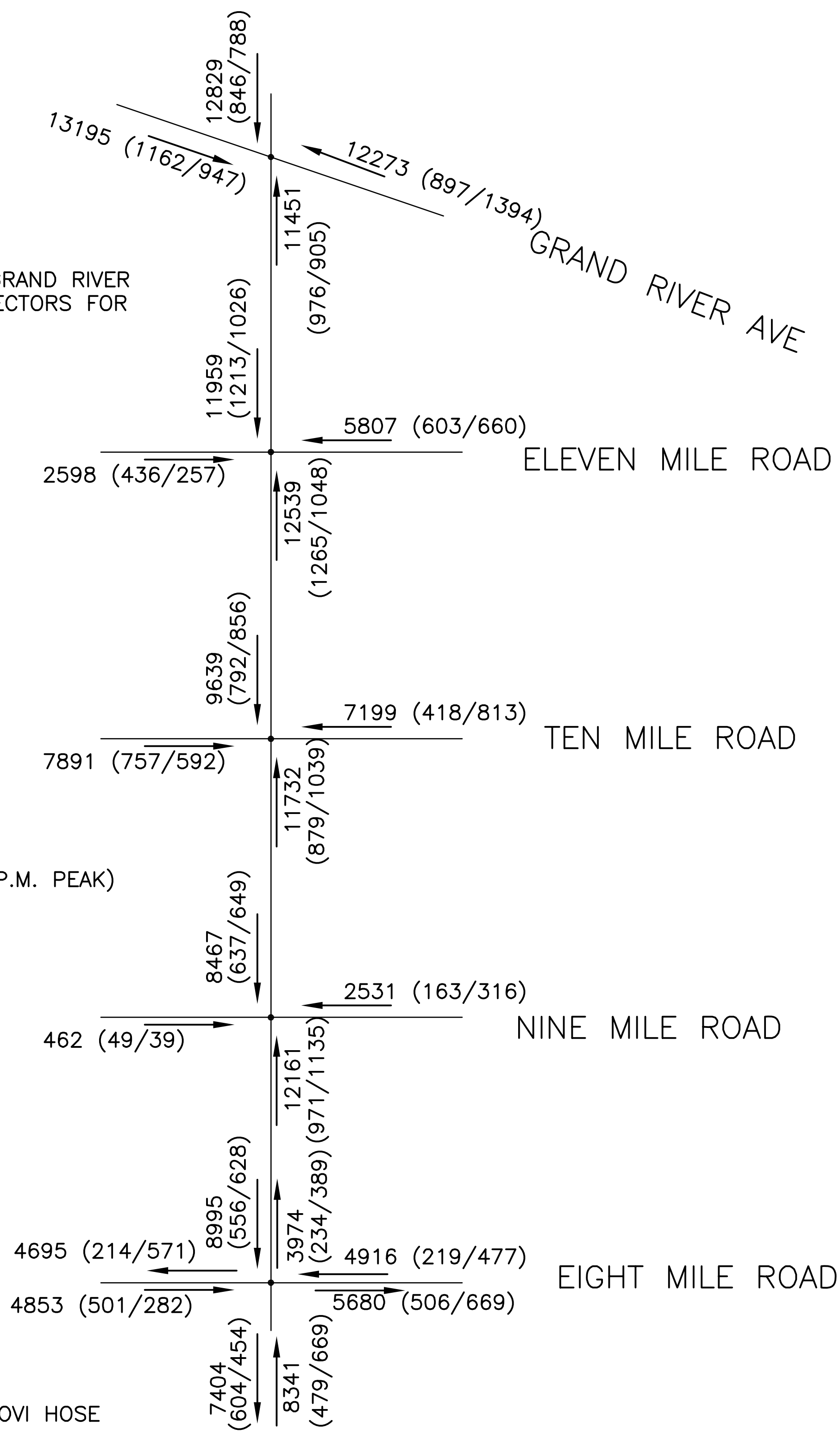
REGIONAL AND SITE LOCATION MAP

PROJECT NO.
G06496

FIGURE NO.
1

PLOT INFO: N:\06496\CD\FIG-1.DWG DATE: 10/26/2006 TIME: 9:27:56 AM USER: BDR

NINE MILE NORTH THRU GRAND RIVER
COUNTS FROM OCRC DETECTORS FOR
THURSDAY, MAY 18, 2006



KEY:
24HR TOTAL (A.M. PEAK/P.M. PEAK)

EIGHT MILE AT BECK
COUNTS FROM CITY OF NOVI HOSE
DETECTORS FOR
THURSDAY, AUGUST 24, 2006

NORTH

BECK ROAD TRAFFIC COUNT

NO SCALE

ftc&h 50 years

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scientists
architects
constructors

CITY OF NOVI
BECK ROAD SCOPING

EXISTING TRAFFIC DATA

PROJECT NO.
G06496

FIGURE NO.
2

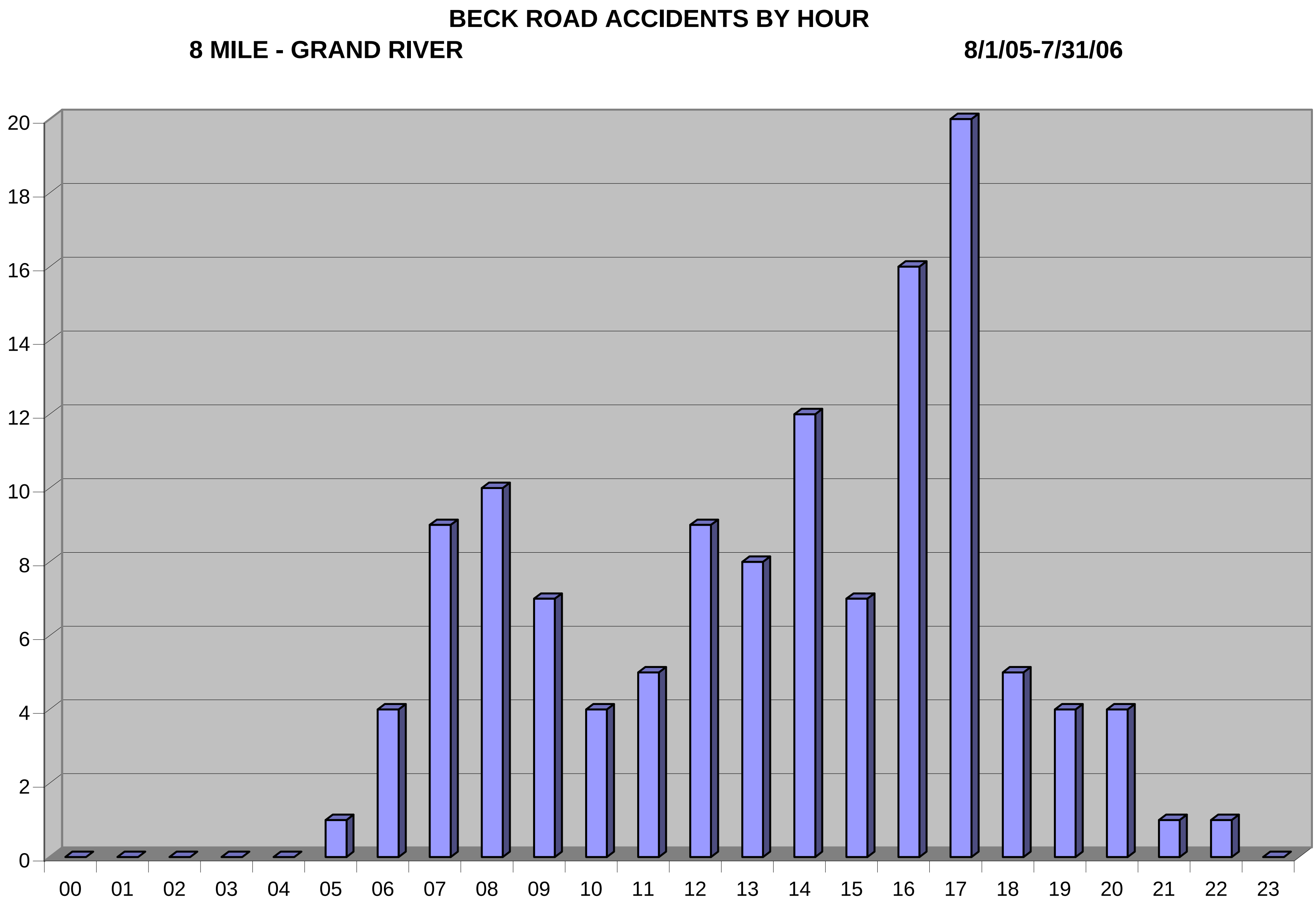
fishbeck, thompson, carr & huber, inc.

FIGURE 3

BECK ROAD
8 MILE - GRAND RIVER
ACCIDENTS
SPEEDING/COMMERCIAL VEHICLE CITATIONS
August 1, 2005 - July 31, 2006

	ACCIDENT	INJURY ACCIDENT	CAR/BIKE	CAR/DEER	HIT & RUN	TOTAL	SPEEDING CITATIONS	COMMERCIAL VEHICLE CITATIONS	TOTAL
8 MILE	7	2	0	0	0	**9**	67	19	**86**
STRATFORD	0	0	0	2	0	**2**	111	38	**149**
BELLAGIO	0	0	0	0	0	**0**	45	7	**52**
9 MILE	5	2	1	0	1	**9**	138	84	**222**
BECKENHAM	0	0	0	0	0	**0**	39	3	**42**
SUNNYBROOK	0	0	0	0	0	**0**	30	0	**30**
CHELTENHAM	0	0	0	0	0	**0**	47	15	**62**
WHITE PINES	1	0	0	0	0	**1**	63	40	**103**
EDINBOROUGH	0	0	0	0	0	**0**	26	4	**30**
IROQUOIS	0	0	0	0	0	**0**	1	0	**1**
TOTTENHAM	0	0	0	0	0	**0**	26	4	**30**
BAKER	1	0	0	0	0	**1**	9	10	**19**
10 MILE	26	6	0	1	2	**35**	171	46	**217**
ASHLEY	0	0	0	0	0	**0**	7	0	**7**
CIDER MILL	2	1	0	2	0	**5**	49	8	**57**
KIRKWAY	0	0	0	1	0	**1**	3	0	**3**
SANFORD	0	0	0	0	0	**0**	20	2	**22**
SIERRA	0	0	0	0	0	**0**	2	0	**2**
11 MILE	6	2	0	1	0	**9**	178	16	**194**
CENTRAL PARK	1	0	0	0	0	**1**	2	0	**2**
GRAND RIVER	43	10	0	0	1	**54**	76	14	**90**
TOTAL	**92**	**23**	**1**	**7**	**4**	**127**	**1,110**	**310**	**1,420**

FIGURE 4



12/1/2006
J:\06496\REPT\FINAL\FIG03-04_Accidents.xls

FIGURE 5

COMMENTS AND QUESTIONS OBSERVED DURING BECK ROAD PUBLIC INPUT SESSION October 3, 2006

- Was there an analysis of traffic trending for the past five years?
- What was the impact of the M-14/Beck closure and the I-96 interchange opening?
- Is Beck Road a truck route? Why are there so many trucks?
- The issue of speed limits was identified and discussed several time, usually in favor of a lower speed limit.
- Who decides what the cross-section of Beck Road will be?
- There was a discussion of the past proposal to widen Ten Mile Road.
- Why does the data show a decrease in traffic on Ten Mile Road?
- A resident suggested additional traffic signals to decrease accidents.
- A concern was expressed about widening Beck Road in front of Pioneer Meadows because of the number of homes impacted on Beck.
- Why weren't citizens asked to be on the committee? How can they get on the committee?
- Reduce the speed limit to 30 mph on Beck Road.
- Impose weight and truck restrictions.
- The amount of noise from the road must be controlled.
- Wouldn't a three lane road add capacity by allowing turning movements?
- There will never be commercial at Ten Mile and Beck Road.
- What is the objective statement of this study?
- A resident stated that the residents on Beck Road do not want it widened but most others do.
- Why is Beck Road designated as a major road?

By: Brian Coburn 10/4/06

FIGURE 6

ftc&h

SUMMARY OF PREFERRED OPTIONS
Beck Road Public Input Session
October 3, 2006

Response Selection	Number of Responses
3 lanes (1 lane each direction with center turn lane)	4
5 lanes (2 lanes each direction with center turn lane)	5
4 lane narrow boulevard (2 lanes each direction with median)	4
Intersection upgrades (1 lane each direction with safety widening)	13
No improvement other than repaving existing road	1
Multiple responses*	14
No response	6
TOTAL RESPONSES	**47**

*Of multiple responses, the following were chosen:	Number of Responses
3 lanes (1 lane each direction with center turn lane)	9
5 lanes (2 lanes each direction with center turn lane)	2
4 lane narrow boulevard (2 lanes each direction with median)	4
Intersection upgrades (1 lane each direction with safety widening)	14
No improvement other than repaving existing road	7

Response Selection	Total Responses including those with multiple selections
3 lanes (1 lane each direction with center turn lane)	13
5 lanes (2 lanes each direction with center turn lane)	7
4 lane narrow boulevard (2 lanes each direction with median)	8
Intersection upgrades (1 lane each direction with safety widening)	27
No improvement other than repaving existing road	8

FIGURE 7

SUMMARY OF COMMENTS
CATEGORIZED BY RESPONSE
Public Information Meeting - October 3, 2006

Comments	Preferred Alternative: Intersection Improvements	3-lane Section	5-lane Section	4-lane Boulevard	No Response	Multiple Responses	TOTAL
Decrease truck traffic	3					6	9
Reduce noise/vibration	4				1	4	9
Improve safety/noise by lowering speed	4	1		1	1	1	8
Consider that Beck is residential/maintain character	3			1	1	2	7
Decrease traffic volume*	4				3		7
Need to improve capacity	2		3	2			7
Improve safety by adding turn lanes	2	1				3	6
Add citizens to the committee to study Beck Road	1			1	2	1	5
Use various cross sections	2			1		1	4
Decrease impact on homes that front on Beck	3						3
Don't add capacity		1				2	3
Look at alternate North-South routes (Napier)	3						3
Provide a map showing where the ROW is limited					3		3
Don’t add non-motorized paths**						2	2
Premature to choose cross-section					2		2
Adding lanes will increase traffic***						1	1
Beck is a major thoroughfare	1						1
Concerned about property values				1			1
Don't design for 3 hours of volume (peak hours)		1					1
Don't listen to just a few, do what's right for City		1					1
Ease traffic flow without widening***	1						1
Find a way to manage peak periods***					1		1
No need for residents on committee, for City Council to decide						1	1
Pavement is in bad condition	1						1
Phase in with intermediate 3-lane section			1				1
Upgrade current road with curbs and drainage						1	1
Use asphalt, not concrete (noise)	1						1

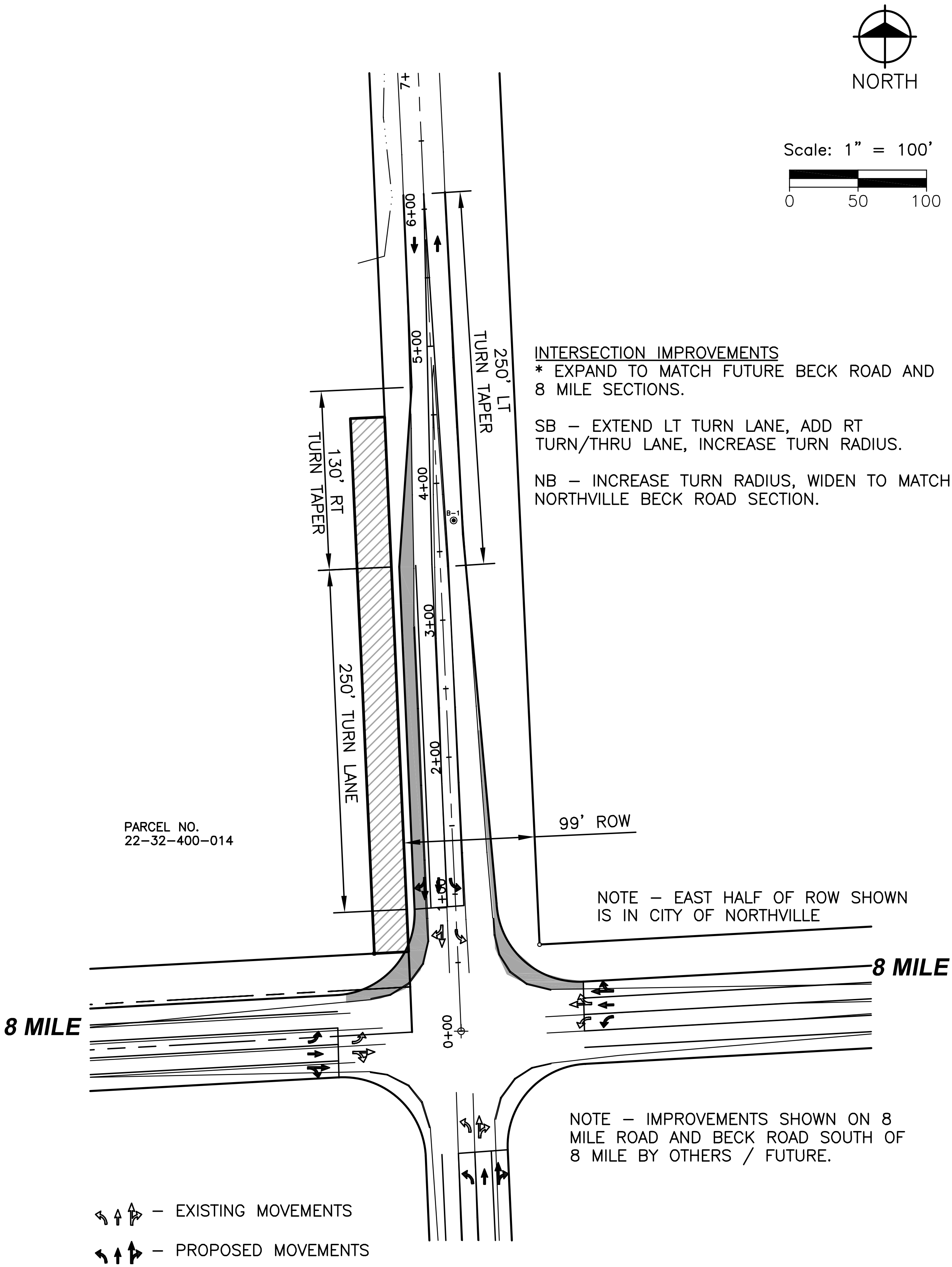
* Only one suggestion provided--alter departure times to decrease traffic.
** The purpose of this may be to reduce ROW needs based on the discussion.
*** Not included in decrease traffic comment

12/1/2006
J:\06496\REPT\FINAL\FIG07_Cmmnts by Resp.xls

FIGURE 8

COMMENTS AND QUESTIONS FROM
BECK ROAD PUBLIC INPUT SESSION No. 2
November 2, 2006

- Noise from trucks is a problem now, won't this get worse in the future?
- What can be done to limit trucks? Can the road be reclassified to restrict them?
- It is difficult to turn out of the Cider Mill intersection. What can be done to make this a safer intersection? Can a signal be added and/or speed be reduced on Beck Road?
- The traffic signal timing at the existing signals seems illogical at times.
- What will happen to trees along Beck Road? Can more be added to act as screening? If the road is widened, trees, berms, or walls should be added to act as a buffer.
- Can the short-term improvements happen more quickly than indicated? It seems they would have an immediate positive effect.
- What will happen to the yards of those houses fronting Beck Road if the long-term capacity improvements are made? IT appears there won't be much left of some.
- Can other roads, like Napier, be improved to get traffic away from Beck Road?
- Refuse trucks seem to be violating axle weight restrictions and cause a majority of the damage to residential streets. It would make sense to have a designated hauler instead of several competing trucks entering the subdivisions.
- Would any of the parcels be rezoned with these options?
- Safety is a concern now, how will this be improved with any of the options presented?
- The quality of life for the residents needs to be a top priority. The road should be redesignated at a natural beauty route, similar to Nine Mile or a portion of Halsted in Farmington Hills.
- Find ways to discourage traffic and reduce speed, not encourage both.



BECK ROAD AT 8 MILE INTERSECTION

ftc&h 50 years

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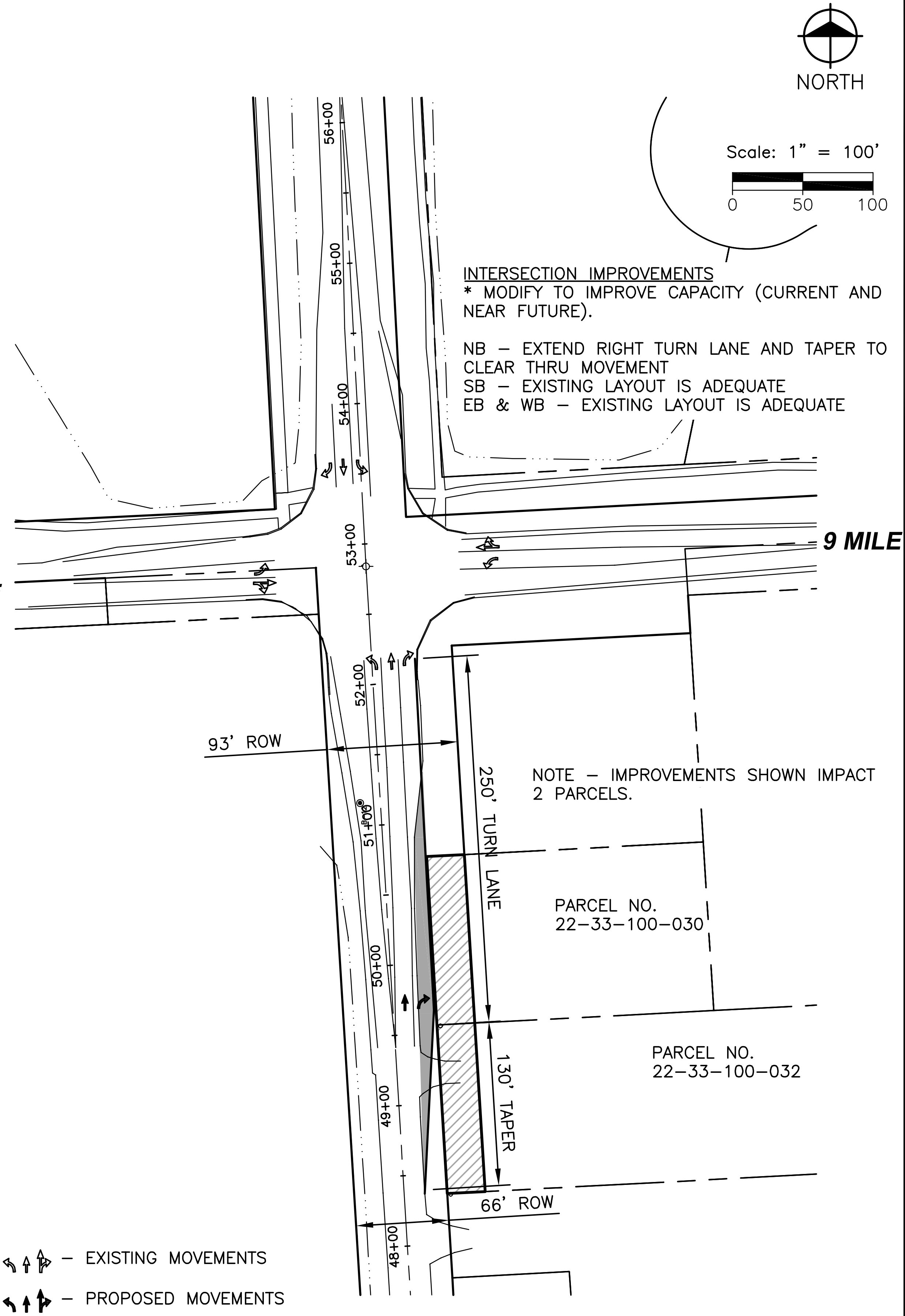
scientists
architects
constructors

CITY OF NOVI
BECK ROAD SCOPING STUDY
INTERSECTION IMPROVEMENTS

PROJECT NO.
06496

FIGURE NO.
9



BECK ROAD AT 9 MILE INTERSECTION

ftc&h 50 years

engineers
scientists
architects
constructors

CITY OF NOVI
BECK ROAD SCOPING STUDY
INTERSECTION IMPROVEMENTS

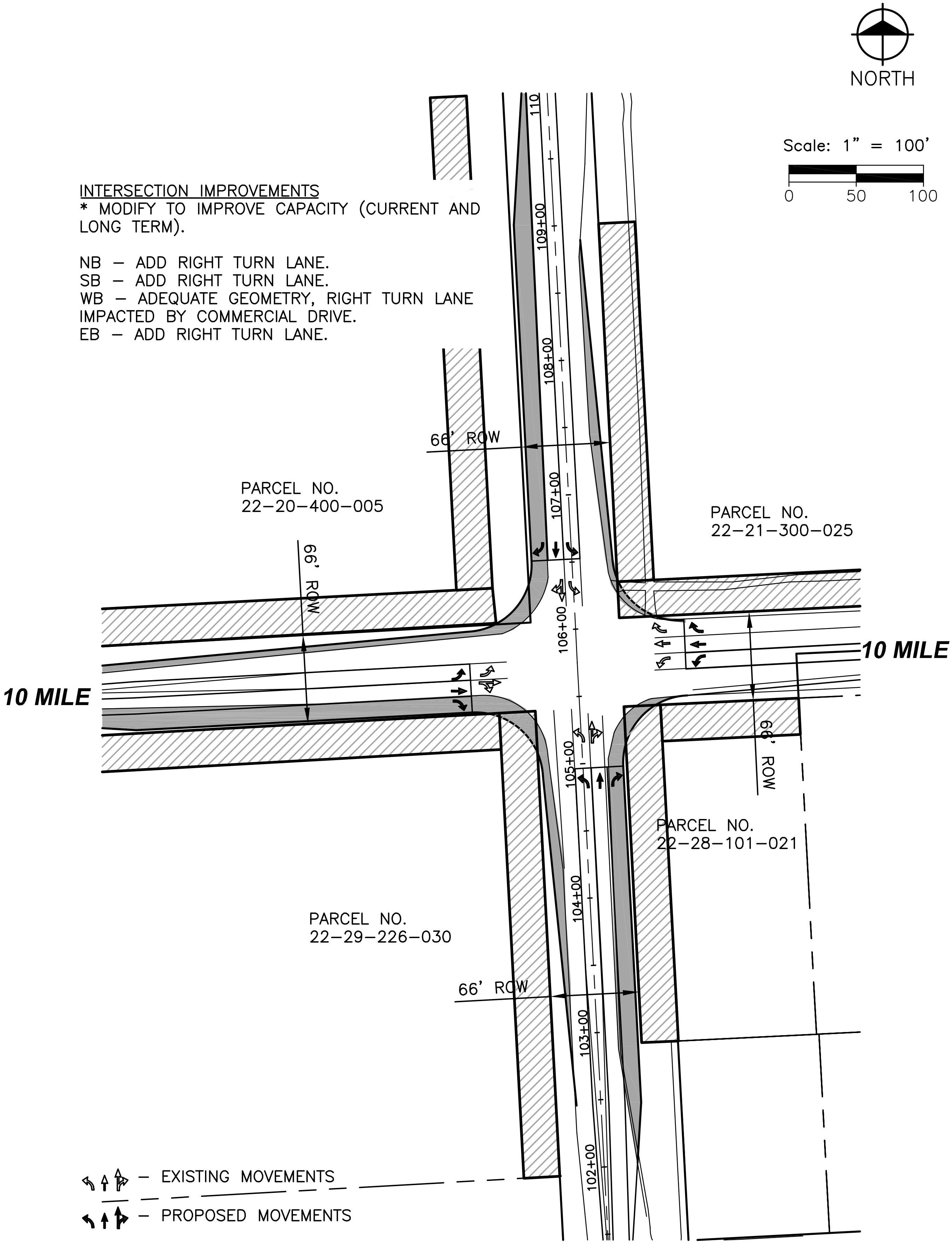
PROJECT NO.
06496

FIGURE NO.
10

fishbeck, thompson, carr & huber, inc.

INTERSECTION IMPROVEMENTS
* MODIFY TO IMPROVE CAPACITY (CURRENT AND LONG TERM).

NB – ADD RIGHT TURN LANE.
SB – ADD RIGHT TURN LANE.
WB – ADEQUATE GEOMETRY, RIGHT TURN LANE IMPACTED BY COMMERCIAL DRIVE.
EB – ADD RIGHT TURN LANE.



BECK ROAD AT 10 MILE INTERSECTION

fTC&H 50 years

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CITY OF NOVI
BECK ROAD SCOPING STUDY
INTERSECTION IMPROVEMENTS

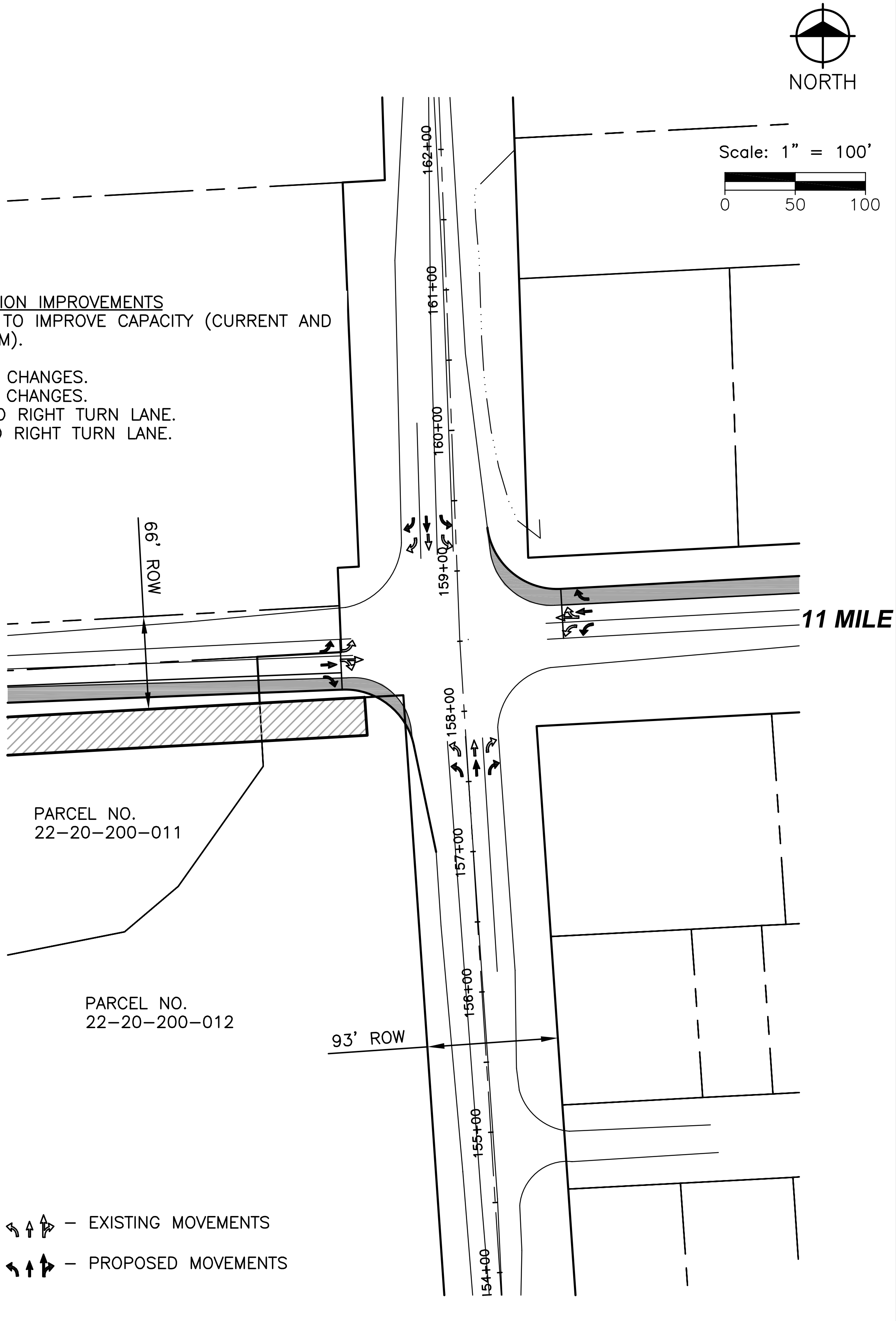
PROJECT NO.
06496

FIGURE NO.
11

fishbeck, thompson, carr & huber, inc.

INTERSECTION IMPROVEMENTS
* MODIFY TO IMPROVE CAPACITY (CURRENT AND LONG TERM).

NB – NO CHANGES.
SB – NO CHANGES.
WB – ADD RIGHT TURN LANE.
EB – ADD RIGHT TURN LANE.



BECK ROAD AT 11 MILE INTERSECTION

ftc&h 50 years

engineers
scientists
architects
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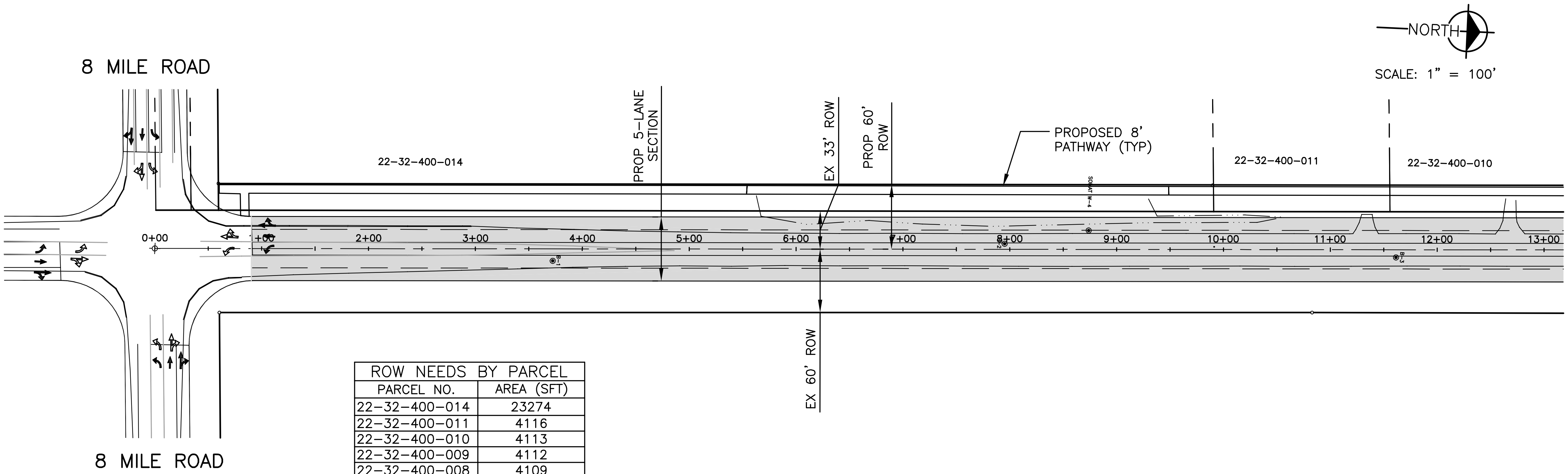
CITY OF NOVI
BECK ROAD SCOPING STUDY
INTERSECTION IMPROVEMENTS

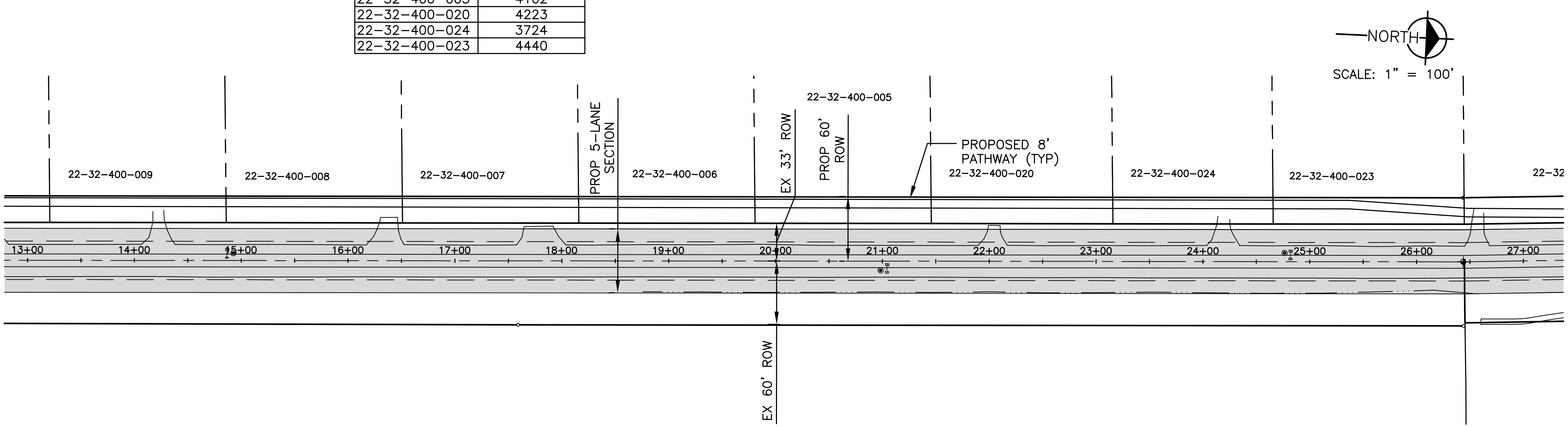
PROJECT NO.
06496

FIGURE NO.
12

fishbeck, thompson, carr & huber, inc.



ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-32-400-014	23274
22-32-400-011	4116
22-32-400-010	4113
22-32-400-009	4112
22-32-400-008	4109
22-32-400-007	4106
22-32-400-006	4104
22-32-400-005	4102
22-32-400-020	4223
22-32-400-024	3724
22-32-400-023	4440



— EXISTING MOVEMENTS

— PROPOSED MOVEMENTS

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

BECK ROAD EIGHT MILE TO NINE MILE LONG TERM CAPACITY IMPROVEMENTS

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City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
13A

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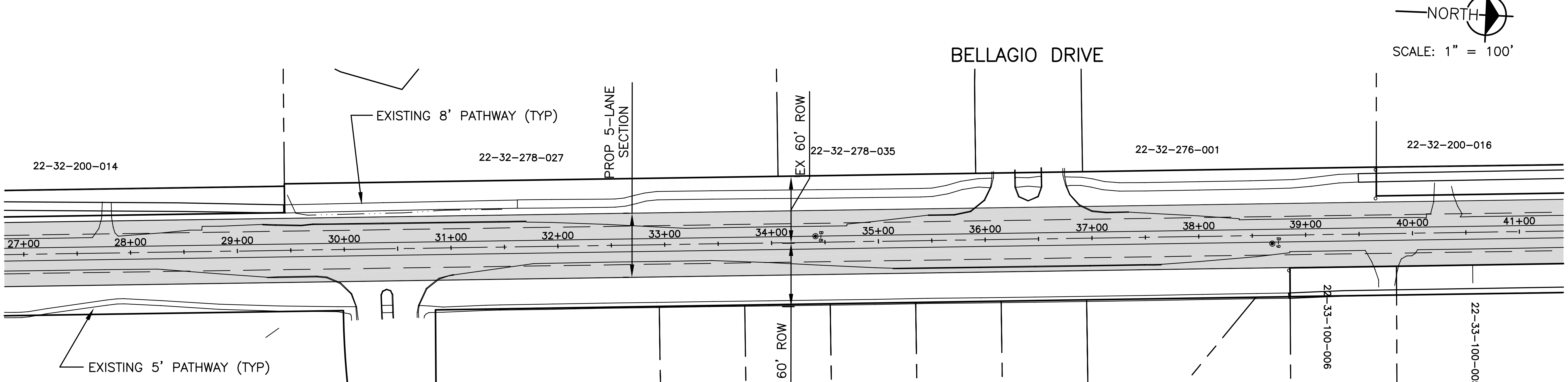

ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
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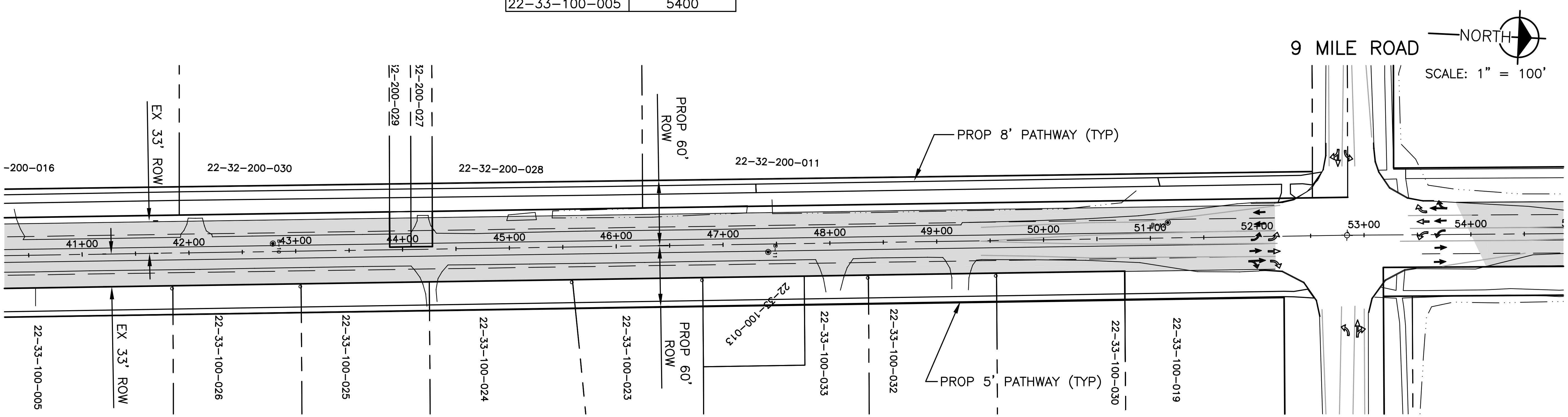
22-32-200-016	6019
22-33-100-006	2691
22-33-100-005	5400



ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-32-200-030	5187
22-32-200-028	5098
22-32-200-011	15745
22-32-200-029	523
22-32-200-027	523
22-33-100-026	3242
22-33-100-025	3240
22-33-100-024	3652
22-33-100-023	3260
22-33-100-013	2565
22-33-100-033	1620

ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-33-100-032	3240
22-33-100-030	3240

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

BECK ROAD EIGHT MILE TO NINE MILE LONG TERM CAPACITY IMPROVEMENTS

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City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
13B

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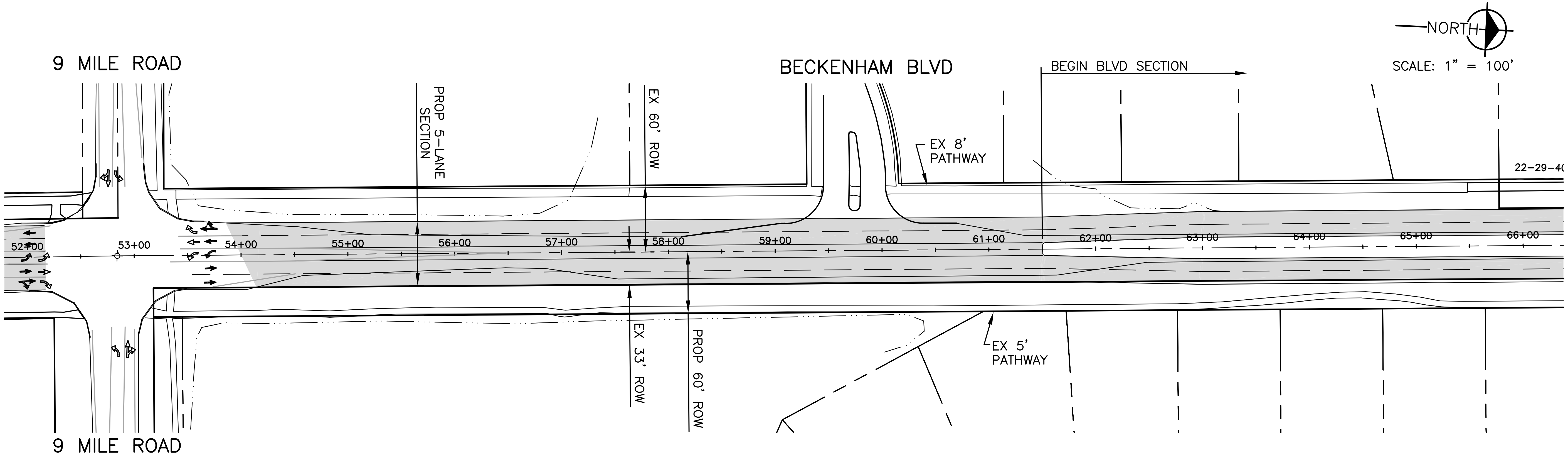
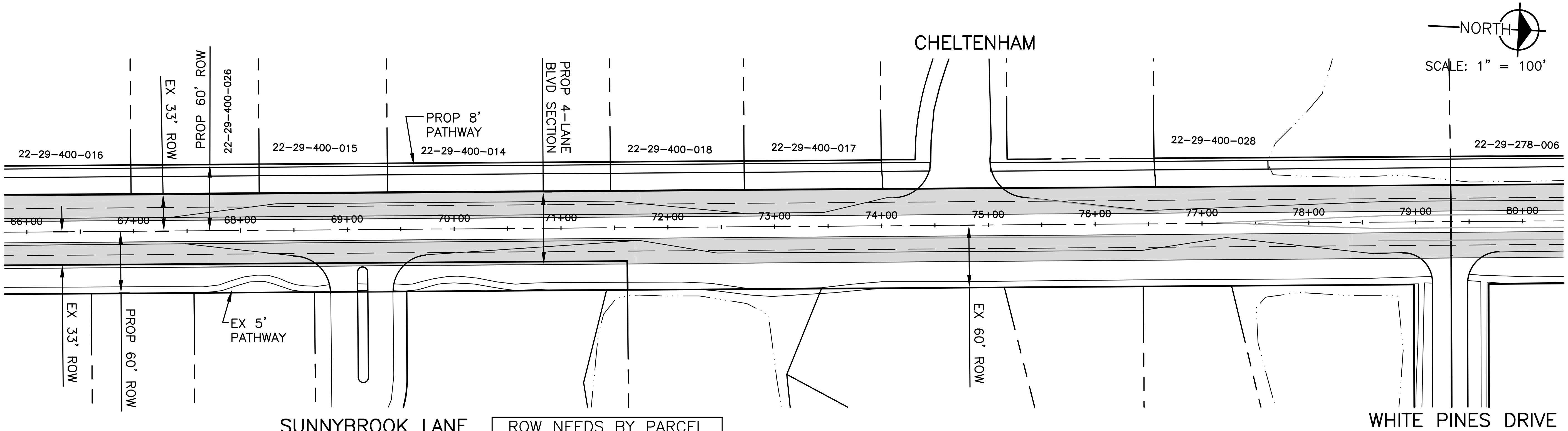




ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-29-400-016	3240
22-29-400-026	3248
22-29-400-015	3238
22-29-400-014	5632
22-29-400-018	2962
22-29-400-017	3477
22-29-400-028	7437
22-29-278-006	10142

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

BECK ROAD NINE MILE TO TEN MILE LONG TERM CAPACITY IMPROVEMENTS

ftc&h 50 years

engineers

scientists

architects

constructors

City of Novi

Beck Road Scoping and Study

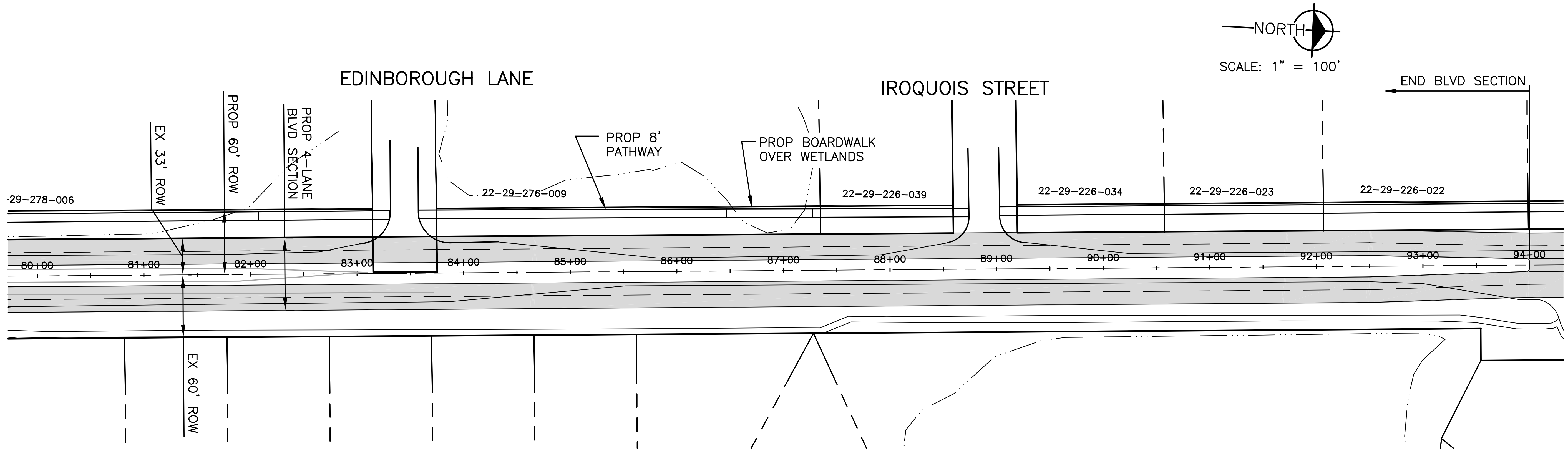
Eight Mile to Grand River

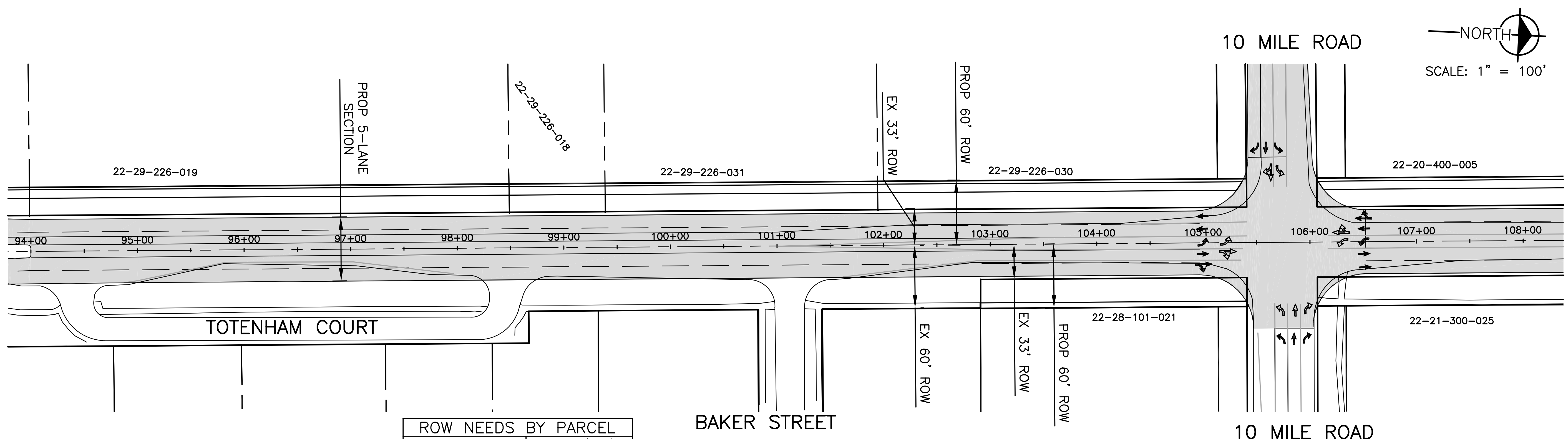
PROJECT NO.

G06496

FIGURE NO.

14A





ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-29-276-009	9442
22-29-226-039	3261
22-29-226-034	3607
22-29-226-023	3911
22-29-226-022	5049
22-29-226-019	11896
22-29-226-018	2390
22-29-226-031	6816
22-29-226-030	9262
22-28-101-021	6760

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

BECK ROAD NINE MILE TO TEN MILE
LONG TERM CAPACITY IMPROVEMENTS

ftc&h 50 years

engineers
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City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
14B

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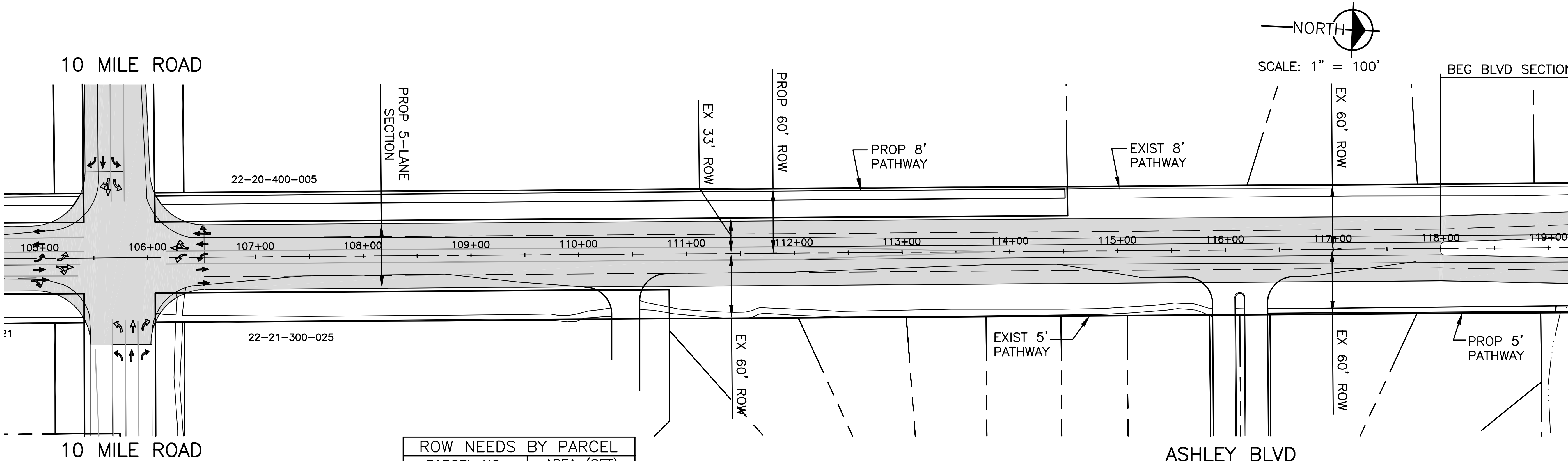

ROW NEEDS BY PARCEL	
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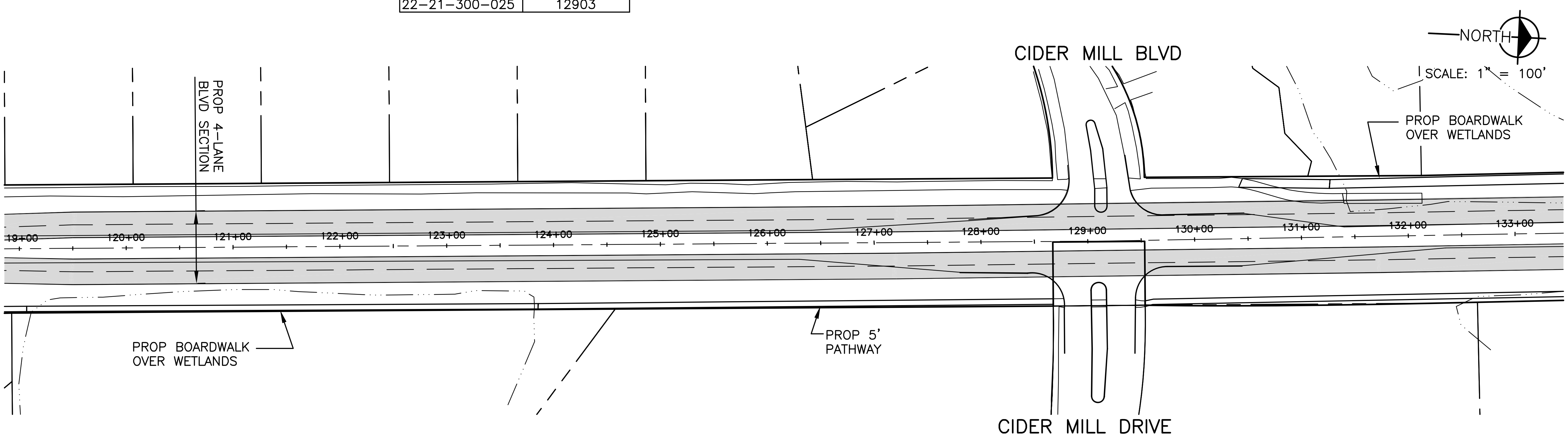
22-21-300-025	12903



– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

BECK ROAD TEN MILE TO ELEVEN MILE LONG TERM CAPACITY IMPROVEMENTS

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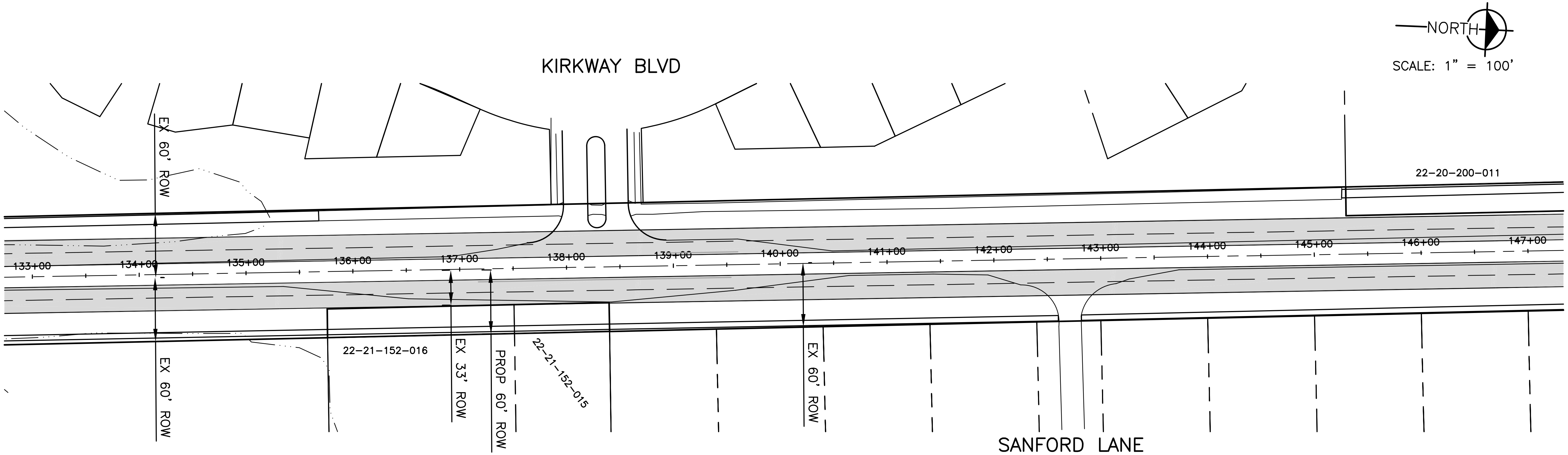
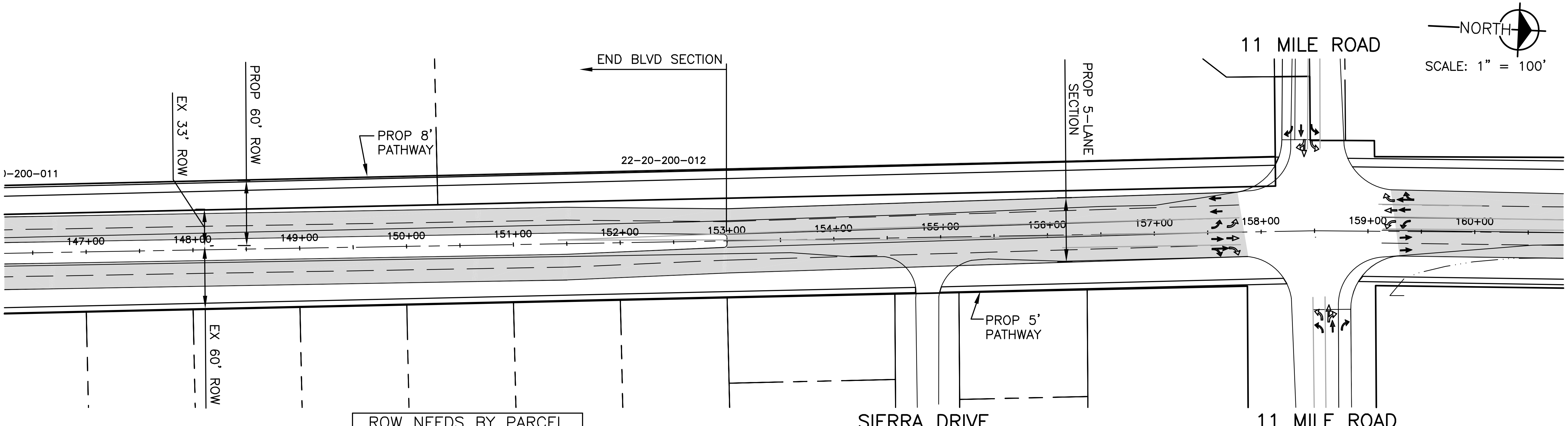
City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
15A

fishbeck, thompson, carr & huber, inc.





ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-21-152-016	4726
22-21-152-015	2403
22-20-200-011	13544
22-20-200-012	21526

– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

BECK ROAD TEN MILE TO ELEVEN MILE LONG TERM CAPACITY IMPROVEMENTS

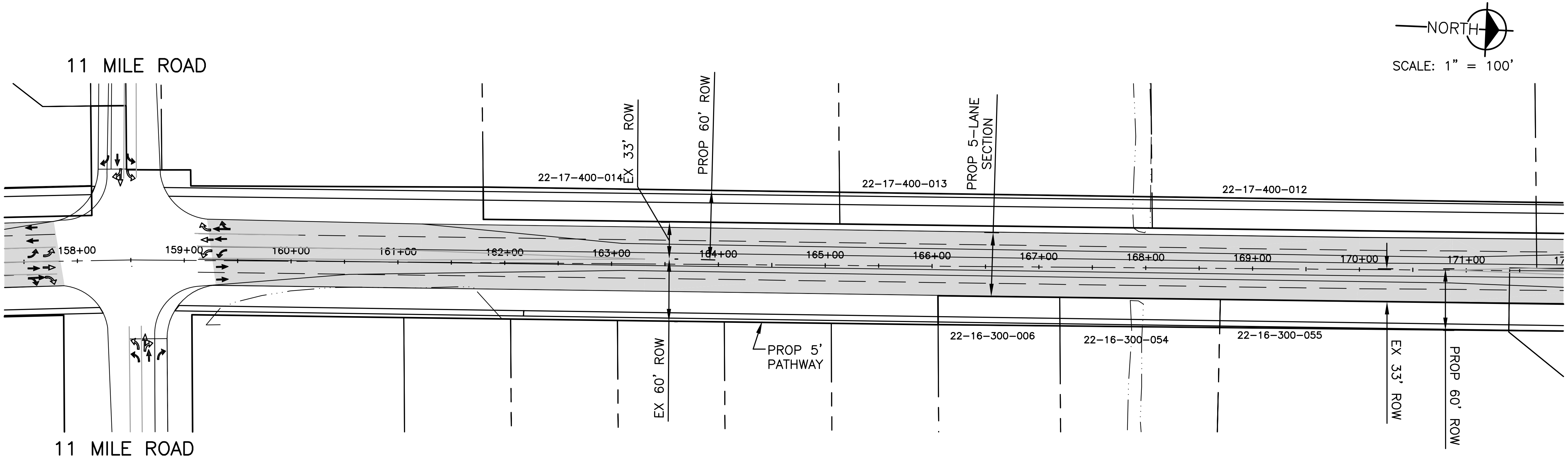
ftc&h 50 years

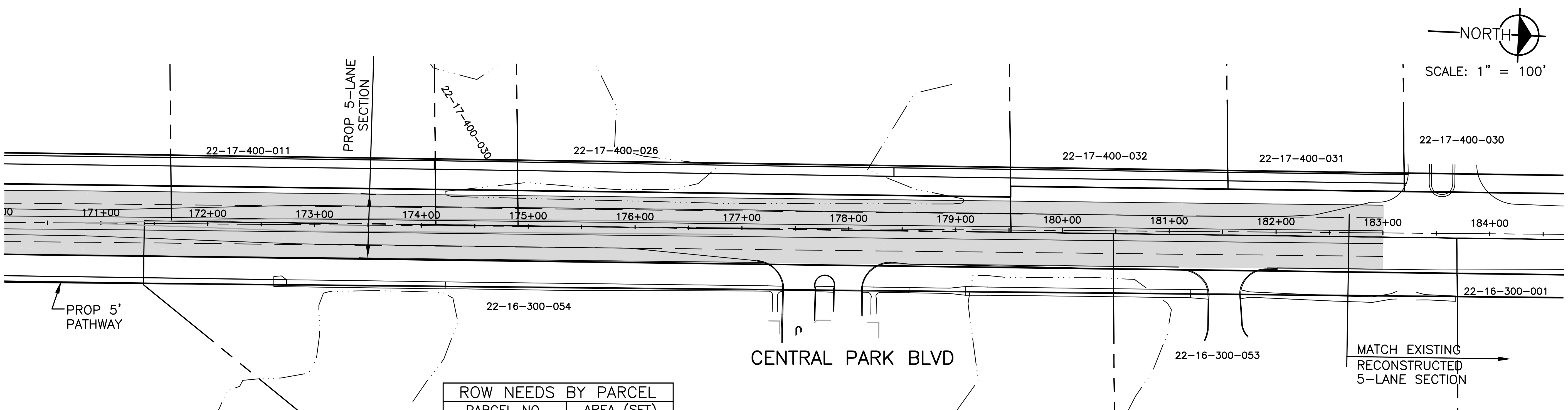
engineers
scientists
architects
constructors

City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
15B





ROW NEEDS BY PARCEL

PARCEL NO.	AREA (SFT)
22-17-400-014	9979
22-17-400-013	8626
22-17-400-012	10443
22-16-300-006	3071
22-16-300-054	3976
22-16-300-055	7187
22-17-400-011	7085
22-17-400-030	2186
22-17-400-026	12937
22-16-300-054	21879
22-17-400-032	3580
22-17-400-031	2861
22-16-300-053	7153

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

– EXISTING MOVEMENTS

– PROPOSED MOVEMENTS

BECK ROAD ELEVEN MILE TO GRAND RIVER
LONG TERM CAPACITY IMPROVEMENTS

ftc&h 50 years

engineers
scientists
architects
constructors

City of Novi
Beck Road Scoping and Study
Eight Mile to Grand River

PROJECT NO.
G06496

FIGURE NO.
16

fishbeck, thompson, carr & huber, inc.

Appendices

Appendix J

Novi Road/Grand River Avenue Multi-Development Traffic Impact

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Novi Road/Grand River Avenue Area Multi-Development Traffic Impact Study - DRAFT

City of Novi

October 12, 2018

DRAFT

Quality information

Prepared by	Checked by	Approved by
Maureen Peters, PE Dan Robyns, PE PTOE		

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	9/7/18	Initial Draft		Maureen Peters	Traffic Engineer/PM
2	10/12/18	Revised Draft		Maureen Peters	Traffic Engineer/PM

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DRAFT

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1. Introduction

1.1 Background Information

The City of Novi has requested the support of AECOM to perform a traffic impact study (TIS) for the City's Town Center area. The Novi Town Center is comprised of several developments surrounding the intersection of Novi Road and Grand River Avenue. The Novi Town Center area has several developments in the planning phase as well as additional parcels that are available for future development. Due to the routine traffic concerns in the area, it was recommended to analyze the potential future traffic impacts and mitigation measures associated with the multiple developments collectively, rather than through a typical, independent TIS that are usually prepared as part of the City's site plan development process. Combining the developments into one TIS will allow the City to assess the traffic impacts beyond the developments' build years and will serve as a planning tool to identify and prepare for roadway modifications as additional developments are introduced into the general area.

AECOM has identified 15 developments that are expected to be incorporated into the overall study, as shown in **Figure 1**. Seven of the developments have either been approved and are in the construction phase or are in the planning stage and currently under review. Some of the background developments produced their own independent studies that may be referenced within this report for the purpose of developing trip generation estimates. There are an additional eight developments/parcels within the general area that could be developed at a later date.

The study includes 10 existing signalized intersections and five unsignalized intersections, as shown in **Figure 2**. The study will also consider the extension of Crescent Boulevard to Grand River Avenue on the west side of Novi Road as part of any future scenarios, which adds a potential eleventh signalized intersection.

1.2 Report Organization

Following the introductory section (Section 1), the report is composed of the following sections:

- **Section 2: Existing (2018) Conditions**
  Section 2 provides a description of the existing transportation facilities and contains an analysis of the existing 2018 peak-hour traffic conditions within the study area.

- **Section 3: Background (2028) Conditions**
  Section 3 contains an analysis of background year (2028) peak-hour traffic conditions – conditions for the projected opening year (2028) of all study area background developments, but without traffic generated by the future developments. Background conditions include estimated traffic from the background developments identified in Figure 1 and are used as a "baseline" from which impacts associated with the future developments can be quantified. Any roadway capacity improvements proposed to be completed by the background developments have also been included.

- **Section 4: Future (2028) Conditions**
  Section 4 contains an analysis of traffic conditions during the projected completion of all proposed developments (2028), including traffic generated by the future developments listed in Figure 1. Future conditions can be compared to background conditions to quantify the impact of the proposed developments.

- **Section 5: Potential Future Mitigation**
  Section 5 contains a discussion of potential mitigation options that could improve the operation of intersections and traffic movements that are projected to operate poorly under future conditions. Varying levels of mitigation options were examined based on input from the City.

- **Section 6: Conclusion**
  Section 6 provides a summary of the analysis and mitigation options available that may lead to improvements in traffic operations throughout the study area.

2. Existing (2018) Conditions

Section 2 provides a description of the existing transportation facilities and contains an analysis of the existing 2018 peak-hour traffic conditions within the study area.

2.1 Study Area

The study area for the TIS generally includes intersections located within and in the vicinity of the Town Center area. A total of 15 intersections have been included in the study area under existing conditions as listed below. Refer to Figure 2, Study Area Intersections, for the locations of these intersections. Note that 16 intersections are shown in the map. The sixteenth intersection, Grand River Avenue at Crescent Boulevard, is a proposed signalized intersection that will be reviewed as part of Background (2028) and Future (2028) conditions and is not included in the Existing (2018) conditions analysis.

1. Novi Road and West Oaks Drive South
2. Novi Road and westbound I-96 off-ramp
3. Novi Road and eastbound I-96 off-ramp
4. Novi Road and Crescent Boulevard
5. Novi Road and Grand River Avenue
6. Novi Road and Flint Street/Main Street
7. Novi Road and Trans X Road
8. Novi Road and US Post Office Driveway
9. Novi Road and Ten Mile Road
10. Grand River Avenue and Flint Street
11. Grand River Avenue and Sixth Gate
12. Grand River Avenue and Main Street/Town Center Drive
13. Grand River Avenue and Meadowbrook Road
14. Eleven Mile Road and Town Center Drive
15. Main Street and Potomac

2.2 Existing Roadways

The study area comprises the following major arterials:

Novi Road is a north-south arterial roadway generally comprised of five lanes to the south of I-96, and seven lanes to the north of I-96. Novi Road has a posted speed limit of 45 mph in the study area.

The Novi Road and Grand River Avenue intersection is signalized with left-turn phases for each approach and is controlled by the Road Commission for Oakland County's (RCOC) Sydney Coordinated Adaptive Traffic System (SCATS). The maximum cycle length is approximately 150 seconds during peak-hours of traffic.

Grand River Avenue is an east-west arterial that varies from five lanes to the west of Novi Road, to three lanes to the east of Meadowbrook Road. The posted speed limit within the study area is 40 mph to the west of Main Street/Town Center Drive, and 50 mph to the east of Main Street/Town Center Drive.

The Grand River Avenue and Meadowbrook Road intersection is signalized with left-turn phases at each approach and is controlled by RCOC's SCATS system. The maximum cycle length is 150 seconds during peak hours of traffic.

Meadowbrook Road is a north-south arterial and is comprised of three lanes with a posted speed limit of 40 mph.

Ten Mile Road is an east-west arterial and is comprised of two lanes with a posted speed limit of 45 mph.

The Novi Road and Ten Mile Road intersection is signalized with left-turn phases for each approach and is controlled by RCOC's SCATS system. The maximum cycle length is 150 seconds during peak-hours of traffic.

The I-96 interchange is a partial cloverleaf with two loop ramps for entering freeway traffic. The westbound exit ramp to Novi Road is comprised of five lanes, and the eastbound exit ramp to Novi Road is comprised of three lanes. Both exit ramps are signalized and controlled by RCOC's SCATS system. The maximum cycle lengths are 150 seconds during peak-hours of traffic.

All other roadways in this study can be generalized as collector roadways, stub streets, or driveways. Crescent Boulevard, Main Street, and Flint Street (Bond Street) are expected to eventually form a "loop" road around the intersection of Novi Road and Grand River Avenue. It is expected that the loop roadway may detour a percentage of traffic away from the Novi Road and Grand River Avenue intersection.

2.3 Existing (2018) Conditions Capacity Analysis

AECOM collected peak-hour turning movement counts at the study area intersections during March/April 2018 for the Weekday Morning (7-9 AM), Weekday Afternoon (4-6 PM), and Saturday Midday (1-3 PM) peak periods of traffic. The traffic data count reports that were collected as part of this study are included in **Appendix A**.

In order to quantify intersection traffic operations at the study-area intersections, existing level-of-service (LOS) values were determined using the industry-standard methodology presented in the Highway Capacity Manual (2010), published by the Transportation Research Board (TRB). Synchro® traffic analysis software (version 9), based on the Highway Capacity Manual (2000) methodologies, was used in the analysis.

The term "level-of-service" (LOS) denotes how well (or poorly) a traffic movement operates under given traffic demands, lane configurations, and traffic controls. Each level is determined by the average amount of control delay per vehicle. Control delay is the total delay associated with stopping for a traffic signal or stop sign, and includes four components; deceleration delay, queue move up time, stopped delay, and final acceleration delay.

As shown in **Table 1**, LOS "A" indicates small average control delays (less than ten seconds per vehicle) whereas LOS "F" indicates intersection failure, resulting in extensive vehicular queues and long delays (over 80 seconds per vehicle at a signalized intersection). **LOS "D" (or better) is typically considered acceptable performance and low LOS values are tolerable for short time periods or during peak-hours when heavier traffic volumes are expected.**

Table 1 - Level of Service Criteria at Intersections

Level-of-Service	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	10 - 20	10 - 15
C	20 - 35	15 - 25
D	35 - 55	25 - 35
E	55 - 80	35 - 50
F	> 80	>50

Source: *HCM, 2010*

The existing (2018) conditions peak-hour intersection LOS results for the 10 signalized intersection and five unsignalized intersections listed on page 6 are shown in **Table 2**. The existing (2018) conditions peak-hour traffic volumes and movement-by-movement LOS results are depicted in **Figure 3**. Capacity analysis reports from the *Synchro®* software for all intersections are included in **Appendix B-1**.

Table 2 – Existing (2018) Conditions Intersection LOS Results

Intersection	Traffic Control	Weekday AM Peak-Hour		Weekday PM Peak-Hour		Saturday Midday Peak-Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Novi Road and West Oaks Drive South	*Signalized*	13.9	B	32.6	C	51.7	D
Novi Road and WB I-96 Off-Ramp	*Signalized*	42.8	D	30.8	C	30.5	C
Novi Road and EB I-96 Off-Ramp	*Signalized*	8.7	A	13.2	B	15.4	B
Novi Road and Crescent Boulevard	*Signalized*	13.2	B	24.3	C	29.9	C
Novi Road and Grand River Avenue	*Signalized*	**60.0**	**E**	**68.8**	**E**	**60.3**	**E**
Novi Road and Flint Street/Main Street	*Signalized*	13.6	B	12.0	B	11.2	B
Novi Road and Trans X Road (WB approach results shown)	*1-Way STOP*	14.7	B	18.4	C	20.8	C
Novi Road and US Post Office Driveway	*Signalized*	3.9	A	5.3	A	4.1	A
Novi Road and Ten Mile Road	*Signalized*	36.3	D	47.1	D	33.9	C
Grand River Avenue and Flint Street (NB approach results shown)	*1-Way STOP*	26.0	D	15.3	C	16.4	C
Grand River Avenue and Sixth Gate (NB approach results shown)	*1-Way STOP*	9.3	A	15.2	C	12.5	B
Grand River Avenue and Main Street/ Town Center Drive	*Signalized*	12.6	B	21.5	C	21.8	C
Grand River Avenue and Meadowbrook Road	*Signalized*	27.1	C	53.5	D	32.5	C
Eleven Mile Road and Town Center Drive	*4-Way STOP*	7.7	A	12.4	B	10.6	B
Main Street and Potomac	*3-Way STOP*	7.6	A	8.1	A	8.5	A

As shown in Table 2, the existing (2018) peak-hour capacity analysis shows that all study area intersections currently operate at an acceptable intersection LOS, with the exception of the Novi Road/Grand River Avenue intersection during all three peak-hours. As shown in Figure 3, several individual turning movements at study area intersections currently operate at unacceptable LOS. Many of these turning movements are relatively low volume movements, and the poor LOS ratings (and lengthy average delay times) are due to the long signal cycle length that the SCATS system provides during peak times to service the major high-volume thru movements.

However, under existing conditions, there are some large volume movements that are currently operating poorly, and should be noted. These movements include:

- At Novi Road/Westbound I-96 off-ramp, the westbound left-turn movement.
- At Novi Road/Eastbound I-96 off-ramp, the eastbound right-turn movement.
- At Novi Road/Grand River Avenue, the westbound and northbound thru movements, as well as all four left-turn movements.
- At Novi Road/Ten Mile Road, the eastbound and northbound left-turn movements.
- At Grand River Avenue/Meadowbrook Road, the westbound and southbound thru movements.

2.4 Existing (2018) Conditions Capacity Analysis (with Mitigation)

The existing poorly operating turning movements were attempted to be mitigated by adjusting signal timings at the study area intersections. Because the intersections are currently controlled by the adaptive control SCATS system, improvement in performance via signal timing adjustments is minor. Some small improvements were achieved using only signal timing adjustments as a mitigation measure.

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The existing (2018) conditions (with mitigation) peak-hour intersection LOS results are shown in **Table 3**. The existing (2018) conditions (with mitigation) peak-hour traffic volumes and movement-by-movement LOS results are depicted in **Figure 4**. Capacity analysis reports from the *Synchro®* software for all intersections are included in **Appendix B-2**.

Table 3 – Existing (2018) Conditions (with Mitigation) Intersection LOS Results

Intersection	Traffic Control	Weekday AM Peak-Hour		Weekday PM Peak-Hour		Saturday Midday Peak-Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Novi Road and West Oaks Drive South	*Signalized*	15.0	B	30.5	C	41.0	D
Novi Road and WB I-96 Off-Ramp	*Signalized*	24.4	C	21.1	C	26.4	C
Novi Road and EB I-96 Off-Ramp	*Signalized*	10.1	B	13.1	B	19.8	B
Novi Road and Crescent Boulevard	*Signalized*	10.9	B	29.1	C	32.6	C
Novi Road and Grand River Avenue	*Signalized*	52.5	D	**55.6**	**E**	**56.0**	**E**
Novi Road and Flint Street/Main Street	*Signalized*	13.1	B	12.0	B	11.1	B
Novi Road and Trans X Road (WB approach results shown)	*1-Way STOP*	14.7	B	18.4	C	20.8	C
Novi Road and US Post Office Driveway	*Signalized*	3.9	A	5.3	A	4.4	A
Novi Road and Ten Mile Road	*Signalized*	36.3	D	47.1	D	33.4	C
Grand River Avenue and Flint Street (NB approach results shown)	*1-Way STOP*	26.0	D	15.2	C	16.3	C
Grand River Avenue and Sixth Gate (NB approach results shown)	*1-Way STOP*	9.3	A	15.3	C	12.6	B
Grand River Avenue and Main Street/ Town Center Drive	*Signalized*	12.1	B	21.8	C	21.1	C
Grand River Avenue and Meadowbrook Road	*Signalized*	26.5	C	52.4	D	33.6	C
Eleven Mile Road and Town Center Drive	*4-Way STOP*	7.7	A	12.4	B	10.6	B
Main Street and Potomac	*3-Way STOP*	7.6	A	8.1	A	8.5	A

When comparing to Table 2, Table 3 shows that adjusting signal timings produced incremental improvements at some intersections, including the Novi Road/Westbound I-96 off-ramp and Novi Road/Grand River Avenue intersections. However, the Novi Road/Grand River Avenue intersection would still operate at a poor intersection overall LOS E during the weekday afternoon and Saturday midday peak-hours.

As shown in Figure 4 following the report text, several large turning movements would continue to operate at poor LOS during the three peak-hours, similar to existing conditions without mitigation measures.

3. Background (2028) Conditions

Section 3 contains an analysis of background year (2028) peak-hour traffic conditions – conditions for the projected opening year (2028) of all study area background developments, but without traffic generated by the future developments. Background conditions include estimated traffic from the background developments identified in Figure 1 and are used as a "baseline" from which impacts associated with the future developments can be quantified.

3.1 Background Traffic Volumes

The background traffic volumes (2028) were calculated based on an annual growth rate and adding traffic that is anticipated to be generated by proposed developments within the study area that have been identified by the City of Novi as having been approved or potentially anticipated to be approved in the near term, as indicated in Figure 1 as "background".

3.1.1 Annual Growth Rate

An annual traffic growth rate was used to estimate growth on the study area roadway network based on information provided by the Southeastern Michigan Council of Governments (SEMCOG). Generally, the study area roadway network has experienced a <u>decline</u> in traffic volumes since 2010. However, the population of the City of Novi is expected to increase by approximately 7.1% from the year 2015 to the build-out year of 2028. Further, SEMCOG population projections for Novi are only showing a 0.6% per year growth in population from 2015 to 2030. Based on the information, a conservative annual growth rate of 0.5% was applied to existing (2018) peak-hour volumes to determine background year (2028) peak-hour volumes. Organic growth is addressed via anticipated trip generation from the seven background developments and eight future developments, another reason for using the lower annual percent growth rate of 0.5% per year.

3.1.2 Previously Approved Developments

The City of Novi has identified seven developments within the study area as "background" developments based on their position within the site plan review process.

The Bond development (aka the District, aka Flint Street) is proposed as a mixed-use commercial/residential development including a total of 250 apartments and a 5,578 square foot retail center. The development is located on the southwest side of the existing Flint Street and plans to revitalize Flint Street with on-street parking and other features. The developer submitted a site-specific TIS to the City dated March 15, 2018. The TIS recommends providing permissive/protected left-turn phasing at all left-turn movements at the intersection of Grand River Avenue and Novi Road, providing a 70-second cycle length at the intersection of Novi Road and Flint Street to reduce minor street vehicle delays while maintaining coordination with adjacent 140-second cycle length signals, and to provide an exclusive left-turn lane for the eastbound approach at the intersection of Novi Road and Bond Street/Main Street.

The **Crowe Center** (aka Town Center Gardens) development is now built as a multi-use development consisting of a high-turnover sit-down restaurant, two specialty retail centers, and a medical-dental office. The 8,883 square foot building contains 2,340 square feet of restaurant, 3,041 square feet of retail, and 3,502 square feet for a possible dental office or other retail use. The development is located on the east side of Novi Road south of Crowe Drive. A TIS was not performed for this development; therefore, only site-generated traffic volumes will be added to background Synchro models for this development.

The **Homewood Suites** development is an 88-room hotel that is located east of Town Center Drive and north of 11 Mile Road. A TIS was not performed for this development; therefore, only site-generated traffic volumes will be added to background Synchro models for this development.

The **Learning Experience** development is a proposed 10,000 square foot daycare center that is located on the north side of 11 Mile Road and east of Town Center Drive. A TIS was not performed for this development; therefore, only site-generated traffic volumes will be added to background Synchro models for this development.

The **Huntley Manor** development is a proposed multi-family residential development consisting of 210 apartments. The development is located on the south side of Grand River Avenue to the west of Meadowbrook Road. A site-specific TIS was previously completed in November 2014.

The **Erhard Jaguar/Land Rover** development is a proposed automobile sales development that is located in the southwest corner of the intersection of Grand River Avenue and Meadowbrook Road. The development is comprised of a total of 58,663 square feet that will include both sales and service areas. A site-specific rezoning TIS was prepared for the previous Erhard BMW site and was submitted to the City on October 9, 2017. The TIS did not recommend any modifications; therefore, only site-generated traffic volumes have been added to background Synchro models for this development.

The **Emerson Park** development is a proposed multi-family residential development consisting of 120 units. The development is located on the west side of Novi Road and south of the USPS driveway. A TIS was performed for this development on February 6, 2017. The study suggested mitigation measures to include reducing the cycle length at the US Post Office Driveway to 60 seconds instead of 120 seconds to more effectively service side street traffic under existing conditions. A southbound right-turn taper lane at the proposed site driveway was also recommended as it met warrants.

3.1.3 Trip Generation

The proposed trip generation for the seven background developments is shown in **Table 4.**

Background (2028) trip generation determination for the weekday morning, afternoon, and Saturday midday peak-hours for the background developments was based on the methods of the ITE Trip Generation Manual. Trip generation was performed based on the methods of the *ITE Trip Generation Manual, 10th Edition*, published by the Institute of Transportation Engineers (ITE). The *ITE Trip Generation Manual* contains information on more than 4,800 trip generation studies nationwide for different land use purposes.

Pass-By Site Trips

It is anticipated that the shopping center in The Bond development will capitalize on the traffic volumes along Novi Road and Grand River Avenue by “capturing” customers passing by the location to/from work or other destinations. These trips are classified as “pass-by” trips, since they are already on the roadway network and enter the site as they drive past. While pass-by trips do not add new trips to the roadway network, they add turning movements at the site driveway locations.

For a shopping center land use, the ITE Trip Generation Handbook provides data for pass-by traffic for the weekday afternoon peak-hour and Saturday midday peak-hour, indicating an average pass-by rate of 35%.

Traffic generated by the proposed developments was used to measure the impact of the developments on the study area intersections for the background (2028) conditions.

Table 4 – Background (2028) Trip Generation

Development #	Development Name	Land Use Description	ITE Land Use	ITE LUC	Size	Units	Weekday AM Peak-Hour Trips			Weekday PM Peak-Hour Trips			Saturday Midday Peak-Hour Trips		
							Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
9	The Bond	retail space	**Shopping Center**	**820**	**6,000**	SF				33	35	**68**	35	32	**67**
			Less: Pass-by trips (35% PM peak-hour, 35% Saturday peak-hour)							-12	-12	**-24**	-12	-12	**-24**
		apartments	**Multi-Family Housing (MID-rise)**	**221**	**250**	units	22	62	**84**	65	42	**107**	54	56	**110**
		The Bond Development TOTAL (Net New)					**22**	**62**	**84**	**86**	**65**	**151**	**77**	**76**	**153**
10	Crowe Center	restaurant	**High-Turnover Sit-Down Restaurant**	**932**	**2,340**	SF	13	10	**23**	14	9	**23**	13	13	**26**
		specialty retail center	**Variety Store**	**814**	**3,041**	SF				11	10	**21**	11	10	**21**
		medical-dental office	**Medical-Dental Office**	**720**	**3,502**	SF	9	2	**11**	4	10	**14**	6	5	**11**
		Crowe Center Development TOTAL					**22**	**12**	**34**	**29**	**29**	**58**	**30**	**28**	**58**
11	Homewood Suites	suites hotel	**All Suites Hotel**	**311**	**88**	occ'd rooms	28	14	**42**	20	26	**46**	13	10	**23**
12	The Learning Experience	daycare	**Day Care Center**	**565**	**10,000**	SF	58	52	**110**	52	59	**111**	11	6	**17**
13	Huntley Manor	apartments	**Multi-Family Housing (low-rise)**	**220**	**210**	units	22	75	**97**	72	42	**114**	97	97	**194**
14	Erhard Auto Sales	auto sales	**Automobile Sales (New)**	**840**	**58,663**	SF	80	30	**110**	51	76	**127**	118	118	**236**
15	Emerson Park	multi-family housing	**Multi-Family Housing (low-rise)**	**220**	**123**	units	13	45	**58**	45	26	**71**	50	50	**100**
Total NET NEW Peak-Hour Trips							245	290	**535**	355	323	**678**	396	385	**781**
Source: ITE Trip Generation Manual, 10th Ed & ITE Trip Generation Handbook, 3rd Ed							**AM Peak Hour**			**PM Peak Hour**			**Sat Peak Hour**		

(Grey shading) Assumes no AM trip generation (not open)

As shown in Table 4, the proposed background developments are projected to generate:

- 535 net new trips (245 entering trips, 290 exiting trips) in the background (2028) weekday morning peak-hour
- 678 net new trips (355 entering trips, 323 exiting trips) in the background (2028) weekday afternoon peak-hour
- 781 net new trips (396 entering trips, 385 exiting trips) in the background (2028) build Saturday midday peak-hour

3.1.4 Trip Distribution and Traffic Assignment

Background development generated trips were assigned to the roadway network based on a methodology that considers traffic volumes entering and exiting the study area via the perimeter intersections. Trip distribution was calculated based on the total two-way trips to/from these perimeter intersections, with separate computations for each peak-hour, based on the respective peak-hour's two-way volumes. AECOM met with the City of Novi and the Road Commission of Oakland County (RCOC) on August 14, 2018 and received acceptance from the City and RCOC on the trip distribution methodology. Based on these two-way volumes at the perimeter intersections, perimeter trip distribution percentages are depicted in **Figure 5**.

The traffic generated by the seven background developments was assigned to the roadway network based on the determined trip distribution percentages. The total background development traffic that would be added to the roadway network is shown in Figure 5. Traffic volumes for each of the seven individual developments are shown separately in **Figures 5A to 5G**.

As shown in Figure 5, several turning movements in the study area will experience an increase in traffic due to trips generated by background developments. Significant increases include:

1. Westbound I-96 off-ramp left-turn at Novi Road
2. Southbound Novi Road left-turn at Grand River Avenue
3. Westbound Grand River Avenue left-turn at Novi Road
4. Northbound Meadowbrook Road left-turn at Grand River Avenue

3.2 Background (2028) Conditions Capacity Analysis

A capacity analysis was conducted for the study area intersections under background (2028) traffic conditions. The background (2028) analysis included two major changes to the study area roadway network. First, based on conversations with the City, it was assumed that the new Bond Street (replacing Flint Street) would be constructed in alignment with The Bond development in the southwest quadrant of Novi Road/Grand River Avenue. Second, it was assumed that Crescent Boulevard would be extended to Grand River Avenue, opposite Bond Street, to the west of Novi Road. It was also assumed that a new traffic signal would be installed at the new intersection of Grand River Avenue with Bond Street/Crescent Boulevard. This signal would be located approximately 1,000 feet west of the Novi Road/Grand River Avenue intersection. The existing Flint Street stub street that intersects with Grand River just west of Novi Road would remain in place. Refer to **Appendix C** for the Bond Street and Crescent Boulevard draft plans.

The background traffic volumes at Novi Road/Grand River Avenue were adjusted, as it is assumed that future traffic volumes would utilize the new Bond Street and Crescent Boulevard connections as “cut-thrus” to avoid congestion at the Novi Road/Grand River Avenue signal. Four turning movements were reassigned, as described, and previously approved by the City in the Flint Street Development Traffic Impact Study. The adjusted turning movements were as follows:

1. Northbound left-turn movement (5% reduction in traffic, shifted to Bond Street)
2. Eastbound right-turn movement (10% reduction in traffic, shifted to Bond Street)
3. Eastbound left-turn movement (5% reduction in traffic, shifted to Crescent Boulevard)
4. Southbound right-turn movement (10% reduction in traffic, shifted to Crescent Boulevard)

In addition, traffic counts were conducted at the two existing industrial driveways along the north side of Grand River Avenue at the Comau and General Filters developments. Traffic that currently accesses these developments directly from Grand River Avenue may utilize the new Crescent Boulevard connection (and Industrial Spur from Crescent Boulevard) in the future. Therefore, in the background analysis, applicable traffic to and from the east was reassigned to Crescent Boulevard and the Industrial Spur. Development traffic was reassigned based on existing turning movements at these driveways. For traffic travelling to/from the east on Grand River Avenue, it was assumed that 40% of this traffic was also to/from the north on Novi Road. Traffic assumed to be to/from the north on Novi Road was reassigned to the Novi Road/Crescent Boulevard intersection via Crescent Boulevard directly, and would thus bypass the Novi Road/Grand River Avenue intersection in the future.

The background (2028) conditions peak-hour intersection LOS results are shown in **Table 5**. The background (2028) conditions peak-hour traffic volumes and movement-by-movement LOS results are depicted in **Figure 6**. Capacity analysis reports from the *Synchro®* software for all intersections are included in **Appendix B-3**.

Table 5 – Background (2028) Conditions Intersection LOS Results

Intersection	Traffic Control	Weekday AM Peak-Hour		Weekday PM Peak-Hour		Saturday Midday Peak-Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Novi Road and West Oaks Drive South	*Signalized*	14.9	B	30.8	C	43.4	D
Novi Road and WB I-96 Off-Ramp	*Signalized*	24.6	C	22.4	C	28.7	C
Novi Road and EB I-96 Off-Ramp	*Signalized*	10.4	B	14.1	B	22.4	C
Novi Road and Crescent Boulevard	*Signalized*	13.3	B	31.3	C	34.6	C
Novi Road and Grand River Avenue	*Signalized*	**72.5**	**E**	**72.7**	**E**	**88.3**	**F**
Novi Road and Bond Street/Main Street	*Signalized*	13.8	B	15.1	B	12.6	B
Novi Road and Trans X Road (WB approach results shown)	*1-Way STOP*	16.5	C	21.5	C	24.8	C
Novi Road and US Post Office Driveway	*Signalized*	3.7	A	5.2	A	4.3	A
Novi Road and Ten Mile Road	*Signalized*	37.8	D	54.2	D	36.6	D
Grand River Avenue and Bond Street/ Crescent Boulevard*	*Signalized**	7.0	A	11.0	B	8.0	A
Grand River Avenue and Sixth Gate (NB approach results shown)	*1-Way STOP*	9.7	A	20.2	C	16.1	C
Grand River Avenue and Main Street/ Town Center Drive	*Signalized*	13.4	B	25.3	C	23.5	C
Grand River Avenue and Meadowbrook Road	*Signalized*	27.9	C	**69.2**	**E**	42.0	D
Eleven Mile Road and Town Center Drive	*4-Way STOP*	8.6	A	15.4	B	11.3	B
Main Street and Potomac	*3-Way STOP*	7.7	A	8.2	A	8.6	A
Crescent Boulevard and Industrial Spur (EB approach results shown)	*1-Way STOP*	8.8	A	9.2	A	8.8	A

**Analysis assumes new traffic signal added at the Grand River Avenue intersection with Bond Street and Crescent Boulevard.*

As shown in Table 5, the background (2028) peak-hour capacity analysis shows that the Novi Road/Grand River Avenue intersection is projected to operate with a poor LOS during all three peak-hours. The intersection currently operates poorly during all three peak-hours, and intersection delay times are projected to increase when compared to existing conditions. In addition, the Grand River Avenue/Meadowbrook Road intersection is projected to operate poorly during the weekday afternoon peak-hour.

As shown on Figure 6, several large turning movements are projected to operate poorly under background (2018) conditions. Some of these movements are in addition to those occurring under existing conditions. These additional poorly operating movements include:

- At Novi Road/Grand River Avenue, the eastbound thru movement and the westbound right-turn movement.
- At Novi Road/Ten Mile Road, the westbound thru movement.
- At Grand River Avenue/Meadowbrook Road, the northbound left-turn movement.

4. Future (2028) Conditions

Section 4 contains an analysis of traffic conditions during the projected completion of all proposed developments (2028), including traffic generated by the future developments listed in Figure 1. Future conditions can be compared to background conditions to quantify the impact of the proposed developments.

4.1 Future Proposed Developments

The City of Novi is planning for the future development of eight different parcels within the study area network, in addition to those identified as "background". With input from City Planning staff on expected projects and through discussions of potential land uses for vacant parcels, the future developments were assumed to include the following:

The **Adell Center** is proposed as a mixed-use development consisting of nine individual units. The development is located on the property of the former Novi Expo Center site west of Novi Road, south of I-96. The development is expected to have one main access point from Crescent Boulevard. The expected land uses for the site include:

- 180-Room Hotel
- 130-Room Business Hotel
- iFLY Indoor Skydiving (10,000 square feet)
- Health/Fitness Club (20,000 square feet)
- Carvana (7,500 square feet)
- Quality Restaurant (7,163 square feet)
- High-Turnover Sit-Down Restaurant (7,000 square feet)
- Open Space, Undeveloped Unit
- Existing Water Tower

The developer of the Adell Center provided trip generation estimates for each of the above land uses which were used as part of this study.

The **potential office/retail** space located at the southeast corner of Crescent Boulevard and Town Center Drive (currently an unused parking lot) is anticipated to be developed into general office use. A potential building size of 19,000 square feet was assumed for this parcel based on comparing the ratio of building-to-lot size (square footage) of similar general office buildings in Novi.

The **Main Street NW** parcel located on the east side of Novi Road, north of Main Street was assumed to be developed with a 6,000 square foot high-turnover sit-down restaurant. The size of the restaurant was determined based on comparing the ratio of building-to-lot size (square footage) of similar high-turnover sit-down restaurant in Novi.

The **Main Street North** parcel located on the north side of Main Street east of Novi Road was assumed to be a multi-family residential development consisting of 206 units. The development proposes on-street parking along Main Street and off-street parking north of the development. The development is assumed to have access to Main Street via a private drive on the west side of the site, east of the existing credit union as well as access to Grand River Avenue via Sixth Gate.

The **Asian Village** development is anticipated to be developed on the Anglin property on the north side of Grand River Avenue, east of Town Center Drive. The development may have up to three access points: one onto Grand River Avenue, one onto Town Center Drive and one along Eleven Mile Road. The potential land uses were based on publicly available news articles from Crain's Detroit on 5/13/18 and ChinaDaily.com on 5/25/18. The following assumptions were used for the TIS analysis:

- 200 multi-family housing units
- 75,000 square foot shopping center (Lifestyle Center)
- 25,000 square foot food market
- 15,000 square feet of general office

The **Main Street Lofts** development is a multi-family residential development with 224 units. The parcel is located on the south side of Main Street, east of Novi Road. The development is proposed to have access points off of Main Street and Trans X Road.

The **City Park** development is proposed for the vacant parcel of land located on the east side of Novi Road and south side of Trans X Road. The park was assumed to be a public park and include a playground encompassing the 3.643 acres available. Access to the park was assume to be from Trans X Road.

The **Mirage Theater and Retail** development is located on the west side of Novi Road, north of Ten Mile Road. The land uses within the development include 20,000 square feet of retail, restaurants, or office uses and a 773 seat movie theater. The development was assumed to have two access points off of Novi Road.

4.2 Trip Generation

The proposed trip generation for the eight future developments is shown in **Table 6.** Traffic generated by the proposed developments was used to measure the impact of the developments on the study area intersections for the future (2028) conditions. Assumptions were made in cases where land use data was not available in the ITE Trip Generation Manual or data was provided from a recent trip generation analysis.

Future (2028) Trip Generation Assumptions (with development name in parentheses):

- iFly (Adell Center) – Saturday trips based on the Kimberley-Horn report appendix.
- Carvana (Adell Center) – Saturday data not available, assume same trips as weekday PM peak-hour.
- All land uses (Asian Village) - Crain's Detroit, 5/13/18 article; and China Daily.com 5/25/18 article http://www.ecns.cn/news/society/2018-05-25/detail-ifyuqkxh5546517.shtml
- Multi-family housing (Mainstreet Lofts) - Trips based on data in the AECOM 09/13/17 memorandum to the City
- Playground (City Park) - Very small city park, ITE Trip Generation 10th Edition does not compute trips for a park of this size. Nominal trips are assumed.
- Movie Theatre (Theatre & Retail) - Based on total number of seats

<u>Pass-By Site Trips</u>
As with The Bond background development, it is anticipated that future retail-oriented developments will capitalize on the traffic volumes along Novi Road and Grand River Avenue by “capturing” customers passing by the location to/from work or other destinations. While pass-by trips do not add new trips to the roadway network, they add turning movements at the site driveway locations.

Based on the ITE pass-by trip data, it is estimated that approximately 10% to 40% of peak-hour trips for each of the three peak-hours are pass-by trips for the retail-type land uses. **Table 7** summarizes the pass-by trip percentages for these applicable land uses.

<u>Internal Site Trips</u>
Some of the proposed developments will also attract internal trips. Internal trips are common between two or more trip generators on the same site, and are common for a development with adjacent businesses like the restaurant and hotel land uses in the Adell Center development. An internal trip occurs when a patron visits two or more land uses that can be accessed from the same parking area (i.e. there is no need to enter the main roadway when going from land use to land use).

For numerous land uses, the <u>ITE Trip Generation Manual</u> provides data for internal trips for selected peak-hours, including many of the land uses in the present study. Some of the land uses for the Adell Center, Asian Village, and the shopping center in the Mirage Theater and Retail development are of the types that involve internal trips. Based on the ITE internal trip data, it is estimated that approximately 10% to 30% of peak-hour trips for these land uses are internal trips. Table 7 summarizes the internal trip percentages for applicable land uses. For those land uses that show internal trip percentages in Table 7, their respective trips shown in Table 6 include this reduction in total trips based on their internal trip percentage.

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Table 6 – Future (2028) Trip Generation

Development #	Development Name	Land Use Description	ITE Land Use	ITE LUC	Size	Units	Weekday AM Peak-Hour Trips			Weekday PM Peak-Hour Trips			Saturday Peak-Hour Trips		
							Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
1	Adell Center	Hotel	Hotel	310	180	rooms	50	35	85	50	48	98	65	51	116
		Business Hotel	Business Hotel	312	130	rooms	21	30	51	21	17	38	25	27	52
		I-Fly (indoor skydiving)	none	n/a	10,000	SF	4	0	4	24	22	46	27	37	64
		Health / Fitness Club	Health / Fitness Club	492	20,000	SF	13	13	26	39	30	69	31	33	64
		Carvana (on-line used car dealer)	none	n/a	7,500	SF	6	6	12	6	6	12	6	6	12
		Quality Restaurant	Quality Restaurant	931	7,163	SF	4	1	5	34	16	50	40	28	68
		Hi-Turnover Restaurant	High-Turnover Sit-Down Restaurant	932	7,000	SF	4	1	5	38	23	61	36	34	70
2	currently unused parking lot	General Office	General Office	710	19,000	SF	38	6	44	4	20	24	5	5	10
3	Main Street NW	Restaurant	High-Turnover Sit-Down Restaurant	932	6,000	SF	33	27	60	36	23	59	34	33	67
4	Main Street North	Residential	Multi-Family Housing (Mid-Rise)	221	206	units	18	51	69	54	35	89	45	48	93
5	Asian Village (mixed use)	Residential	Multi-Family Housing (Mid-Rise)	221	200	units	18	50	68	52	34	86	44	47	91
		Lifestyle Center	Shopping Center	820	75,000	SF	88	46	134	74	84	158	30	26	56
		Food Market	Supermarket	850	25,000	SF	49	33	82	113	109	222	92	89	181
		Office	General Office	710	15,000	SF	35	6	41	3	16	19	4	4	8
6	Mainstreet Lofts		Multi-Family Housing (Mid-Rise)	221	224	units	19	56	75	59	37	96	49	52	101
7	City Park	playground	Public Park	411	3.643	acres				5	5	10	10	10	20
8	Theater & Retail (see Mirage Cinema Development info)	Theater	Movie Theater	445	773	seats				22	40	62	50	20	70
		Shopping Center	Shopping Center	820	20,000	SF				79	86	165	47	43	90
Total NET NEW Peak-Hour Trips							400	361	761	713	651	1364	640	593	1233
							AM Peak Hour			PM Peak Hour			Sat Peak Hour		

Source: ITE Trip Generation Manual, 10th Ed & ITE Trip Generation Handbook, 3rd Ed

(grey cell) Assumes no AM trip gen (not open)

Table 7 – Future (2028) Pass-By and Internal Trips

Development #	Development Name	Land Use Description	ITE Land Use	ITE LUC	Size	Units	Pass-By Trip Percentages			Internal Trip Percentages		
							AM	PM	SAT	AM	PM	SAT
1	Adell Center	Hotel	**Hotel**	**310**	**180**	rooms					**10%**	**10%**
1	Adell Center	Business Hotel	**Business Hotel**	**312**	**130**	rooms					**10%**	**10%**
1	Adell Center	iFly (indoor skydiving)	**none**	**n/a**	**10,000**	SF					**15%**	**15%**
1	Adell Center	Health / Fitness Club	**Health / Fitness Club**	**492**	**20,000**	SF						
1	Adell Center	Carvana (on-line used car dealer)	**none**	**n/a**	**7,500**	SF						
1	Adell Center	Quality Restaurant	**Quality Restaurant**	**931**	**7,163**	SF		**40%**	**30%**		**10%**	**10%**
1	Adell Center	Hi-Turnover Restaurant	**High-Turnover Sit-Down Restaurant**	**932**	**7,000**	SF		**40%**	**30%**		**10%**	**10%**
2	currently unused parking lot	General Office	**General Office**	**710**	**19,000**	SF						
3	Main Street NW	Restaurant	**High-Turnover Sit-Down Restaurant**	**932**	**6,000**	SF	**20%**	**40%**	**30%**			
4	Main Street North	Residential	**Multi-Family Housing (Mid-Rise)**	**221**	**206**	units						
5	Asian Village (mixed use)	Residential	**Multi-Family Housing (Mid-Rise)**	**221**	**200**	units						
5	Asian Village (mixed use)	Lifestyle Center	**Shopping Center**	**820**	**75,000**	SF	**10%**	**30%**	**20%**	**15%**	**20%**	**30%**
5	Asian Village (mixed use)	Food Market	**Supermarket**	**850**	**25,000**	SF	**10%**	**30%**	**20%**	**15%**	**20%**	**30%**
5	Asian Village (mixed use)	Office	**General Office**	**710**	**15,000**	SF						
6	Mainstreet Lofts		**Multi-Family Housing (Mid-Rise)**	**221**	**224**	units						
7	City Park	playground	**Public Park**	**411**	**3.643**	acres						
8	Theater & Retail (Mirage Cinema Development info)	Theater	**Movie Theater**	**445**	**773**	seats					**10%**	**10%**
8	Theater & Retail (Mirage Cinema Development info)	Shopping Center	**Shopping Center**	**820**	**20,000**	SF		**30%**	**20%**		**10%**	**10%**

Source: ITE Trip Generation Manual, 10th Ed & ITE Trip Generation Handbook, 3rd Ed

(grey shading) Assumes pass-by trips for these land uses are not applicable.

4.3 Trip Distribution and Traffic Assignment

Future development generated trips were assigned to the roadway network using the same distribution percentages assumed for the background development trips. The traffic generated by the eight future developments was assigned to the roadway network based on the determined trip distribution percentages. The total future development traffic that would be added to the roadway network is shown in **Figure 7**. Traffic volumes for each of the eight individual developments are shown separately in **Figures 7A to 7H**.

As shown in Figure 7, several turning movements in the study area will experience an increase in traffic due to trips generated by future developments. Significant increases include:

1. Westbound I-96 off-ramp left-turn movement at Novi Road
2. Southbound Novi Road thru movement at Grand River Avenue
3. Northbound Novi Road thru movement at Grand River Avenue

4.4 Future (2028) Conditions Capacity Analysis

A capacity analysis was conducted for the study area intersections under future (2028) traffic conditions. The future (2028) analysis did not include any additional changes to the roadway network, beyond the Bond Street and Crescent Boulevard new ring road improvements that were introduced in the background (2028) analysis. The future analysis did consider "cut-thru" traffic avoiding congestion at the Novi Road/Grand River Avenue signal.

The future (2028) conditions peak-hour intersection LOS results are shown in **Table 8**. The future (2028) conditions peak-hour traffic volumes and movement-by-movement LOS results are depicted in **Figure 8**. Capacity analysis reports from the *Synchro®* software for all intersections are included in **Appendix B-4**.

Table 8 – Future (2028) Conditions Intersection LOS Results

Intersection	Traffic Control	Weekday AM Peak-Hour		Weekday PM Peak-Hour		Saturday Midday Peak-Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Novi Road and West Oaks Drive South	*Signalized*	14.7	B	30.9	C	44.6	D
Novi Road and WB I-96 Off-Ramp	*Signalized*	24.8	C	22.8	C	31.9	C
Novi Road and EB I-96 Off-Ramp	*Signalized*	10.4	B	14.8	B	25.9	C
Novi Road and Crescent Boulevard	*Signalized*	16.6	B	35.6	D	40.7	D
Novi Road and Grand River Avenue	*Signalized*	**100.3**	**F**	**111.7**	**F**	**133.6**	**F**
Novi Road and Bond Street/Main Street	*Signalized*	19.8	B	18.9	B	15.2	B
Novi Road and Trans X Road (WB approach results shown)	*1-Way STOP*	18.2	C	27.5	D	27.0	D
Novi Road and US Post Office Driveway	*Signalized*	3.5	A	4.9	A	4.2	A
Novi Road and Ten Mile Road	*Signalized*	39.8	D	**69.0**	**E**	40.9	D
Grand River Avenue and Bond Street/ Crescent Boulevard*	*Signalized**	9.8	A	16.7	B	13.4	B
Grand River Avenue and Sixth Gate (NB approach results shown)	*1-Way STOP*	13.3	B	30.8	D	34.7	D
Grand River Avenue and Main Street/ Town Center Drive	*Signalized*	15.7	B	34.6	C	29.5	C
Grand River Avenue and Meadowbrook Road	*Signalized*	28.6	C	**83.2**	**F**	47.9	D
Eleven Mile Road and Town Center Drive	*4-Way STOP*	9.1	A	17.3	C	11.8	B
Main Street and Potomac	*3-Way STOP*	7.9	A	8.5	A	9.0	A
Crescent Boulevard and Industrial Spur (EB approach results shown)	*1-Way STOP*	9.2	A	9.9	A	9.6	A

**Analysis assumes new traffic signal added at the Grand River Avenue intersection with Bond Street and Crescent Boulevard.*

As shown in Table 8, the future (2028) peak-hour capacity analysis shows that the Novi Road/Grand River Avenue intersection is projected to operate with a poor LOS F during all three peak-hours, as is the case with the existing and background conditions. In addition, the Novi Road/Ten Mile Road and Grand River Avenue/Meadowbrook Road intersections are projected to operate poorly during the weekday afternoon peak-hour. The Grand River

Avenue/Meadowbrook Road intersection was already projected to operate poorly during the weekday afternoon peak-hour under background conditions.

As shown on Figure 8, several large turning movements are projected to operate poorly under future (2028) conditions. Some of these movements are in addition to those occurring under existing and background conditions. These additional poorly operating movements include:

- At Novi Road/Crescent Boulevard, the eastbound left-turn movement.
- At Grand River Avenue/Crescent Boulevard, the southbound left-turn movement.
- At Novi Road/Grand River Avenue, the southbound thru and right-turn movements.
- At Novi Road/Ten Mile Road, the southbound thru and right-turn movements.

5. Potential Future Mitigation

Section 5 contains a discussion of potential mitigation options that could improve the operation of intersections and traffic movements that are projected to operate poorly under future (2028) conditions after all study developments are implemented. Varying levels of mitigation options were examined based on input from the City. The mitigation recommendations were grouped into the following 'categories':

1. Signal timing adjustments
2. Traffic diversion via Taft Road and potential Fountain Walk Avenue connections
3. Roadway improvements within existing rights-of-way
4. Transit opportunities

5.1 Signal Timing Adjustments

The potential mitigation solution that is least expensive, and least invasive, is to adjust signal timings at the study area intersections. The signals in the study area currently operate on RCOC's SCATS system. The SCATS system produces traffic-responsive signal timings that adjust in real time based on the traffic volumes. The system provides for coordinated timings between signals along the Novi Road and Grand River Avenue corridors. Since the signal system already operates fully-actuated in real time, there is very little potential to improving signal operations based on signal timings alone. However, an existing timing optimization analysis was conducted to review if signal timing adjustments could improve operations. AECOM tested split adjustments at intersections with poorly operating traffic movements. Some small improvements were achieved by using timing adjustments as a mitigation measure.

An analysis of signal timing adjustments for future conditions produced incremental improvements for a few large traffic movements in the study area. These movements include:

- At Novi Road/Westbound I-96 off-ramp, the westbound left-turn movement.
- At Novi Road/Crescent Boulevard, the eastbound left-turn movement.
- At Novi Road/Ten Mile Road, the eastbound and northbound left-turn movements.

The signal timing adjustment opportunities will be coordinated with the RCOC and considered for implementation, as deemed necessary.

5.2 Taft Road/Fountain Walk Avenue Connection

A good portion of traffic utilizing the Novi Road and Grand River Avenue corridors is travelling to and from the West Oaks and Twelve Oaks shopping centers on the north side of I-96. Similarly, it is assumed that a significant portion of the traffic within the study area is traveling between the residential areas to the south and west of the study area to the shopping districts and freeway interchange within the study area. Therefore, an alternative connection between the two areas could be considered. The connection of Taft Road over the I-96 expressway, and a subsequent connection of Fountain Walk Avenue to Taft Road over the railroad (and up to Twelve Mile Road), as shown in the City's Master Plan, could provide another point of access to these shopping centers and freeway interface from the residential areas of Novi to the south and west. Refer to **Figure 9** for a schematic concept drawing. These connections could ease the traffic burden placed on Novi Road and Grand River Avenue in the Town Center vicinity, including specific traffic movements such as the eastbound Grand River Avenue left-turn onto northbound Novi Road and the southbound Novi Road right-turn onto westbound Grand River Avenue. Similarly, these connection roadways could ease the burden on the eastbound Ten Mile Road left-turn onto northbound Novi Road, and the southbound Novi Road right-turn onto westbound Ten Mile Road.

Connection of these roadways would incur a significant cost. However, these costs would be on par with purchasing right-of-way along the Novi Road corridor that may be required to otherwise increase capacity of the corridor.

The future (2028) condition capacity analysis showed that three study area intersections are projected to operate over capacity. A preliminary diversion analysis was conducted to determine what level of traffic would need to be diverted away from the study area to allow these intersections to operate within capacity in the future. This iterative analysis showed the following diversions would be required:

1. Novi Road/Grand River Avenue – 25% diversion required under AM, PM and Saturday peak periods
2. Novi Road/Ten Mile Road – 10% diversion required under the PM peak period
3. Grand River Avenue/Meadowbrook Road – 15% diversion required under the PM peak period

A more detailed analysis, such as an origin-destination study, would need to be conducted to determine the extent of traffic in the study area travelling to/from the southwest portion of the city to the West Oaks and Twelve Oaks shopping centers or I-96/Novi Road interchange and would therefore be inclined to utilize the alternative Taft Road (and/or subsequent Fountain Walk Avenue) connections. However, it would seem that a 25% diversion may be ambitious, and that alternative mitigation measures should be examined as well.

5.3 Potential Roadway Improvements

Roadway improvements at key locations could provide the additional capacity to allow the study area intersections to operate acceptably in the future. However, some improvements would incur large costs in acquiring additional right-of-way. Based on the projected poorly operating intersections and traffic movements in the future, the following roadway improvements should be considered.

Novi Road/Grand River Avenue – add dual left-turn lanes on all approaches, and a southbound right-turn lane.

This intersection operates over capacity during all three peak periods under existing conditions, and the addition of traffic generated by future developments worsens this situation. The existing left-turn volumes at this intersection are 140 vehicle or higher during the peak-hours. The eastbound left-turn movement is currently 420 vehicles during the weekday morning peak-hour. All four left-turn movements are projected to be more than 200 vehicles during at least one peak-hour under future (2028) conditions.

In addition, the southbound right-turn movement is currently 300 vehicles during the Saturday midday peak-hour. Despite this being the largest right-turn movement at the intersection, there is no southbound right-turn lane at this intersection. The addition of a southbound right-turn lane, with overlapping right-turn green arrow operation, would improve the operation of this intersection. Refer to **Figure 10A** for a concept map showing these improvements.

However, the recommended improvements at this intersection are restricted by limited right-of-way in all four quadrants of this intersection. Purchase of the necessary right-of-way would be costly and invasive to existing businesses at this intersection. Therefore, widening of this intersection does not appear to be feasible and, therefore, was not included as part of the capacity analysis.

Novi Road/Ten Mile Road – add dual left-turn lanes on all approaches, and a southbound right-turn lane.

This intersection is projected to operate over capacity during the weekday afternoon peak-hour under future conditions. The same capacity issues that occur at Novi Road/Grand River Avenue, also occur at this intersection but to a lesser extent.

Four-way dual left-turn lanes, plus a southbound right-turn lane would allow this intersection to operate acceptably under future conditions. Unlike the Grand River Avenue intersection, this intersection appears to have sufficient right-of-way to accommodate widening of the intersection, therefore these recommendations are included in the capacity analysis. Refer to **Figure 10B** for a concept map showing these improvements.

The Ten Mile corridor from Napier Road to Haggerty Road is currently being reviewed under a separate study. If Ten Mile Road were to be widened in the future, the intersection of Novi Road at Ten Mile Road could be enhanced with suggested mitigation measures at the same time.

Grand River Avenue/Meadowbrook Road – add northbound dual left-turn lanes

Under future traffic conditions, the northbound Meadowbrook Road left-turn movement at Grand River Avenue is projected to contain approximately 300 vehicles during the weekday afternoon and Saturday midday peak-hours. This is an increase from approximately 180-190 vehicles under existing conditions. This projected increase is due to the proposed developments near this intersection. Dual northbound left-turn lanes could allow this intersection to operate acceptably under future conditions. This recommendation is included in the capacity analysis. Refer to **Figure 10C** for a concept map showing these improvements.

Grand River Avenue/Main Street/Town Center Drive – add north/south right-turn green arrows to signal

The northbound and southbound right-turn movements at this intersection are both projected to have increased traffic volumes due to proposed future developments in the area. The addition of right-turn green arrows would be a relatively easy addition, as the north/south approaches already have exclusive right-turn lanes, and the right-turn green arrows could operate as overlaps to the existing east/west Grand River Avenue left-turn phases. This recommendation is included in the capacity analysis. Refer to **Figure 10D** for a concept map showing these improvements.

Grand River Avenue – widen to five lanes from Meadowbrook Road to Novi Road

The projected increase in development along Grand River Avenue between Main Street/Town Center Drive and Meadowbrook Road would lend itself to a future roadway widening. Many of the parcels in this area are currently undeveloped. Grand River Avenue currently has a variable cross-section ranging from three lanes to five lanes along this stretch of roadway, including some extended right-turn bays or deceleration lanes. Therefore, the roadway widening would not be extensive along a good portion of this section. There appears to be ample right-of-way to accommodate this widening. The second eastbound Grand River Avenue thru lane could be constructed as a right-turn lane at Meadowbrook Road, so no widening would be necessary to the east of Meadowbrook Road. This recommendation is included in the capacity analysis. Refer to **Figure 10D** for a concept map showing these improvements.

5.4 Transit Opportunities

Another option for potentially improving traffic operations within the area is to provide alternate ride-sharing opportunities for motorists, which would in turn reduce the number of individual trips on the roadway network. Ride-share opportunities could include services such as Uber, Lyft, autonomous shuttles, transit connectors, etc. The City has expressed interest in exploring transit connector options between the shopping districts to the north and south of the I-96 freeway, as recommended in the 2016 Thoroughfare Master Plan. Additional transit connections could be explored beyond the immediate study area to capture some repetitive and recurring trips between various locations such as large residential populations, the Providence Park hospital or the Suburban Collection Showplace. In order to assess the practicality of transit solutions, the City could consider conducting an origin-destination study to determine where potential transit stop locations may fit and the volume of customers that may be expected to utilize the systems. Ride-sharing and transit opportunity impacts were not included in the capacity analysis of this study.

5.5 Future (2028) Conditions Capacity Analysis (with Mitigation)

A capacity analysis was conducted for the study area intersections under future (2028) traffic conditions with recommended roadway improvements in place. The capacity analysis included all of the roadway improvements listed in the previous section, except for suggestions at the intersection of Novi Road and Grand River Avenue due to right-of-way limitations, and as directed by the City. The capacity analysis included timing changes to account for laneage modifications included in the mitigation recommendations.

The future (2028) conditions (with mitigation) peak-hour intersection LOS results are shown in **Table 9**. The future (2028) conditions (with mitigation) peak-hour traffic volumes and movement-by-movement LOS results are depicted in **Figure 11**. Capacity analysis reports from the *Synchro®* software for all intersections are included in **Appendix B-5**.

Table 9 – Future (2028) Conditions (with Mitigation) Intersection LOS Results

Intersection	Traffic Control	Weekday AM Peak-Hour		Weekday PM Peak-Hour		Saturday Midday Peak-Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Novi Road and West Oaks Drive South	*Signalized*	14.6	B	30.7	C	43.9	D
Novi Road and WB I-96 Off-Ramp	*Signalized*	25.4	C	23.3	C	29.9	C
Novi Road and EB I-96 Off-Ramp	*Signalized*	10.4	B	15.2	B	25.3	C
Novi Road and Crescent Boulevard	*Signalized*	19.0	B	35.0	C	36.5	D
Novi Road and Grand River Avenue	*Signalized*	**95.8**	**F**	**95.0**	**F**	**103.5**	**F**
Novi Road and Bond Street/Main Street	*Signalized*	19.7	B	19.0	B	15.2	B
Novi Road and Trans X Road (WB approach results shown)	*1-Way STOP*	18.2	C	27.5	D	27.0	D
Novi Road and US Post Office Driveway	*Signalized*	3.5	A	4.9	A	4.1	A
Novi Road and Ten Mile Road	*Signalized*	40.6	D	47.6	D	36.8	D
Grand River Avenue and Bond Street/ Crescent Boulevard	*Signalized*	9.9	A	15.9	B	13.8	B
Grand River Avenue and Sixth Gate (NB approach results shown)	*1-Way STOP*	12.5	B	12.9	B	12.8	B
Grand River Avenue and Main Street/ Town Center Drive	*Signalized*	14.9	B	27.3	C	26.2	C
Grand River Avenue and Meadowbrook Road	*Signalized*	31.7	C	44.9	D	36.0	D
Eleven Mile Road and Town Center Drive	*4-Way STOP*	9.1	A	17.3	C	11.8	B
Main Street and Potomac	*3-Way STOP*	7.9	A	8.5	A	9.0	A
Crescent Boulevard and Industrial Spur (EB approach results shown)	*1-Way STOP*	9.2	A	9.9	A	9.6	A

As shown in Table 9, with roadway modifications (and corresponding signal timing adjustments) included in the future conditions analysis, the Novi Road/Ten Mile Road and Grand River Avenue/Meadowbrook Road intersections are both projected to operate with improved (and acceptable) intersection LOS during the weekday afternoon peak-hour. However, the Novi Road/Grand River Avenue intersection is still projected to operate poorly during all three peak-hours.

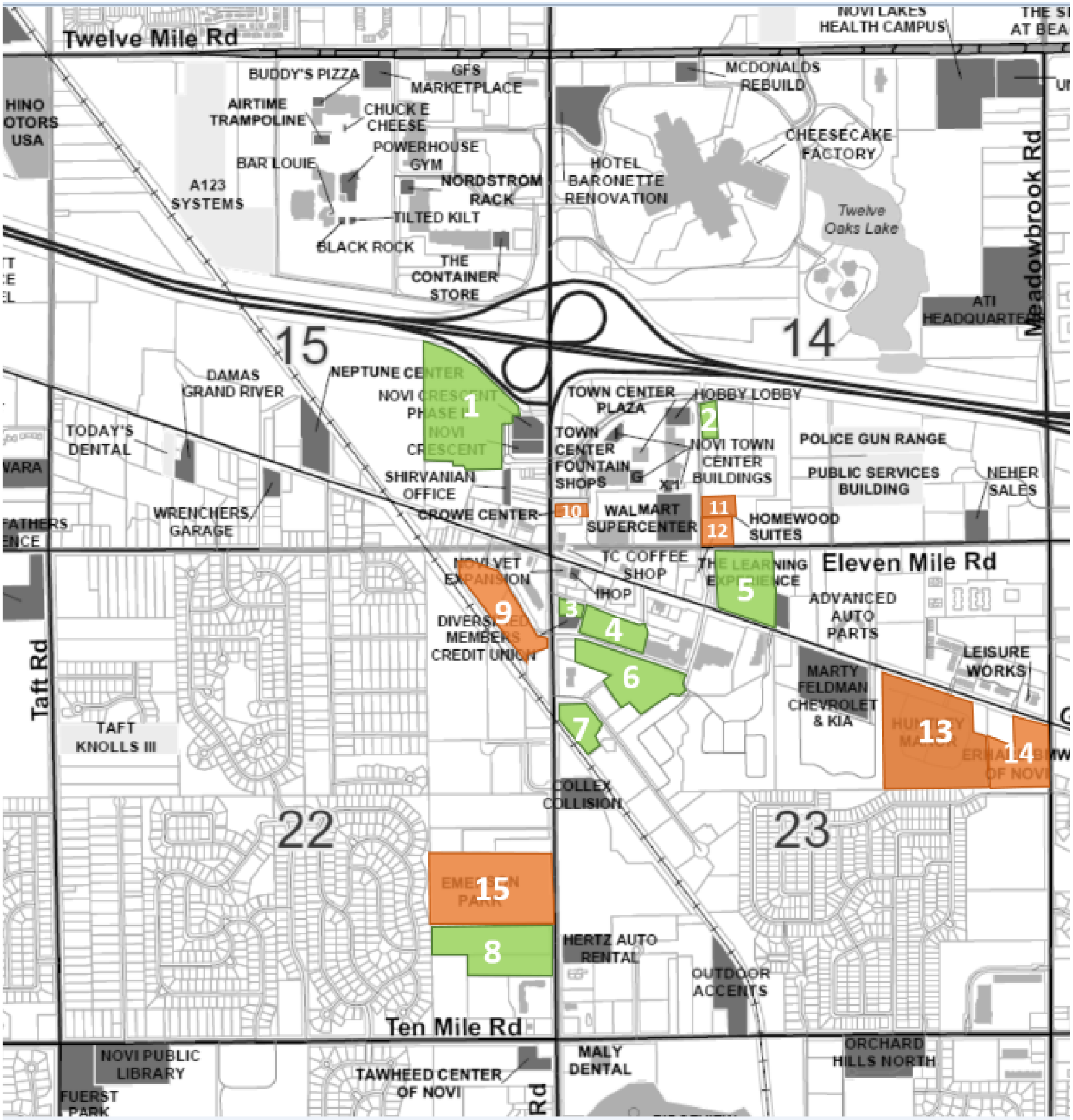
As shown on Figure 11, many poorly operating turning movements are projected to operate with improved LOS, with roadway improvements assumed to be in place. This is primarily true at the Novi Road/Ten Mile Road and Grand River Avenue/Meadowbrook Road intersections.

6. Conclusions

The large Town Center area within the city of Novi is expected to experience additional development over the next ten years. The study examined the traffic operations of the roadways during existing (2018) conditions, and with the anticipated traffic impacts of 15 background and future developments in the horizon year of 2028. The analysis concluded that the intersection of Novi Road and Grand River Avenue operates with an unacceptable LOS under existing conditions. Additionally, several other individual turning movements operate poorly within the study area under existing conditions. Signal timing adjustments show incremental improvements; however, because of the existing operation of RCOC's SCATS system, signal timing impacts are minimal.

The addition of background and future development traffic will impact the study area intersections and cause additional intersections to operate below acceptable LOS, including Novi Road/Ten Mile Road and Grand River Avenue/Meadowbrook Road. Several individual turning movements are projected to operate poorly under future (2028) conditions as well.

The study offers varying levels of mitigation opportunities including signal timing adjustments, lane additions, roadway connections over the I-96 expressway, and local transit services. The signal timing and lane adjustments were analyzed as part of this study, as discussed in Section 5. The Taft Road/Fountain Walk Avenue connections and transit opportunities were discussed qualitatively because additional investigation is required to determine the effectiveness and feasibility of those solutions. Implementation of the mitigation measures as discussed in Section 5 could result in improved intersection LOS to acceptable levels at all study intersections, except for the intersection of Novi Road and Grand River Avenue where right-of-way is limited and other options should be considered.



Future Developments

1 – Adell Center
2 – Potential Retail/Office
3 – Main Street NW
4 – Main Street North
5 – Asian Village
6 – Mainstreet Lofts
7 – City Park
8 – Mirage Theater & Retail

Background Developments

9 – The Bond Development
10 – Crowe Center
11 – Homewood Suites
12 – The Learning Experience
13 – Huntley Manor
14 – Erhard Jaguar/Land Rover
15 – Emerson Park

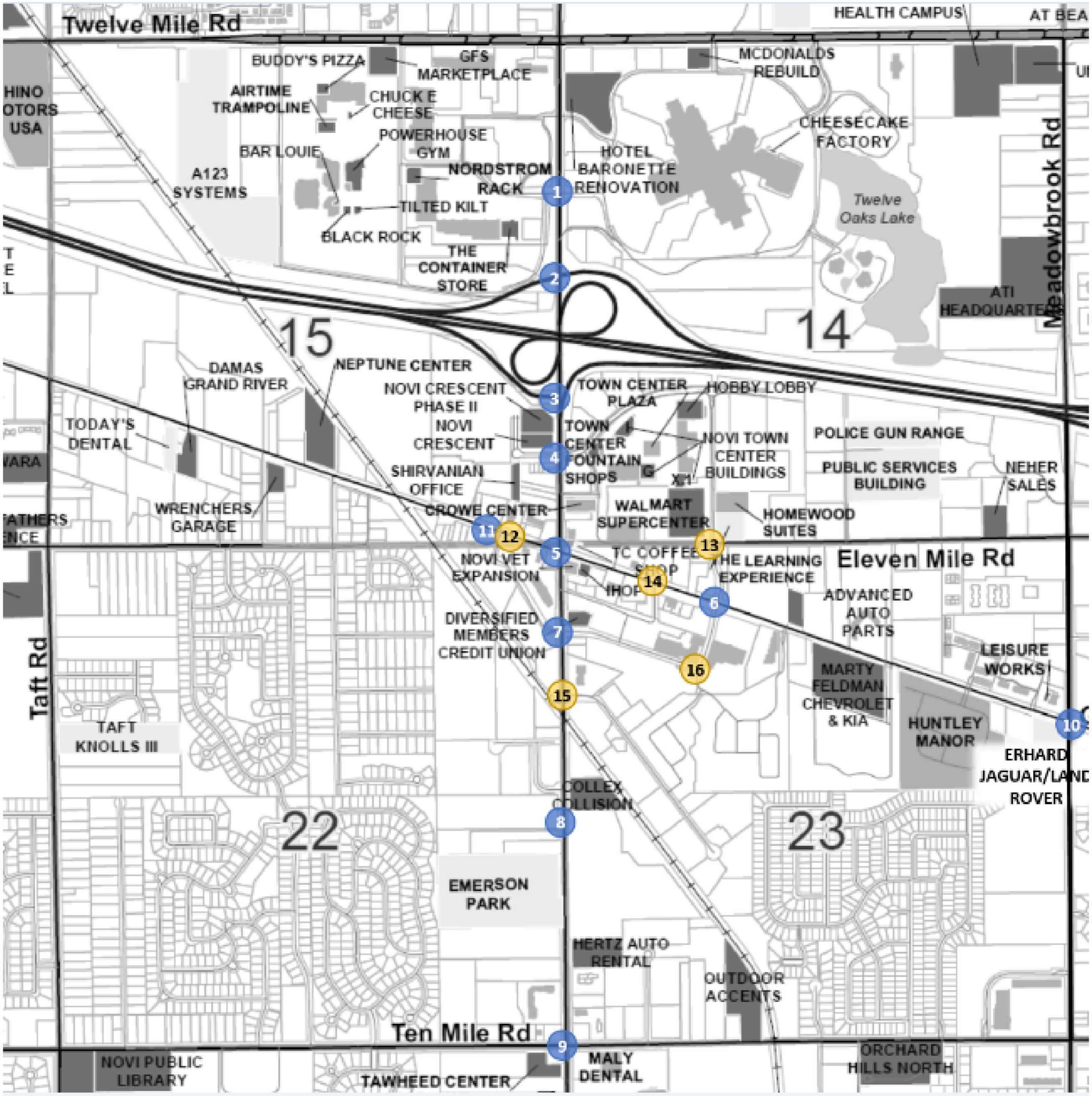
NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

AECOM

STUDY AREA DEVELOPMENTS

FIGURE 1

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-1_Study Area Developments



Signalized Study Intersections

1 – Novi Road and West Oaks Dr S
2 – Novi Road and WB I-96 Off Ramp
3 – Novi Road and EB I-96 Off Ramp
4 – Novi Road and Crescent Boulevard
5 – Novi Road and Grand River Avenue
6 – Grand River Avenue and Main Street
7 – Novi Road and Flint Street/Main Street
8 – Novi Road and Post Office Driveway
9 – Novi Road and Ten Mile Road
10 – Grand River Avenue and Meadowbrook
11 – Grand River Avenue and Crescent Blvd/Flint Street (proposed)

Unsignalized Study Intersections

12 – Grand River Avenue and existing Flint Street
13 – Eleven Mile Road and Town Center Dr
14 – Grand River Avenue and Sixth Gate
15 – Novi Road and Trans X
16 – Main Street and Main Street/Potomac

*Additional site driveways will be included as necessary for purposes of identifying mitigation measures.

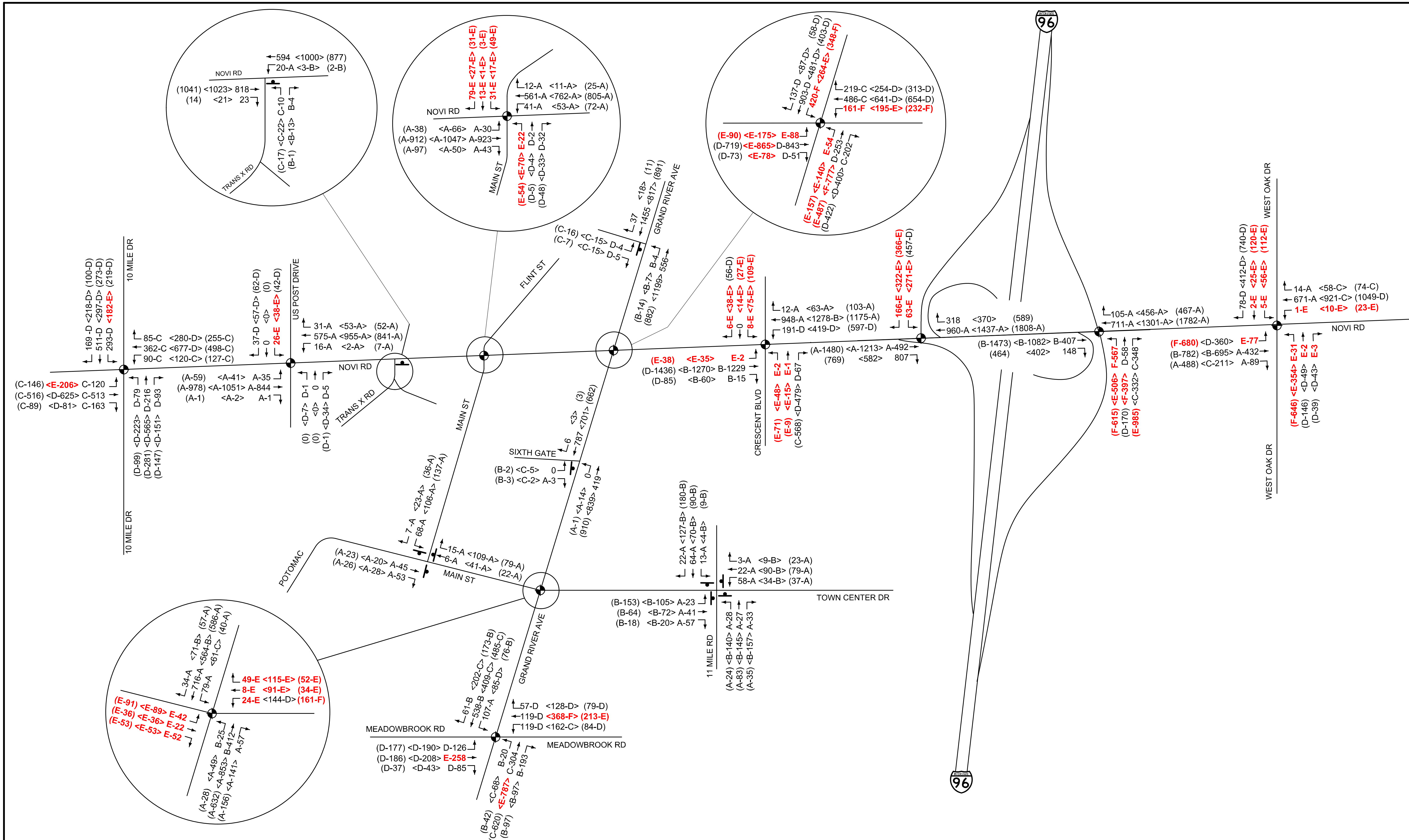
NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

AECOM

STUDY AREA INTERSECTIONS

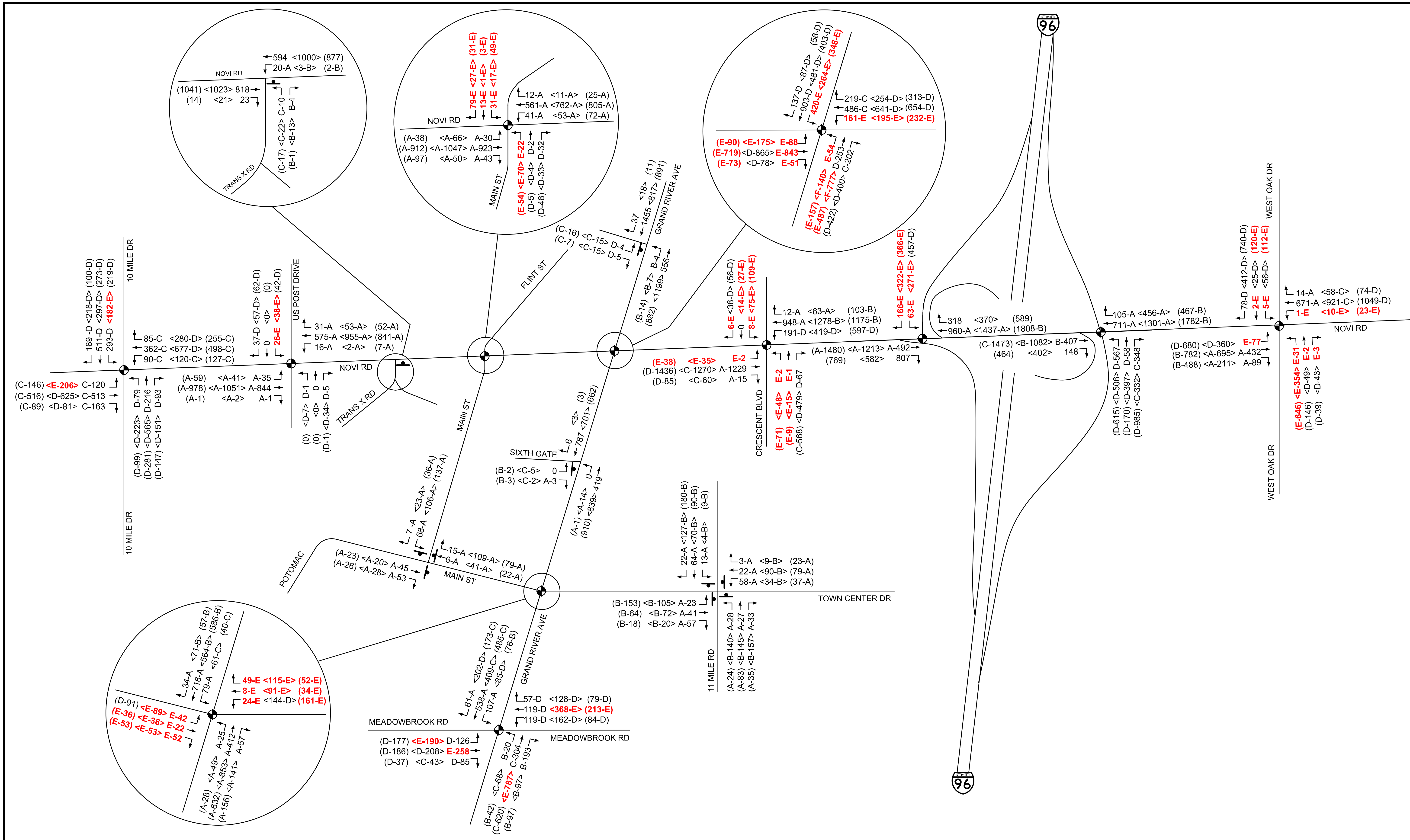
FIGURE 2

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-2_Study Area Intersections



LEGEND	NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY	
- TRAFFIC SIGNAL - STOP SIGN - LANE MOVEMENT XXX-X - AM-PEAK WEEKDAY TRAFFIC VOLUME & LOS <XXX-X> - PM-PEAK WEEKDAY TRAFFIC VOLUME & LOS (XXX-X) - SATURDAY PEAK TRAFFIC VOLUME & LOS	EXISTING (2018) AM, PM AND SATURDAY PEAK-HOUR VOLUMES AND LEVELS OF SERVICE	FIGURE 3

AECOM



AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX-X - AM-PEAK WEEKDAY TRAFFIC VOLUME & LOS

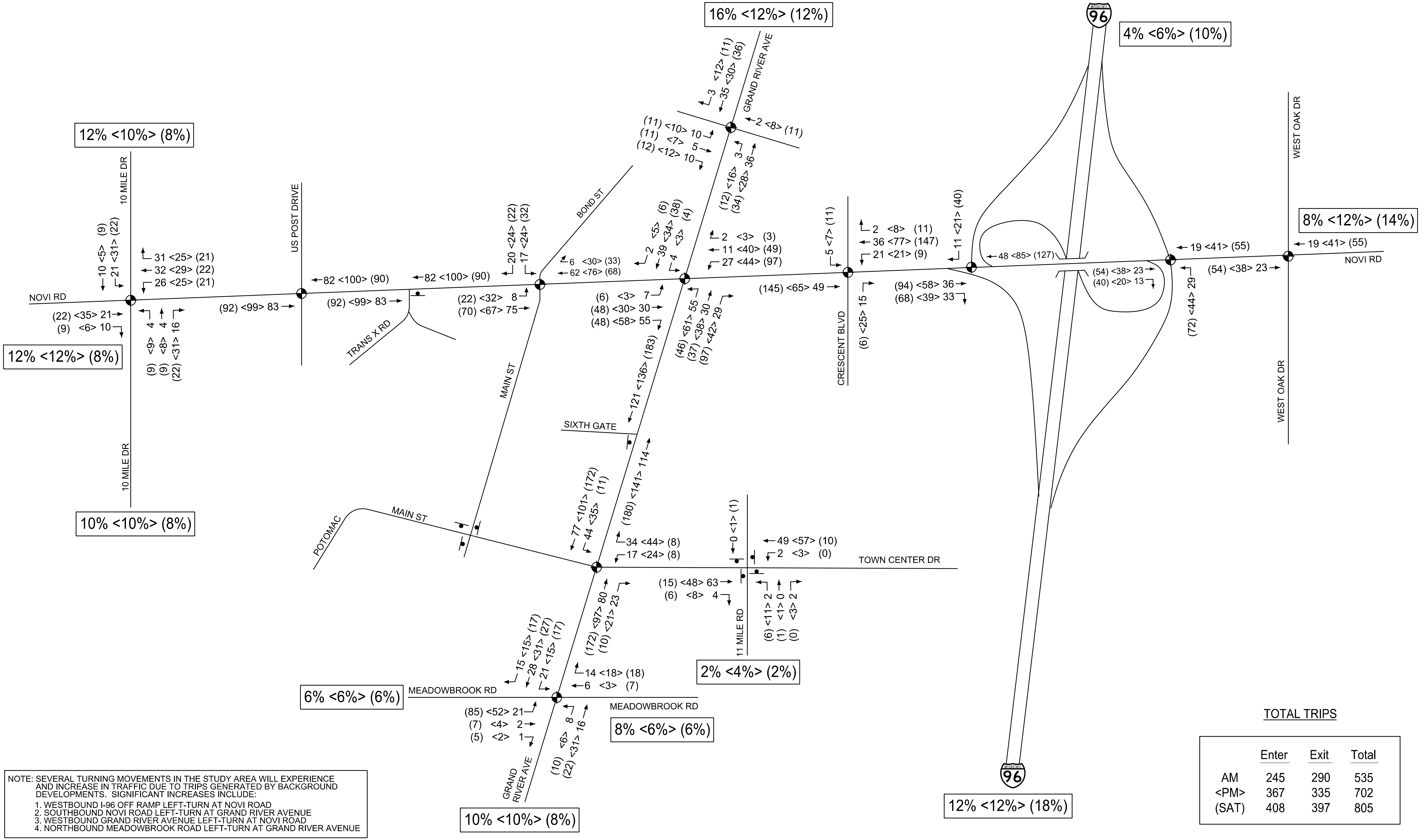
<XXX-X> - PM-PEAK WEEKDAY TRAFFIC VOLUME & LOS

(XXX-X) - SATURDAY PEAK TRAFFIC VOLUME & LOS

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

EXISTING (2018) AM, PM AND SATURDAY PEAK-HOUR VOLUMES AND LEVELS OF SERVICE (W/MITIGATION)

FIGURE 4



NOTE: SEVERAL TURNING MOVEMENTS IN THE STUDY AREA WILL EXPERIENCE AND INCREASE IN TRAFFIC DUE TO TRIPS GENERATED BY BACKGROUND DEVELOPMENTS. SIGNIFICANT INCREASES INCLUDE:
1. WESTBOUND I-96 OFF RAMP LEFT-TURN AT NOVI ROAD
2. SOUTHBOUND NOVI ROAD LEFT-TURN AT GRAND RIVER AVENUE
3. WESTBOUND GRAND RIVER AVENUE LEFT-TURN AT NOVI ROAD
4. NORTHBOUND MEADOWBROOK ROAD LEFT-TURN AT GRAND RIVER AVENUE

TOTAL TRIPS

	Enter	Exit	Total
AM	245	290	535
<PM>	367	335	702
(SAT)	408	397	805

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

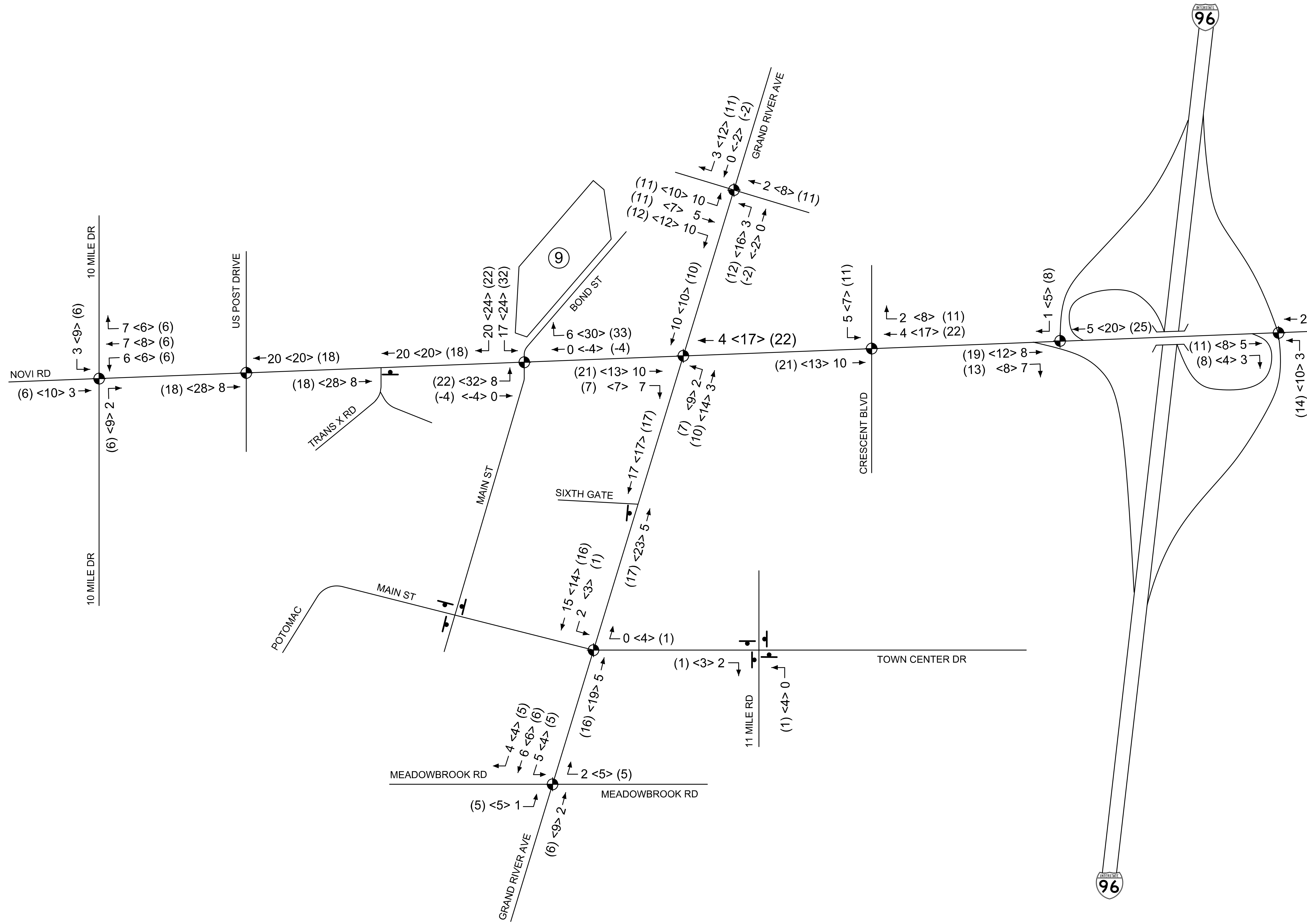
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

2028 BACKGROUND DEVELOPMENT TRIP GENERATION AND DISTRIBUTION

FIGURE 5

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-5_BKGD DEVELOPMENT TOTAL GENERATED VOLUMES



9 - BOND DEVELOPMENT

TOTAL TRIPS

	Enter	Exit	Total
AM	22	62	84
<PM>	98	77	175
(SAT)	89	88	177

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

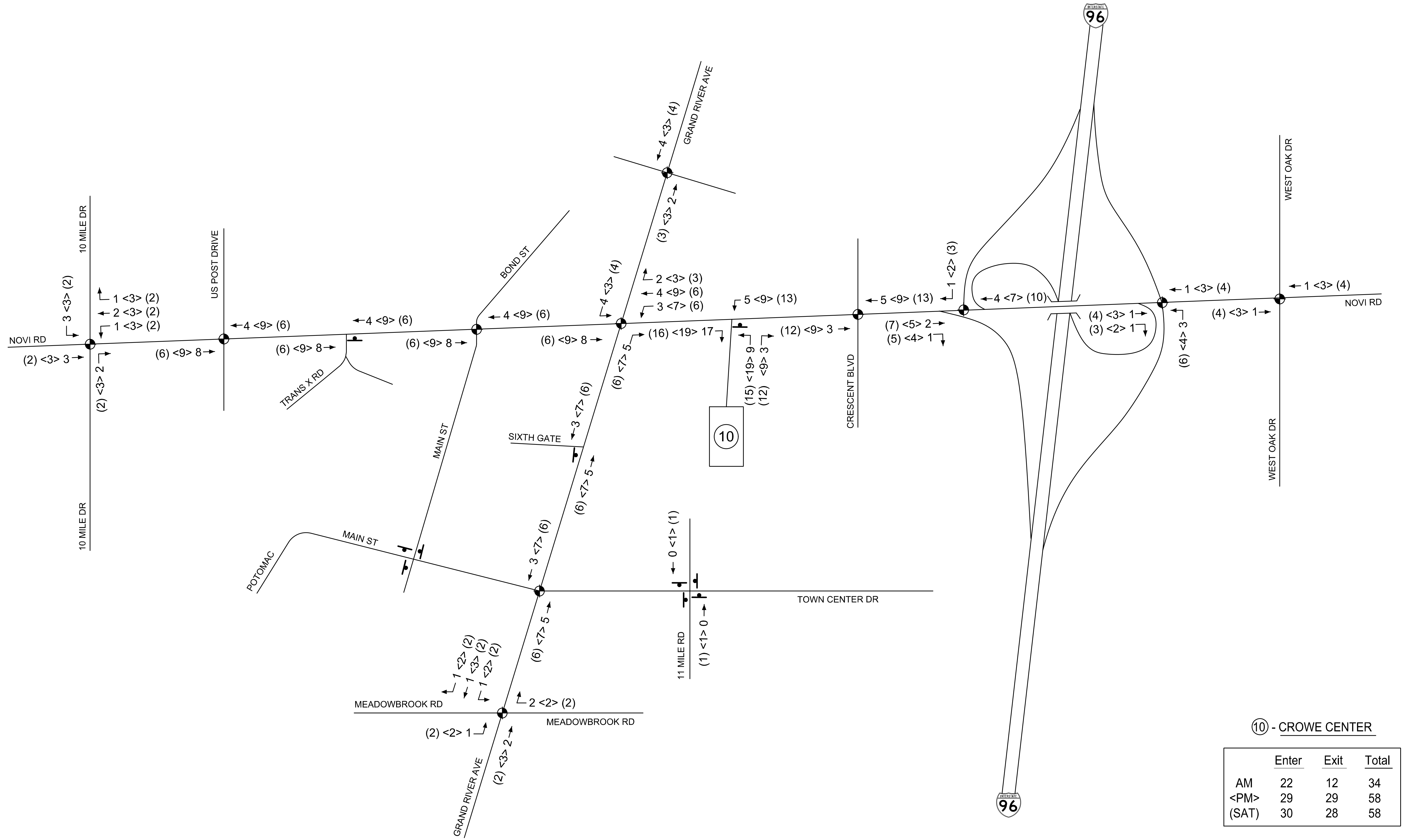
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

BOND DEVELOPMENT
GENERATED TRAFFIC VOLUMES

FIGURE 5A



⑩ - CROWE CENTER

	Enter	Exit	Total
AM	22	12	34
<PM>	29	29	58
(SAT)	30	28	58

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

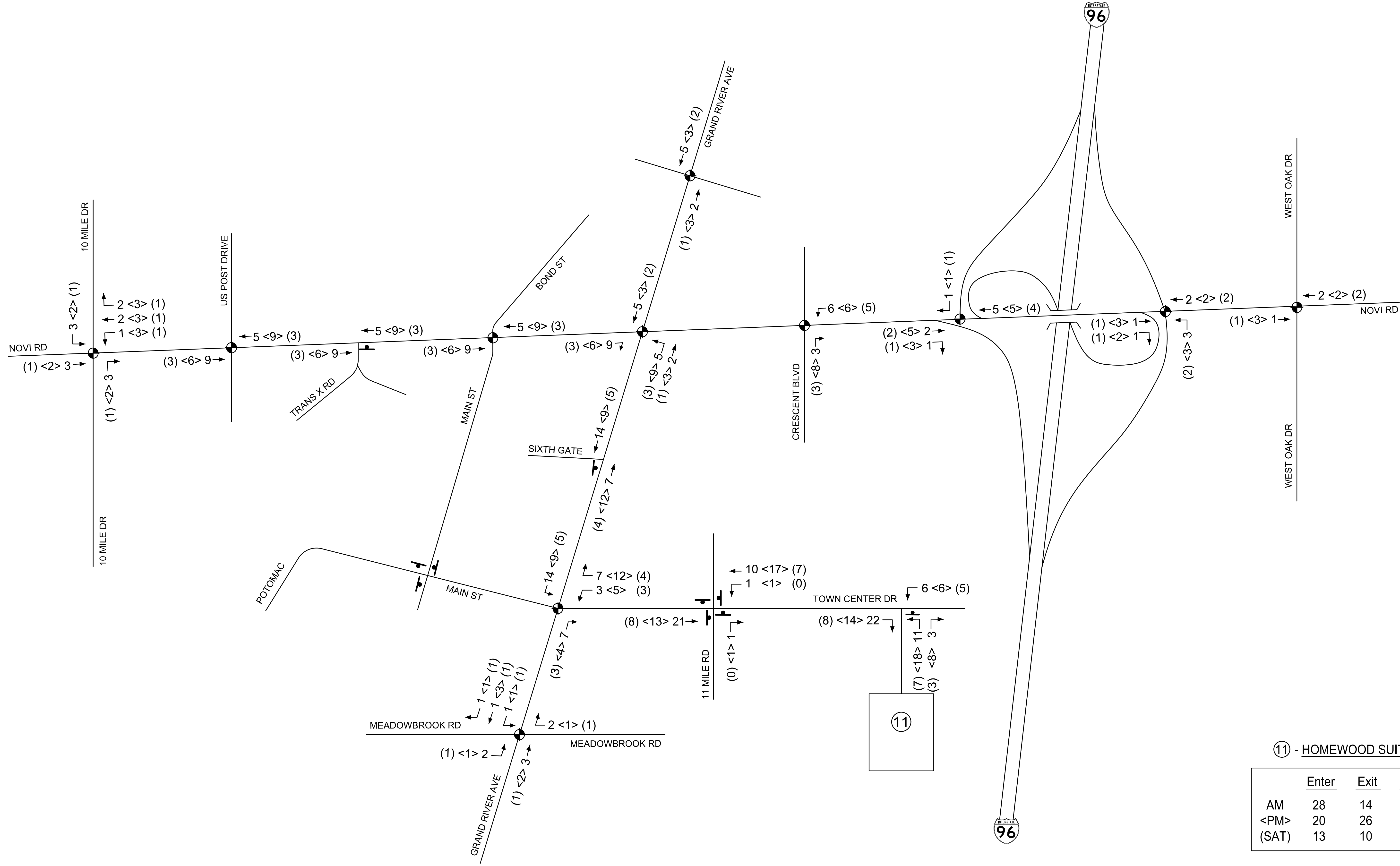
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

CROWE CENTER GENERATED TRAFFIC VOLUMES

FIGURE 5B



11 - HOMEWOOD SUITES

	Enter	Exit	Total
AM	28	14	42
<PM>	20	26	46
(SAT)	13	10	23

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

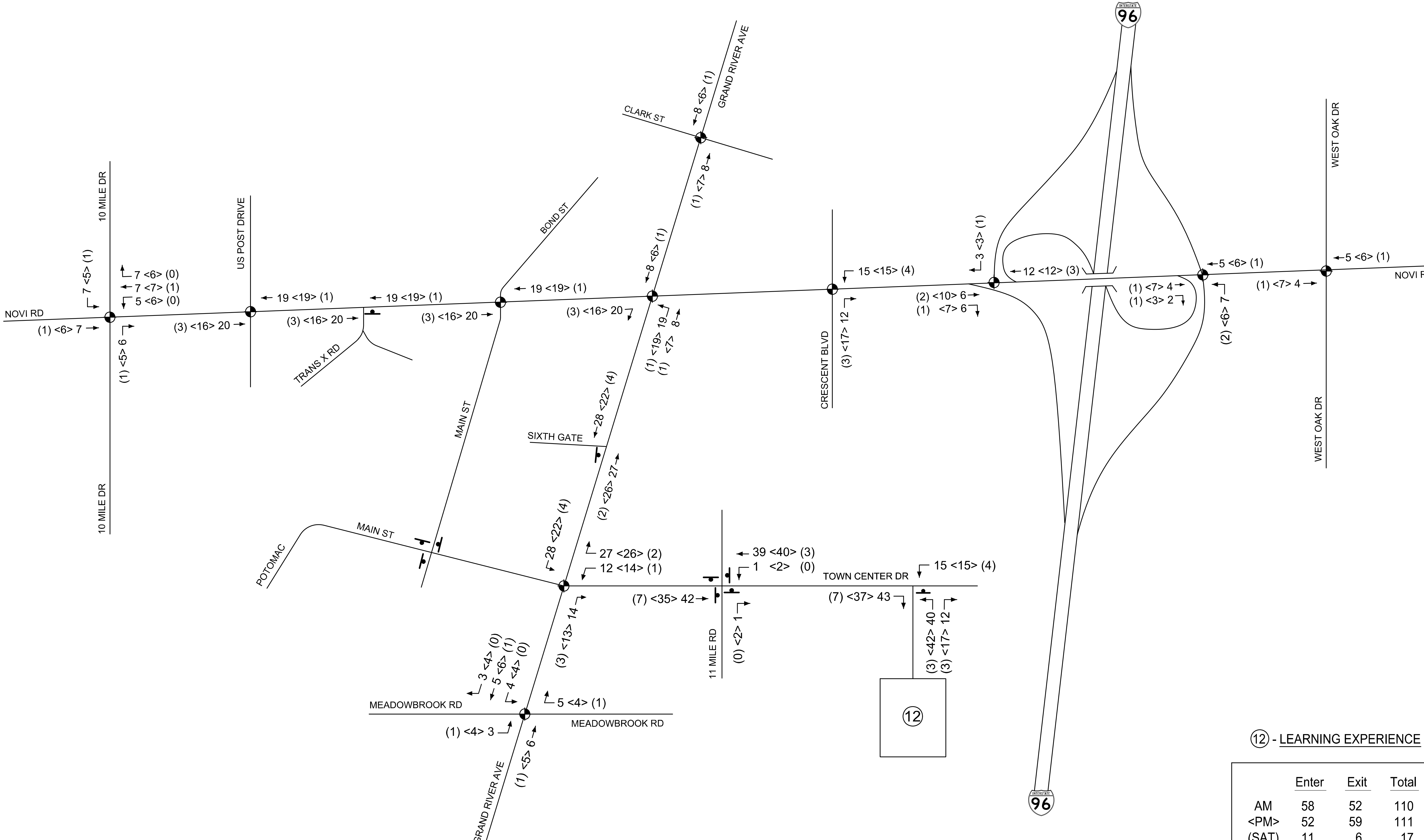
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

HOMEWOOD SUITES
GENERATED TRAFFIC VOLUMES

FIGURE 5C



⑫ - LEARNING EXPERIENCE

	Enter	Exit	Total
AM	58	52	110
<PM>	52	59	111
(SAT)	11	6	17

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

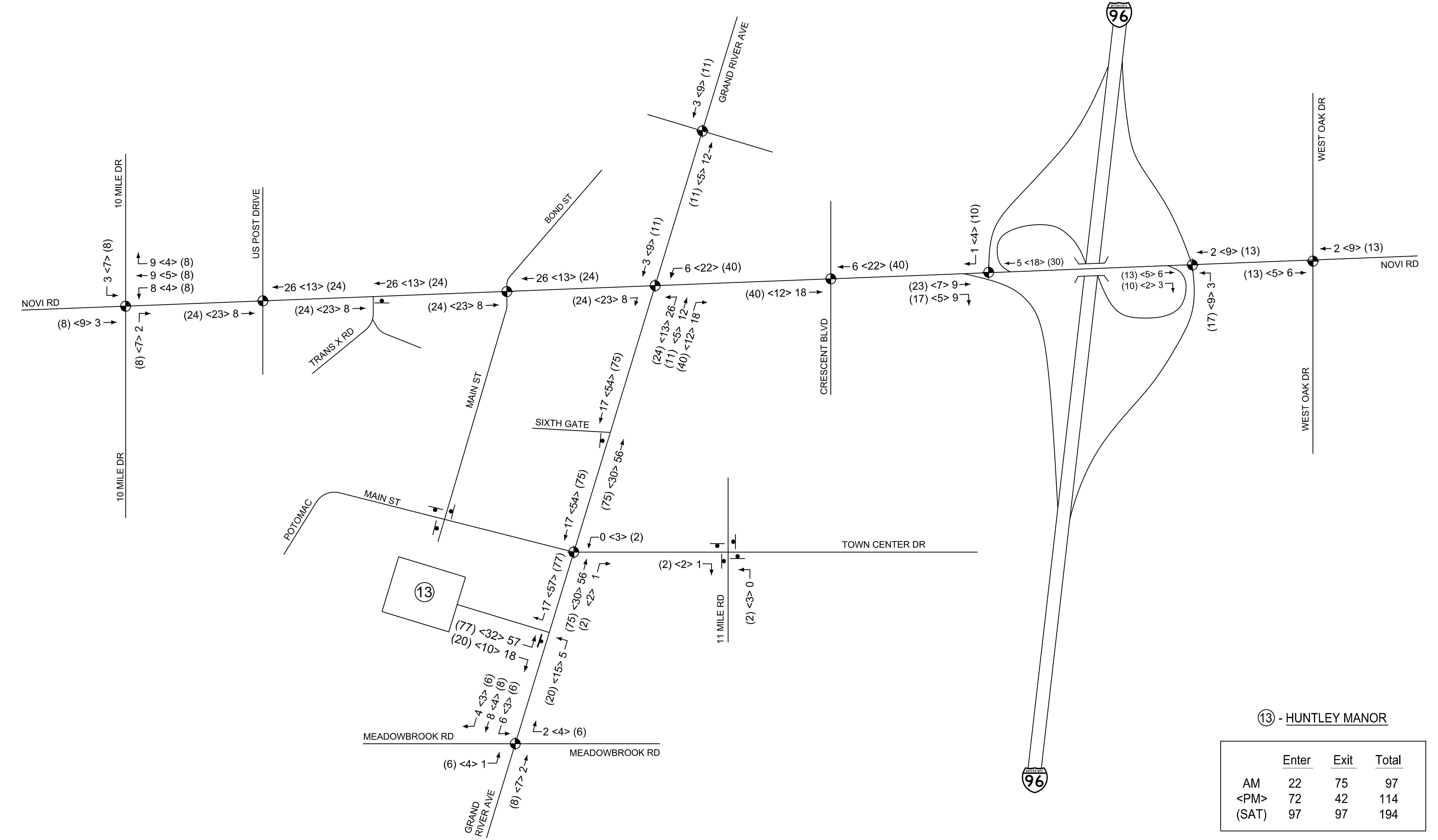
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

LEARNING EXPERIENCE GENERATED TRAFFIC VOLUMES

FIGURE 5D



(13) - HUNTLEY MANOR

	Enter	Exit	Total
AM	22	75	97
<PM>	72	42	114
(SAT)	97	97	194

AECOM

LEGEND

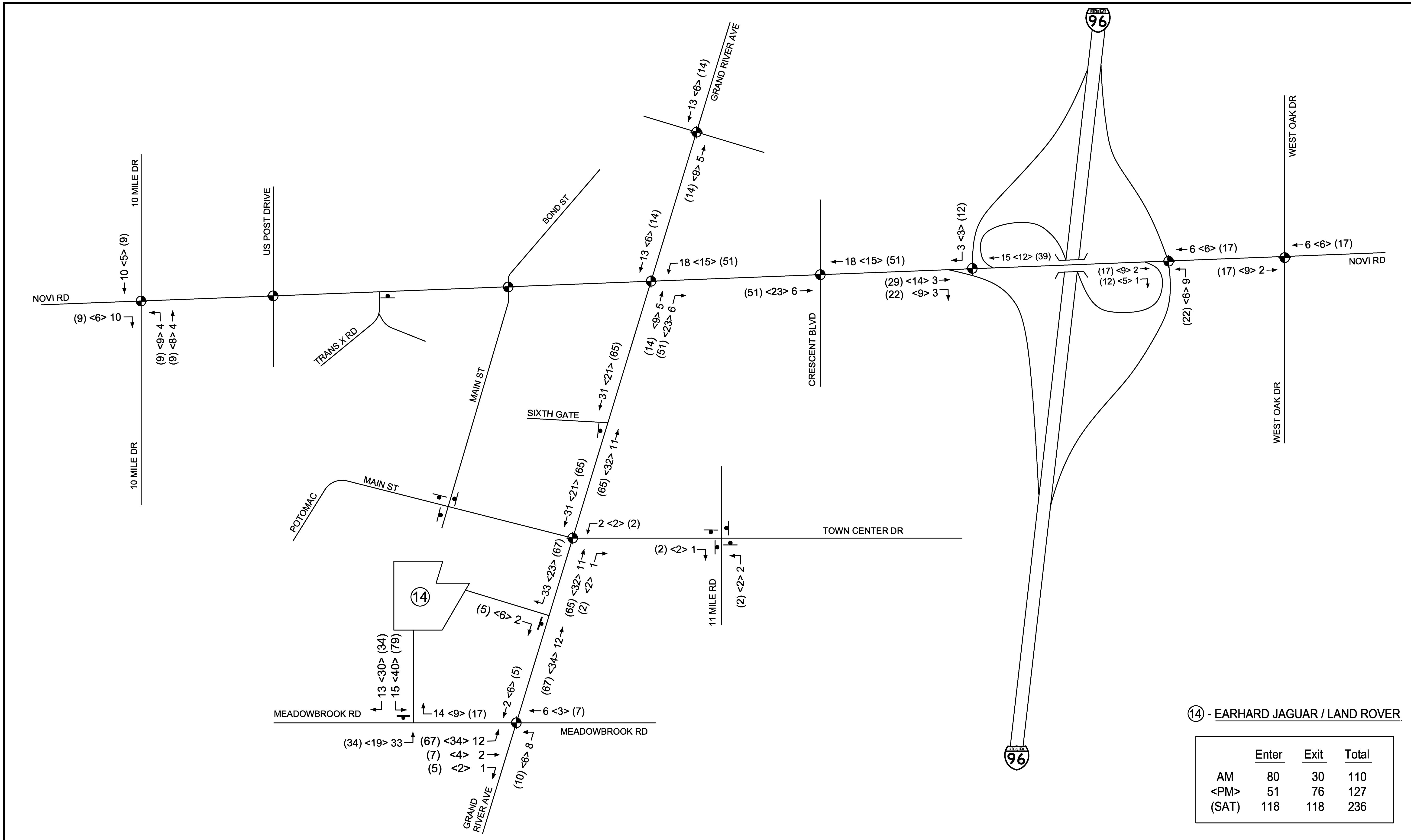
- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

HUNTLEY MANOR GENERATED TRAFFIC VOLUMES

FIGURE 5E



	Enter	Exit	Total
AM	80	30	110
<PM>	51	76	127
(SAT)	118	118	236

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

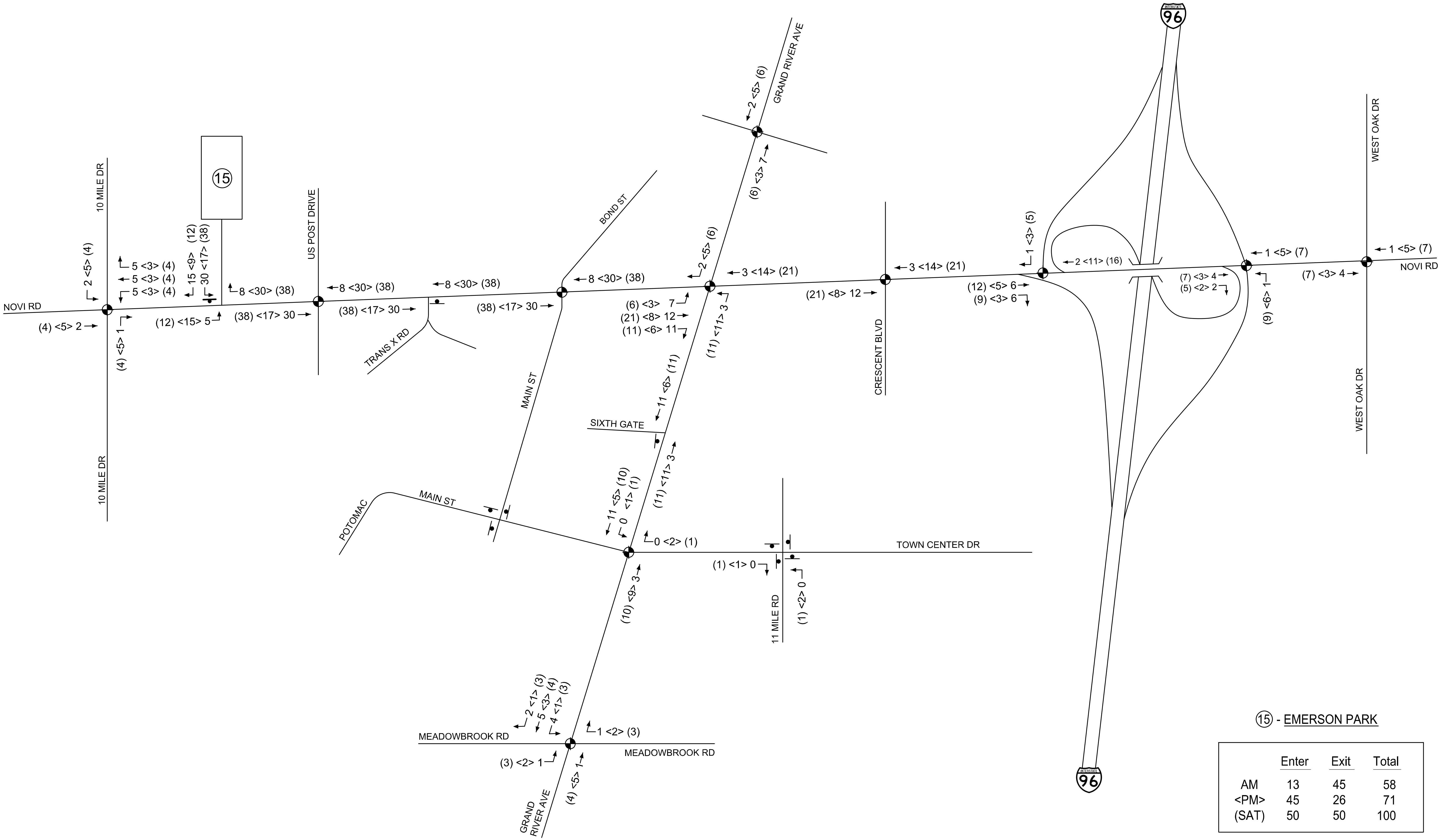
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

ERHARD JAGUAR / LAND ROVER
GENERATED TRAFFIC VOLUMES

FIGURE 5F



15 - EMERSON PARK

	Enter	Exit	Total
AM	13	45	58
<PM>	45	26	71
(SAT)	50	50	100

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

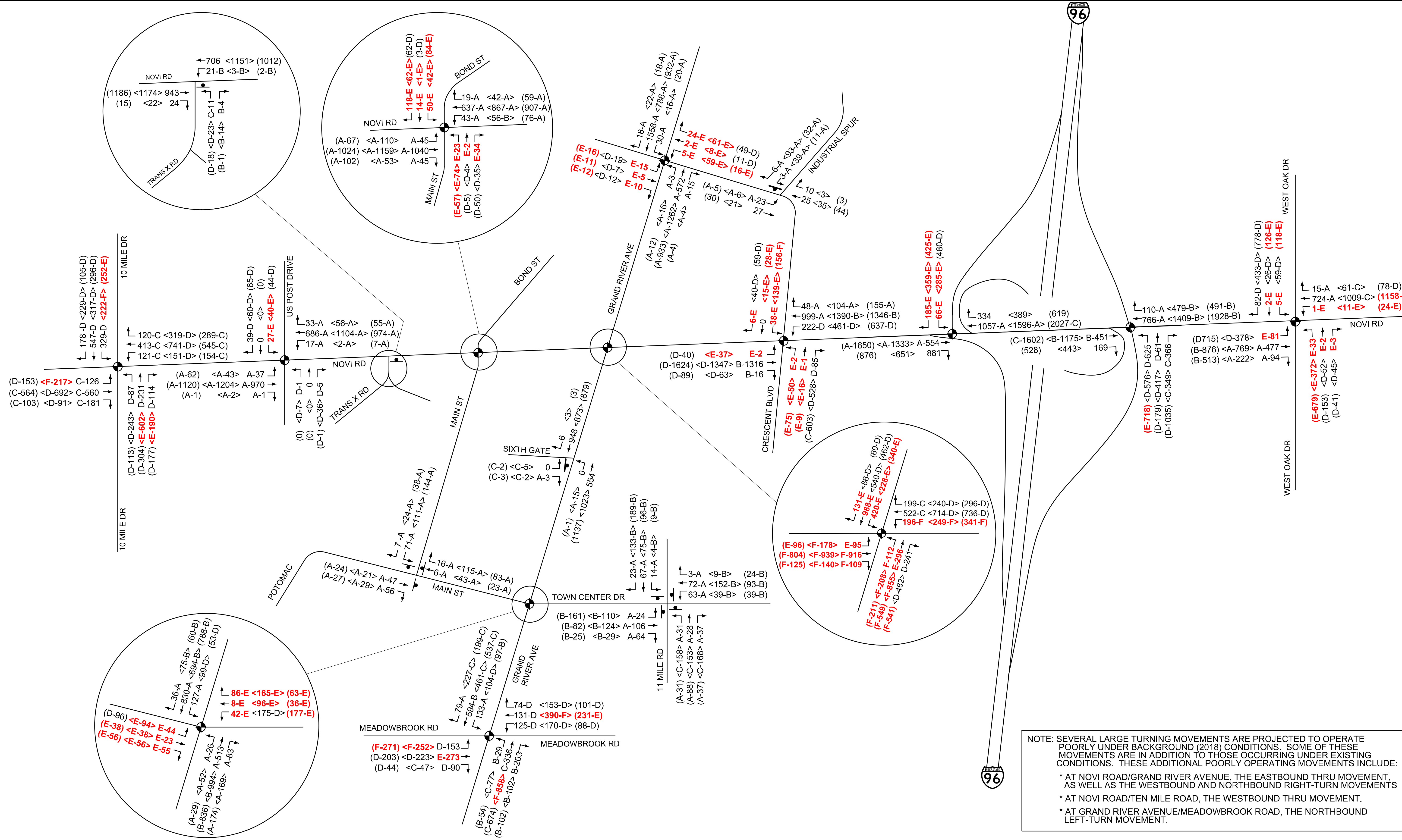
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

EMERSON PARK
GENERATED TRAFFIC VOLUMES

FIGURE 5G



NOTE: SEVERAL LARGE TURNING MOVEMENTS ARE PROJECTED TO OPERATE POORLY UNDER BACKGROUND (2018) CONDITIONS. SOME OF THESE MOVEMENTS ARE IN ADDITION TO THOSE OCCURRING UNDER EXISTING CONDITIONS. THESE ADDITIONAL POORLY OPERATING MOVEMENTS INCLUDE:

* AT NOVI ROAD/GRAND RIVER AVENUE, THE EASTBOUND THRU MOVEMENT, AS WELL AS THE WESTBOUND AND NORTHBOUND RIGHT-TURN MOVEMENTS
* AT NOVI ROAD/TEN MILE ROAD, THE WESTBOUND THRU MOVEMENT.
* AT GRAND RIVER AVENUE/MEADOWBROOK ROAD, THE NORTHBOUND LEFT-TURN MOVEMENT.

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

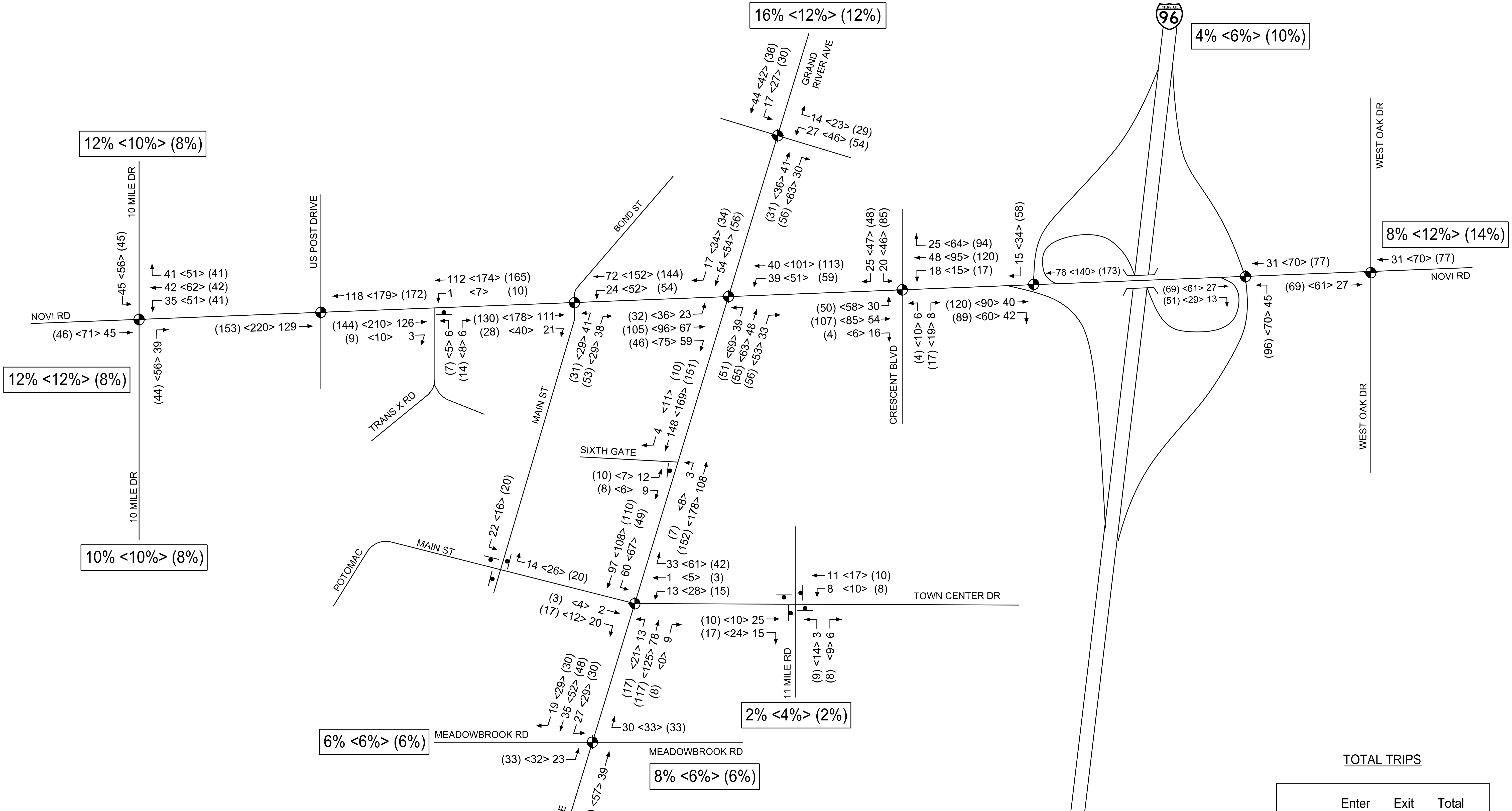
XXX-X - AM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
<XXX-X> - PM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
(XXX-X) - SATURDAY PEAK TRAFFIC VOLUME & LOS

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

BACKGROUND (2028) AM, PM AND SATURDAY PEAK-HOUR VOLUMES AND LEVELS OF SERVICE

FIGURE 6

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-6_BKGD 2028 VOLUMES & LOS



NOTE: SEVERAL TURNING MOVEMENTS IN THE STUDY AREA WILL EXPERIENCE AND INCREASE IN TRAFFIC DUE TO TRIPS GENERATED BY FUTURE DEVELOPMENTS. SIGNIFICANT INCREASES INCLUDE:

1. WESTBOUND I-96 OFF RAMP LEFT-TURN MOVEMENT AT NOVI ROAD
2. SOUTHBOUND NOVI ROAD THRU MOVEMENT AT GRAND RIVER AVENUE
3. NORTHBOUND NOVI ROAD THRU MOVEMENT AT GRAND RIVER AVENUE

TOTAL TRIPS

	Enter	Exit	Total
AM	400	361	761
<PM>	703	638	1,341
(SAT)	630	587	1,217

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

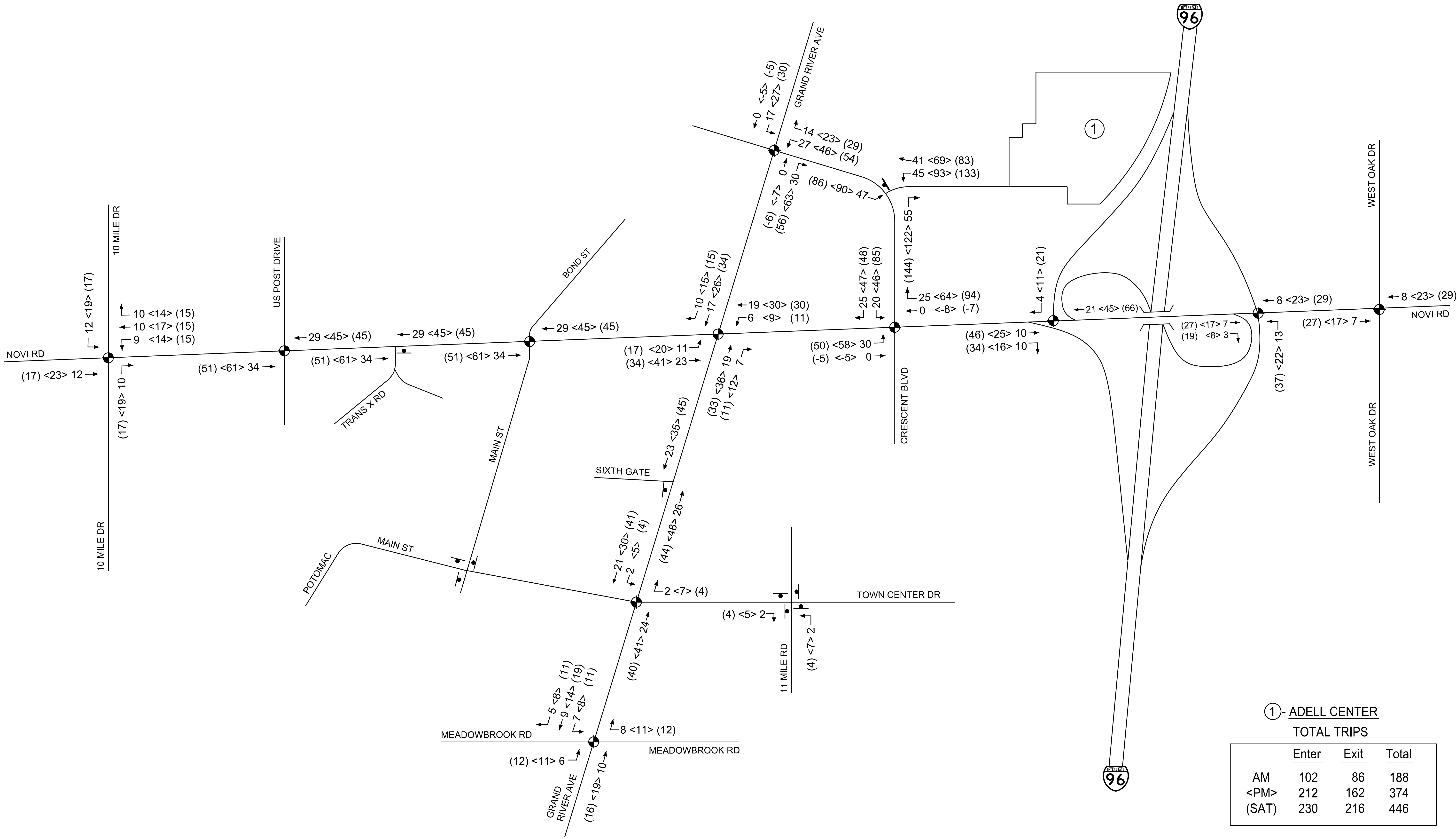
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

2028 FUTURE DEVELOPMENT TRIP GENERATION AND DISTRIBUTION

FIGURE 7



1 - ADELL CENTER

TOTAL TRIPS

	Enter	Exit	Total
AM	102	86	188
<PM>	212	162	374
(SAT)	230	216	446

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

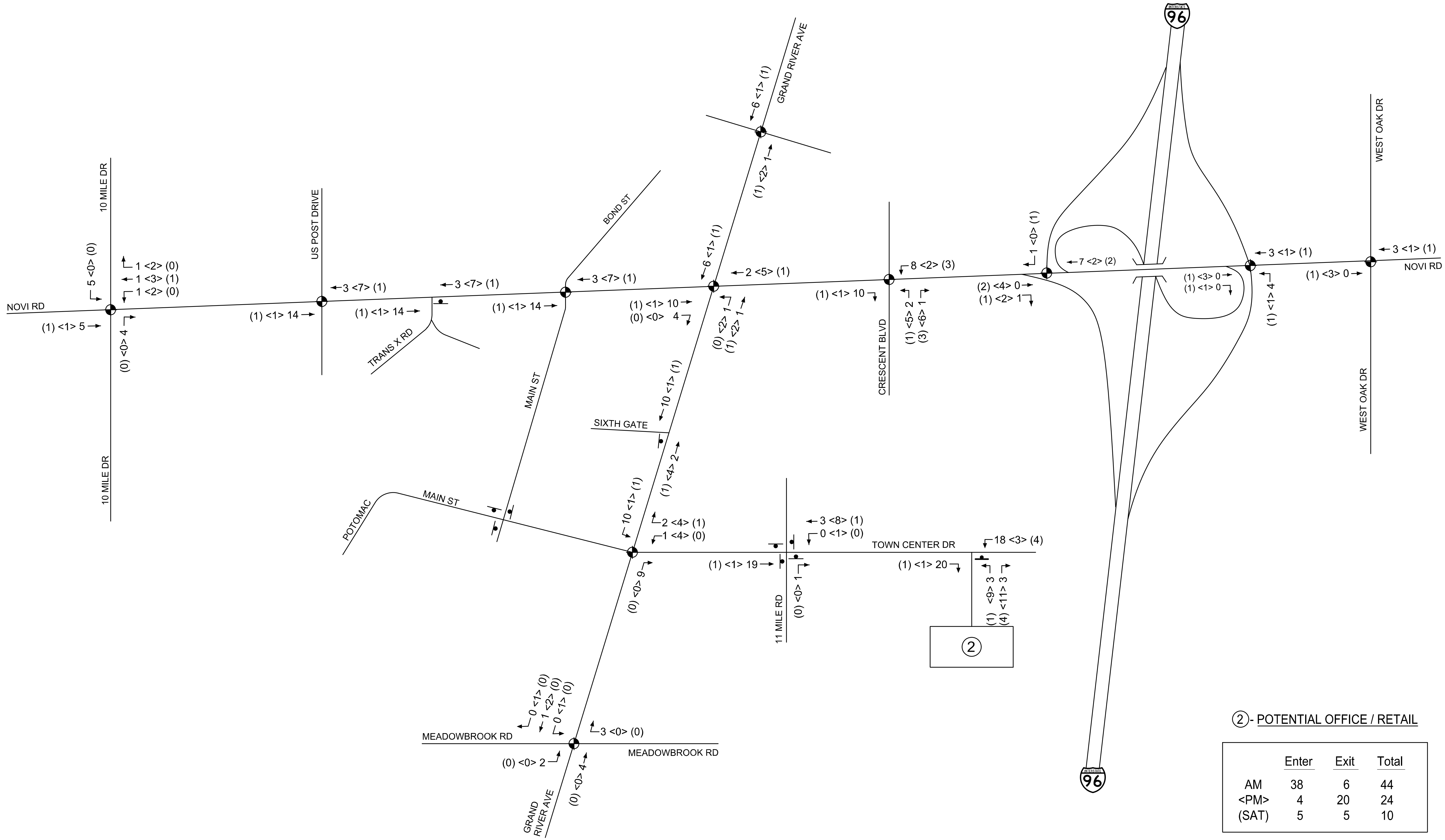
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

ADELL CENTER
GENERATED TRAFFIC VOLUMES

FIGURE 7A



② - POTENTIAL OFFICE / RETAIL

	Enter	Exit	Total
AM	38	6	44
<PM>	4	20	24
(SAT)	5	5	10

AECOM

LEGEND

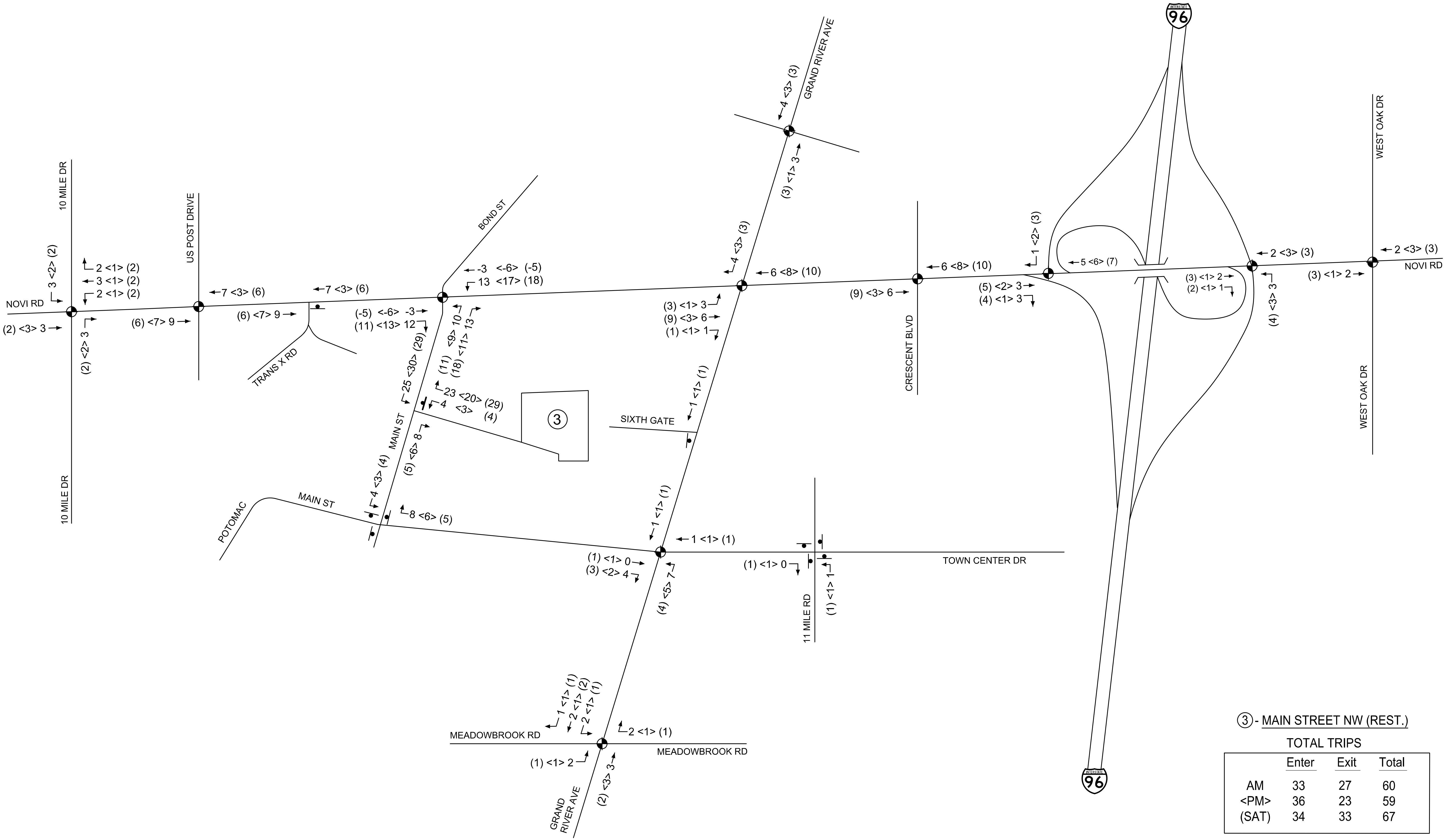
- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

POTENTIAL OFFICE / RETAIL
GENERATED TRAFFIC VOLUMES

FIGURE
7B



3 - MAIN STREET NW (REST.)

TOTAL TRIPS

	Enter	Exit	Total
AM	33	27	60
<PM>	36	23	59
(SAT)	34	33	67

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

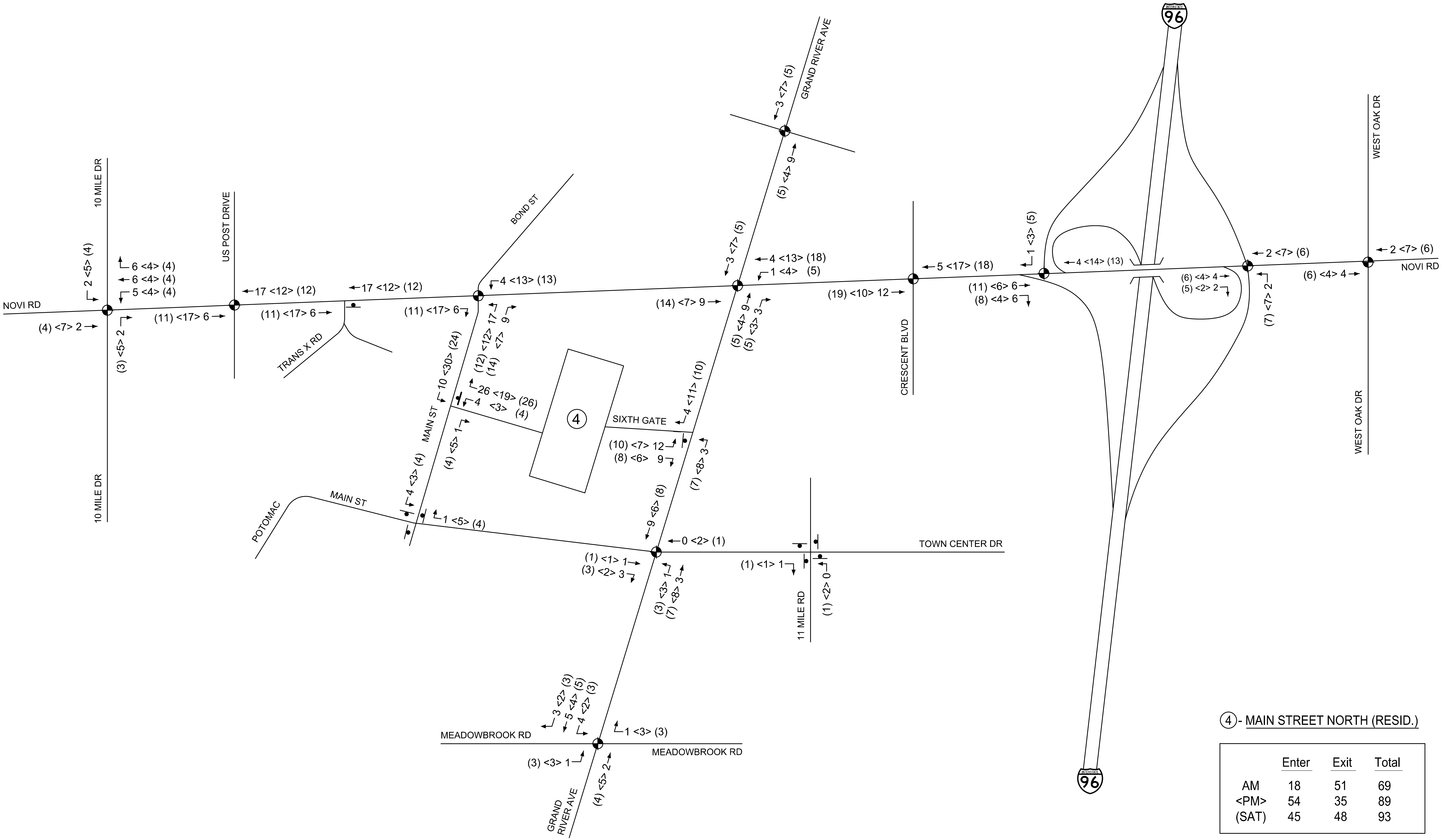
AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

MAIN STREET NW (RESTAURANT)
GENERATED TRAFFIC VOLUMES

FIGURE 7C

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-7C_MAIN STREET NW RES GENERATED VOLUMES



4 - MAIN STREET NORTH (RESID.)

	Enter	Exit	Total
AM	18	51	69
<PM>	54	35	89
(SAT)	45	48	93

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

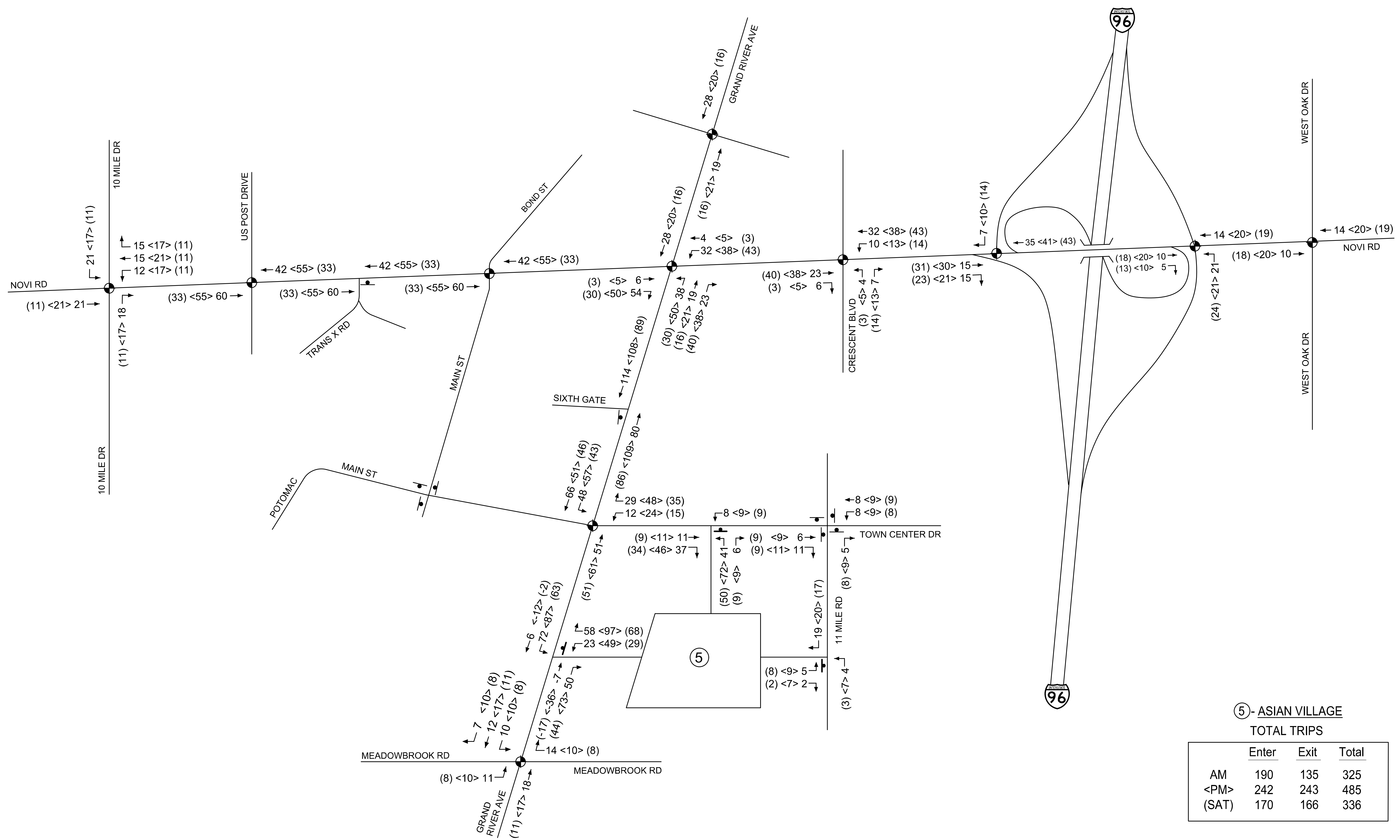
XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

MAIN STREET NORTH (RESIDENTIAL) GENERATED TRAFFIC VOLUMES

FIGURE 7D

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-7D_MAIN STREET NORTH RESID GENERATED VOLUMES



5 - ASIAN VILLAGE

TOTAL TRIPS

	Enter	Exit	Total
AM	190	135	325
<PM>	242	243	485
(SAT)	170	166	336

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

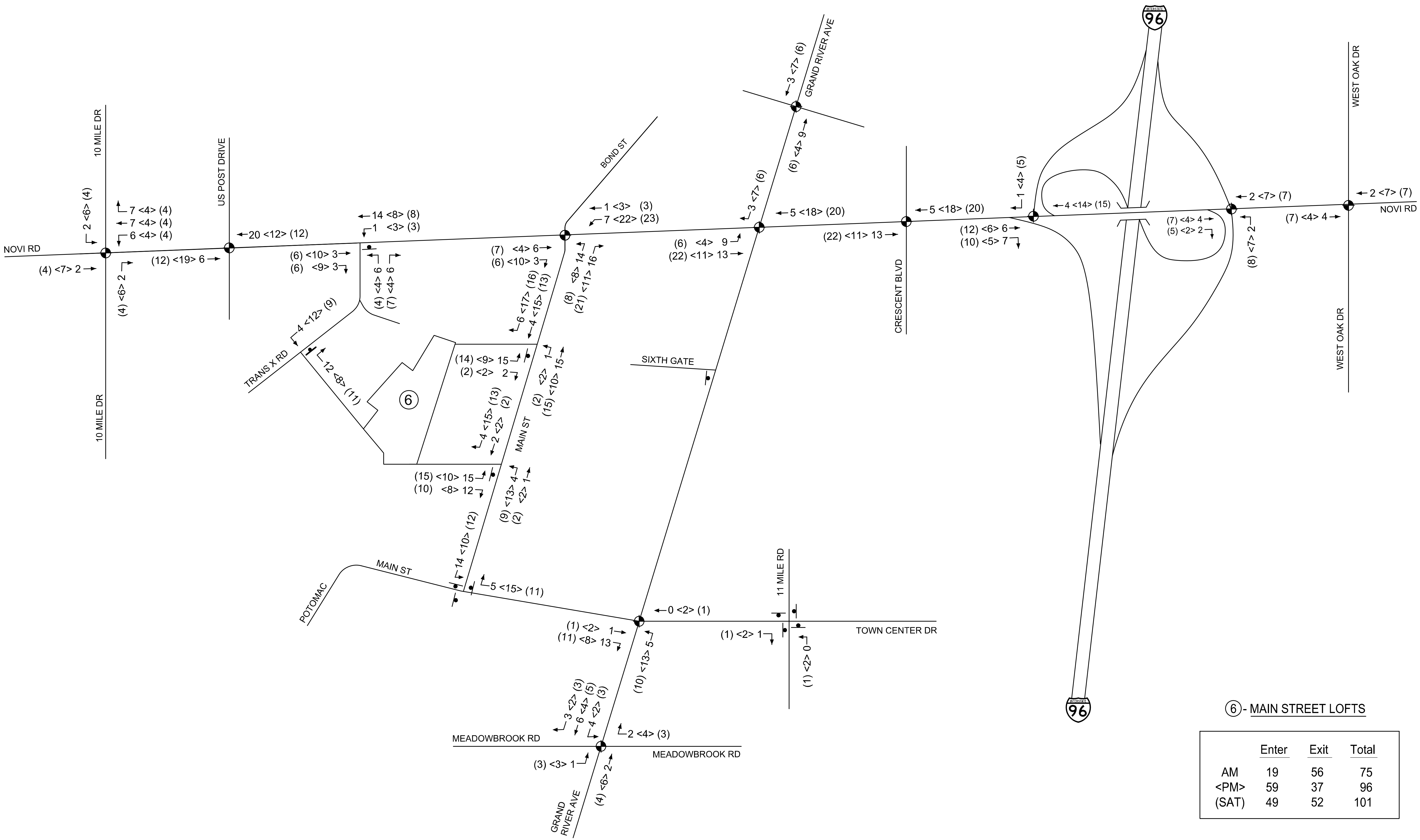
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

ASIAN VILLAGE
GENERATED TRAFFIC VOLUMES

FIGURE 7E



	Enter	Exit	Total
AM	19	56	75
<PM>	59	37	96
(SAT)	49	52	101

AECOM

LEGEND

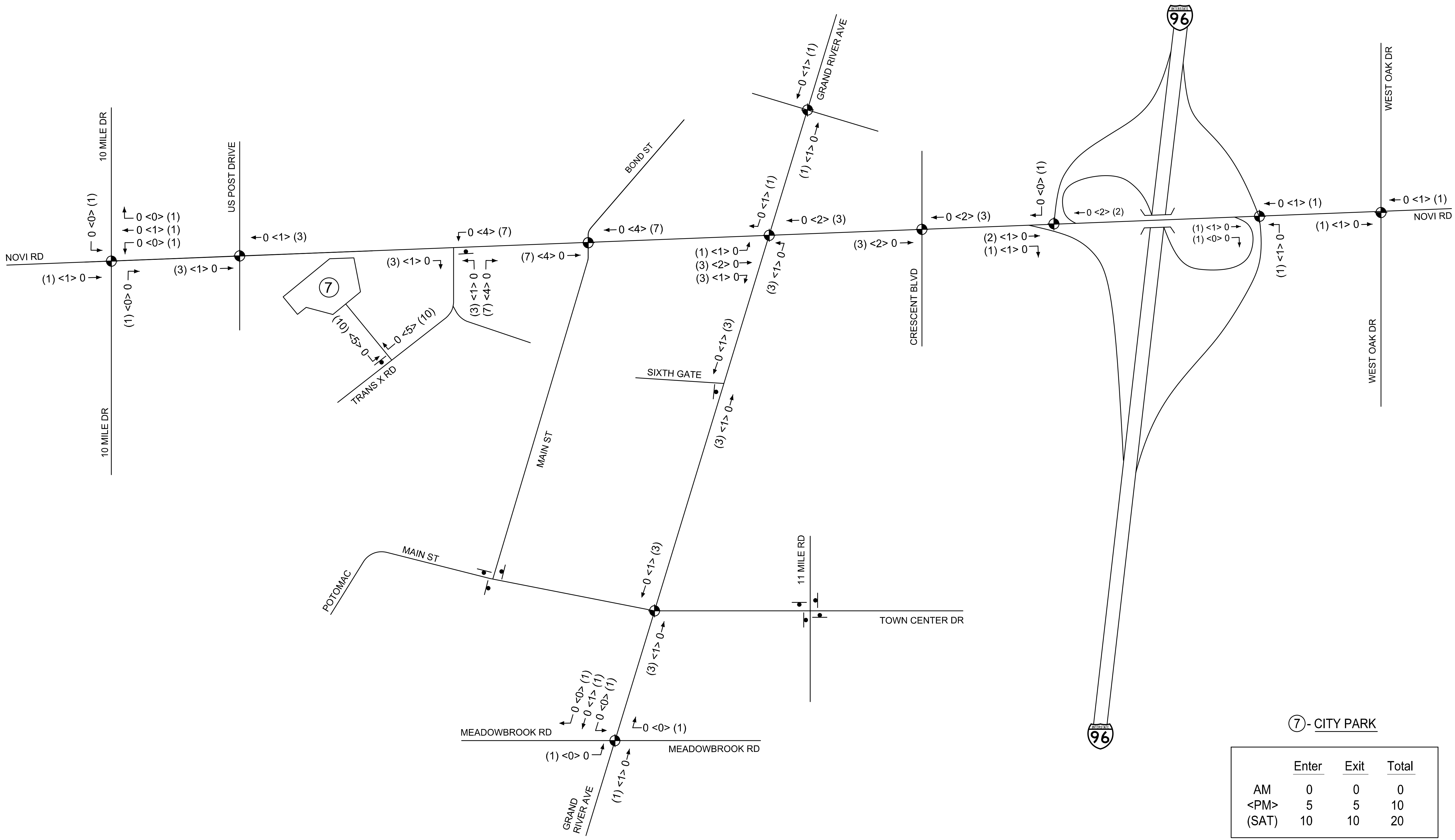
- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

MAIN STREET LOFTS
GENERATED TRAFFIC VOLUMES

FIGURE 7F



	Enter	Exit	Total
AM	0	0	0
<PM>	5	5	10
(SAT)	10	10	20

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME

<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME

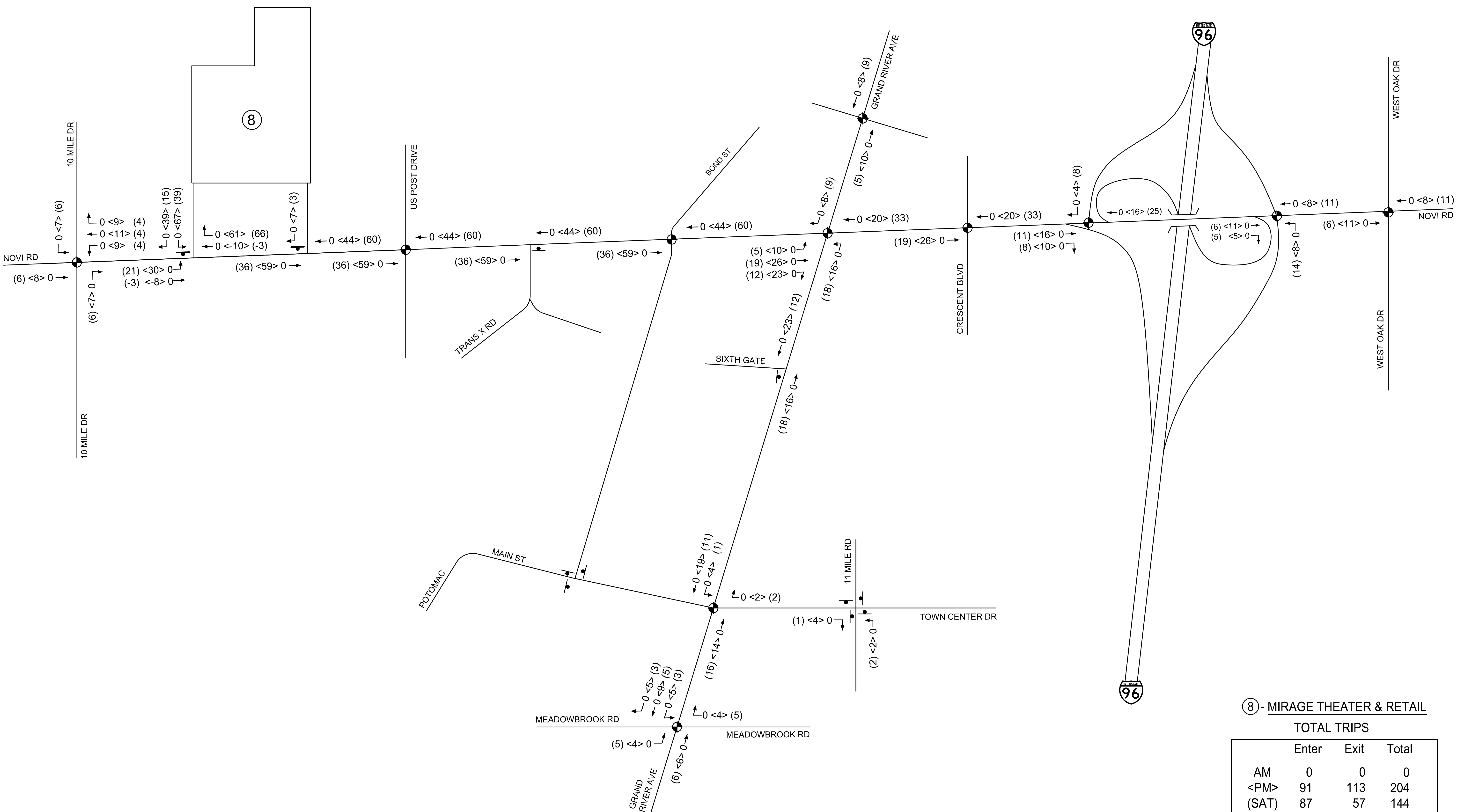
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

AECOM

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

CITY PARK GENERATED TRAFFIC VOLUMES

FIGURE 7G



8 - MIRAGE THEATER & RETAIL

TOTAL TRIPS

	Enter	Exit	Total
AM	0	0	0
<PM>	91	113	204
(SAT)	87	57	144

AECOM

LEGEND

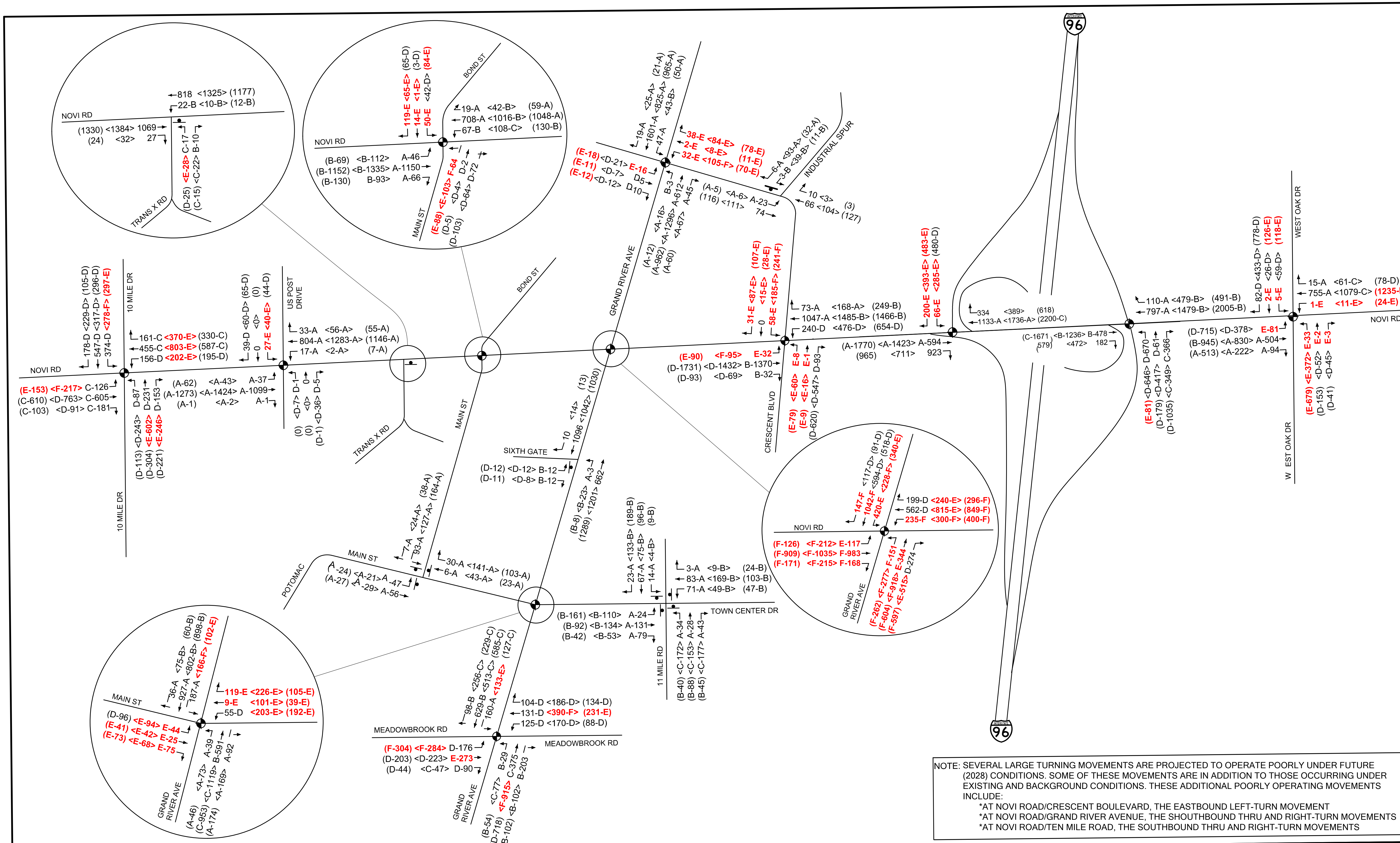
- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX - AM-PEAK WEEKDAY TRAFFIC VOLUME
<XXX> - PM-PEAK WEEKDAY TRAFFIC VOLUME
(XXX) - SATURDAY PEAK TRAFFIC VOLUME

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

MIRAGE THEATER & RETAIL
GENERATED TRAFFIC VOLUMES

FIGURE
7H



NOTE: SEVERAL LARGE TURNING MOVEMENTS ARE PROJECTED TO OPERATE POORLY UNDER FUTURE (2028) CONDITIONS. SOME OF THESE MOVEMENTS ARE IN ADDITION TO THOSE OCCURRING UNDER EXISTING AND BACKGROUND CONDITIONS. THESE ADDITIONAL POORLY OPERATING MOVEMENTS INCLUDE:
*AT NOVI ROAD/CRESCENT BOULEVARD, THE EASTBOUND LEFT-TURN MOVEMENT
*AT NOVI ROAD/GRAND RIVER AVENUE, THE SHOUTHBOUND THRU AND RIGHT-TURN MOVEMENTS
*AT NOVI ROAD/TEN MILE ROAD, THE SOUTHBOUND THRU AND RIGHT-TURN MOVEMENTS

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

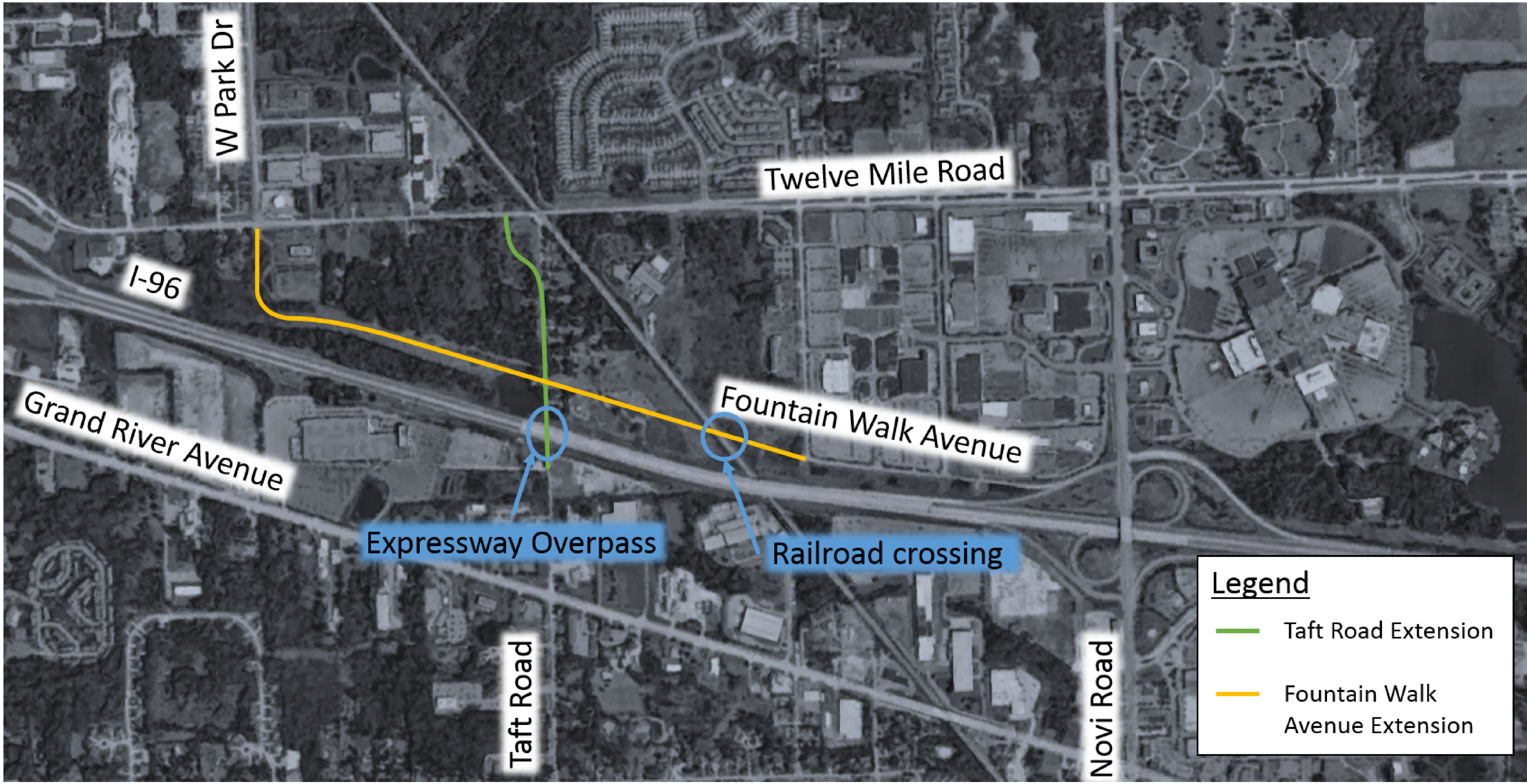
XXX-X - AM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
<XXX-X> - PM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
(XXX-X) - SATURDAY PEAK TRAFFIC VOLUME & LOS

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

FUTURE (2028) AM, PM AND SATURDAY PEAK-HOUR VOLUMES AND LEVELS OF SERVICE

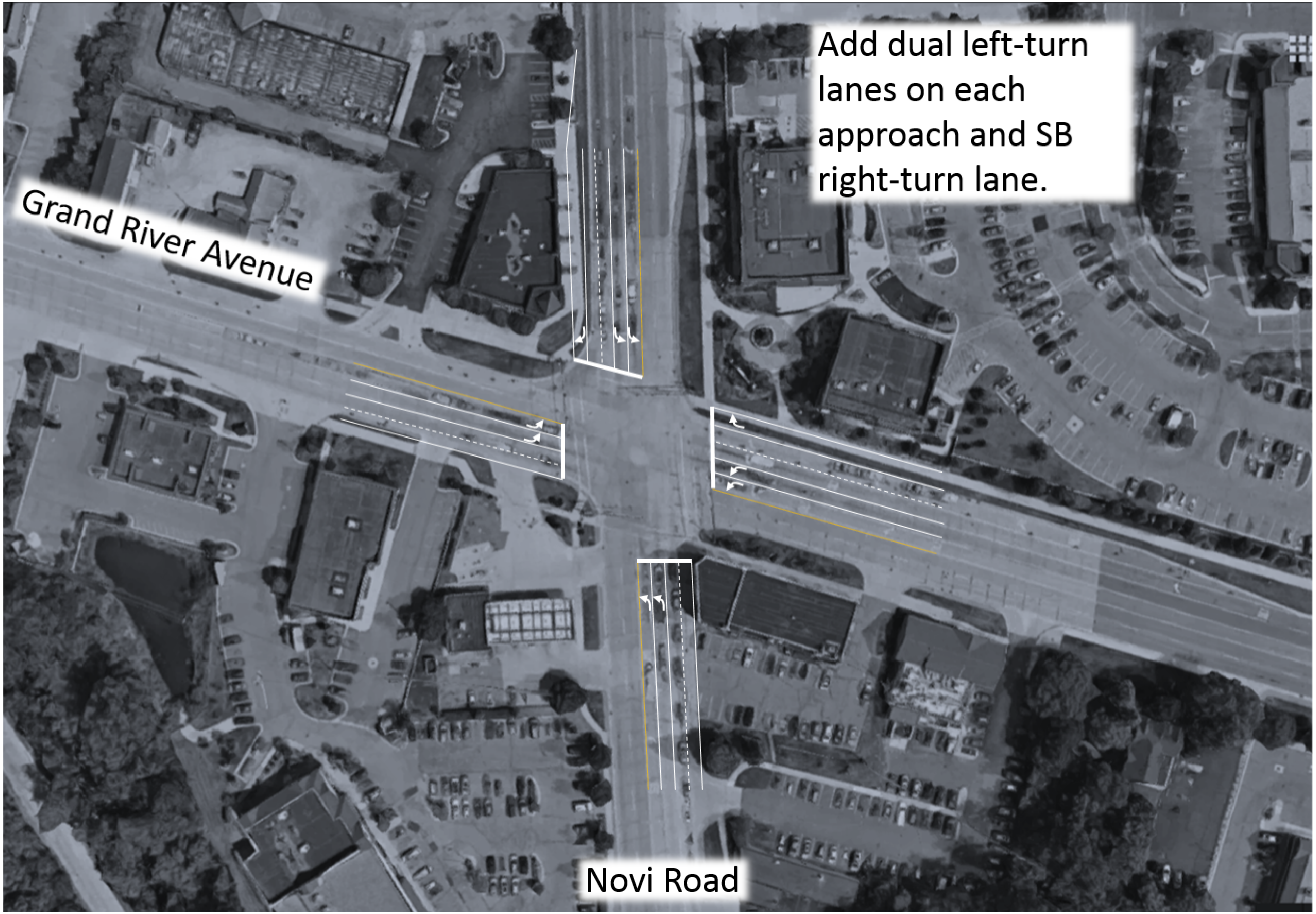
FIGURE 8

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-8_FUTURE 2028 VOLUMES & LOS



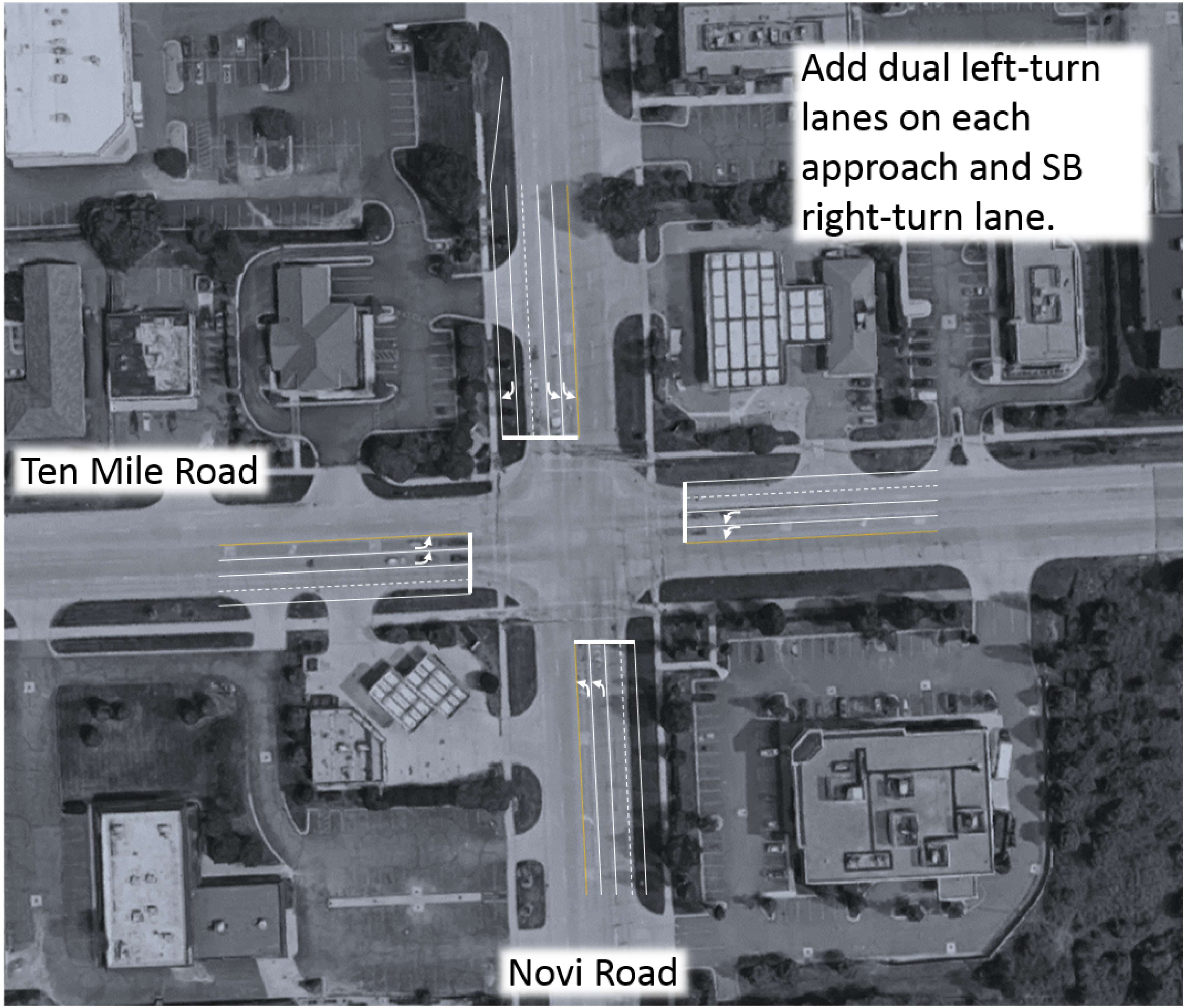
AECOM	LEGEND	NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY
		TAFT ROAD/FOUNTAIN WALK AVENUE CONNECTION CONCEPT — FIGURE 9

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-9_TAFT ROAD FOUNTAIN WALK AVE CONNECTION CONCEPT



	LEGEND	NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY	
AECOM		NOVI ROAD/GRAND RIVER AVENUE INTERSECTION MITIGATION CONCEPT	FIGURE 10A

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-10A_NOVI RD-GRAND RIVER INTERSECTION MIT CONCEPT



LEGEND

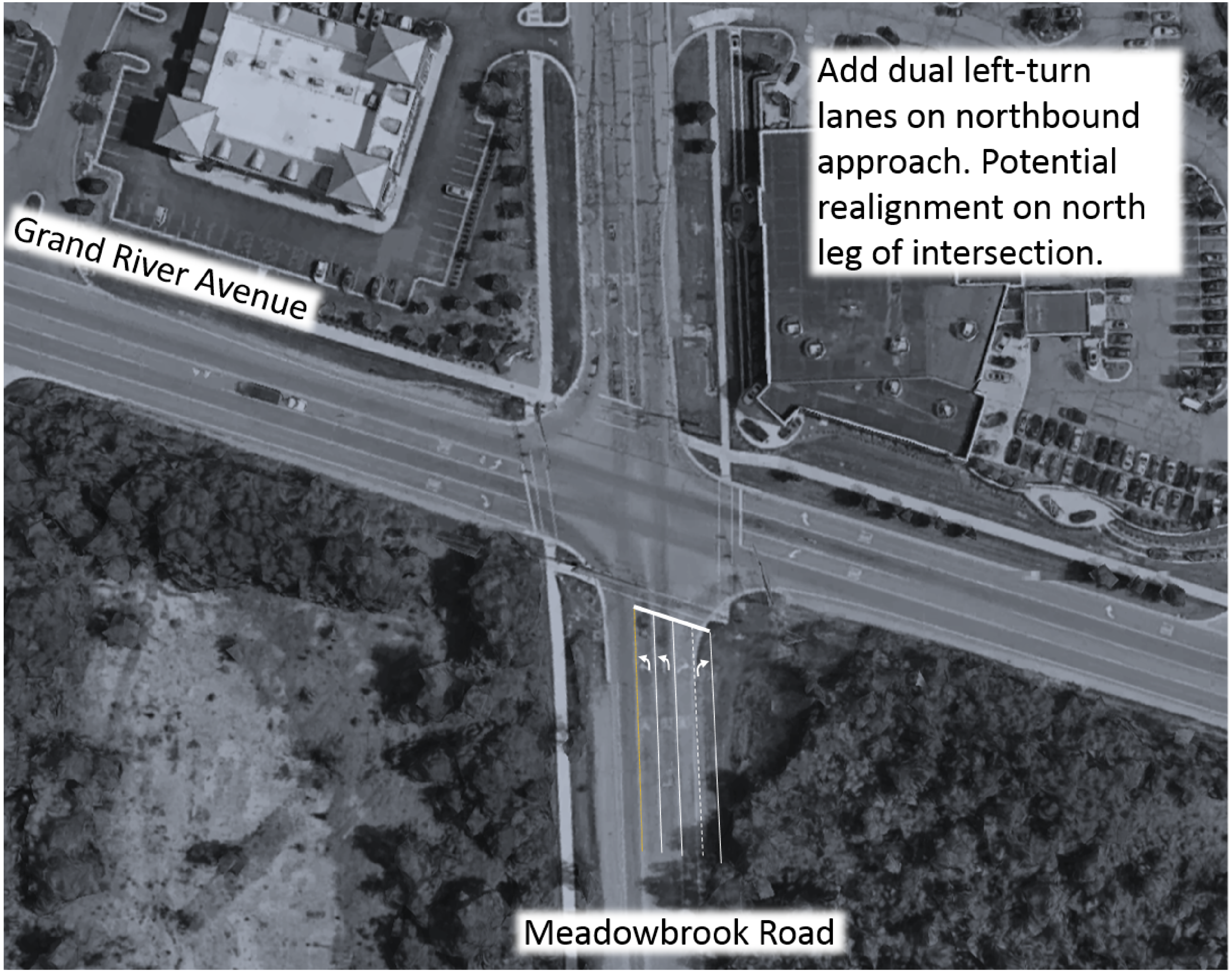
NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

AECOM

NOVI ROAD/TEN MILE INTERSECTION MITIGATION CONCEPT

FIGURE 10B

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-10B_NOVI RD-TEN MI INTERSECTION MIT CONCEPT



LEGEND

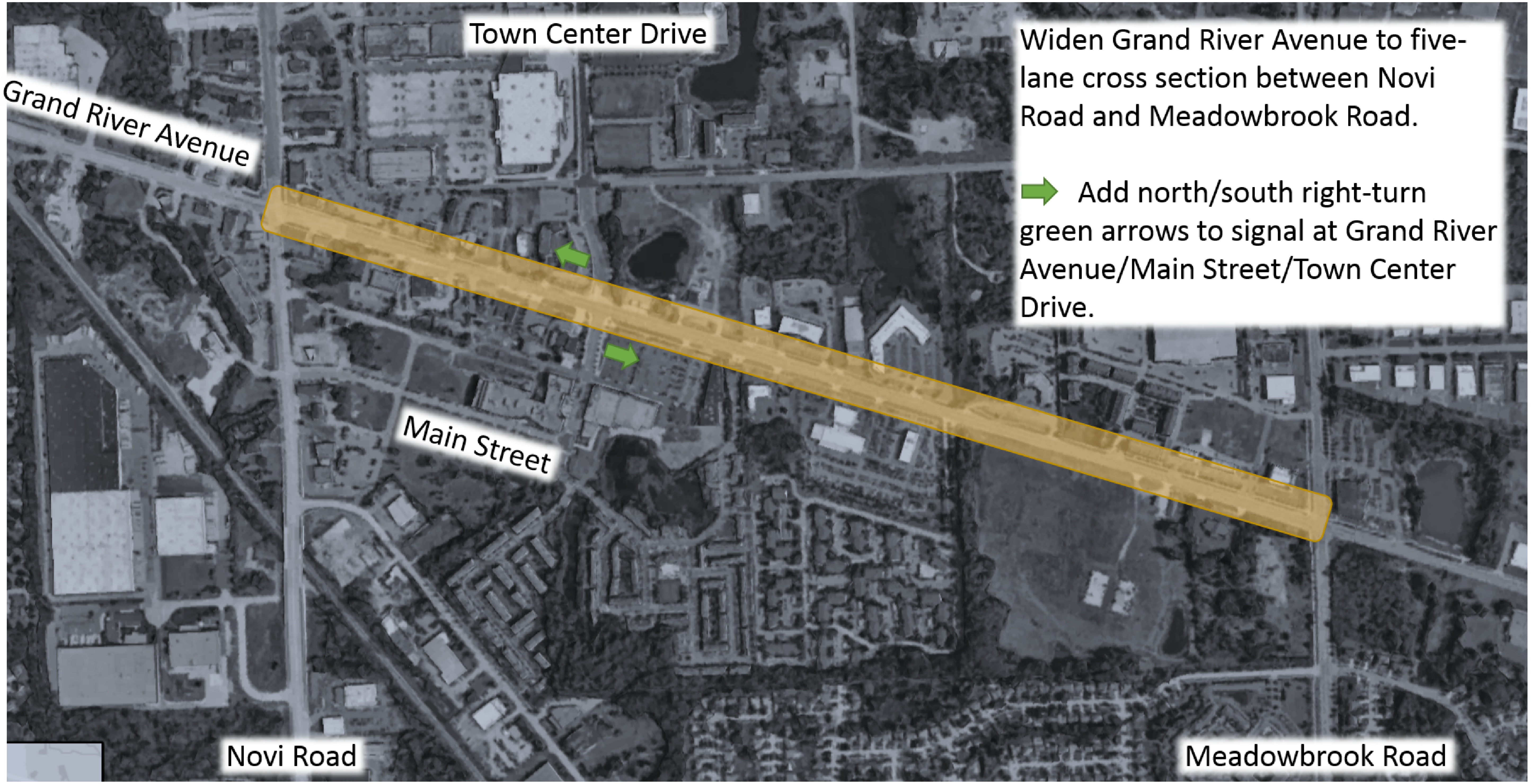
NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

AECOM

GRAND RIVER AVENUE/MEADOWBROOK ROAD
INTERSECTION MITIGATION CONCEPT

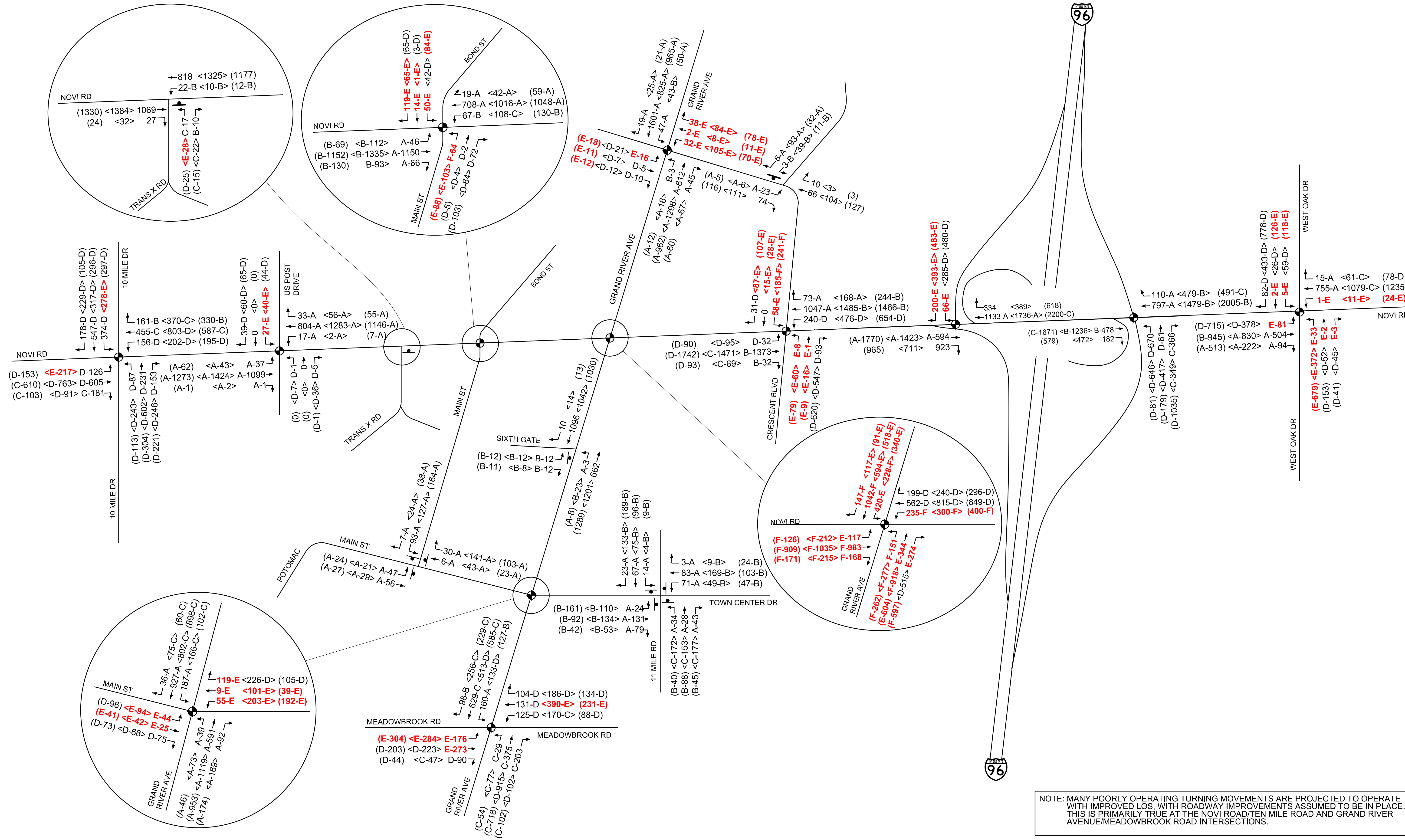
FIGURE
10C

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-10C_GRAND RIVER AVENUE MEADOWBROOK ROAD INTERTSECTION MIT CONCEPT



AECOM	LEGEND	NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY	
		GRAND RIVER AVENUE MITIGATION CONCEPT	FIGURE 10D

G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-10D_GRAND RIVER AVENUE MITIGATION CONCEPT



NOTE: MANY POORLY OPERATING TURNING MOVEMENTS ARE PROJECTED TO OPERATE WITH IMPROVED LOS. WITH ROADWAY IMPROVEMENTS ASSUMED TO BE IN PLACE. THIS IS PARTICULARLY TRUE AT THE NOVI ROAD/TEN MILE ROAD AND GRAND RIVER AVENUE/MEADOWBROOK ROAD INTERSECTIONS.

AECOM

LEGEND

- TRAFFIC SIGNAL
- STOP SIGN
- LANE MOVEMENT

XXX-X - AM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
<XXX-X> - PM-PEAK WEEKDAY TRAFFIC VOLUME & LOS
(XXX-X) - SATURDAY PEAK TRAFFIC VOLUME & LOS

NOVI RD / GRAND RIVER AVE AREA TRAFFIC IMPACT STUDY

FUTURE (2028) AM, PM AND SATURDAY PEAK-HOUR VOLUMES AND LEVELS OF SERVICE (W/MITIGATION)

FIGURE 11

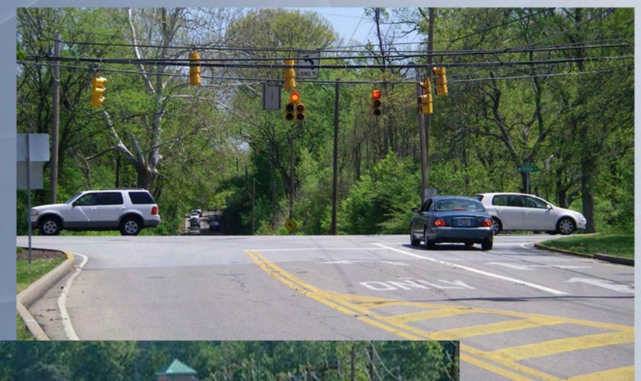
G:\GrandRapids\DCS\Projects\12944755\Engineering\Traffic\60528219 - Novi POs\Novi_Grand River TIS\CADD-11_FUTURE (MITIGATION) 2028 VOLUMES & LOS

APPENDIX A. Turning Movement Counts

Appendix K

Thoroughfare Master Plan

CITY OF NOVI THOROUGHFARE MASTER PLAN



DRAFT FINAL REPORT

June, 2016

Submitted by: THE CORRADINO GROUP

Engineers • Planners • Program Managers • Environmental Scientists

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Summary

The leaders and citizens of Novi understand that the purpose of a truly multi-modal thoroughfare master plan is to establish physical and cultural environments that support and encourage safe, comfortable, and convenient travel by a variety of modes.

They understand that a broad constituency must be engaged in the planning process, including elected and agency officials, neighborhood and business leaders, and, most important, the general public. A Thoroughfare Master Plan (TMP) must give form to their vision and provide a consensus on how to move the plan forward to fruition.

Long-range planning is driven by a number of factors: local growth and land use changes; the Michigan Department of Transportation (MDOT) need to maintain its Trunkline system; the Road Commission for Oakland County (RCOC) need to manage county roads; available funding; and, the planning process of the Southeast Michigan Council of Governments (SEMCOG), which integrates these considerations with the needs of its members, including the City of Novi.

This requires the integration of projects among transportation modes to form a plan that complements the Master Plan for Land Use, and is also forward-thinking. To assist in preparing the TMP, Novi has engaged The Corradino Group of Michigan consulting firm (Corradino).

Throughout the project, input was received through the web-based application known as *Community Remarks*, the results of which are included in a separate Public Involvement Diary. Each public comment received a response. The categories of “Safety and Traffic Calming,” “Intersection Improvements,” and “Pedestrian Improvements” received more than 75% of the comments. Other comments were divided among “Roadway Improvements” (ten comments), “Bicycle Improvements” (three comments), and “Transit” (two comments). In all, *Community Remarks* receive over 2000 “hits” by people visiting the site.

Over the course of the project, four public meetings were conducted. All but the February, 2016, meeting was preceded by a Novi Planning Commission meeting. Notes of each meeting are included in the *Public Information Diary*.

At the December, 2015, and February, 2016, meetings, those in attendance were asked, using a touch-pad polling system known as *Turning Point,* to provide their opinion on eight topics. In summary, the results, indicate the meeting attendees were older adults and drove fewer than ten minutes in the off-peak hours to volunteer or work. None biked or walked on a regular basis, for a variety of reasons. Oddly though, when asked about the most important items that would enhance Novi’s transportation system, improvements to streets/sidewalks, biking facilities, and traffic signal timing were cited in almost equal amounts (20% to 25%) as the most preferred; roadway widening was preferred by fewer than 10% of the respondents. These independent opinions closely align with the comments received through the *Community Remarks* application.

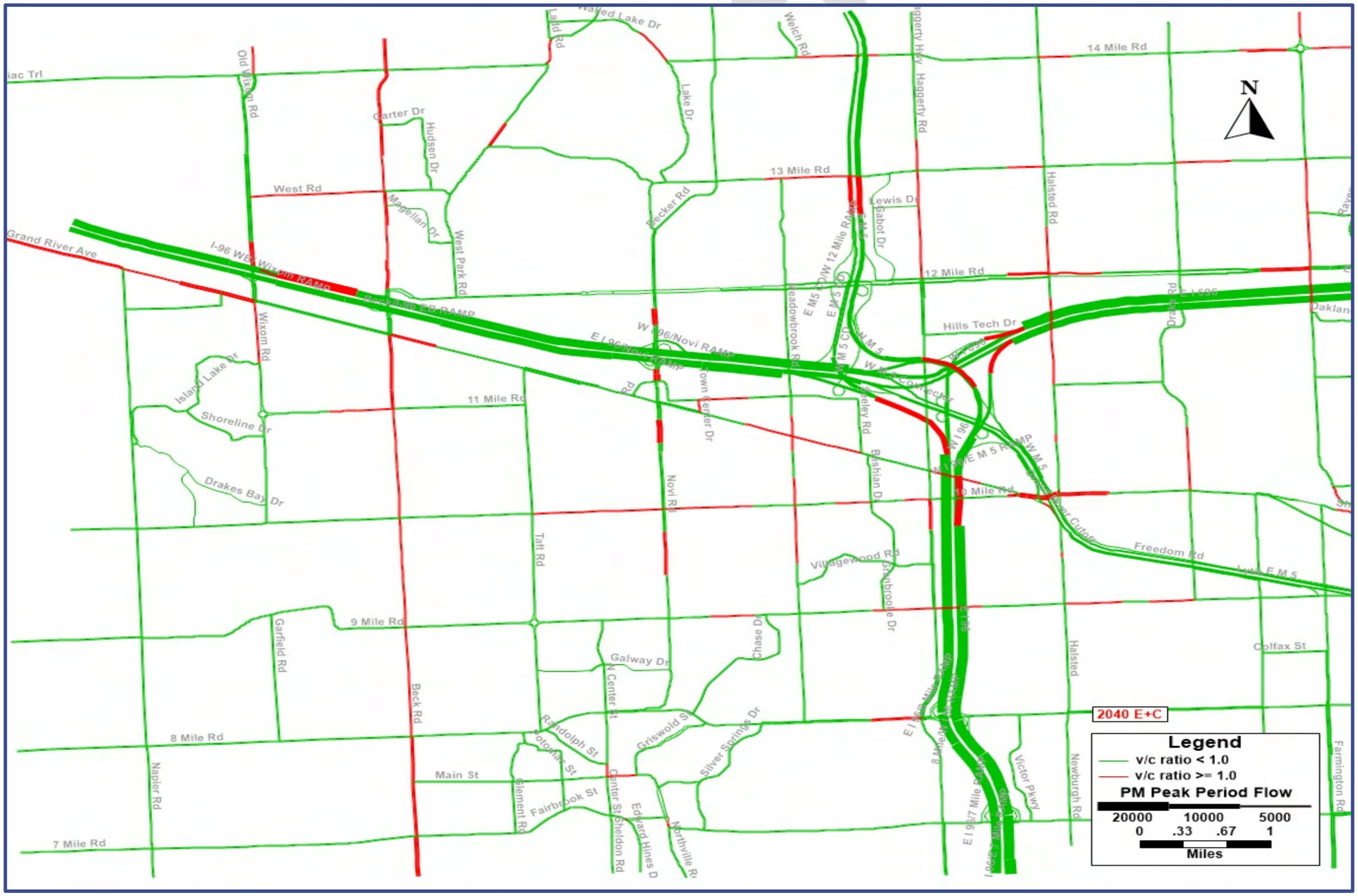
Recommendations

Roads

A central task to successfully execute this project is predicting traffic in the year 2040. To do so, Corradino developed daily and PM peak period (3-6 pm) travel forecasting models. The 2015 Base Model was developed consistent with modeling of the *2011 Novi and Wixom Transportation Plan* prepared by Corradino. Additional information included SEMCOG model files and the latest traffic data provided by the RCOC, MDOT, and the Traffic Improvement Association of Michigan.

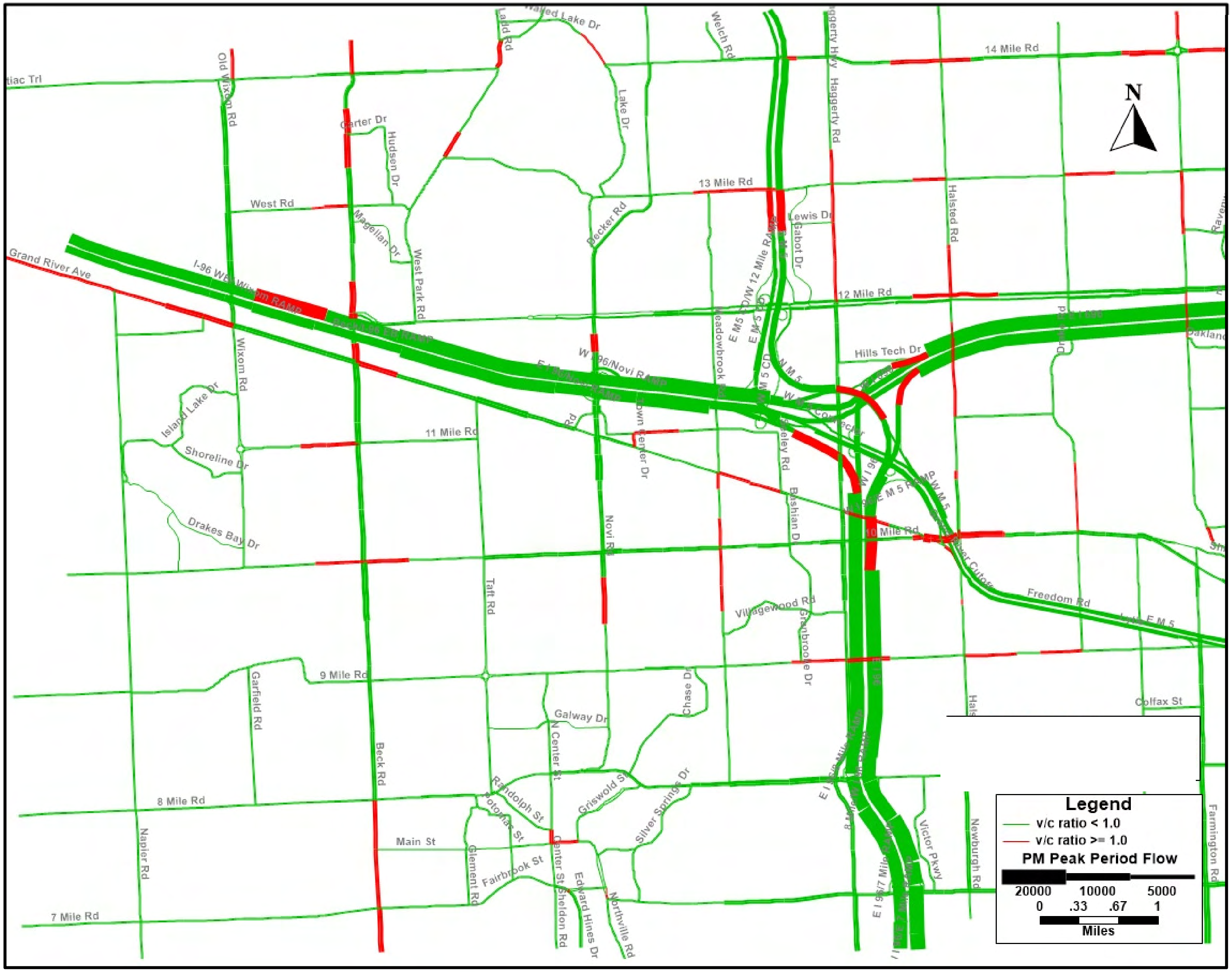
Multi-modal transportation elements were examined in layers, beginning with the most costly-to-implement element – roads. Analysis of future traffic conditions are illustrated in Figure S-1 which shows the 2040 volume/capacity (V/C) ratios in the PM peak period. In this graphic, RED indicates the V/C ratio exceeds 1.00, reflecting significant congestion. GREEN indicates significant congestion is not detected by the model. To determine the potential positive impact on congestion, a series of tests was executed. The most cost-effective alternative combines widening Beck Road from 8 Mile Road to Pontiac Trail and 10 Mile Road from Haggerty to Taft. Funding, impact and policy constraints prevent more road widenings in the near future. It is noted that widening Beck and 10 Mile Roads does not address all the congestion expected in 2040, as evidenced by the red/congested paths on Figure S-2. Proposed improvements at the intersections circled on Figure S-3 will also address congestion.

Figure S-1. 2040 E+C PM Peak Period Traffic Condition



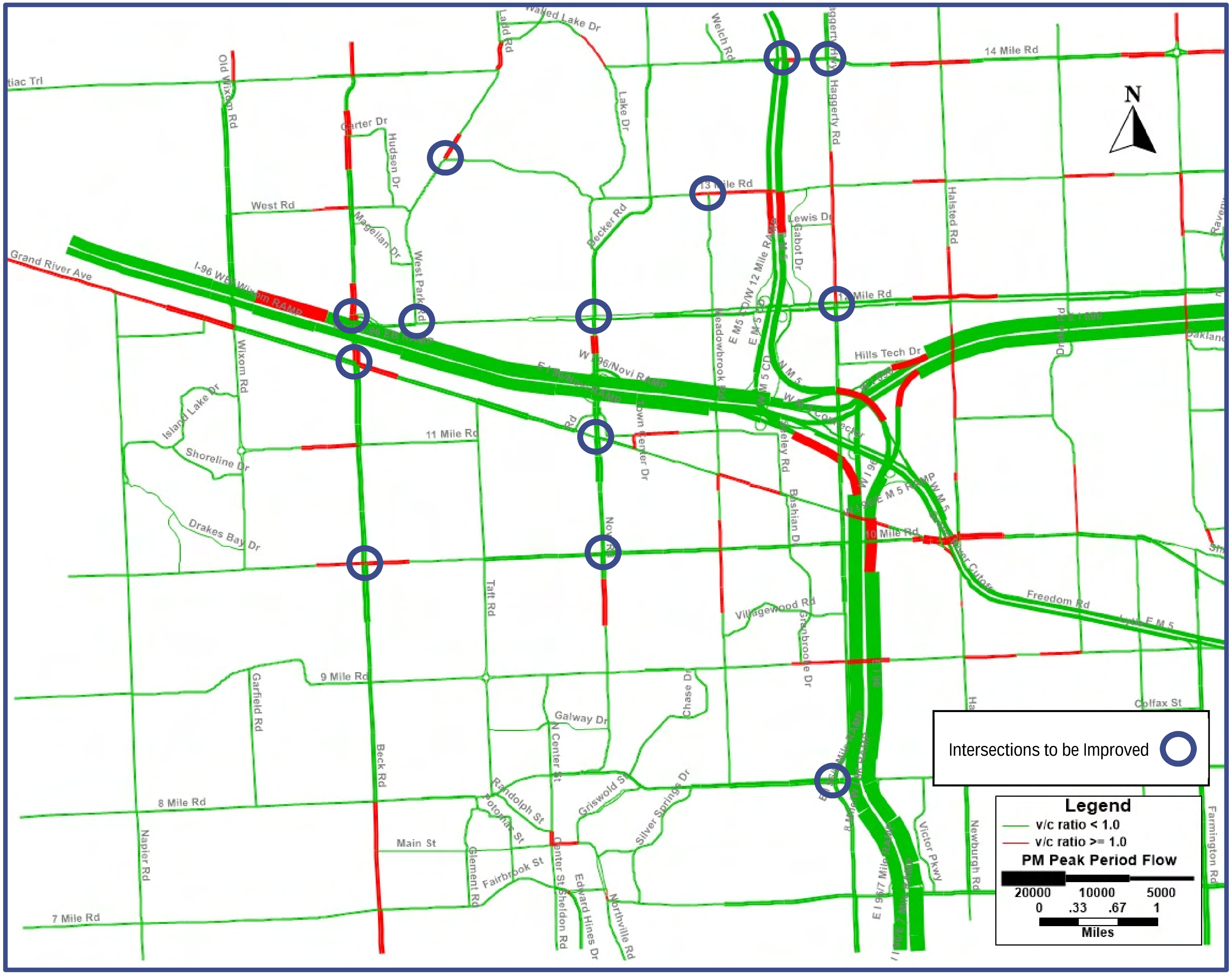
Source: The Corradino Group of Michigan, Inc.

Figure S-2. 2040 E+C PM Peak Period Traffic with Widened Beck and 10 Mile Roads



Source: The Corradino Group of Michigan, Inc.

Figure S-3. Novi Intersections Proposed to be Improved



Source: *The Corradino Group of Michigan, Inc.*

Intersections

For the Thoroughfare Master Plan, Corradino used an approach that examines crash rates per million vehicles entering an intersection. Additionally, a *Severity Index* was calculated for each intersection.

Corradino determined the candidate intersections for crash countermeasures are:

1. Beck Road at 10 Mile Road;
2. Beck Road at Grand River Avenue
3. Beck Road at I-96 ramps;
4. Novi Road at Grand River Avenue;
5. 8 Mile Road at Haggerty Road;
6. Novi Road at 10 Mile Road;
7. 12 Mile Road at Novi Road;
8. 12 Mile Road at Haggerty Road;
9. 12 Mile at West Park Drive;
10. 14 Mile Road at M5;
11. 14 Mile Road at Haggerty Road;
12. Meadowbrook at 13 Mile Road; and,
13. West Park Drive at South Lake Drive

All but the last two intersections are under MDOT or RCOC control. Intersections #13 and #14 are under the control of the City of Novi.

Details of the proposed improvements at these locations are covered in Section 7.2 of this report.

Non-Motorized

Novi's current top priority pathway/sidewalk projects, as listed in the *Annual Non-Motorized Prioritization 2015-16 Update,* are shown on Table S-1.

Table S-1. Table 4A from Annual Non-Motorized Prioritization 2015-16 Update

Annual Non-Motorized Prioritization: 2015-2016 Update

Table 4A:
2015-16 Top 20 Priority Pathway and Sidewalk Segments excluding deferred segments
City of Novi

Overall Segment Rank	Segment Item #	Section #	Type	Side of Street	Location	From	To	# of Pieces in Segment	Segment Length (ft.) excluding Developer Planned & Completed Pieces	Notes
1	81B		P	south	**Ten Mile**	Willowbrook	Haggerty	1	2,750	17-18 & 19/20 CIP
2	81A	25	P	south	**Ten Mile**	Meadowbrook	Willowbrook	1	2,530	17-18 & 19/20 CIP
3	9B	4	S	south	**Pontiac Trail**	Wedgewood	West Park	2	2,560	16-17 & 17-18 CIP
5	120A	36	S	west	**Haggerty**	Eight Mile	N of Orchard Hill	2	1,390	
6	9A	4	S	south	**Pontiac Trail**	Beck	Wedgewood	1	2,440	16-17 & 17-18 CIP
7	62	22	S	north	**Ten Mile**	Eaton Center	Churchill Crossing	1	400	15-16 CIP
8	39	17	P	west	**Beck**	Eleven Mile	Providence	1	1,100	17-18 CIP
9	93B	27	S	north	**Nine Mile**	Plaisance	Taft	2	650	
11	90	26	P	south	**Ten Mile**	Novi Rd.	Chipmunk	1	2,400	18-19 CIP
11	119c	36	S	east	**Meadowbrook**	Eight Mile	N of Llewelyn	1	1,200	18-19 CIP
13	84B	25	S	east	**Meadowbrook**	Nine Mile	Chattman	1	2,050	19-20 CIP
14	119B	36	S	east	**Meadowbrook**	Singh Blvd	N of Llewelyn	1	1,300	18-19 CIP
15	93A	27	S	north	**Nine Mile**	Novi Rd.	Plaisance	1	2,650	
16	70	23	P	west	**Meadowbrook**	Eleven Mile	Gateway Village	3	900	
17	99A	29	P	south	**Ten Mile**	Wixom	400' E of Lynwood	1	2,900	17-18 CIP
20	5	2	S	south	**Fourteen Mile**	Beachwalk Apartments	East Lake	1	600	19-20 CIP
21	119A	36	S	east	**Meadowbrook**	Nine Mile	Singh Blvd	1	1,300	18-19 CIP
22	84A	25	S	east	**Meadowbrook**	Ten Mile	Chattman	1	2,350	19-20 CIP
23	99B	29	P	south	**Ten Mile**	400' E of Lynwood	Beck	1	1,100	17-18 CIP
24	120B	36	S	west	**Haggerty**	Orchard Hill	High Pointe	1	375	
									32,945	

Legend S= 6 ft. sidewalk P= 8 ft. pathway

Segments with pathways or sidewalks on most of the opposite side of the street - *note that these segments may be critical for system connectivity & must be analyzed separately for connectivity*

Segments with a higher ranking segment planned for the opposite side of the street - *note that these segments may be critical for system connectivity & must be analyzed separately for connectivity*

Short Segments (400 ft. or less

Scheduled Segment

CIP Budget Year

Source: Annual Non-Motorized Prioritization 2015-16 Update

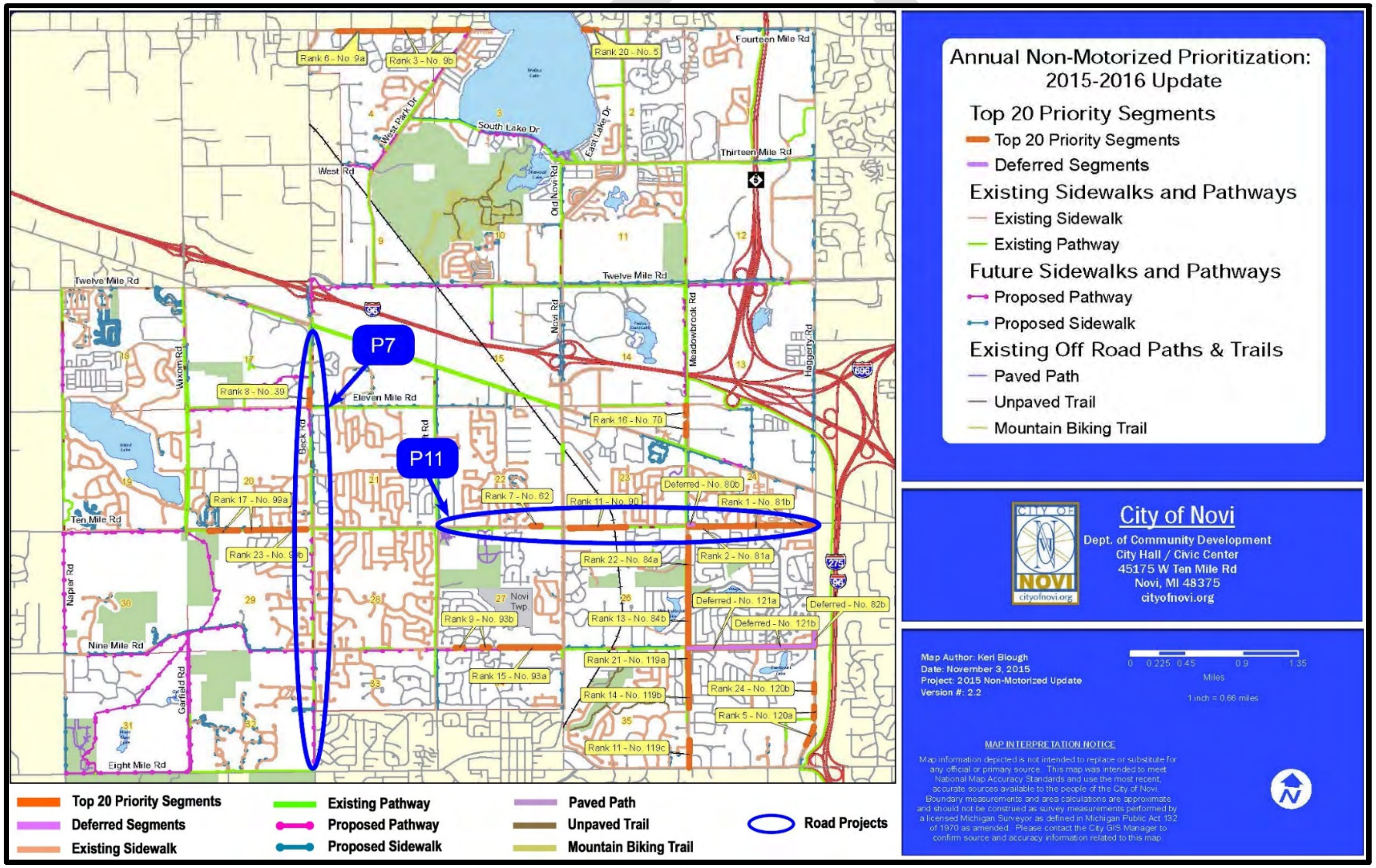
Four of these would be constructed when Beck Road, between 8 Mile Road and Grand River Avenue, and 10 Mile Road, between Taft Road and Haggerty Road are widened (Table S-1 and Figure S-4). Other non-motorized projects will be implemented as part of Novi's Annual Non-Motorized Projects Prioritization Update.

Table S-2. 2015–16 Top 20 Priority Pathway/Sidewalk Segments Associated with Potential Road Widening Projects

Road Segment		Non-motorized Project	Non-motorized Length	Capital Improvement Program Yr.	Cost
P7	Beck Road – 8 Mile to Grand River	Rank 8 – No. 39, west side	1,100'	2017–2018	$155,000
P11	10 Mile – Taft to Haggerty	Rank 1 – No. 81b, south side Rank 7 – No. 62, north side Rank 11 – No. 90, south side	2,750' 400' 2,400'	2017–2018 & 2019–2020 2015–2016 2018–2019	$775,000

Source: *The Corradino Group of Michigan, Inc.*

Figure S-4. Proposed Thoroughfare Road Improvement Projects Superimposed on 2015–16 Top Priority Pathway and Sidewalk Segments Map



Source: City of Novi, Michigan, and The Corradino Group of Michigan, Inc.

Transit

Regional Transit

The Regional Transit Authority (RTA) of Southeast Michigan, created in 2012, is responsible for planning and coordinating transit within Washtenaw, Oakland, Wayne, and Macomb counties, including that provided by the Suburban Mobility Authority for Regional Transportation (SMART). In November, 2016, there will be a referendum in the four-county region that, if successful, would fund regional transit through the RTA. The referendum will be a regional yes or no vote; there can be no "opt out" for individual cities or counties. Currently, SMART routes do not extend into Novi, as the city has opted out of the millage that underwrites service, SMART does provide some funding of Novi's Older Adults transportation program.

RTA has proposed a Regional Master Transit Plan to guide transit developments in Southeast Michigan over the next 20 years.

RTA's Master Transit Plan indicates Novi has an "emerging" transit demand. It offers a number of ways to serve it (Figure S-5):

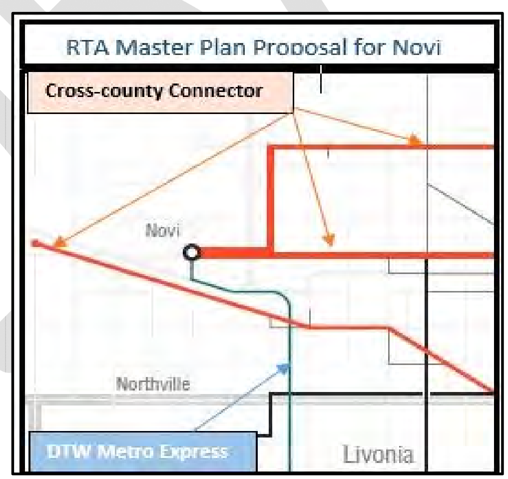
- Premium service, such as express bus routes to the Detroit-Wayne County Airport (DTW);
- Cross-county service; and,
- Demand-responsive service, like Novi's Older Adults transportation program.

To examine the potential cost of a regional transit approach in the Novi TMP, a logical starting point was to extend existing SMART bus routes that today serve communities to the east. The current westernmost limit of these routes is Haggerty Road (Figure S-6). Routes 330 and 740 could be extended farther to the west into Novi. Route 780 could extend south from Maple Road along Haggerty Road.

If Route 330 were extended, it could serve the many attractions along Grand River Avenue, terminating at the Providence Park Hospital campus. Routes 740 and 780 could follow a common path west along 12 Mile Road to serve the Twelve Oaks Mall. These proposals reflect the Regional Master Plan for Novi (Figure S-7).

Annual costs to extend all these SMART routes, on the basis for the existing number of scheduled runs and using SMART's cost per mile and per hour, could be almost $15 million (Table S-3). If limited weekday service were provided (two inbound trips in the morning and two outbound in the evening), the cost could be near $2.5 million.

Figure S-5. RTA Master Plan Proposal



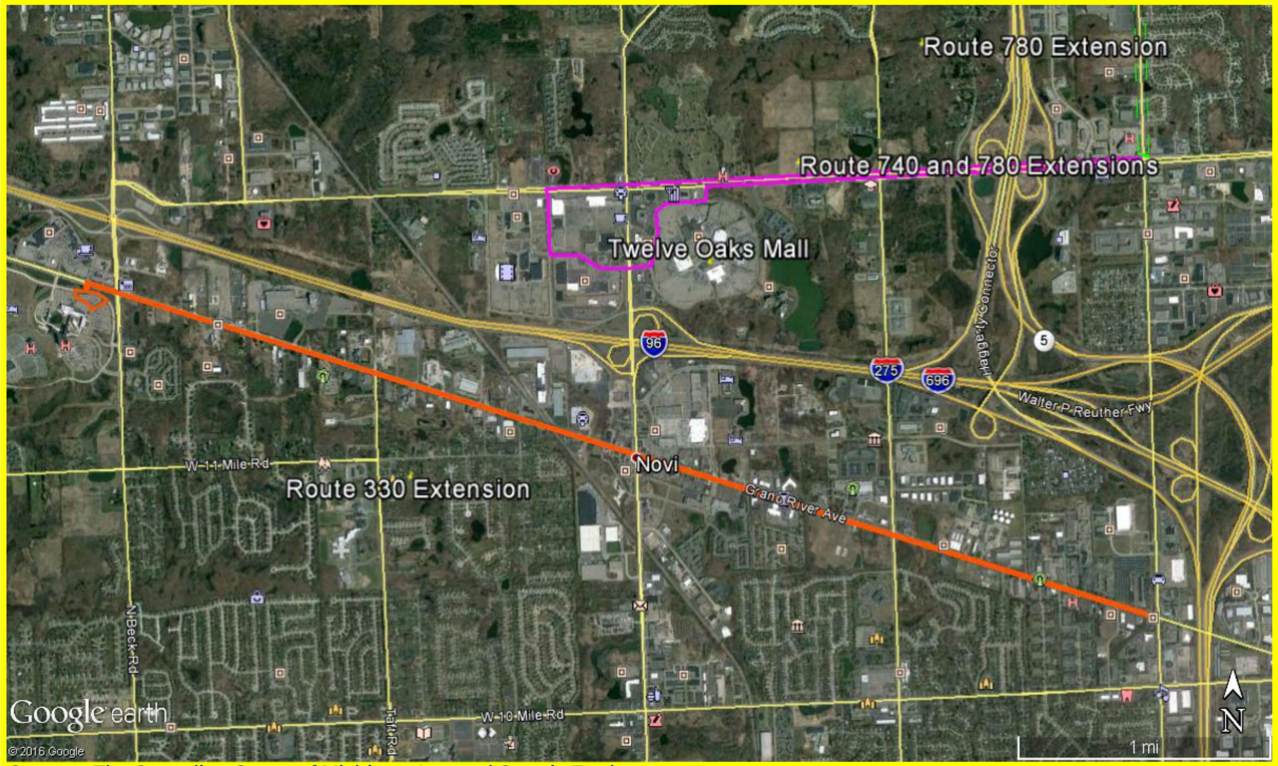
Source: SMART

Figure S-6. Current SMART Bus Service near Novi

Source: SMART

In reviewing these services with the TMP Steering Committee, there was concern about Novi bearing this expense, unless the regional transit millage passes. If the 1.2 mils in additional property taxes is approved in the regional vote, the City of Novi would contribute approximately $3.8 million per year. By legislative mandate, no county can receive transit services which cost less than 85% of what it contributes in taxes. If this provision applies to cities, it appears regional transit is in Novi's future. There is a caveat: It is a formula unique to Oakland County and does not imply an 85% contribution to the City of Novi although it does look like the proposed services will be extensive for Novi.

Figure S-7. Example Extensions of SMART Routes 330, 740, and 780



Source: The Corradino Group of Michigan, Inc. and Google Earth

Table S-3. Potential Costs to Extend SMART Routes 330, 740, and 780 in Novi

	Extension in Miles	Cost/Mile*	Cost/Run	Runs/Wkday	Runs/Sat	Runs/Sun	Yearly Runs	Annual Cost
Full Service								
Extension of Route 330	9.4	$100	$940	19	14	0	5668	$5,327,920
Extension of Route 740	5.3	$ 100	$530	18	15	12	6084	$3,224,520
Extension of Route 780	9.2	$100	$920	20	17	13	6760	$6,219,200
Limited Service								
Extension of Route 330	9.4	$100	$940	4	0	0	1040	$977,600
Extension of Route 740	5.3	$100	$530	4	0	0	1040	$551,200
Extension of Route 780	9.2	$100	$920	4	0	0	1040	$956,800

**Operating Expense per Hour as reported to MDOT for 2014.*

Source: The Corradino Group of Michigan, Inc.

Older Adult Services Transportation

The City of Novi Older Adult Services Transportation (OAST) provides specialized transportation for Novi residents age 55+ and those under 55 with a limiting disability. Service is to medical appointments, shopping, special events, classes, etc. The program operates Monday through Friday from 8am–5pm and Saturday between 9am and 3pm; there are no Sunday operations. Reservations are required at least two days in advance and trips are scheduled based on availability. In FY 2014/2015, OAST provided 12,034 one-way rides (including those for special events) using seven vehicles. Passengers may travel anywhere within the City of Novi for $3 per one-way ride and $5 per one-way ride for trips outside the city but within ten miles from the Novi Civic Center. There are complimentary rides to the Meadowbrook Activity Center, the Civic Center, Novi's Public Library, or to a City of Novi special events or programs within the city limits.

The OAST current annual budget of about $160,000 is supported by fare box revenues ($30,000), the City of Novi General Fund ($25,000), the Parks, Recreation & Cultural Fund ($27,000), SMART ($54,450), program donations ($20,000), and advertising ($2,400), The TMP expects the service to continue in its current form which costs about $160,000 per year. Passage of the RTA plan may provide funds to cover these costs.

Funding Source	Amount	% of Funding
Fare Box	$30,000	19%
Novi General Fund	$25,000	16%
Parks, Recreation	$26,916	17%
SMART	$54,454	34%
Donations	$20,000	12%
Advertising	$2,400	2%
TOTAL	*$158,770*	*100%*

Source: City of Novi, Michigan

Transit Circulator

A circulator between the Twelve Oaks Mall area and Town Center area was analyzed for service on Saturdays and recommended as a six-month "trial" project. The estimated cost is $45,000. The vehicles would be those of the OAST available for six hours on Saturdays. If the service proves successful, additional hours may be beneficial, which may require additional equipment.

Circulator Bus

Future Possibilities

Autonomous (self-driving) vehicles are the future of transportation around the world. Traditional modes of transportation are being inundated with technology, and, as with everything else technology-driven, the future of transportation is evolving at a rapid pace. The limitations are, in fact, not the autonomous vehicles and technology, as much as the regulations to be put into place.

In that regard, federal regulators plan to issue guidance within months on preferred performance characteristics and testing methods for driverless vehicles and collaborate with state officials on policies. And, the federal government is considering spending $4 billion to encourage developing driverless vehicles.

While researchers began building autonomous vehicles that could be tested on public roads, the concept evolved into Connected Autonomous Vehicles (CAVs) which can communicate with each other, and communicate with infrastructure, much more efficiently and as fast as the human brain.

CAVs, once fully implemented, have the potential to improveour way of life. Among the numerous benefits are:

1. Improving safety by reducing the number of crashes that occur annually on our roadways; and,

2. Reducing:
   - traffic congestion;
   - speeding;
   - emissions/pollution;
   - impaired driving;

- texting-while driving; and,
- road rage.

In addition to these transportation system improvements, CAVs also have the potential to improve daily living, particularly for seniors and the disabled. Concerns like: *"How will I get to the grocery store or the doctor or just get out of the house because I can no longer safely operate a moving vehicle"* can be addressed.

To meet these needs today, there are the Older Adults Services transportation program, taxicabs, Uber, and Lyft. In the next several years, there will also be CAVs. Government support of this technology could be the catalyst for funding of a mass transit system that includes a fleet of CAVs. The federal government has been receptive and willing to embrace CAVs because of their social benefits. Providing an alternative to bus/van and other transit modes/vehicles will help encourage more government funding to make CAVs a reality for public use. Concern about loss of revenue from existing transportation systems is on the opposite side of this discussion. But, as explained in the article: Autonomous vehicles will have tremendous impacts on government revenue,[1] there is a potential for significant cost savings to governments compared to the loss of revenue.

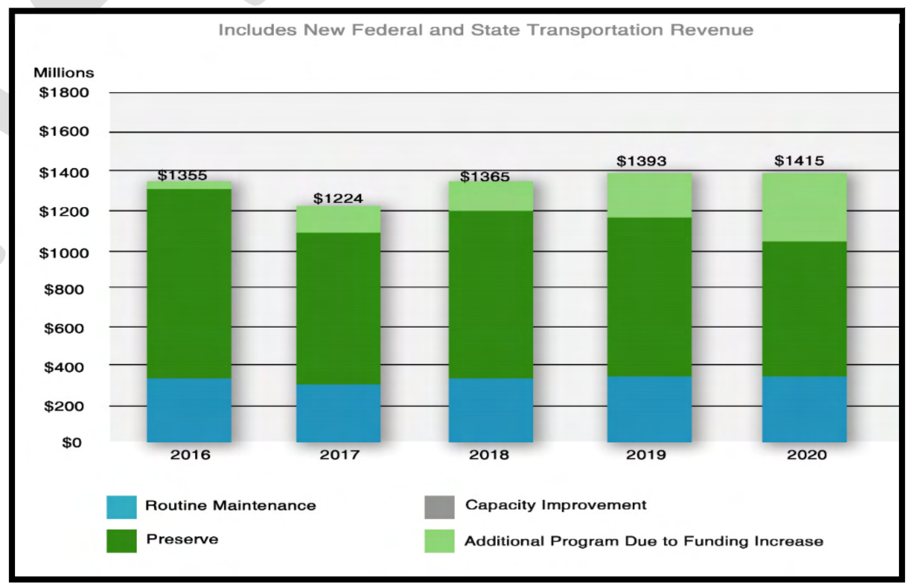
Consider tha, t If you do not possess the ability to operate an auto, how transformative it could it be for a vehicle to come to you, on demand, and provide travel, with comfort, safety, and security?

Funding Situation

State and Federal Programs

After years of frustration at the federal and state levels, both governments enacted transportation funding legislation in 2015. The state program doesn't begin to provide monies until January 1, 2017; it then takes until fiscal year 2020 for the full effect (estimated to be $1.234 billion per year) to be felt. Those funds are to be distributed 696 ways: MDOT, 80 transit agencies, 83 counties, and 533 villages and cities. At the federal level, the FAST Act (Fixing America's Surface Transportation) will provide five years (FY 2016 through FY 2020) of funding certainty. For Michigan, that represents $1.02 billion in the first fiscal year and $1.17 billion in FY 2020. This is about $52 million (5.1%) of net new money in 2016 versus 2015 and, then, about $20 to $25 million (about 2.25%, on average) of net new money each year after. When combined with state funding, cities in Michigan can expect $66.4 million in FY 2017, when additional Michigan funding begins to flow. That will grow to $186 million in 2020. It must be kept in mind funding to local government will be divided 533 ways. Novi is the 27th largest city in Michigan with about 1% of the total city/village population. It is also important to recognize that these funds are to be allocated overwhelmingly to routine maintenance and preservation of existing roads. A relatively small amount will be available for projects that will increase capacity.

Michigan Highway Program Investment by Category, FY 2016 to 2020



Source: NTH Consultants, Ltd. Webinar Slides

[1] Kevin C. Desouza, Nonresident Senior Fellow, Governance Studies, Center for Technology Innovation; Kena Fedorschak, MBA candidate, W.P. Carey School of Business, Arizona State University

Novi Funding

The City of Novi annually spends approximately $11.5 million on roadway capital improvements and another $3 million on maintenance. Novi's sidewalks/pathways program for the five fiscal years ending in FY 2020, totals $11.4 million, all but $733,000 to come from the Municipal Street or Major Road Funds. Phase II of the M5/I-275 Regional Trail Connection is the project for which $733,000 is needed from local/Novi funds. The Older Adults Services transportation program is supported by several sources, including non-government donations, advertising and fare revenue.

Implementation

Table S-4 provides a summary of the cost of each element of the multi-modal Thoroughfare Master Plan. The total road ($41.3 million) and intersection ($5.8 million) cost estimate is $47.1 million. Beck Road widening is phased over FY 2017-2021 while expanding 10 Mile Road is phased between FY 2021-2025. Intersection improvements are programmed to occur between 2016 and 2020. The 11 sidewalk and pathway projects that are part of the plan are programmed to be built in the period FY 2016-2022 at a cost of $4.3 million. In addition to continuing the Older Adults transportation program, and a $45,000 "trial" mall circulator, major transit developments appear to be dependent on the Regional Transportation Authority's multi-county referendum of November, 2016.

Table S-4. Novi Thoroughfare Master Plan Recommendations

Widening/Capacity Improvement		Estimated Cost[1]	Implementation Period
Beck Road	8 Mile Road to Grand River Avenue	$21.5 million	FY 2017–2021
–Segment A	–8 Mile Road to 9 Mile Road	$6.3 million	FY 2017–2018
–Segment B	–9 Mile Road to 10 Mile Road	$5.6 million	FY 2018–2019
–Segment C	–10 Mile Road to 11 Mile Road	$6.3 million	FY 2019–2020
–Segment D	–11 Mile Road to Grand River Avenue	$3.3 million	FY 2020–2021
10 Mile Road	Haggerty Road to Taft Road	$19.8 million	FY 2021–2025
Meadowbrook Road	10 Mile Road to 12 Mile Road	TBD	After 2025
Grand River Avenue	Novi Road to Haggerty Road	TBD	After 2025
Novi Road	9 Mile Road to 10 Mile Road	TBD	After 2025

Intersection Improvements	Estimated Cost	Time Frame
Beck Road at 10 Mile Road	$750,000	See footnote 2
Beck Road at I-96 Ramps	$300,000	See footnote 2
Beck Road at Grand River Avenue	$750,000	In progress
West Park Drive at 12 Mile Road	$215,000	FY 2019–20
West Park Drive at South Lake Drive	$175,000	FY 2019–20
Novi Road at 10 Mile Road	$75,000	FY 2018–19
Novi Road at Grand River Avenue	$3,250,000	FY 2018–19
Novi Road at 12 Mile Road	$10,000	FY 2018–19
Meadowbrook at 13 Mile Road	$200,000	FY 2018–19
Haggerty Road 8 Mile Road	$5,000	FY 2016–17
Haggerty Road at 12 Mile Road	$35,000	FY 2016–17
Haggerty Road at 14 Mile Road	$40,000	FY 2016–17
M5 at 14 Mile Road	$3,000	FY 2016–17

Sidewalks and Pathways	Segment	Estimated Cost	Time Frame
South side of 10 Mile Road	Meadowbrook to Haggerty	$745,000	FY 2019–22
South side of Pontiac Trail	Beck to West park	$490,000	FY 2017–19
West side of Haggerty Road	8 Mile to High Pointe	$295,000	FY 2019–20
North side of 10 Mile road	Eaton Center to Churchill Crossing	$175,000	FY 2018–19
West side of Beck Road	11 Mile to Providence	$185,000	FY 2018–19
North side of 9 Mile Road	Novi Road to Taft	$415,000	FY 2018–21
South side of 10 Mile Road	Novi Road to Chipmunk Trail	$345,000	FY 2019–20
East side of Meadowbrook Road	8 Mile to 9 Mile	$490,000	FY 2019–22
East side of Meadowbrook Road	9 Mile to 10 Mile	$615,000	FY 2019–22
West side of Meadowbrook Road	11 Mile to Gateway Village	$450,000	FY 2019–20
South side of 14 Mile Road	Beach Walk to East Lake	$95,000	FY 2016–17

Transit	Service	Estimated Cost	Time Frame
Older Adult Services Transportation	Continuation of Current Service	$160,000/year	Ongoing
Novi Mall Circulator	Six-month demonstration	$45,000	FY 2017

[1] *2016 dollars*

[2] *To be coordinated with widening Beck Road*

Source: The Corradino Group of Michigan, Inc.

1. Introduction

Novi is one of the fastest growing cities in Michigan. The construction of Twelve Oaks Mall in the 1970s made the city a major destination in the Detroit metropolitan area and is often credited with ushering in an era of growth that lasted for 40 years (although, in fact, the community had been growing rapidly since the 1950s). This growth has led to substantial increases in the city's population, as well as commercial and industrial developments. Novi was ranked #48 on Money magazine's list of the *Top 100 Best Places to Live* in 2008.

Historical population		
Census	**Pop.**	**%±**
1970	9,668	—
1980	22,525	133.00%
1990	32,998	46.50%
2000	47,386	43.60%
2010	55,224	16.50%
Est. 2014	58,416	5.80%
U.S. Decennial Census		

Economy: Novi has a local economy that includes businesses of all sizes from international corporations with local and regional offices to owner-operated businesses serving the local area. While Novi is recognized for its concentration of retail businesses clustered at the Novi Road/I-96 interchange, there are several large retail centers in the city as well as many individual retail businesses. The city's industrial and office parks are home to companies in high-tech research and development, health care, transportation and logistics, manufacturing and supplying domestic and foreign automotive equipment. Google recently announced it will locate a self-driving technology center in Novi in the Beck West Corporate Park, off Beck Road. The Japan Auto Parts Industries Association of North America has its offices in Novi. Toyota Boshoku America has more than 200 employees in the city. Energy-related companies are one of the fastest growing sectors in the city. These include ITC Transmission, Novi Energy and Patrick Energy Services. Kroger has its Michigan-region headquarters in Novi.

Economic Growth: Over the last few years, Novi has focused its economic development efforts on the telematics and car connectivity industries. In telematics, approximately 70,000 people are employed in Oakland County, many of them are in Novi. Novi firms include Cooper-Standard Automotive, Freescale Semiconductor, Elektrobit, and Harman/Becker Automotive.

Novi's Neighborhoods and Business Relations Group attracts and retains businesses. It has streamlined many of its planning and approvals processes to encourage new business. The enhancements speed the process, allowing businesses to move ahead with plans for relocation or expansion.

Novi attracted several smaller, innovative international firms that have expanded into a larger facility, such as Howa USA Holdings, a Japanese auto supplier with a new research and development center in Novi specializing in interior components for vehicles.

Ryder System, Inc. constructed a new regional headquarters, representing a $22 million investment in the community. ITC Transmission Company, the nation's largest independent electrical transmission company, made Novi its national headquarters. St. John Providence Park has a 200-bed hospital on a 200-acre campus. In addition to the full-service hospital, the campus provides an array of services in a wooded setting, complete with walking and cycling paths and 18 acres devoted to health-related retail establishments.

All indications point to continued growth and development in Novi. So, with a dynamic future, developing a Thoroughfare Master Plan, to complement the Land Use Master Plan, is timely.

1.1 Thoroughfare Master Plan

The leaders and citizens of Novi understand that the purpose of a truly multi-modal thoroughfare master plan is to establish physical and cultural environments that support and encourage safe, comfortable, and convenient travel by a variety of modes.

They understand that a broad constituency must be engaged in the planning process, including elected and agency officials, neighborhood and business leaders and, most important, the general public. A Thoroughfare Master Plan (TMP) must give form to their vision and provide a consensus on how to move the plan forward.

The overarching goal of the Novi Thoroughfare Master Plan is to protect and enhance the quality of life in Novi. The following guiding principles will help achieve that goal:

- Provide an efficient, safe, and connected transportation system that is coordinated with existing and projected needs and takes into consideration future growth;

- Provide a transportation system that is economical and responsive to land use and non-motorized principles; and,

- Promote interconnectivity between development plans and the existing and future roadway networks.

In creating the Novi plan, an emphasis has been placed on improved connectivity to lessen the traffic burden on collector and arterial roadways. Expanding the sidewalks/pathways system will also assist in reducing vehicular traffic. Likewise, ensuring transit has an appropriate role, particularly serving the elderly, is essential to building a truly multi-modal system.

Foundation of Multi-Modal Plan

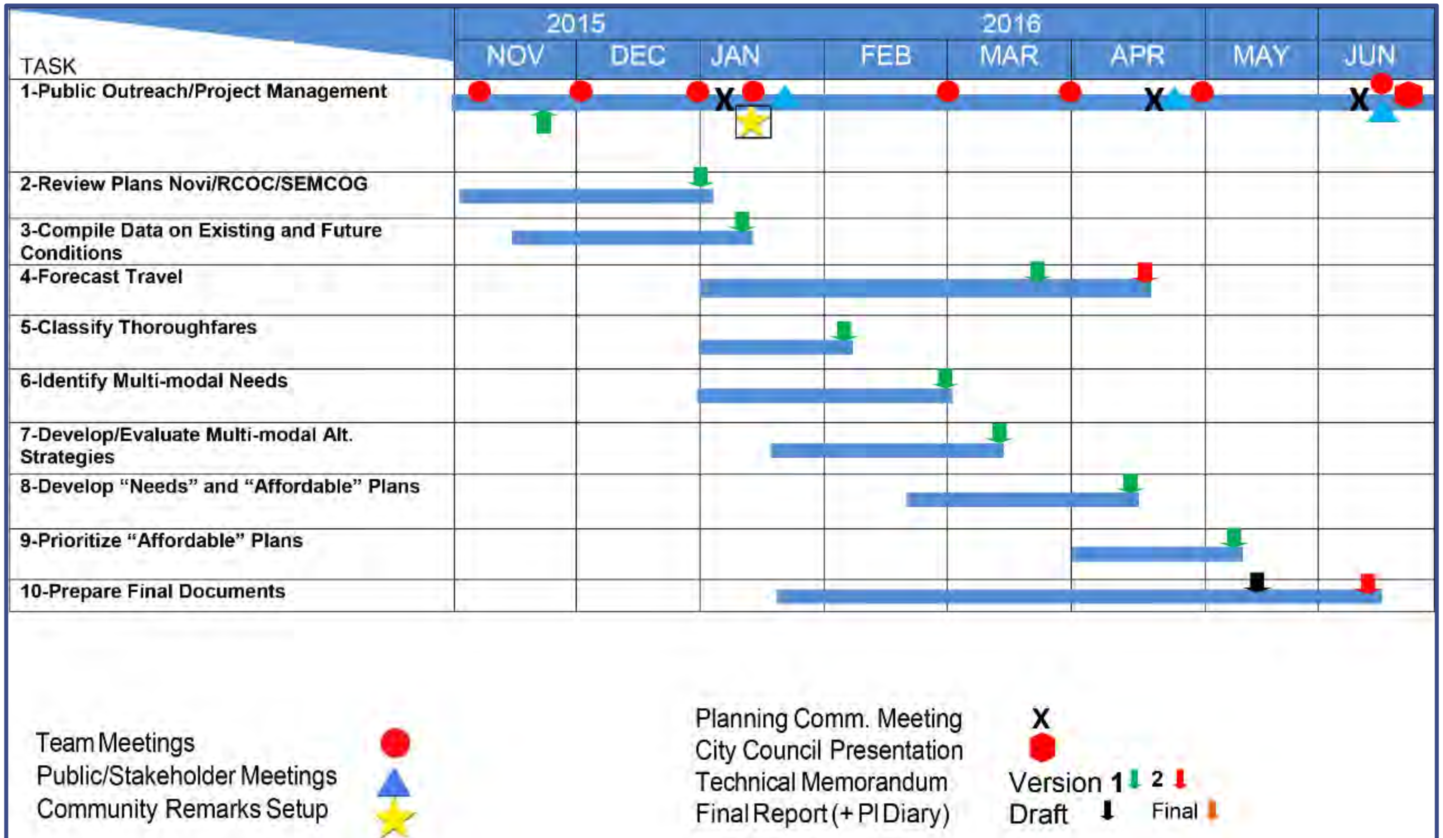
Long-range planning is driven by a number of factors: local growth and land use changes; the Michigan Department of Transportation (MDOT) need to maintain its Trunkline system; the Road Commission for Oakland County (RCOC) need to manage county roads; available funding; and, the planning process of the Southeast Michigan Council of Governments (SEMCOG), which integrates these considerations with the needs of its members, including the City of Novi.

This project requires the integration of projects among transportation modes to form a plan that complements the Master Plan for Land Use, and is also forward-thinking. To assist in preparing the TMP, Novi has engaged The Corradino Group of Michigan consulting firm (Corradino).

1.2 Schedule

The TMP was conducted in 2015-2016 (Figure 1). Three public meetings were conducted – in December, 2015, to introduce the project; in April, 2016, to present the preliminary plan; and, in June, 2016, to present the contents of the Final Report. A mid-day meeting was added in February, 2016, in cooperation with Novi's Older Adult Services. Three meetings were held with the Planning Commission, each preceding a public meeting so the Planning Commission could review/comment on the material to be presented to the citizens of Novi.

Figure 1. Schedule



Products/Reports

1. Tech Memo #1: Public Outreach Plan
2. Tech Memo #2: Summary of Planning Documents
3. Tech Memo #3: Existing/Future Conditions
4. Tech Memo #4: Travel Forecasts
5. Tech Memo #5: Classification of Thoroughfares
6. Tech Memo #6: Multi-modal Needs
7. Tech Memo #7: Alternative Strategies
8. Tech Memo #8: "Needs"/"Affordable" Plans
9. Final Report: Draft & Final

2. Reports Summaries

The first task in this study involved thorough the review of a number of recent, relevant reports. Summaries of each report listed in Table 1 are included in Tech Memo #2, to which the reader is referred. It is available, as are all other tech memos, on the City of Novi Website under "City Services and Community Development." This location may change in the future.

Table 1. Background Documents

	REPORT	RECOMMENDATIONS	RESULT
1.	Beck — 8 Mile to Grand River Scoping Study, 2006	Short- and long-term rehab and capacity recommendations, with ultimate widening to five lanes	Some turn lanes have been added; no milling/rehab has been done. Rehab between 8 Mile and 9 Mile is scheduled for 2017. Rehab between 9 Mile and White Pine was completed in 2014.
2.	13 Mile/Old Novi/South Lake Intersection Study, 2009	Replace the signal with a stop sign and make geometric improvements, including those for pe-destrians.	Complete
3.	Draft South Lake Drive Traffic Calming, September 2015	Install transverse pavement markings, possibly "speed kidneys," address the fact that there is a bike path in only one direction which is used mostly by pedestrians	No action, but the study was just recently completed.
4a.	NW Ring Road Study, June 2007	Updated earlier work on how best to extend Crescent Blvd. west and south to Grand Blvd. (Ring Road)	The City has the right-of-way, but nothing has happened since the planning study.
4b.	11 Mile and Town Center Area Walmart Traffic Impacts Report, 2012	Make signal, signage, and minor geometric changes	Some improvements are complete
4c.	Town Center Study, March 2014	Land use, zoning, design guidelines, and wayfinding	Ongoing zoning and design guideline actions.
4d.	Flint Street Improvement Study, January 2015	Extend the ring road concept south of Grand Blvd via Flint Street to Novi Road listing alterna-tives, costs and environmental considerations	No action, but the study was just recently completed.
5.	Speed Limit Study of Novi Road 12 to 14 Mile, 2010	Set speed limit to 45 mph; ask the School District Superintendent to request a speed zone, and install advisory 35 mph signing at curves	Speed limits were implemented.
6.	Transportation Improvement Plan, I 96/I-696/I-275 in Novi and Wixom	Presented a series of improvements in ten categories, identifying implementing entity, cost, and timing	Projects in various stages
7.	Identification of High Crash Intersections in Novi 2006-2010, January 2012	Examined 60 local intersections and identified 12 as having high crash rates or high casualty ra-tios	Led to the following listed study
8.	Crashes at 12 Intersections, June 2012	Specific recommendations for each of the 12 intersections	Project in various stages.
9.	Wixom and Glenwood Signal Study, November 2012	Add signals and crosswalks	Complete
10.	8 Mile and Haggerty Road Safety Audit, 2014	Make extensive changes to Haggerty Road and I-696 ramps where they intersect 8 Mile Road. Short and long-term changes, based on risk analysis	Project status is unknown
11.	Novi Road 12 to 13 Mile Scoping Report, July 2014	A range of alternatives is compared to an earlier mill and overlay with no geometric changes	Reconstruction with 4-lane depressed boulevard is scheduled for summer 2016.
12.	SEMCOG Regional Bicycle and Pedestrian Travel Plan, October 2014	Aggregates and links community plans	NA
13.	Annual Non-Motorized Prioritization 2014-2015 Update, October 2014	Annual reprioritization of non-motorized projects	Projects are implemented each year
14.	RCOC Documentation	FY 2015-16 Budget, Strategic Plan, and jurisdictional map	Summary of budget shown
15.	RCOC Complete Streets Guide	Guidelines for implementing Complete Streets	Table of Contents shown
16.	Hazmat Analysis 42445 W 10 Mile Road, October 2015	Identifies lead and methane as issues for subsurface work at the site	Not relevant to the Thoroughfare Plan
17.	Master Plan Corridor Study – Grand River, Ongoing	Land use, zoning and "sense-of-place" features.	To date: Grand River was designated as a Special Treatment Corridor; specifically, an Entrance Corridor.

Source: The Corradino Group of Michigan, Inc.

3. Travel Forecasting

A central task to successfully execute this project is predicting traffic in the year 2040. Corradino developed daily and PM peak period (3-6 pm) travel forecasting models using software known as TransCAD, an industry standard. The 2015 Base Model was developed consistent with modeling of the *2011 Novi and Wixom Transportation Plan* prepared by Corradino. Additional information included SEMCOG model files and the latest traffic data provided by the RCOC, MDOT, and the Traffic Improvement Association of Michigan.

3.1 2015 Model

3.1.1 Traffic Analysis Zones (TAZs)

The Novi model traffic analysis zones (TAZs) form a subset of the SEMCOG regional model (Figure 2). The Novi model includes 148 internal zones and 54 external stations.

Corradino used the road network from its 2011 Study to create a 2015 project area network. Novi provided a list of projects that were added to the 2015 Base network.

- Novi Road Reconstruction – Widen from two to five lanes (RCOC project, completed in 2011);
- Reconstruct Grand River Avenue – Novi Road to Haggerty Road (RCOC project, completed in 2012); and,
- Haggerty Road – Add second SB lane to fill gap at Stonehenge (completed in 2014).

Corradino reviewed Google aerial mapping (imagery date 4/11/2015) to ensure the 2015 Base network represented the existing condition of roadways in Novi. The review indicates that 8 Mile Road currently has two lanes in each direction from South Lexington Boulevard to Haggerty Road at the southern edge of the Novi study area.

Corradino made additional refinements to the road network to incorporate a few, key local roads into the network. Figure 3 illustrates the new links, in orange, that were added to the 2015 Base network.

3.1.2 Traffic Data

Corradino collected the latest traffic data from:

- RCOC;
- SEMCOG; and,
- MDOT.

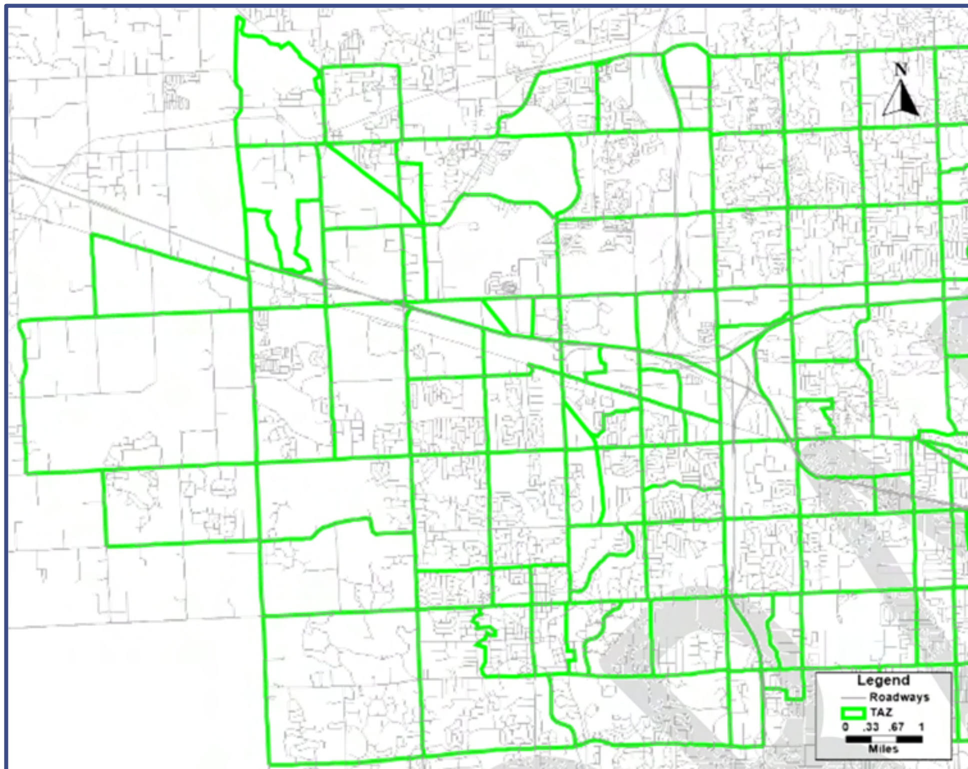
Both daily and PM peak period traffic counts were assembled for arterials, local roads, and freeways (I-96, I-275, I-696, and M-5) throughout the Novi study area. A blend of data was used for model development, depending on availability and quality (recent vs. old counts). Table 2 summarizes use of these data sources.

Table 2. Utilization of Traffic Data Sources

Data Source	Daily Counts		PM Peak Counts		Year of Data Used
	Freeways	Arterial and Local Roads	Freeways	Arterial and Local Roads	
RCOC		√		√	2012–2015
SEMCOG	√	√	√	√	2011–2014
MDOT	√				2014

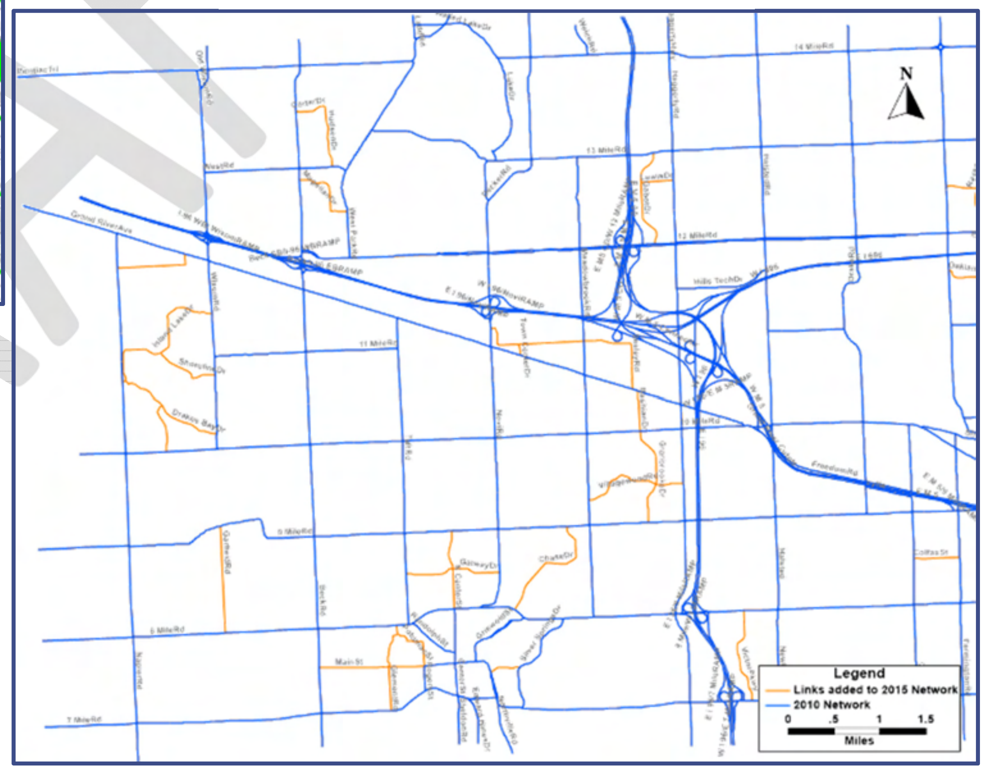
Source: The Corradino Group of Michigan, Inc.

Figure 2. 2015 Base Model Traffic Analysis Zones (TAZs)



Source: The Corradino Group of Michigan, Inc.

Figure 3. 2015 Refined Base Network



Source: The Corradino Group of Michigan, Inc.

For some roadway segments where PM peak period traffic counts were not available, time-of-day (TOD) factors were derived from data collected in the 2011 Study or older counts from aforementioned sources, then applied to the latest daily counts to obtain PM peak period traffic. Model development required counts to be coded by direction, which is particularly critical for the PM model, as traffic flows show significant directional difference during the afternoon peak. For roadway segments for which directional counts were not available, directional factors were derived from data collected in the 2011 study. A reasonable 50/50 split was also used for daily directional counts at some locations. This data collection effort resulted in a sufficient sample size of daily counts (501) and PM peak period counts (425), to provide very good coverage of all roadways in the Novi study area.

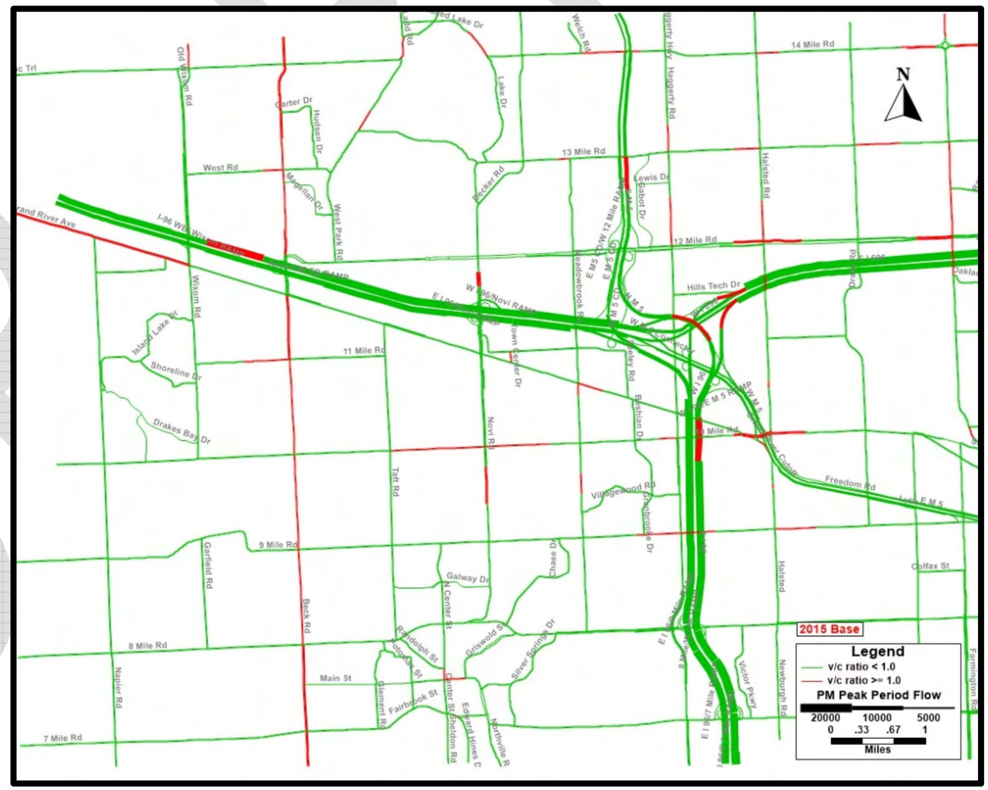
3.1.3 2015 Base Model Calibration

The 2015 Base Model is calibrated to the latest traffic counts using the Origin-Destination Matrix Estimation (ODME) technique in TransCAD. The ODME is an iterative process that switches back and forth between a traffic assignment stage and an OD matrix estimation stage, until the estimated OD matrix achieves assigned network flows with the least difference from observed traffic counts.

The 2010 daily and PM peak period trip tables, which were extracted from the SEMCOG model and used in the 2011 Study, were used separately as "seed" matrices in the ODME process. The daily model has a Root Mean Square Error percentage (RMSE%) of 18.5%, and the PM peak period model has a RMSE% of 8.3%, each of which indicate the modeled volumes are very close to traffic counts from a system-wide perspective. On I-96, the correlation of traffic counts with model-assigned volumes is even closer (Daily:8.69%; Peak period; RMSE=8.46%). The optimum RMSE is 0.0%.

Figure 4 shows the 2015 volume/capacity (V/C) ratios in the PM peak period. In this analysis, RED indicates the V/C ratio exceeds 1.00, reflecting significant congestion. GREEN indicates significant congestion is not detected by the model. It is noted that the TransCAD model is measuring congestion primarily based on the physical width of the roadway pavement and determines if it is adequate to serve the traffic volume. Where it cannot, the model calculates a V/C ratio equal to or greater than 1.0.

Figure 4. 2015 PM Peak Period Traffic Conditions



Source: The Corradino Group of Michigan, Inc.

This analysis concentrates on "significant" congestion, i.e., V/C >/= 1.0. There are a number of roads in Novi that have heavy traffic and do not meet this criterion so will not show as RED on Figure 4. For example, volume/capacity ratios for I-96 WB (PM peak direction) between Novi Rd and M5 range between 0.89 and 0.96. Congestion on I-96 in the study area is also evident in 2040 when the V/C ratios are as high as 0.99. They just don't reach 1.0. Further, in the real world, freeway congestion is usually felt by weaving, merging and diverging behaviors. A travel demand model is not able to capture these operations. It accounts for capacity-constrained delays.

3.2 2040 E+C Model

The City of Novi provided a list of projects that are in the it's Six-Year Plan that will improve roadway link capacity or change road geometry. They are identified as *existing and committed* (E+C) projects and are coded into the study's 2040 E+C network. SEMCOG's latest 2014–2017 Transportation Improvement Program (TIP) was also reviewed to identify E+C projects. The TIP does not show roadway link capacity improvements in Novi. There is a new roundabout project on Orchard Lake Road at 14 Mile Road, according to the TIP. Although this project is not within the Novi city limits, it is coded into the 2040 E+C network as it will change road geometry in the model network. Table 3 summarizes the E+C projects.

The 2010 and 2035 trip tables used in the 2011 Study, which were extracted from the SEMCOG model, were used to estimate origin-to-destination (trip) growth. The production and attraction of each zone were interpolated for the 2015 Base Year and were extrapolated for the 2040 Future Year. For each zone, the 2015–2040 growth was derived using a ratio method and a net growth (difference) method separately. The final 2040 zonal control totals are the average of the two methods. This estimation procedure of future trips is consistent with the method recommended by *NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design*.

The 2040 OD matrix was then obtained by applying a growth factor (Fratar) process to the 2015 ODME-calibrated trip matrix. The aforementioned process was performed for daily and PM peak period traffic, separately.

The 2040 OD matrices were then assigned to 2040 E+C network. Figure 5 shows the 2040 V/C ratios for the E+C network in the PM peak period.

3.3 Existing and Future Traffic Conditions[2]

Table 3. 2040 E+C Projects

2040 E+C Projects	Source
Crescent Blvd. Extension – Novi to Grand River (Ring Rd.)	Novi Six-Year Plan
Taft Rd. at 9 Mile Rd., New Roundabout to Replace All-way Stop	Novi Six-Year Plan
11 Mile Rd. at Wixom Rd., Add Roundabout to Replace Stop Control on 11 Mile Rd.	Novi Six-Year Plan
Construct Modern Roundabout on Orchard Lake Rd. at 14 Mile Rd.	SEMCOG 2014-2017 TIP

Source: The Corradino Group of Michigan, Inc.

Table 4. Novi Trip Growth – 2015 to 2040

Year	Novi Total Trips	
	Daily	PM
2015	1,447,125	356,470
2040	1,518,272	375,859
Growth %	4.9%	5.4%

Source: The Corradino Group of Michigan, Inc. and SEMCOG database

[2] This discussion is limited to non-interstate roads.

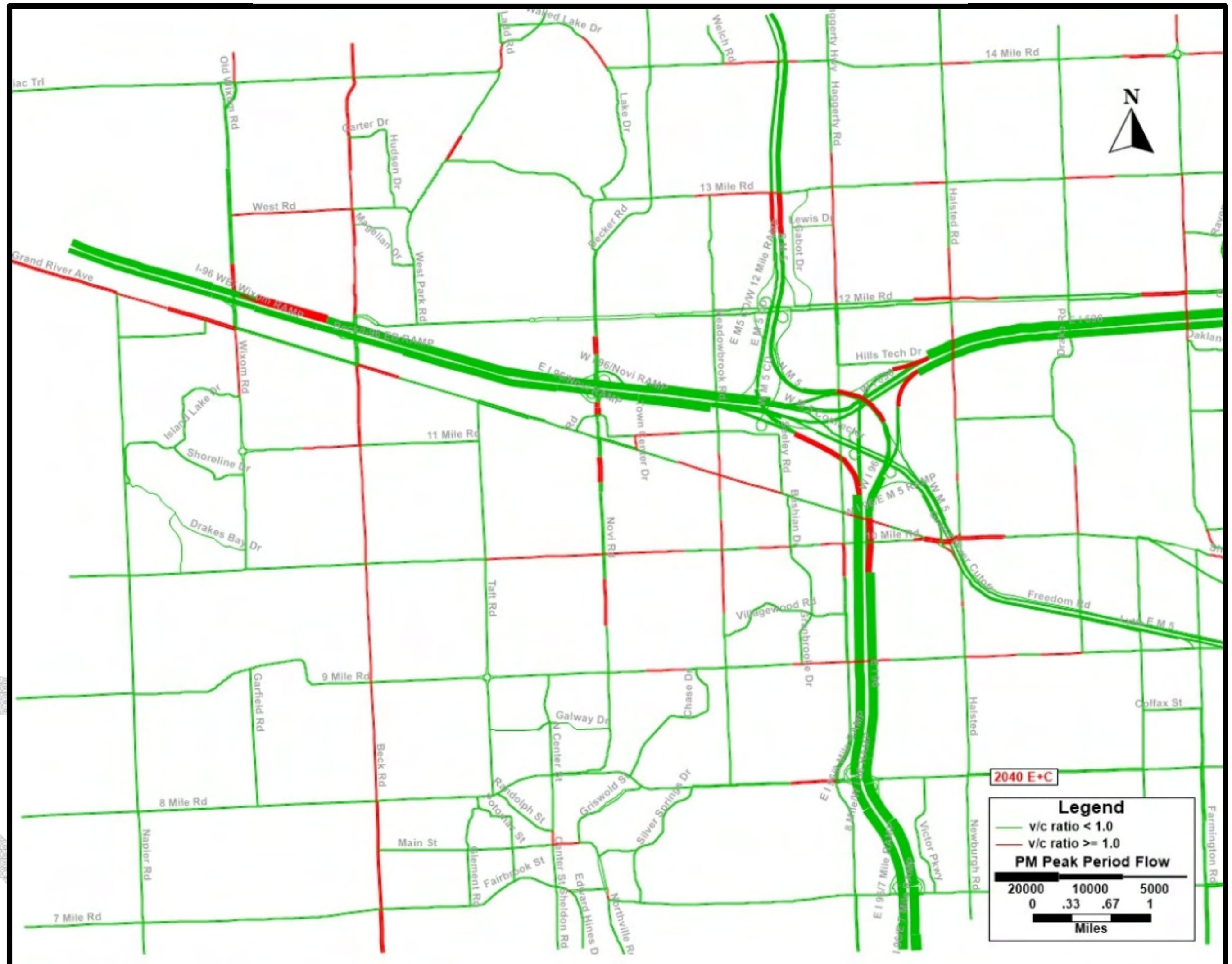
Based on the above discussion, the growth in trips in Novi from 2015 to 2040 is forecast to be 4.9% on a daily basis and 5.4% during the afternoon peak period (Table 4).

In 2015 (Figure 4), Beck Road has the most extensive congestion in Novi. Most "Mile Roads" experience some PM peak period congestion. Sections of 10 Mile Road are also very congested in the afternoon peak period.

By comparing Figures 4 and 5, it can be seen that in 2040 Beck Road will continue to be the road with the most continuous congestion in Novi, if improvements are not made. Sections of 10 Mile Road continue to be congested.

The discussion of transit and non-motorized modes, plus highway intersections, is included in Section 5 of this report.

Figure 5. 2040 E+C PM Peak Period Traffic Condition



Source: The Corradino Group of Michigan, Inc.

4. Public Engagement

Throughout the project, input was received through the web-based application known as *Community Remarks* (Figure 6), the results of which are included in a separate Public Involvement Diary. Each public comment received a response. The categories of "Safety and Traffic Calming," "Intersection Improvements," and "Pedestrian Improvements" received more than 75% of the comments. Other comments were divided among "Roadway Improvements" (ten comments), "Bicycle Improvements" (three comments), and "Transit" (two comments). In all, Community Remarks received over 2000 "hits" by people visiting the site.Over the course of the project, four public meetings were conducted. All but the February, 2016, meeting was preceded by a Novi Planning Commission meeting. Notes of each meeting are included in the *Public Information Diary*.

Figure 6. *Community Remarks* Application

Source: *The Corradino Group of Michigan, Inc.*

Turning Point Voting Touch-pads

At the meetings in December, 2015, and February, 2016, those in attendance were asked, using a touch-pad polling system known as *Turning Point,* to provide their opinion on eight topics. In summary, the results (Figures 7a and 7b), indicate the meeting attendees were older adults (Question 1) and drove fewer than ten minutes in the off-peak hours to volunteer or work (Questions 3 and 4). None biked or walked on a regular basis, for a variety of reasons (Questions 5 and 6). Oddly though, when asked about the most important items that would enhance Novi's transportation system, improvements to streets/sidewalks, biking facilities, and traffic signal timing were cited in almost equal amounts (20% to 25%) as the most preferred; roadway widening was preferred by fewer than 10% of the respondents (Question 7). These independent opinions closely align with the comments received through the *Community Remarks* application.

December 10, 2015
Novi Police Training Center

February 10, 2016
Older Adults Services, Meadowbrook Commons

April 28, 2016
Novi Civic Center

June 23, 2016
Novi Civic Center

MEDIA RELEASE

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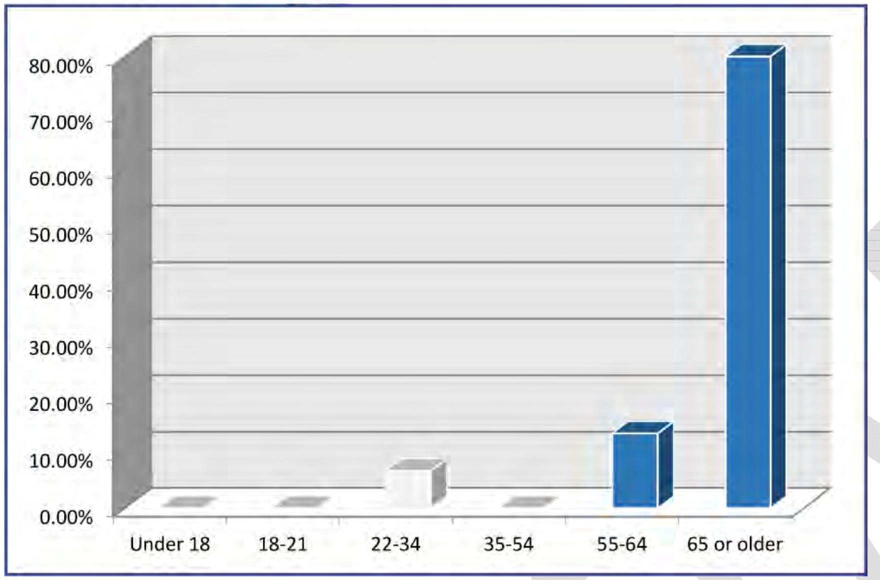
FOR IMMEDIATE RELEASE

Novi planning for future development, growth
City in process of updating Master Plan for Land Use & Thoroughfare Master Plan

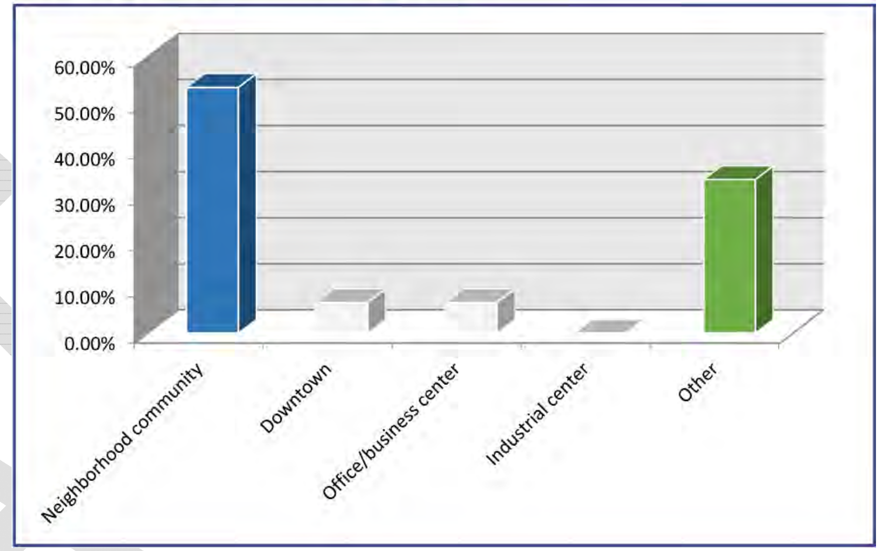
Another public presentation for the Thoroughfare Master Plan Final Report has been scheduled for **June 23 from 7-8 pm** in the Novi City Council Chambers. This report is recommending improvements to Beck Road and Ten Mile Road.

Figure 7a. Touchpad Voting Results

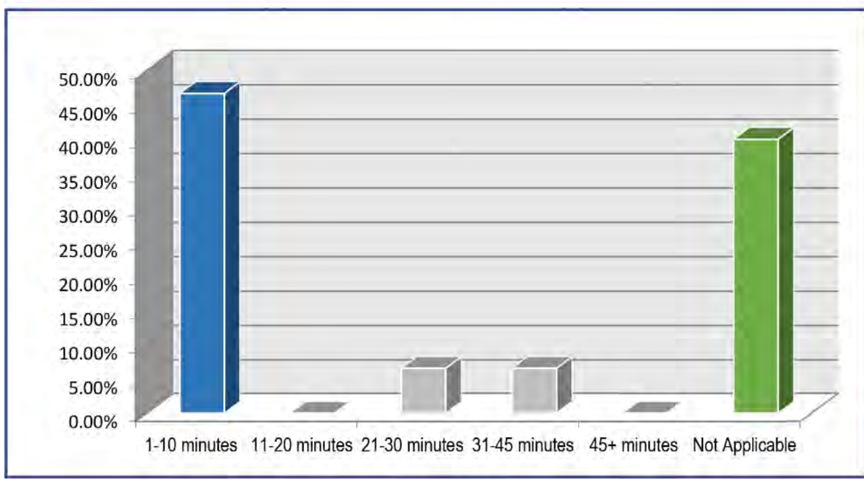
1. What is your age group?
The polling results indicate the participants in the public meetings in December and February were overwhelmingly over 55 years of age.



2. How would you describe where you work/volunteer?
Consistent with the age of the meeting attendees, it is logical that most indicated their place or work/ volunteering was "neighborhood/community" and "other."



3. If you commute, how long does it take for you to arrive at work/volunteering place?
The morning commute is 10 minutes or less for about 45% of the meeting attendees and another 40% of the attendees indicated the "commute to work" question was not applicable to them, reflecting the age of the attendees.



4. When is the time of day that you experiencethe most delay?
The overwhelming number of meeting attendees travel outside the AM and PM peaks.

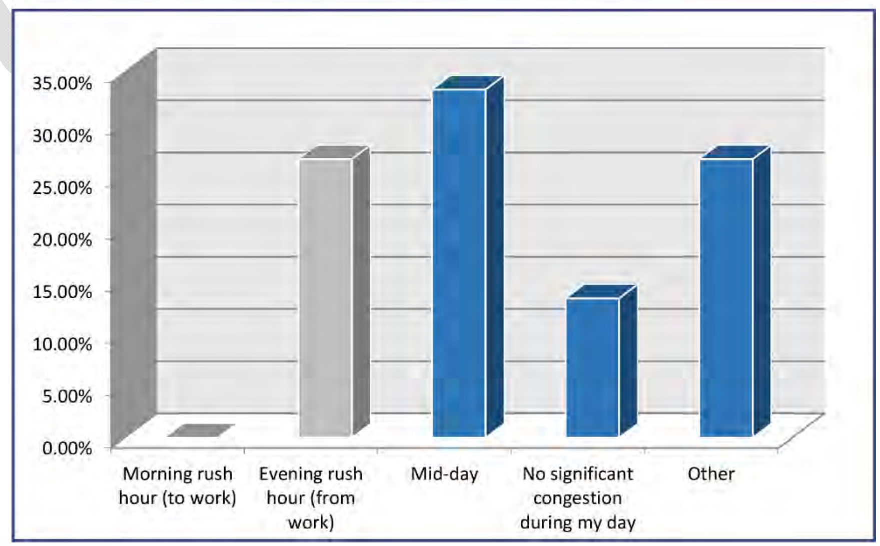
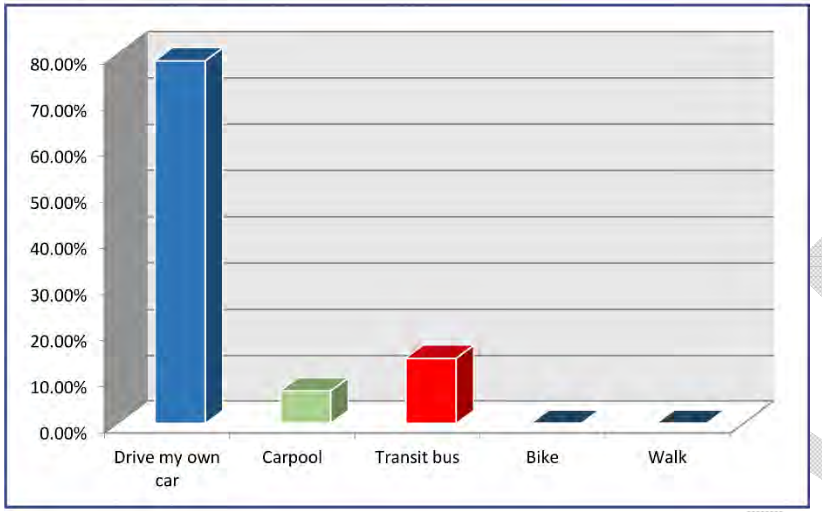


Figure 7b. Touchpad Voting Results

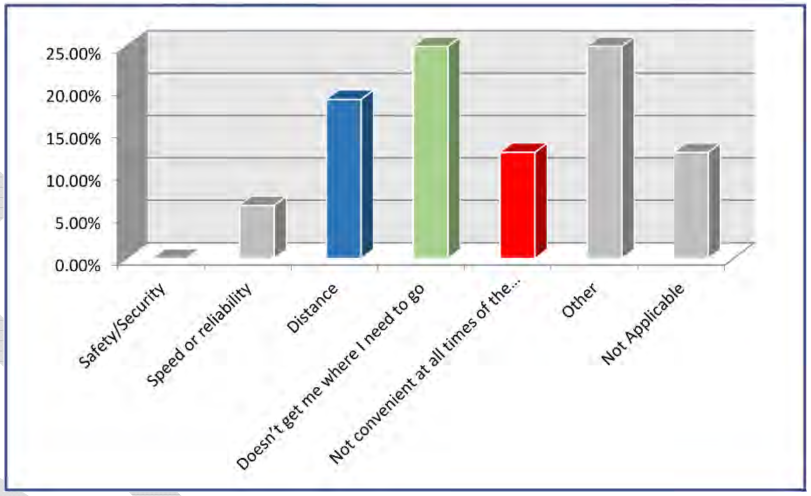
5. For my day-to-day travel I use the following transportation modes: (Multiple Response)

While over three-quarters of the meeting attendees chose to drive their car, one-quarter of the meeting attendees either carpool or use transit.



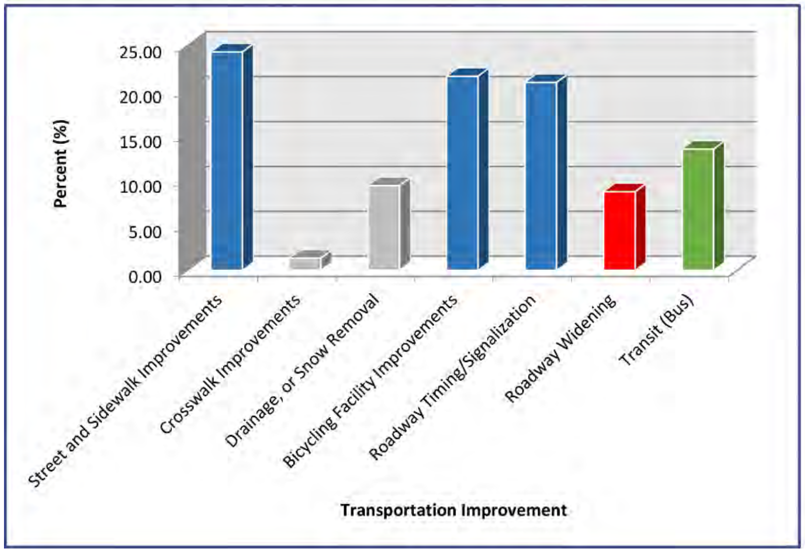
6. If you don't bike, walk, or take transit the primary reason for NOT DOING this is?

Many of the respondents choose NOT to bicycle, walk, or take transit because of concerns with the distance of the trip, connectivity, and convenience.



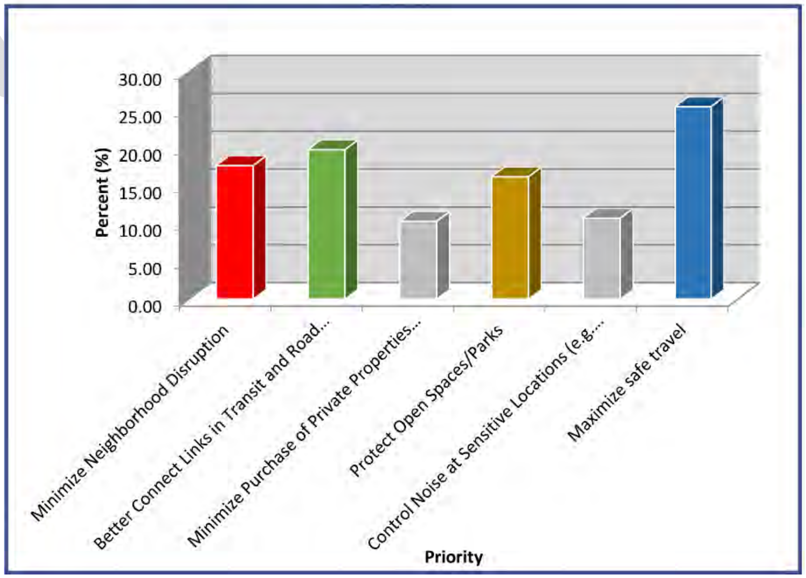
7. The top THREE transportation items I would like to see enhanced in Novi are....

The respondents in almost equal numbers would most prefer improvements to street/sidewalk, roadway signalization and bicycling facilities. The latter is odd, when considering the age of the respondents and the non-use of bicycling. A greater number would prefer transit than road widening.



8. When transportation improvements are made, which items are of most importance to you?

Most meeting participants feel maximizing safe travel is of most importance. But, that number is only slightly more than those who want to improve connectivity in the transportation network and minimize disruption to neighborhoods, parks and open spaces.



5. Multi-modal Alternatives

5.1 Roads

Multi-modal transportation elements were examined in layers, beginning with the most costly-to-implement element – roads. Analysis of 2040 traffic conditions are illustrated in Figure 8 which shows the 2040 volume/capacity (V/C) ratios in the PM peak period. In this analysis, RED indicates the V/C ratio exceeds 1.00, reflecting significant congestion. GREEN indicates significant congestion is not detected by the model. To determine the potential positive impact on congestion, a series of tests was executed (Table 5). Data on the vehicle miles traveled in congested conditions, otherwise known as VMT, were developed (Figure 9a). Also, the hours that vehicles spend in congested conditions were calculated in the traffic assignment model (Figure 9b). The results point to the following alternatives that lessen congestion more than others as pointed out by the green arrows ( ).

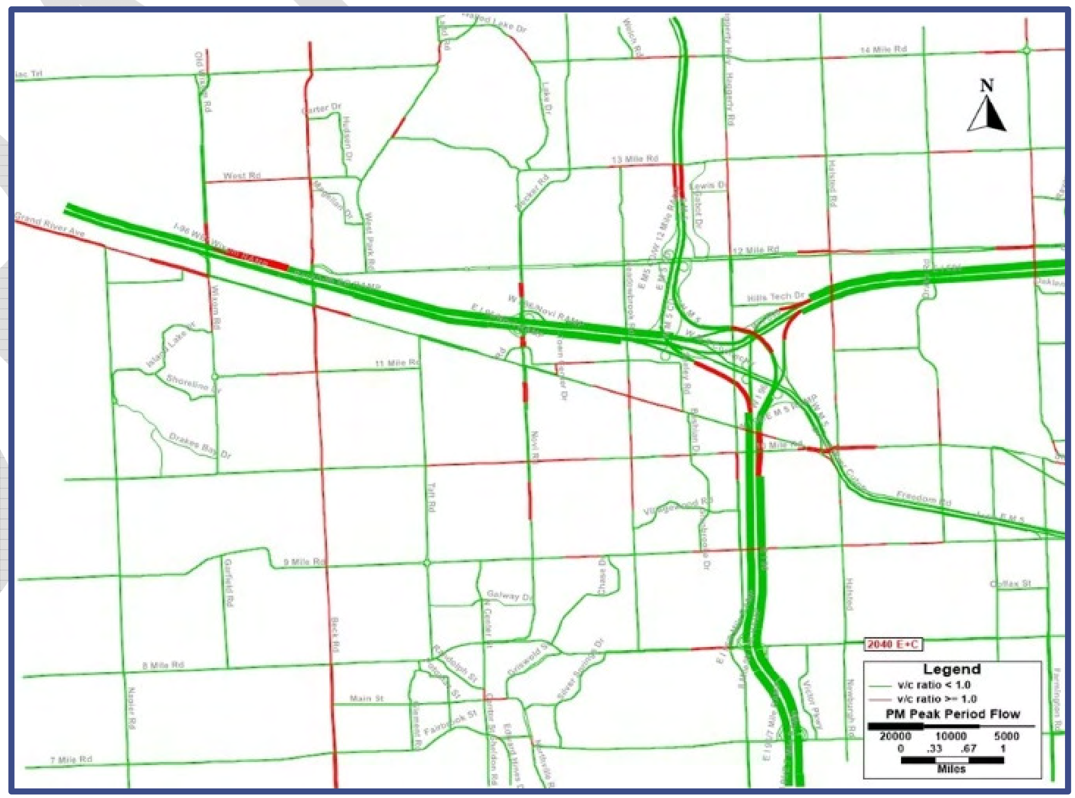
- Alternative 3: Widen Beck from Pontiac Trail to 12 Mile;[3]
- Alternative 7: Widen Beck from Grand River to 8 Mile; and,
- Alternative 11: Widen 10 Mile from Haggerty to Taft.

Combinations of these alternatives were then tested (Table 6). The same two measures of congestion relief were computed. The results in Figures 10a and 10b indicate that the most cost-effective alternative is Alternative I (see) which combines widening Beck Road from 8 Mile Road to Pontiac Trail (Alternatives 3 and 7) and 10 Mile Road from Haggerty to Taft (Alternative 11). The slight improvement with Alternative H comes with the increased cost to widen Meadowbrook Road between 10 and 12 Mile Roads. That link is to be included in a later stage of implementation.

It is also noted that Alternative G is the most expansive improvement scenario as it combines all roads needing improvement but an Alpha Road extension (Alternative 2) and connecting Meadowbrook Road to Twelve Oaks Mall (Alternative 8) because these two projects are too localized to ease congestion.

Alternative G should perform well and demonstrate what could happen if all of Novi's road needs were satisfied. This cannot be accomplished in the near term; there are funding, impact and policy constraints that prevent more road widenings than Beck and 10 Mile Roads. It is further noted that widening Beck and 10 Mile Roads does not address all the congestion expected in 2040, as evidenced by the red/congested paths on Figure 11. Proposed intersection improvements will address a number of locations expected to be congested in the future. These are covered in Section 7.2 of this report (Figure 12).

Figure 8. 2040 E+C PM Peak Period Traffic



Source: The Corradino Group of Michigan, Inc.

[3] Note that Beck Road from I-96 north to Pontiac Trail is in Wixom, but fixing that road was tested as it affects Novi.

Table 5. Basic Alternative Improvements Tested to Relieve Congestion

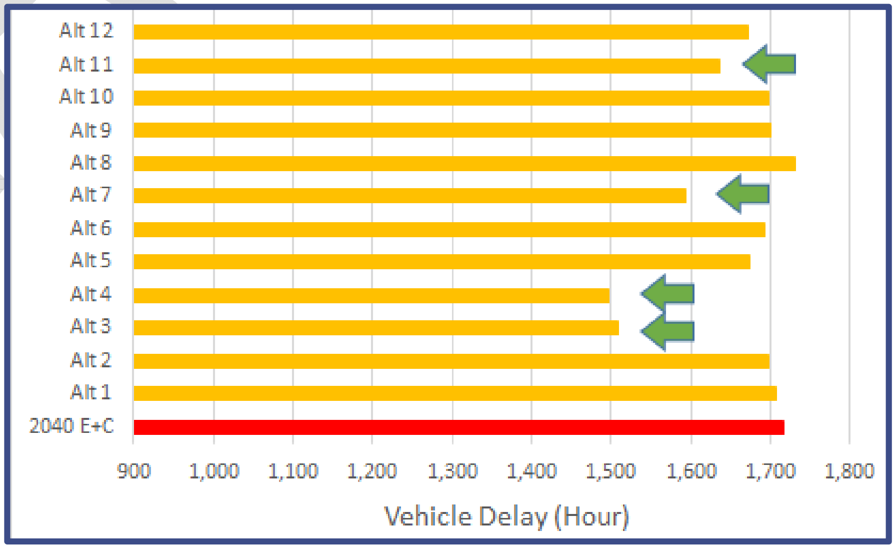
Alt 1 (Widen 12 Mile from Beck to Cabaret Dr)
Alt 2 (Connect Alpha Tech Dr to Beck with Road Extension)
Alt 3 (Widen Beck from Pontiac Trail to 12 Mile)
Alt 4 (Widen Grand River from Napier to Wixom)
Alt 5 (Widen Grand River from Novi to Haggerty)
Alt 6 (Widen Meadowbrook from 10 Mile to 12 Mile)
Alt 7 (Widen Beck from Grand River to 8 Mile)
Alt 8 (Connect Meadowbrook to Twelve Oaks Mall with New Road)
Alt 9 (Widen Haggerty Rd from 12 Mile to Grand River)
Alt 10 (Extend Taft Rd over I-96)
Alt 11 (Widen 10 Mile from Haggerty to Taft)
Alt 12 (Widen Novi from 9 Mile to Nick Lidstrom Dr.)

Source: The Corradino Group of Michigan, Inc.

Figure 9a: Basic Alternatives Test Results
PM Peak Period Over-capacity Vehicle Miles of Travel
(Volume/Capacity ≥ 1.0)

Source: The Corradino Group of Michigan, Inc.

Figure 9b: Basic Alternatives Test Results
PM Peak Period Vehicle Hours of Congested Travel
(Volume/Capacity ≥ 1.0)



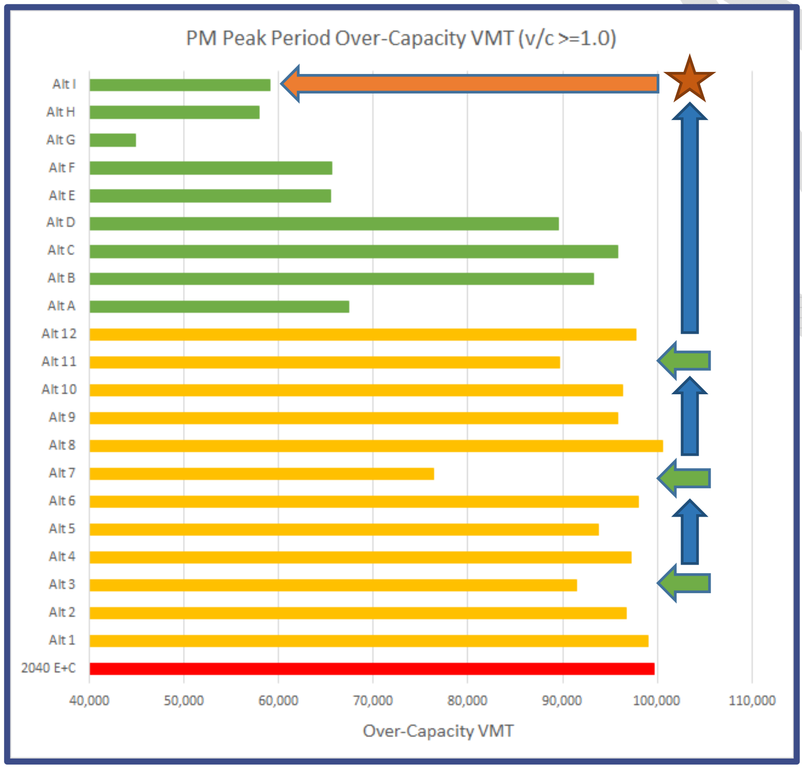
Source: The Corradino Group of Michigan, Inc.

Table 6. Combination Alternatives Tested to Ease Congestion

Alt A (Alt 3 + 7) (Widen Beck Road: Pontiac Trail to 8 Mile)
Alt B (Alt 5 + 6) (Widen Grand River: Novi to Haggerty + Widen Meadowbrook: 10 Mile to 12 Mile)
Alt C (Alt 6 + 9) (Widen Meadowbrook: 10 Mile to 12 Mile + Widen Haggerty: 12 Mile to Grand River)
Alt D (Alt 5 + 6 + 9) (Widen Grand River: Novi to Haggerty + Widen Meadowbrook + Widen Haggerty)
Alt E (Alt 3 + 7 + 10) (Widen Beck + Extend Taft over I-96)
Alt F (Alt 3 + 6 + 7) (Widen Beck + Widen Meadowbrook)
Alt G (All but Alt 2, 8) (All but Alpha Road Extension + Connect Meadowbrook to Twelve Oaks Mall)
Alt H (Alt 3 + 6 + 7 + 11) (Widen Beck + Widen Meadowbrook + Widen 10 Mile)
Alt I (Alt 3 + 7 + 11) (Widen Beck + Widen 10 Mile)

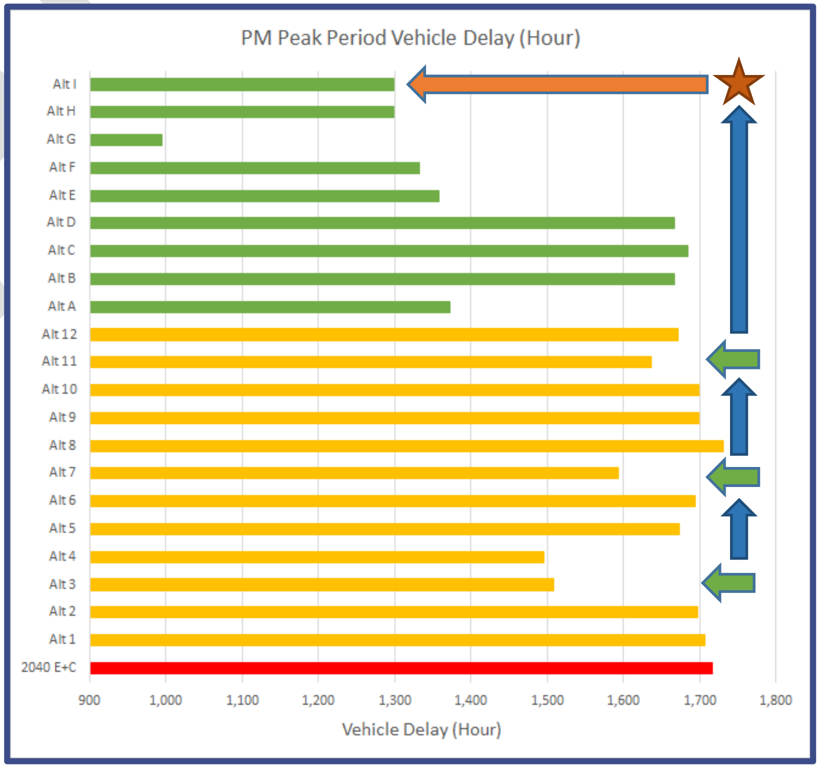
Source: The Corradino Group of Michigan, Inc.

Figure 10a: Combination Alternatives Test Results
PM Peak Period Over-capacity Vehicle Miles of Travel
(Volume/Capacity ≥ 1.0)



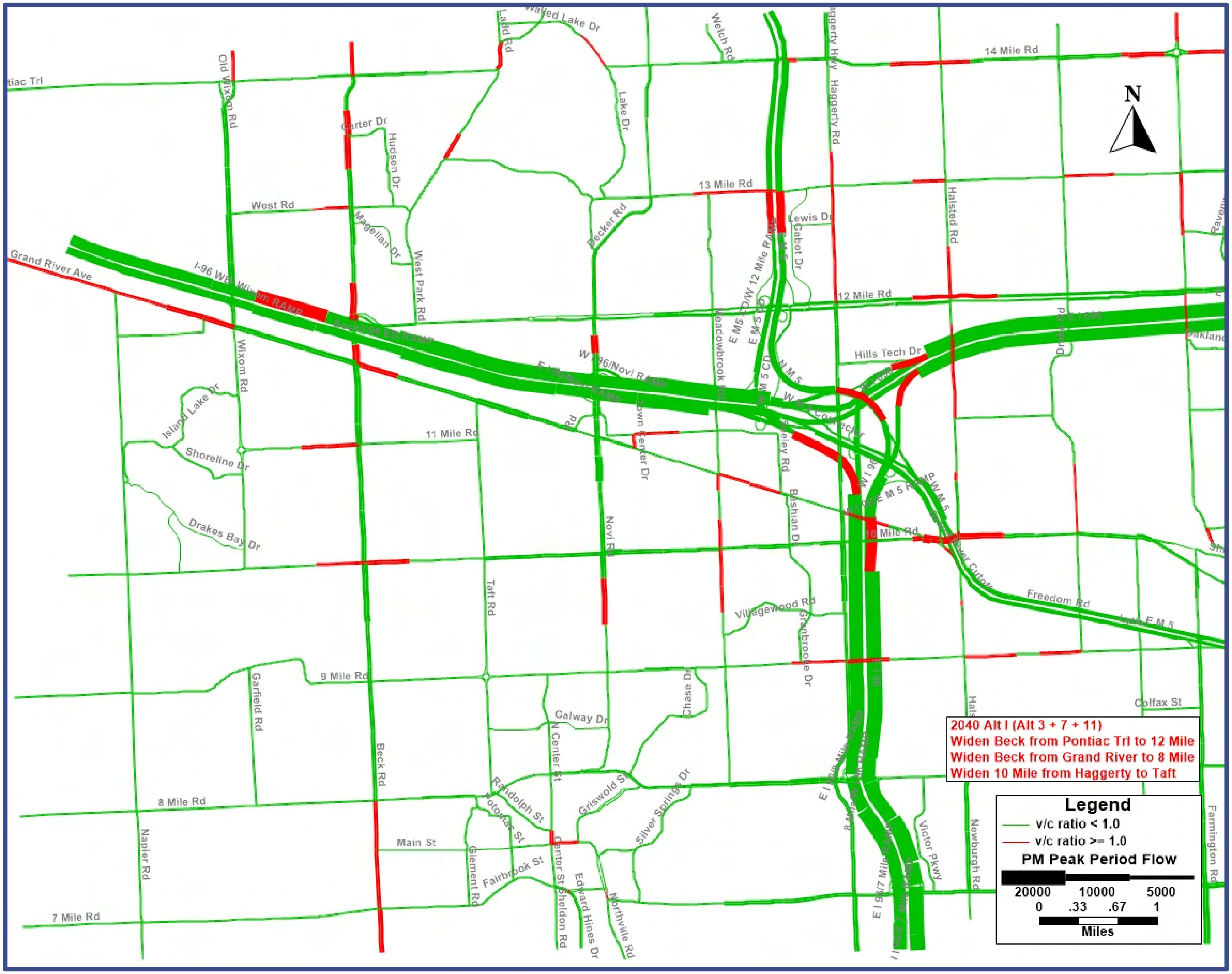
Source: The Corradino Group of Michigan, Inc.

Figure 10b: Combination Alternatives Test Results
PM Peak Period Vehicle Hours of Congested Travel
(Volume/Capacity ≥ 1.0)



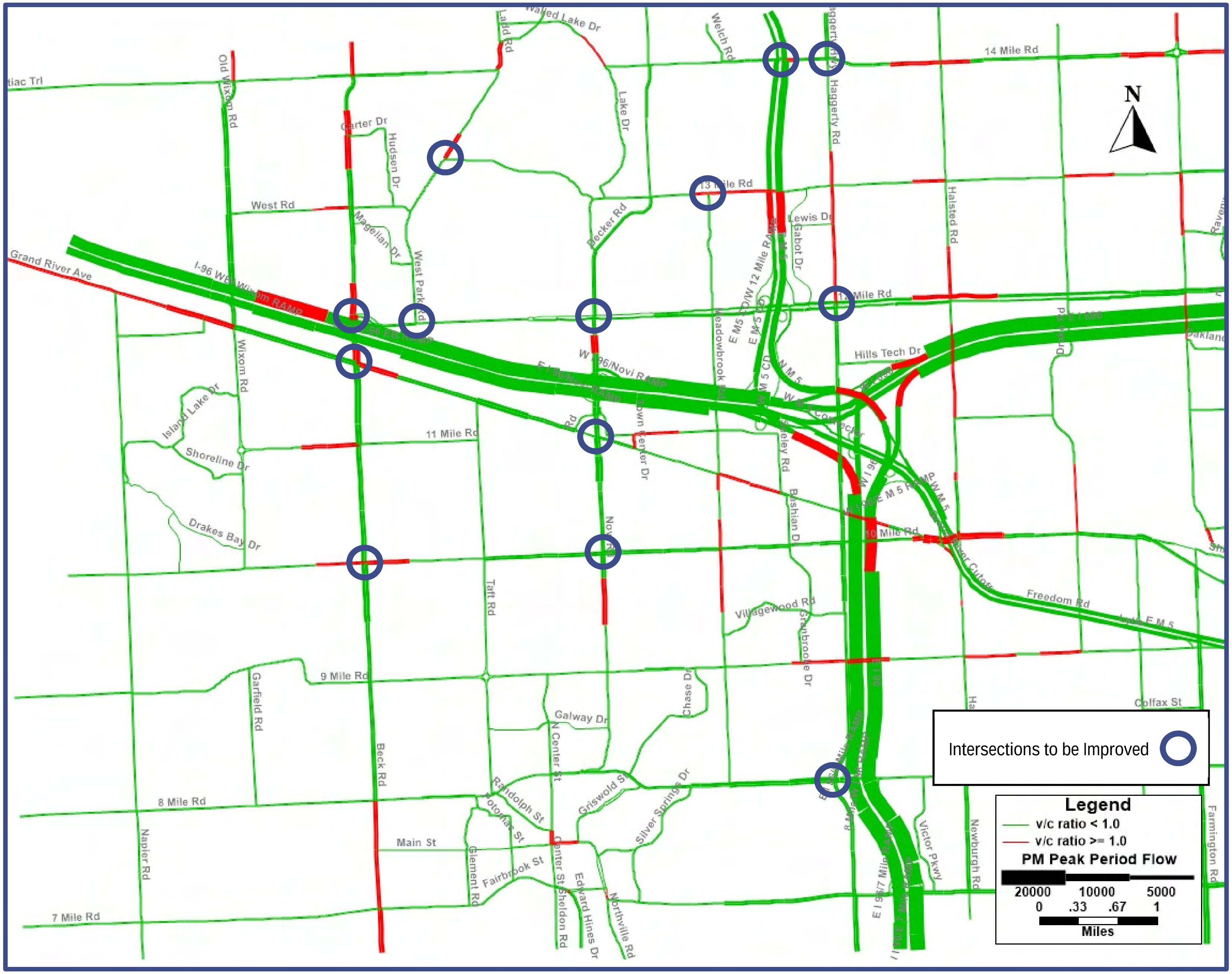
Source: The Corradino Group of Michigan, Inc.

Figure 11. Alternative I with 2040 Traffic



Source: The Corradino Group of Michigan, Inc.

Figure 12. Novi Intersections Proposed to be Improved



Source: The Corradino Group of Michigan, Inc.

5.2 Non-Motorized

With the road priority to improve Beck and 10 Mile Roads, the non-motorized system was examined. It incorporates the city's annual process for identifying and prioritizing its potential non-motorized projects. That process allocates points to proposed sidewalk and pathway segments to prioritize them. Sidewalks, per city ordinance, are six feet wide, pathways are eight feet, and trails are ten feet wide. The screening includes the following factors:

1. Number of crashes within a segment;
2. Road speeds and volumes;
3. Access provided to schools – number and proximity;
4. Access provided to parks;
5. Access provided to hotels;
6. Access provided to shopping;
7. Access provided to places of worship;
8. Connection to system;
9. Population served;
10. Proportion of segment being completed;
11. Expressed public interest; and,
12. Support of the Master Plan.

The top 20 segments that emerge from the screening using these factors are then analyzed again using the following criteria:

1. Ease of construction;
2. Right-of-way availability;
3. Availability of "outside" funding;
4. Relationship to sidewalk or pathway on opposite side of street;
5. Opportunity for private development to build segment; and,
6. Evidence of existing use (worn path).

Some projects/segments that perform well in the priority ranking, but are considered to be part of future development projects, are placed in a "deferred" category pending the associated development project proceeding.

The pace of implementation depends on funding. As each of the top 20 sidewalk/pathway segments are completed, new projects advance to the top 20 for assignment of implementation dates. The current top 20 projects, as listed in the *Annual Non-Motorized Prioritization 2015-16 Update*. are shown in Table 7.

Based on the roadway projects being considered as part of the Thoroughfare Master Plan, seven top 20 listed sidewalk/pathway projects would be constructed as the corresponding roadway segment is improved along Beck Road, between 8 Mile Road and Grand River Avenue, and 10 Mile Road between Taft Road and Haggerty Road (Table 8 and Figure 13). Other non-motorized projects will continue to be implemented under the Thoroughfare Master Plan as part of Novi's Annual Non-Motorized Prioritization Process.

Table 8. 2015–16 Top 20 Priority Pathway/Sidewalk Segments Associated with Potential Road Widening Projects

Road Segment		Non-motorized Project	Non-motorized Length	Capital Improvement Program Yr.	Cost
P7	Beck Road – 8 Mile to Grand River	Rank 8 – No. 39, west side	1,100'	2017–2018	$155,000
P11	10 Mile – Taft to Haggerty	Rank 1 – No. 81b, south side Rank 7 – No. 62, north side Rank 11 – No. 90, south side	2,750' 400' 2,400'	2017–2018 & 2019–2020 2015–2016 2018–2019	$775,000

Source: The Corradino Group of Michigan, Inc.

Table 7. Table 4A from Annual Non-Motorized Prioritization 2015-16 Update

Annual Non-Motorized Prioritization: 2015-2016 Update

Table 4A:
2015-16 Top 20 Priority Pathway and Sidewalk Segments excluding deferred segments
City of Novi

Overall Segment Rank	Segment Item #	Section #	Type	Side of Street	Location	From	To	# of Pieces in Segment	Segment Length (ft.) excluding Developer Planned & Completed Pieces	Notes
1	81B		P	south	**Ten Mile**	Willowbrook	Haggerty	1	2,750	17-18 & 19/20 CIP
2	81A	25	P	south	**Ten Mile**	Meadowbrook	Willowbrook	1	2,530	17-18 & 19/20 CIP
3	9B	4	S	south	**Pontiac Trail**	Wedgewood	West Park	2	2,560	16-17 & 17-18 CIP
5	120A	36	S	west	**Haggerty**	Eight Mile	N of Orchard Hill	2	1,390	
6	9A	4	S	south	**Pontiac Trail**	Beck	Wedgewood	1	2,440	16-17 & 17-18 CIP
7	62	22	S	north	**Ten Mile**	Eaton Center	Churchill Crossing	1	400	15-16 CIP
8	39	17	P	west	**Beck**	Eleven Mile	Providence	1	1,100	17-18 CIP
9	93B	27	S	north	**Nine Mile**	Plaisance	Taft	2	650	
11	90	26	P	south	**Ten Mile**	Novi Rd.	Chipmunk	1	2,400	18-19 CIP
11	119c	36	S	east	**Meadowbrook**	Eight Mile	N of Llewelyn	1	1,200	18-19 CIP
13	84B	25	S	east	**Meadowbrook**	Nine Mile	Chattman	1	2,050	19-20 CIP
14	119B	36	S	east	**Meadowbrook**	Singh Blvd	N of Llewelyn	1	1,300	18-19 CIP
15	93A	27	S	north	**Nine Mile**	Novi Rd.	Plaisance	1	2,650	
16	70	23	P	west	**Meadowbrook**	Eleven Mile	Gateway Village	3	900	
17	99A	29	P	south	**Ten Mile**	Wixom	400' E of Lynwood	1	2,900	17-18 CIP
20	5	2	S	south	**Fourteen Mile**	Beachwalk Apartments	East Lake	1	600	19-20 CIP
21	119A	36	S	east	**Meadowbrook**	Nine Mile	Singh Blvd	1	1,300	18-19 CIP
22	84A	25	S	east	**Meadowbrook**	Ten Mile	Chattman	1	2,350	19-20 CIP
23	99B	29	P	south	**Ten Mile**	400' E of Lynwood	Beck	1	1,100	17-18 CIP
24	120B	36	S	west	**Haggerty**	Orchard Hill	High Pointe	1	375	
									32,945	

Legend S= 6 ft. sidewalk P= 8 ft. pathway

Segments with pathways or sidewalks on most of the opposite side of the street - *note that these segments may be critical for system connectivity & must be analyzed separately for connectivity*

Segments with a higher ranking segment planned for the opposite side of the street - *note that these segments may be critical for system connectivity & must be analyzed separately for connectivity*

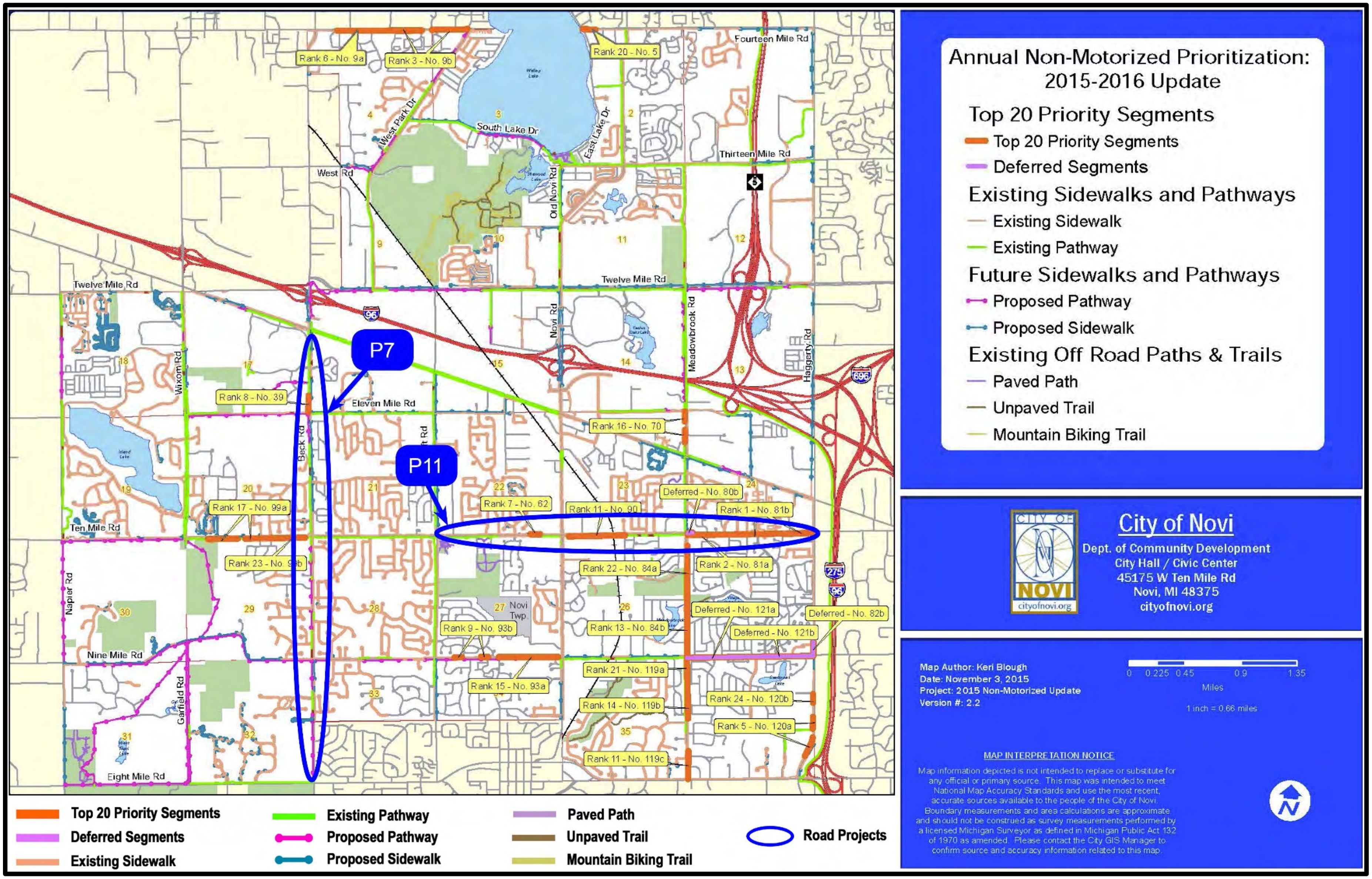
Short Segments (400 ft. or less

Scheduled Segment

CIP Budget Year

Source: Annual Non-Motorized Prioritization 2015-16 Update

Figure 13. Proposed Thoroughfare Road Improvement Projects Superimposed on 2015–16 Top Priority Pathway and Sidewalk Segments Map



Source: City of Novi, Michigan, and The Corradino Group of Michigan, Inc.

5.3 Transit

5.3.1 Regional Transit

To improve transit, a regional approach was first examined by linking Novi to the SMART (Suburban Mobility Authority for Regional Transportation) bus system. SMART is the transit provider in Oakland County. Its Community Partnership Program (CPP) supports local transit service in 75 municipalities by leveraging federal funding and returning those funds to local communities to build their own transit program. SMART supports both fixed route and dial-a-ride (demand responsive) services. The latter is similar to Novi's Older Adults transportation program. And, while SMART routes do not extend into Novi, as the city has opted out of the millage that underwrites service, SMART does provide some funding of the Older Adults transportation program.

It is important to note that the Regional Transit Authority (RTA) of Southeast Michigan has a measure on the ballots of Washtenaw, Oakland, Wayne, and Macomb counties in November, 2016, that, if successful, would fund regional transit. The referendum will be a regional yes or no vote; there can be no "opt out" for individual cities or counties.

RTA has developed a Regional Master Transit Plan to guide transit developments in Southeast Michigan over the next 20 years. It:

- Examines the state of the current transit system and explains what will happen if nothing changes;
- Determines the appropriate mix of transit service to meet the needs of Southeast Michigan;
- Recommends future transit service, including rapid transit and better coordination among the existing providers; and,
- Presents a funding strategy and the steps needed to make this plan a reality.

SMART's Master Transit Plan indicates Novi has an "emerging" transit demand. It offers a number of ways to serve it:

- Premium service, such as bus express routes to the Detroit-Wayne County Airport (DTW);
- Cross-county service; and,
- Demand-responsive service like Novi's Older Adults transportation program.

To examine the potential cost of a regional transit approach in the Novi TMP, a logical starting point was to extend existing SMART bus routes that today serve communities to the east. The current westernmost limit of these routes is Haggerty Road (Figure 14). Routes 330 and 740 could be extended farther to the west into Novi. Route 780 could extend south from Maple Road along Haggerty Road.

If Route 330 were extended, it could serve the many attractions along Grand River Avenue, terminating at the Providence Park Hospital campus (Figure 15). Routes 740 and 780 could follow a common path west along 12 Mile Road to circulate through the Twelve Oaks Mall. These proposals reflect the Regional Master Plan for Novi (Figure 16).

Figure 14. Current SMART Bus Service near Novi

Source: SMART

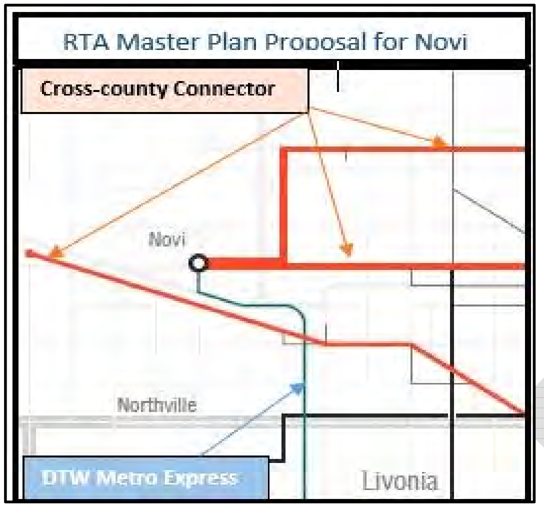
Annual costs to extend all these SMART routes, on the basis for the existing number of scheduled runs and using SMART's cost per mile and per hour, could be almost $15 million (Table 9). If limited weekday service were provided (two inbound trips in the morning and two outbound in the evening), the cost could be near $2.5 million.

In reviewing these services with the TMP Steering Committee, they were considered too expensive for Novi to cover alone, unless the regional transit millage passes.

It is estimated that 1 mil of property taxes in the City of Novi would amount to approximately $3.2 million per year. By legislative mandate, no county can receive transit services which cost less than 85% of what it contributes in taxes. If the Master Transit

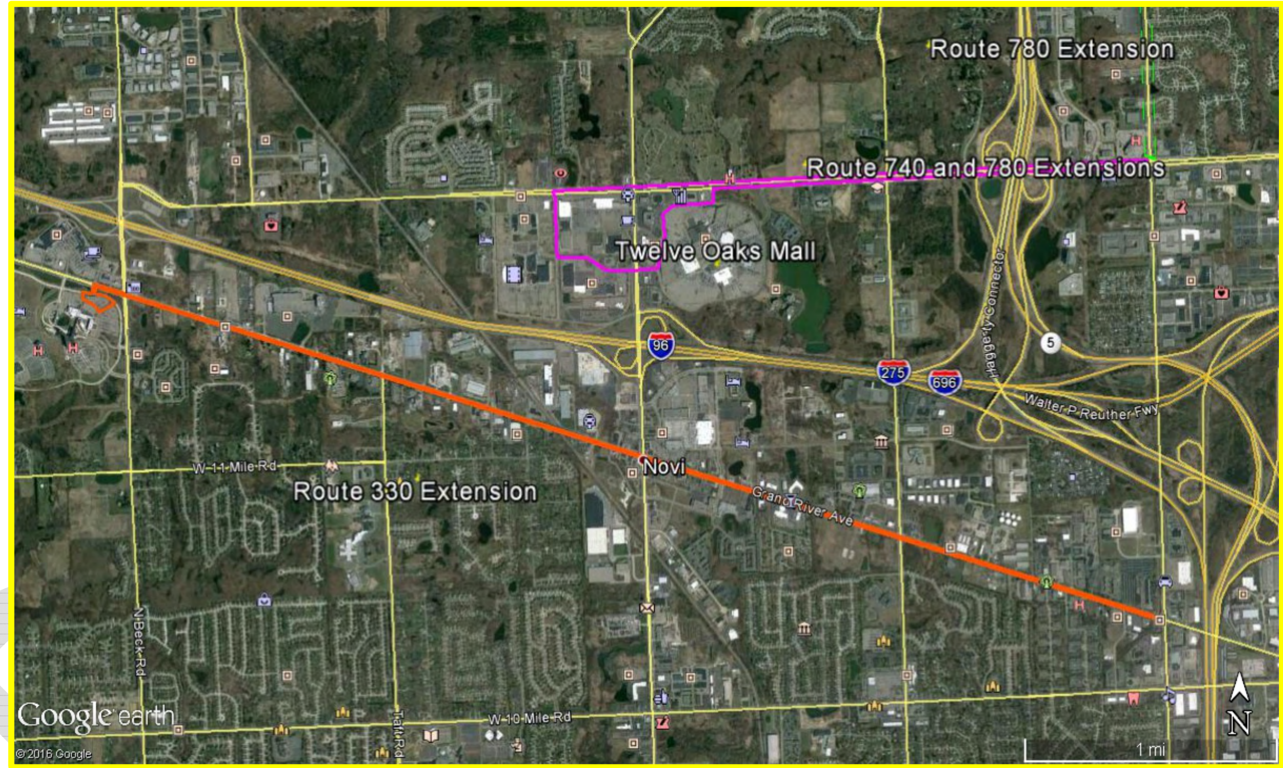
Plan services, noted above, are implemented, it appears to be good for Novi. There is a caveat: It is a formula unique to Oakland County and does not imply an 85% contribution formula applies to the City of Novi although it does look like the proposed services will be extensive for Novi.

Figure 16. RTA Master Plan Proposal



Source: SMART

Figure 15. Example Extensions of SMART Routes 330, 740, and 780



Source: The Corradino Group of Michigan, Inc. and Google Earth

Table 9. Potential Costs to Extend SMART Routes 330, 740, and 780 in Novi

	Extension in Miles	Cost/Mile*	Cost/Run	Runs/Wkday	Runs/Sat	Runs/Sun	Yearly Runs	Annual Cost
Full Service								
Extension of Route 330	9.4	$100	$940	19	14	0	5668	$5,327,920
Extension of Route 740	5.3	$ 100	$530	18	15	12	6084	$3,224,520
Extension of Route 780	9.2	$100	$920	20	17	13	6760	$6,219,200
Limited Service								
Extension of Route 330	9.4	$100	$940	4	0	0	1040	$977,600
Extension of Route 740	5.3	$100	$530	4	0	0	1040	$551,200
Extension of Route 780	9.2	$100	$920	4	0	0	1040	$956,800

**Operating Expense per Hour as reported to MDOT for 2014.*

Source: The Corradino Group of Michigan, Inc.

5.3.2 Older Adults Services Transportation

The City of Novi Older Adult Services Transportation (OAST) provides specialized transportation for Novi residents age 55+ and those under 55 with a limiting disability. Service is to medical appointments, shopping, special events, classes, etc. The program operates Monday through Friday, 8am–5pm and on Saturday, 9am–3pm; there are no Sunday operations. Reservations are required at least two days in advance and trips are scheduled based on availability. In FY 2014/2015, OAST provided 12,034 one-way rides (including for special events) using seven vehicles. Passengers may travel anywhere within the City of Novi for $3 per one-way ride and $5 per one-way ride for trips outside the city but within ten miles from the Novi Civic Center. There are complimentary rides to the Meadowbrook Activity Center, the Civic Center, Novi's Public Library, and to a City of Novi special events or programs within the city limits.

The OAST current annual budget of about $160,000 is supported by fare box revenues ($30,000), the City of Novi General Fund ($25,000), the Parks, Recreation & Cultural Fund) ($27,000), SMART ($54,450), program donations ($20,000), and advertising ($2,400), the TMP expects the service to continue in its current form which costs about $160,000 per year. Passage of the RTA plan may cover these costs.

Funding Source	Amount	% of Funding
Fare Box	$30,000	19%
Novi General Fund	$25,000	16%
Parks, Recreation	$26,916	17%
SMART	$54,454	34%
Donations	$20,000	12%
Advertising	$2,400	2%
TOTAL	*$158,770*	*100%*

Source: City of Novi, Michigan

5.3.3 Transit Circulator

A circulator between the Twelve Oaks Mall area and Town Center area was analyzed for service on Saturdays and recommended as a six-month "trial" project. The estimated cost is $45,000. The vehicles would be those of the OAST available for six hours on Saturdays. If the service proves successful, additional hours of service may be beneficial, which may require additional equipment.

Circulator Bus

5.3.4 Future Possibilities

Autonomous (self-driving) vehicles are the future of transportation around the world. Traditional modes of transportation are being inundated with technology, and as with everything else technology-driven, the future of transportation is evolving at a rapid pace. The limitations are, in fact, not the autonomous vehicles and technology, as much as the regulations that need to be put into place.

In that regard, federal regulators plan to issue guidance within months on preferred performance characteristics and testing methods for driverless vehicles and collaborate with state officials on policies. And, the federal government has proposed to spend $4 billion to encourage developing driverless vehicles.

While researchers began building autonomous vehicles that could be tested on public roads, the concept evolved into Connected Autonomous Vehicles (CAVs) which can communicate with each other, and communicate with infrastructure, much more efficiently and as fast as the human brain can respond.

CAVs, once fully implemented, have the potential to improve our way of life. Among the numerous benefits are:

- Improving safety by reducing the number of crashes that occur annually on our roadways; and,
- Reducing:
  - ✓ traffic congestion;
  - ✓ speeding;
  - ✓ emissions/pollution;

- ✓ impaired driving;
- ✓ texting-while driving; and,
- ✓ road rage.

In addition to these transportation system improvements, CAVs also have the potential to improve daily living, particularly for seniors and the disabled. Concerns like: *"How will I get to the grocery store or the doctor or just get out of the house because you can no longer safely operate a moving vehicle"* can be addressed.

To meet these needs today, there are the Older Adults Services transportation program, taxicabs, Uber, and Lyft. In the next several years, there will also be CAVs. Government support of this technology, could be the catalyst for funding a mass transit system that includes a fleet of CAVs. The federal government has been receptive and willing to embrace CAVs because of their social benefits. Providing an alternative to bus/van and other transit modes/vehicles will help encourage more government funding to make CAVs a reality for public use. Concern about loss of revenue from existing transportation systems is on the opposite side of this discussion. But, as explained in the article: *Autonomous vehicles will have tremendous impacts on government revenue*,[4] there is a potential for significant cost savings to governments compared to the loss of revenue.

Consider, that If you do not possess the ability to operate an auto, how transformative it could it be for a vehicle to come to you, on demand, and provide travel, with comfort, safety, and security?

6. Funding Situation

6.1 State and Federal Programs

After years of frustration at the federal and state levels, both governments enacted transportation funding legislation in 2015. The state program doesn't begin to provide monies until January 1, 2017; it then takes until fiscal year 2020 for the full effect (estimated to be $1.234 billion per year) to be felt. Those funds are to be distributed 696 ways: MDOT, 80 transit agencies, 83 counties, and 533 villages and cities.

At the federal level, the FAST Act (Fixing America's Surface Transportation) will provide five years (FY 2016 through FY 2020) of funding certainty. For Michigan, that represents $1.02 billion in the first fiscal year and $1.17 billion in FY 2020 (Figure 17). This is about $52 million (5.1%) of net new money in 2016 versus 2015 and, then, about $20 to $25 million (about 2.25%, on average) of net new money each year after. When combined with state funding, cities in Michigan can expect $66.4 million in FY 2017, when additional Michigan funding begins to flow. That will grow to $186 million in FY 2020 (Figure 18). It must be kept in mind this funding for citie/villages will be divided 533 ways. Novi is the 27th largest city in Michigan with about 1% of the total city/village population.

It is also important to recognize that these funds are to be allocated overwhelmingly to routine maintenance and preservation of existing roads (Figure 19). A relatively small amount will be available for projects that will increase capacity.

6.2 Novi Funding

The City of Novi annually spends approximately $11.5 million on roadway capital improvements and another $3 million on maintenance.

Novi's projected sidewalks/pathways program for the five fiscal years ending in FY 2020, totals $11.4 million, all but $733,000 to come from the Municipal Street or Major Road Funds. Phase II of the M5/I-275 Regional Trail Connection is the project for which $733,000 is needed from local/Novi funds.

The Older Adults Services transportation program is supported by several sources, including non-government donations, advertising and fare revenue.

[4] Kevin C. Desouza, Nonresident Senior Fellow, Governance Studies, Center for Technology Innovation; Kena Fedorschak, MBA candidate, W.P. Carey School of Business, Arizona State University

Figure 17. Federal Funding for Michigan

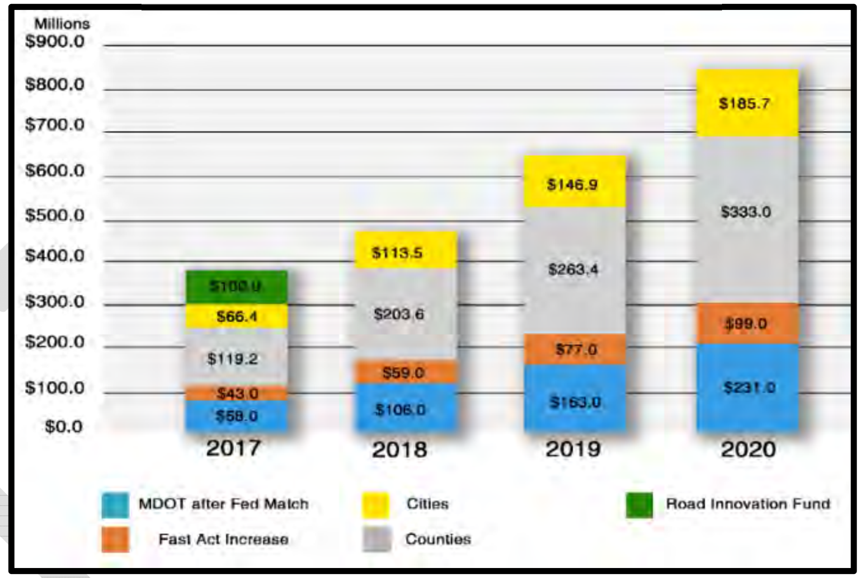
FAST Act – Michigan Funding

(Millions)	Map-21	FAST Act				
	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Total Highway Funding	$1,016	$1,068	$1,090	$1,114	$1,139	$1,166
Increase From Prior Year	0.0%	5.1%	2.2%	2.2%	2.2%	2.4%

Source: MDOT

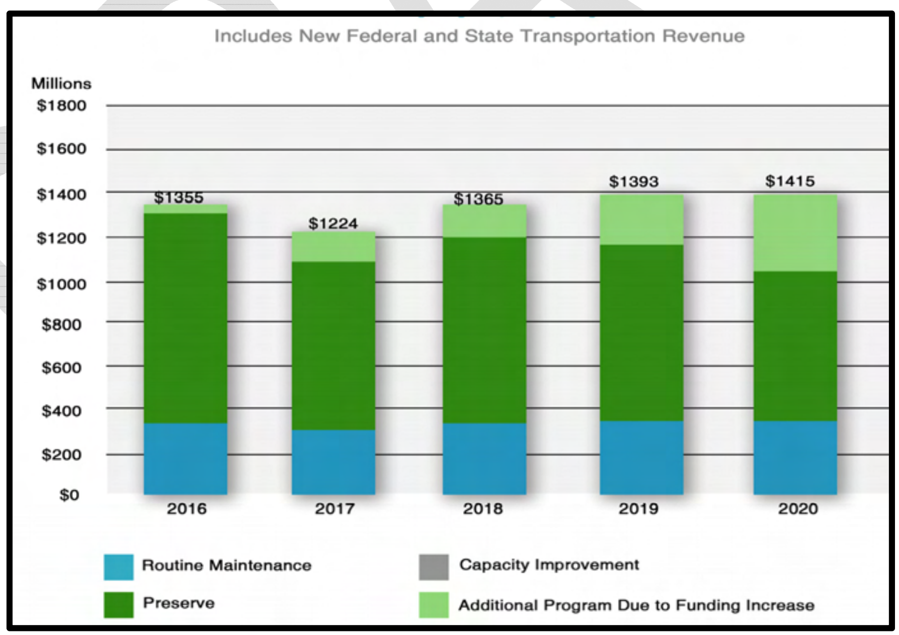
Source: NTH Consultants, Ltd. Webinar Slides

Figure 18. Increased Transportation Revenues



Source: NTH Consultants, Ltd. Webinar Slides

Figure 19. Michigan Highway Program Investment by Category, FY 2016 to 2020



Source: NTH Consultants, Ltd. Webinar Slides

7. Recommendations

In preparing recommendations (Table 10) for the Novi Thoroughfare Master Plan, the City's "Complete Streets" policy, adopted in 2010, has been an underlying principle. "Complete Streets" are key to creating healthy, active communities. The City's policy recognizes that streets serve multiple purposes and they must be designed to balance the needs of all transportation users. The preliminary recommendations cited here recognize the need to involve multiple uses, including safe, active and ample space for pedestrians, bicyclists and transit riders. Working with the Steering Committee, a practical set of improvements has been selected for the road, intersection, non-motorized, and transit projects to be implemented.

7.1 Roads

Widening Beck and 10 Mile Roads is likely to cost $21.5 million and $19.8 million, respectively. Assuming these are done sequentially over the period FY 2017-2025, inclusive, they represent a small portion of the total federal and state funds available to Michigan cities and villages. The consultant believes this program is aggressive, but achievable.

The widening plan for Beck Road is summarized on Table 11, and illustrated in the appendix to this report. It should be noted the $21.5 million cost is for only the section in Novi. The remaining section north to Pontiac Trail will be the responsibility of Wixom. Likewise, possible environmental impacts are presented only for Beck Road in Novi. But, optimal return on Novi's investment will only be achieved if the section in Wixom is improved. The concept for 10 Mile Road is a five-lane section with curb, gutter, and sidewalk.

There are other potential capacity improvements needed to Meadowbrook and Grand River Avenue. However, because the funding picture is unclear, those projects are in the "beyond 2025" timeframe. In the more-immediate future, improvements to intersections along these roads can be addressed as discussed in Section 7.2.

7.1.1 Potential Impacts of Road Widening

The potential environmental impacts related to the widening of Beck Road, between 8 Mile Road and just south of Grand River Avenue, plus 10 Mile Road, between Taft Road and Haggerty Road, are summarized in Table 12.

Wetlands are widespread in Novi, especially in the western portion of the city. The basic rules related to wetlands are: if they can't be avoided, then their use must be minimized. If their use can't be minimized, then the impact must be mitigated. Usually, mitigation means replacement of more than two acres of wetland for every acre used, because the replacement wetlands do not always function as designed. Taken together, the widening of Beck and 10 Mile Roads would likely affect 2.5 acres of wetland. The Novi total includes the pond on the south side of 10 Mile Road east of Pheasant Run.

Protecting ***floodplains and floodways*** is to address risks to structures and property by preventing obstructions that would increase flooding. Occupation of a floodplain generally requires demonstrating how flooding risk will be avoided under permitting by the Michigan Department of Environmental Quality. For Beck Road, about 0.2 acres of floodplain are affected; it is 0.6 affected acres along 10 Mile Road.

There are regulations to protect natural streams to ensure proper drainage. Widening of Beck Road in Novi is expected to affect about one-half mile of streams. Widening of 10 Mile Road is likely to impact about 950 feet. Proper design must address the impacts.


Historic Church

The church on the west side of Beck Road 600 feet south of 10 Mile Road is the only known designated historic site potentially affected. The Novi Historical Society notes the church was established in 1875 on Grand River Boulevard, west of Novi Road. It was closed for some years starting in the 1920s. In 1997 the church was moved to Beck Road. It would not be affected by the widening of Beck, but its presence is noted. It would not ordinarily be considered eligible for the *National Register of Historic Places* because it has been moved. However, if it were to be considered "eligible," it would be subject to the regulations promulgated under the National Historic Preservation Act which require certain kinds of protection.

Table 10. Novi Thoroughfare Master Plan Recommendations

Widening/Capacity Improvement		Estimated Cost[1]	Implementation Period
Beck Road	8 Mile Road to Grand River Avenue	$21.5 million	FY 2017–2021
–Segment A	–8 Mile Road to 9 Mile Road	$6.3 million	FY 2017–2018
–Segment B	–9 Mile Road to 10 Mile Road	$5.6 million	FY 2018–2019
–Segment C	–10 Mile Road to 11 Mile Road	$6.3 million	FY 2019–2020
–Segment D	–11 Mile Road to Grand River Avenue	$3.3 million	FY 2020–2021
10 Mile Road	Haggerty Road to Taft Road	$19.8 million	FY 2021–2025
Meadowbrook Road	10 Mile Road to 12 Mile Road	TBD	After 2025
Grand River Avenue	Novi Road to Haggerty Road	TBD	After 2025
Novi Road	9 Mile Road to 10 Mile Road	TBD	After 2025

Intersection Improvements	Estimated Cost	Time Frame
Beck Road at 10 Mile Road	$750,000	See footnote 2
Beck Road at I-96 Ramps	$300,000	See footnote 2
Beck Road at Grand River Avenue	$750,000	In progress
West Park Drive at 12 Mile Road	$215,000	FY 2019–20
West Park Drive at South Lake Drive	$175,000	FY 2019–20
Novi Road at 10 Mile Road	$75,000	FY 2018–19
Novi Road at Grand River Avenue	$3,250,000	FY 2018–19
Novi Road at 12 Mile Road	$10,000	FY 2018–19
Meadowbrook at 13 Mile Road	$200,000	FY 2018–19
Haggerty Road 8 Mile Road	$5,000	FY 2016–17
Haggerty Road at 12 Mile Road	$35,000	FY 2016–17
Haggerty Road at 14 Mile Road	$40,000	FY 2016–17
M5 at 14 Mile Road	$3,000	FY 2016–17

Sidewalks and Pathways	Segment	Estimated Cost	Time Frame
South side of 10 Mile Road	Meadowbrook to Haggerty	$745,000	FY 2019–22
South side of Pontiac Trail	Beck to West park	$490,000	FY 2017–19
West side of Haggerty Road	8 Mile to High Pointe	$295,000	FY 2019–20
North side of 10 Mile road	Eaton Center to Churchill Crossing	$175,000	FY 2018–19
West side of Beck Road	11 Mile to Providence	$185,000	FY 2018–19
North side of 9 Mile Road	Novi Road to Taft	$415,000	FY 2018–21
South side of 10 Mile Road	Novi Road to Chipmunk Trail	$345,000	FY 2019–20
East side of Meadowbrook Road	8 Mile to 9 Mile	$490,000	FY 2019–22
East side of Meadowbrook Road	9 Mile to 10 Mile	$615,000	FY 2019–22
West side of Meadowbrook Road	11 Mile to Gateway Village	$450,000	FY 2019–20
South side of 14 Mile Road	Beach Walk to East Lake	$95,000	FY 2016–17

Transit	Service	Estimated Cost	Time Frame
Older Adult Services Transportation	Continuation of Current Service	$160,000/year	Ongoing
Novi Mall Circulator	Six-month demonstration	$45,000	FY 2017

[1] 2016 dollars
[2] To be coordinated with widening Beck Road
Source: The Corradino Group of Michigan, Inc.

Table 11. Proposed Beck Road Improvement Cross Section and Cost Summary

Segment	Length	Existing Section	Proposed Section	Parcels Affected	Estimate (2016)
8 Mile Road to 9 Mile Road	1 Mile	2 Lanes	5 Lanes	28	$6,293,100
9 Mile Road to 10 Mile Road	1 Mile	2 Lanes	5 Lanes/4 Lane Boulevard	18	$5,564,800
10 Mile Road to 11 Mile Road	1 Mile	2 Lanes	5 Lanes/4 Lane Boulevard	6	$6,315,400
11 Mile Road to Grand River Avenue	0.45 Miles	3 Lanes	5 Lanes	13	$3,323,200
TOTAL	3.45 Miles			65	$ 21,496,500

Source: The Corradino Group of Michigan, Inc.

Table 12. Summary of Potential Environmental Impacts
of Widening Beck Road and 10 Mile Road

	Beck Road, 8 Mile to Grand River*	10 Mile Road, Taft to Haggerty
Wetlands (acres)	1.7	0.8
Floodplains – Zone AE (acres)	0.2	0.6
Streams (in linear feet)	2,636	938
Historical Resources	None	None
Parkland	None	0.6 acres of Fuerst Park
Relocations	None	1 Vacant Single Family
Land Use (acres):		
Commercial/Office	0.8	1.6
Single Family	3.3	0.5
Multiple Family	0.5	0.6
Industrial	0.0	0.7
Railroad	0.0	0.3
Public/Institutional	1.4	0.9
Recreation/Conservation	0.8	1.2
Vacant	2.7	1.5
Water	0.1	0.1
Total Acres	9.6	7.4
Threatened/Endangered Species	See text	See text
Potential Contamination	See text	See text

** Novi values are based on the city's GIS system*

*** Wixom's values are based on mapping available on their Web site*

Source: City of Novi GIS and The Corradino Group of Michigan, Inc.

A small sliver of Fuerst Park, which is part of Novi's Civic Center complex at the southeast corner of Taft and 10 Mile Roads, would be required for the widening of 10 Mile Road. Some roadway widening has already occurred there with previous intersection work. Nonetheless, the use of this land will likely be subject to Section 4(f) of the National Transportation Act, which was written to protect conversion of parkland to transportation uses. Because the city controls the property, and it was not developed with money from the Land and Water Conservation Fund (Section 6[f]) of the National Parks Service, problems are not anticipated, as long as the necessary procedural steps are followed.

One vacant single-family residence, north of 10 Mile Road at the intersection with Beck Road would be affected. The home and land are now owned by Providence Hospital. About 3.3 acres of residential land abutting the right-of-way would likely be used to widen Beck Road in Novi, an acre in Wixom, and one-half acre along 10 Mile Road.

Property acquisitions are mainly strips of land along each road. Sometimes the city owns the land between the road and the newer sidewalks and sometimes not.

If federal funds are used, it is expected that widening Beck Road will be subject to noise analysis when the environmental clearance document is prepared. There are areas along Beck Road where clusters of homes have direct exposure to noise from Beck Road. These areas should be reviewed in evaluating noise abatement.

A review of threatened and endangered species[5] finds the Eastern Mississauga rattlesnake (*Sistrurus catenatus*) (proposed as a federal threatened species) is found in Oakland County (records are kept by county). Experts will look for evidence of this snake during design. Both road projects are within the range of the Indiana bat (*Myotis sodalis*) (endangered) and northern long-eared bat (*Myotis septentrionalis*) (threatened), both of which have suffered catastrophic losses due to white-nose syndrome. Experts will have to determine during roadway design if evidence exists of the presence of either of these species.

Poweshiek Skipperling Butterfly

The Poweshiek skipperling butterfly (*Oarisma poweshiek*) (endangered) is found in Oakland County, but its specific habitats are not near the project. As with the bats, coordination will have to occur with U.S. Fish & Wildlife Services, at the time the projects are designed.

A contaminated site along the Beck and 10 Mile Road corridors would be a leaking underground storage tank (LUST) that has not been completely remediated. A review of the Michigan Department of Environmental Quality (MDEQ)/Licensing and Regulatory Affairs (LARA) Web site[4] indicates there is one such site – Sovel's Service Center – at 41425 W 10 Mile Road. The status of the LUST will need to be checked during roadway design.

During the environmental review phase of project design, a records check and "walkover" will likely be conducted to make sure there are no former uses of contaminating materials, including agricultural pesticides and herbicides.

In summary, these environmental issues are within the normal range for a roadway widening project in an urban setting.

7.2 Intersections

Crash data were received from the Traffic Improvement Association of Michigan (TIA) for the 50 intersections in Novi with the highest crash frequencies. A majority of these intersections are under the jurisdiction of the RCOC and MDOT. The results of analyzing these data for 2012–2014 were compared with those in the January, 2012, Birchler Arroyo Associates report titled: *Crash-Data-Assisted Safety Evaluation of 12 Intersections in the City of Novi.*

For the Thoroughfare Master Plan, Corradino used an approach that examines crash rates per million vehicles entering the intersection. Additionally, a *Severity Index* was calculated for each intersection. The index weights fatal crashes with a factor of 12, injury crashes with a factor of three, and non-injury

[5] http://www.fws.gov/midwest/endangered/lists/michigan-cty.html

crashes with a factor of one, then averages the total. While judgement, based on experience, was used to establish these factors, the overall approach is that found in the Federal Highway Administration Road Safety Information Analysis on their website.

Birchler Arroyo Associates' (BAA) report identified ten Novi intersections with the highest crash rates or casualty ratios (2006 thru 2010 data). In June, 2012, that analysis was advanced to identify significant crash patterns, possible causes and countermeasures, based on field inspection and the SEMCOG *Traffic Safety Manual*.

With the data provided by TIA, all ten BAA Novi intersections were confirmed by Corradino as candidates for crash countermeasures. Those intersections are:

1. Beck Road at Grand River Avenue;
2. Novi Road at Grand River Avenue;
3. 8 Mile Road at Haggerty Road;
4. Novi Road at 10 Mile Road;
5. 12 Mile Road at Novi Road;
6. 12 Mile Road at Haggerty Road;
7. 14 Mile Road at M5;
8. 14 Mile Road at Haggerty Road;

The results of the Corradino analysis indicated two intersections with a high crash rate to be added to the list:

- Beck Road at the I-96 interchange ramps; and,
- Beck Road at 10 Mile Road.

The Corradino analysis also found one intersection with a high *Severity Index* which is added the list. While this intersection may not have a particularly high number of crashes or crash rate, the crashes that occur are of a significant nature.

- 12 Mile Road at West Park Drive.

During the course of the study, two more intersections, which are under the jurisdiction of the City of Novi, were added to the analysis:

- Meadowbrook Road at 13 Mile Road; and,
- West Park Drive at South Lake Drive.

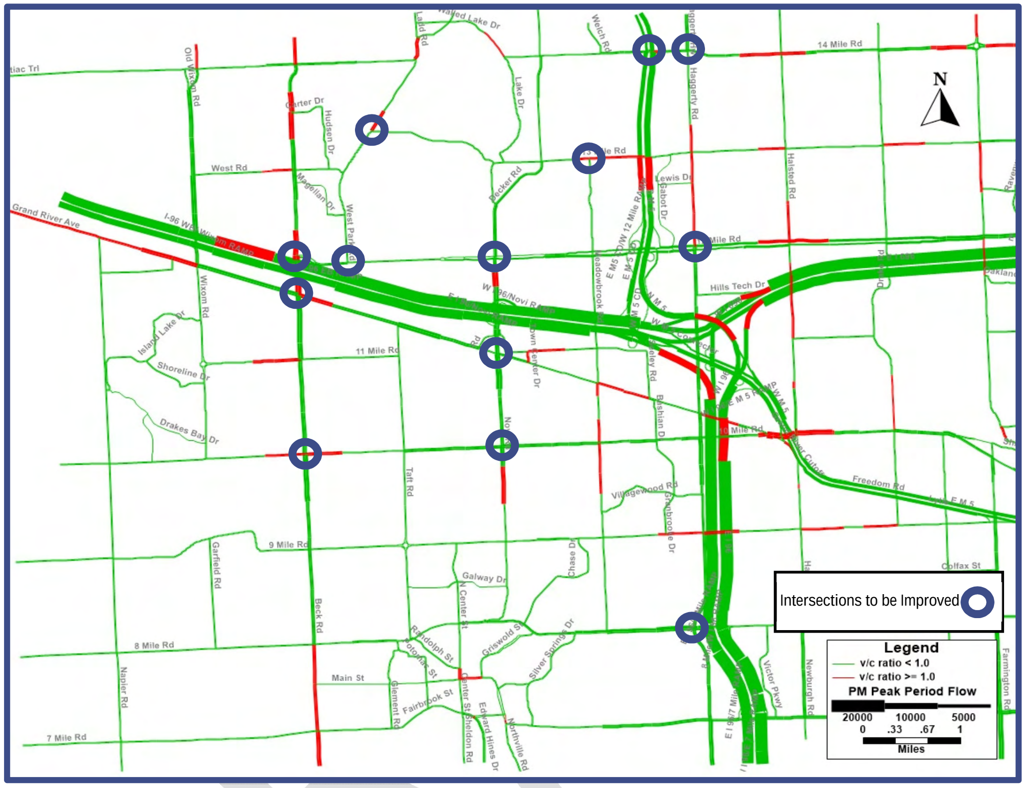
Proposed corrective actions for these intersections are presented next. In this discussion, reference will be made to "Level-of-Service" and "volume-to-capacity" ratios.

Level-of-Service (LOS) is a qualitative measure used to relate the quality of traffic service. LOS categorizes traffic flow and assigns quality levels based on performance measures like speed, density, etc. The letters "A" through "F" are reported, with A being the best and F the worst. A summary of the LOS letter grades is provided in Table 14.

The Volume-to-Capacity (V/C) ratio provides a quantitative assessment of how well traffic movements are accommodated. A V/C above one demonstrates that the traffic demand is greater than the facility's capacity. The demand will not be served, and long queues are likely to form. An emphasis of the proposed improvements was to achieve V/C less than one at the intersections studied.

It is important to note that, while there are funding, impact, and policy constraints that prevent more road widenings than Beck and 10 Mile Roads, the following proposals for the locations circled on Figure 20, and listed on Table 13, will address much of this congestion in a cost-effective way.

Figure 20. Novi Intersections Proposed to be Improved



Source: The Corradino Group of Michigan, Inc.

Table 13. Level-of-Service Descriptions

A:	Free flow operations. Vehicles are almost completely unimpeded in their ability to maneuver with the traffic stream. The general level of physical and psychological comfort provided to the driver is high.
B:	Reasonable free flow operations. The ability to maneuver within the traffic stream is only slightly restricted and the general level of physical and psychological comfort provided to the driver is still high.
C:	Flow with speeds at or near free flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more vigilance on the part of the driver. The driver notices an increase in tension.
D:	Speeds decline with increasing traffic. Freedom to maneuver within the traffic stream is more noticeably limited. The driver experiences reduced physical and psychological comfort levels.
E:	At lower boundary, the facility is at capacity. Operations are volatile because there are virtually no gaps in the traffic stream. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.
F:	Breakdowns in traffic flow. The number of vehicles entering the highway section exceed the capacity or ability of the highway to accommodate that number of vehicles. There is little room to maneuver. The driver experiences poor levels of physical and psychological comfort.

Source: The Highway Capacity Manual and The Corradino Group of Michigan, Inc.

7.2.1 Beck Road at 10 Mile Road

Each approach to this signalized intersection (Figure 21) includes one through-lane, one left-turn lane and one right-turn lane. There were 89 crashes at this location in 2012, 2013, and 2014, combined. The crash rate of the intersection is 2.46 crashes per million entering vehicles; equal to the highest rate of the intersections being analyzed. Twenty-five percent were injury crashes. The majority of the crashes were rear-end (62%), during the afternoon peak hours, in clear weather (71%), and on dry pavement (79%). Based on these characteristics, congestion appears to be a leading factor in the crashes. That will be addressed with the Beck Road widening.

In the near term, proposed countermeasures to be implemented at minimum costs are:

- Investigate retiming the signal to mitigate congested conditions and long queues;
- Place advance warning signs on all four approaches to the intersection. The preferred warning sign is a *"Be Prepared to Stop"* with a *"When Flashing"* supplemental plaque and a flashing beacon that is interconnected with the signal;
- As an alternate to the sign assembly noted above, a *"Signal Ahead"* sign could be placed on each approach; and,
- Maintain/renew the pavement markings on all four approaches to the intersection.

Figure 21. Beck Road at 10 Mile Road

It is recommended in conjunction with widening Beck Road that westbound 10 Mile Road, departing from Beck Road, be widened for a minimum distance of 0.25 miles (Figure 22). This will allow motorists to use both lanes through the signal and have adequate time to merge into a single lane west of the intersection. Also, westbound 10 Mile Road, approaching Beck Road, should be re-striped so that the existing exclusive right-turn lane becomes a shared through/right-turn lane. This will create additional capacity by taking advantage of the widened portion of westbound 10 Mile Road west of Beck Road.

Figure 22. Beck Road at 10 Mile Road

Source: Google Earth and The Corradino Group of Michigan, Inc.

In combination with widening Beck Road, the recommended improvements to 10 Mile Road at this location will maintain the overall LOS of the intersection in the year 2040 at D (Table 14). The LOS of the westbound and southbound approaches will be improved from D to C. No approach movement

Table 14. 2040 PM Existing and Proposed LOS, Beck Road at 10 Mile Road

Primary Road	Cross Road	Criterion	2040 Existing Geometry				2040 Proposed Geometry			
			EB	WB	NB	SB	EB	WB	NB	SB
Beck	10 Mile	Approach LOS	D	D	D	D	D	C	D	C
		Intersection LOS	D				D			
		Max. V/C Ratio	1.01				0.94			

will have a V/C over 1.0 (Table 15). The improvements are estimated to cost $750,000, if done separately from widening Beck Road.

7.2.2 Beck Road at Grand River Avenue

The proposed Beck Road widening will be to a five-lane section of Beck just south of its intersection with Grand River Avenue. To address the congestion issues at the intersection, improvements now underway are to restripe the existing median pavement along northbound Beck Road approaching Grand River Avenue to create an additional left-turn lane. This will create a double left-turn lane (Figure 23). Also, an additional left-turn lane is being constructed along eastbound Grand River Avenue approaching Beck Road to create a double left-turn lane.

Table 15. 2040 PM Existing and Proposed V/C>1.0, Beck Road at 10 Mile Road

	Ten Mile Road						Beck Road					
	Eastbound			Westbound			Northbound			Southbound		
	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.
Existing							X					
Proposed												

Source: The Corradino Group of Michigan, Inc.

The latter improvements will improve the LOS of the intersection in the year 2040 from E to D (Table 16). No approach movement will have an LOS worse than D or a V/C over one (Table 17).

The city's 2014–2020 Capital Improvement Program calls for these improvements, estimated to cost approximately $680,000. It is conservatively estimated that the signing, striping, and signal modification to modify the northbound approach to a double left-turn lane will cost approximately $100,000. Therefore, the combined improvements are estimated to cost $780,000.

Figure 23. Beck Road at Grand River Avenue Aerial Imagery

Source: Google Earth and The Corradino Group of Michigan, Inc.

Table 16. 2040 PM Existing and Proposed LOS, Beck Road at Grand River Avenue

Primary Road	Cross Road	Criterion	2040 Existing Geometry				2040 Proposed Geometry			
			EB	WB	NB	SB	EB	WB	NB	SB
Beck	Grand River	Approach LOS	E	F	E	D	D	D	D	C
		Intersection LOS	E				D			
		Max. V/C ratio	1.22				0.96			

Source: The Corradino Group of Michigan, Inc.

Table 17. 2040 PM Existing and Proposed V/C>1.0, Beck Road at Grand River Avenue

	Grand River Avenue						Beck Road					
	Eastbound			Westbound			Northbound			Southbound		
	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.	Lt.	Tr.	Rt.
Existing	X			X	X	X	X	X				
Proposed												

7.2.3 Beck Road at I-96 Ramps

Beck Road at I-96 (Figure 24) is a signalized, single-point urban interchange (SPUI). There were 109 crashes at this location in 2012, 2013, and 2014, combined. The crash rate of the intersection is 2.46 crashes per million entering vehicles, matching the highest crash rate of the intersections being analyzed. Eleven percent were injury crashes. The majority of the crashes were of the rear-end type (75%), during the morning and afternoon peak hours, in clear or cloudy weather conditions (87%), and on dry pavement (81%). Based on these characteristics, congestion appears to be a leading factor in the crashes. The proposed countermeasures, estimated to cost $300,000 and to be implemented with widening Beck, include:

- Place an advance-warning sign on the southbound Beck Road approach to the I-96 interchange. The preferred warning sign is a *"Be Prepared to Stop"* with a *"When Flashing"* supplemental plaque and a flashing beacon that is interconnected with the signal;
- As an alternate to the sign assembly noted above, a *"Signal Ahead"* sign could be placed on the southbound approach;
- Replace the existing span-wire signal configuration with a mast-arm configuration to improve the visibility of the signal heads;
- Maintain/renew the pavement markings within the interchange; and,
- Investigate retiming the signal to mitigate congested conditions and long queues.

Figure 24. Beck Road at I-96 Interchange

7.2.4 West Park Drive at 12 Mile Road

The east and west legs of this intersection (Figure 25) are 12 Mile Road and the north leg is West Park Drive. A private drive is the south leg. The eastbound and westbound approaches of 12 Mile Road include one through-lane, one left-turn lane and one right-turn lane. The southbound approach of West Park Drive includes a shared through/right-turn lane and a left-turn lane. The northbound approach of the private drive includes a shared through/right-turn lane and a left-turn lane.

There were 26 crashes at this location in 2012, 2013, and 2014, combined. The crash rate of the intersection is 1.25 crashes per million entering vehicles. Half were injury crashes. The majority were of the rear-end type (54%), during the afternoon peak hours (69%), in clear or cloudy weather conditions (76%), and on dry pavement (73%). Congestion appears to be a leading factor in the crashes. Proposed countermeasures, estimated at $215,000 and to be implemented during the period FY 2019–2020, include:

- Replace the existing span-wire signal configuration with a mast-arm configuration to improve the visibility of the signal heads;
- Investigate retiming the signal to mitigate congested conditions and long queues;
- Place advance-warning signs on the Twelve Mile Road and West Park Drive approaches to the intersection. The preferred warning sign is a "Be Prepared to Stop" with a "When Flashing" supplemental plaque and a flashing beacon that is interconnected with the signal;
- As an alternate to the sign assembly noted above, a "Signal Ahead" sign could be placed on each approach listed; and,
- Maintain/renew the pavement markings on all three public road approaches to the intersection.

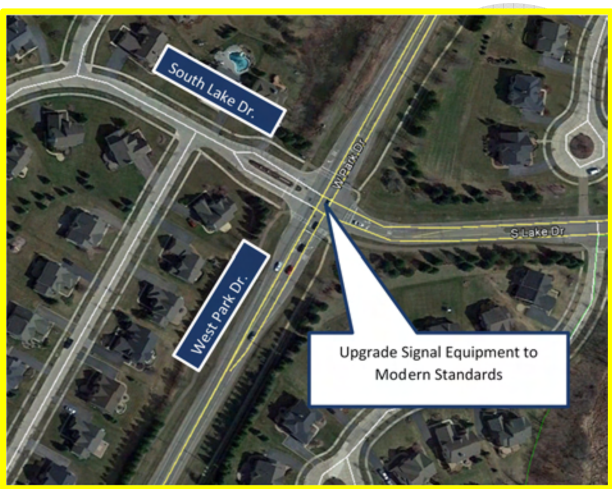
Figure 25. W Park Drive at 12 Mile Road

7.2.5 West Park Drive at South Lake Drive

At this intersection (Figure 26), West Park Drive has three lanes on each approach – one dedicated to left-turning vehicles, one for right-turning vehicles, and a through lane. The South Lake Drive westbound approach to the intersection also has three lanes – one for left turns, one for right turns, and a through lane. There were four crashes at this location causing a crash rate of 0.32 per million vehicles entering the intersection. All four crashes involved injuries. Two of the four crashes were of the rear-end type. The crashes were distributed through the day and most occurred during clear weather on dry pavement.

To address this experience, it is recommended that the signal system be upgraded to current standards with improvements to technology since the signal was installed in 1999. The signal system upgrade is programmed in the Novi FY 2015–2021 Capital Improvement Plan. The estimated construction cost of the improvements in the CIP is $175,000 with implementation during the period FY 2019–2020.

Figure 26. West Park Drive at South Lake Drive



7.2.6 Novi Road at 10 Mile Road

This intersection (Figure 27) is another heavily-commercial location. The northbound Novi Road approach has three lanes: one for left-turning vehicles; one for vehicles turning right; and, the third for through traffic. The southbound approach is configured in the same way. The two approaches on 10 Mile Road each have a left-turn lane, a lane dedicated to through traffic, and a third lane for vehicles turning right or moving through the intersection. There were 96 crashes in the three years ending in 2014. The crash rate was 2.27 per million vehicles entering the intersection. Crashes were 22% injury and 43% rear-end. As at the other inter-sections, most crashes happened in clear or cloudy weather on dry pavement.

The crash countermeasures proposed for this intersection are:

- Add right-turn lane on southbound Novi Road; and,
- Enhance crosswalks.

The consultant estimates the cost of these measure at $75,000 with implementation during FY 2018-2019.

Figure 27. Novi Road at 10 Mile Road

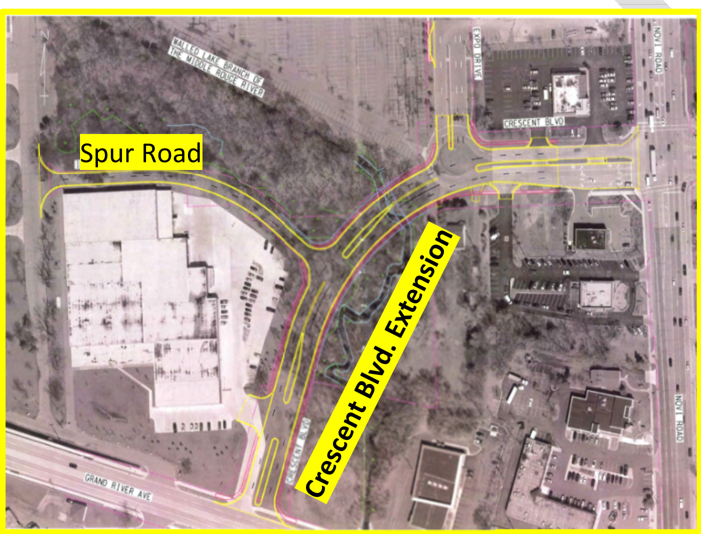
7.2.7 Novi Road at Grand River Avenue

Significant commercial development is located at and constrains the edges of this intersection (Figure 28). Both of the Novi Road's approaches are configured with a left-turn lane, a center/through lane and a shared right-turn and through vehicle lane. Westbound Grand River Avenue has two through lanes, and exclusive left- and right-turn lanes. The eastbound approach has three lanes with an exclusive left-turn lane and a center through lane plus a through-plus-right-turn lane.

There were 108 crashes at this location in the 2012–2014 period. The rate was 2.10 crashes per million vehicles entering the intersection; two-thirds, were rear-end collisions.

Figure 28. Novi Road at Grand River Avenue

Figure 28a. Novi Road at Grand River Avenue



To counter the crash experience, the following measures are offered:

- Extend Crescent Boulevard west to Grand River Avenue, plus build a "spur road" on the north side of the intersection;
- Enhance the crosswalks.

The cost of these measures is estimated by the consultant at $3,250,000. The bulk of this cost ($3,200,000) is associated with the proposed extension of Crescent Boulevard plus a "spur" around the industrial building at the northwest corner of the extension of Crescent Boulevard to Grand River Avenue (Figure 28a).

7.2.8 Novi Road at 12 Mile Road

The northbound approach of Novi Road at this location (Figure 29) has an exclusive right-turn lane, a through lane, and a through-plus-left-turn lane. Twelve Mile Road has a grass median at this location. Vehicles turning left do so before the intersection on each 12 Mile Road approach. Vehicles turning right have an exclusive lane for that maneuver. Two lanes on each 12 Mile Road intersection approach are for through vehicles.

The crash rate at this location is 2.42 crashes per million vehicles entering the intersection which is the second highest among the intersections analyzed. Twenty-three percent of crashes involved injuries, with over half (51%) being rear-end. Most were during clear or cloudy weather on dry pavement.

Based on these characteristics, crash counter measures to be considered are:

- Provide for a pedestrian refuge on each of the crossings of Novi Road; and,
- Enhance the crosswalk markings.

The consultant's cost estimate for these measures is $10,000. Implementation is for the period FY 2016-2017.

Figure 29.   Novi Road at 12 Mile Road

7.2.9 Meadowbrook Road at 13 Mile Road

Meadowbrook Road at this location forms a T-intersection with 13 Mile Road (Figure 30). One lane is for left-turning vehicles, the other is an exclusive right-turn lane. The 13 Mile Road westbound intersection approach has one lane exclusively for left turns to Meadowbrook and another for through movements. The eastbound approach has an exclusive right-turn lane and a through lane. There were 11 crashes at this location causing a crash rate of 0.88 per million vehicles entering the intersection. Only one crash involved injuries. In almost all cases, the weather was clear, with the crashes spread throughout the day.

To improve the intersection:

- Signal heads should be installed on mast arms instead of span wire;

Figure 30. Meadowbrook Road at 13 Mile Road

- Back plates with retro-reflective borders should be placed around the signal heads;
- Vehicle detection should be improved; and,
- Signing and striping should be improved.

The recommended signal system upgrade will improve the safety and operations of the intersection by improving the signal's visibility. The cost of these improvements is estimated at $200,000 with implementation during FY 2018-2019.

7.2.10 Haggerty Road at 8 Mile Road

This intersection (Figure 31) was the site of 134 crashes from 2012 to 2014, inclusive. The crash rate was 2.07 crashes per million vehicles entering the intersection.

Northbound Haggerty Road at this location is four lanes wide: two through lanes plus one exclusive lane for left-turning vehicles and another for right-turning vehicles. The southbound approach is three lanes wide: one exclusive left-turn lane, a center/through lane, and a curb lane for through plus right-turning vehicles.

The eastbound and westbound approaches are four lanes: two center/through lanes and exclusive lanes for left turns and right turns.

Twenty-nine percent of crashes involved injuries. Rear-end crashes were most common (48%), and occurred during the noon hour and afternoon peak, in clear or cloudy weather, on dry pavement.

In order to develop measures to counter this crash experience, the following is proposed:

- Add left-turn traffic signal phases on all four approaches; and,
- Improve transverse (cross-intersection) markings.

These measures are estimated to cost $5,000 with implementation during 2016-2017.

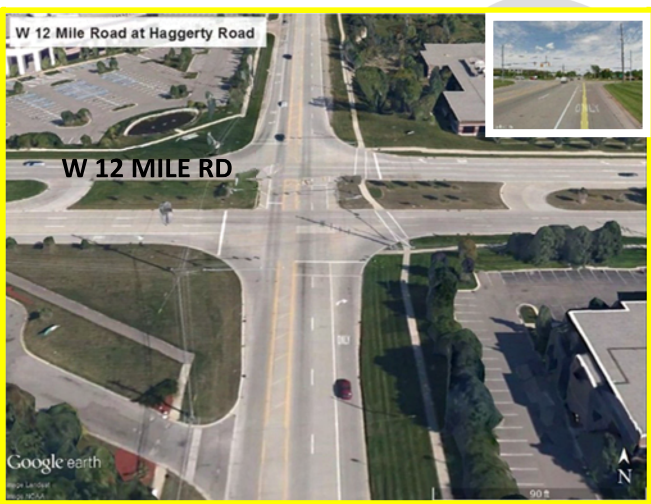
Figure 31. Haggerty Road at 8 Mile Road

7.2.11 Haggerty Road at 12 Mile Road

At this sprawling intersection (Figure 32), 12 Mile Road has a grass median. Left turns to Haggerty Road are made prior to the intersection. One lane on each approach is for right-turning vehicles. The two remaining lanes are for through traffic. The Haggerty Road northbound approach to the intersection has three lanes. One is dedicated to right turns. The two remaining lanes are for through traffic. On Haggerty's southbound approach, there are two lanes: one for right-turning vehicles and the other for through traffic.

Seventy-six crashes occurred at this location in the three-year period 2012–2014, inclusive. The crash rate was 1.50 crashes per million entering vehicles. A very high percentage of crashes at this location involved injuries (76%) including one fatality. The leading crash type was rear-end (64%), during clear or cloudy weather on dry pavement. The crash countermeasures proposed for this intersection are:

Figure 32. Haggerty Road at 12 Mile Road



- Remove shrubbery and prune trees in the median;
- Extend sidewalk on west side of Haggerty Road; and,
- Conduct a speed study on 12 Mile Road, and adjust speed limit accordingly.

Implementation is proposed in FY 2016-2017 at a cost of $35,000.

7.2.12 Haggerty Road at 14 Mile Road

This intersection (Figure 33) is located in a highly-commercial area. The northbound Haggerty Road approach to the intersection has exclusive left-turn and right-turn lanes plus one through-lane. Southbound, Haggerty Road has one exclusive left-turn lane and a lane for both through and right-turning vehicles.

Fourteen Mile Road has, on each approach to Haggerty Road, exclusive left-turn and right-turn lanes with one lane for vehicles moving straight through the intersection. From 2011 to, and including, 2014, there were 86 crashes at this location causing a crash rate of 2.23 crashes per million vehicles entering the intersection, among the highest of the crash rates. Rear-end crashes were most common (41%), followed by angle crashes (26%). Crashes were most common at noon and in the afternoon peak hours, in clear or cloudy weather (82%), and on dry pavement (77%).

Based on these characteristics, the crash countermeasures proposed here are:

- Develop an access management plan to coordinate vehicles entering/leaving the land uses in the corners of the intersection;
- Prohibit "right-turn-on-red" on the westbound 14 Mile Road approach;
- Place a sidewalk around the northwest corner; and,

Implementing these items in FY 2016-2017 is estimated to cost $40,000.

Figure 33. Haggerty Road at 14 Mile Road

7.2.13 M5 at 14 Mile Road

This is a signal-controlled intersection (Figure 34). Both the eastbound and westbound approaches of 14 Mile Road have one dedicated left-turn lane, one dedicated right-turn lane and a lane for both through and right-turning vehicles. M5 has a lane reserved for vehicles turning right and four through lanes. Left-turns are made by the "Michigan-left" maneuver. There were 130 crashes at this intersection in the three-year period of 2012–2014. The crash rate was 1.25 crashes per million vehicles entering the intersection, with rear-end crashes the most common (69%). Crashes were spread through the afternoon hours in clear or cloudy weather on dry pavement. Based on these characteristics, proposed measures to counter this crash experience are:

- Place advance warning *"Signal Ahead"* signs on the M5 approaches to the intersection;

Figure 34. M5 at 14 Mile Road

- Place *"Turning Vehicles Yield to Pedestrian"* signs on the westbound 14 Mile Road approach and the southbound M5 approach to the intersection; and,

- Re-evaluate signal timing.

Making these changes in 2016-2017 is estimated to cost $3,000.

7.2.14 Other Intersections

Analysis of the Beck Road at 9 Mile Road improvements demonstrated that this intersection will operate at an adequate level of service for the reasonable future. It is programmed in the Novi FY 2015–2021 Capital Improvement Plan to be improved with new equipment reflecting updated standards and improved technology that has changed since the original installation in 1998. The estimated cost of the improvements is $215,000. This includes engineering, along with an improved street light, pedestrian signals, and sidewalks.

Analysis of the Beck Road at 11 Mile Road intersection indicates it will also operate at an adequate level of service. Investment would be better served at other intersections.

7.3 Sidewalks and Pathways

Table 7 defines the sidewalk and pathway improvements scheduled over the period FY 2017–2022. The cost estimate is listed in Table 13. In total $4.3 million is in the plan, which excludes the neighborhood part of the sidewalk/pathway program.

7.4 Transit

The Older Adult Services Transportation service is essential for maintaining the quality of life for those citizens of Novi 55 years of age and older. Therefore, the TMP expects the service to continue in its current form which costs about $160,000 per year. Additionally, it is proposed that a "mall" circulator be tested on Saturdays over a six-month period. The cost of this "trial" program is estimated at $45,000. The vehicles will be those of the OAST available for six hours on Saturdays. If the service proves successful, additional hours of service may be beneficial, which may require additional equipment.

If the 1.2 mil increase in property taxes is approved in a November, 2016, referendum supported by the Regional Transit Authority, the City of Novi would contribute approximately $3.8 million per year. By legislative mandate, no county can receive transit services which cost less than 85% of what it contributes in taxes. That may mean regional transit may be in Novi's future. There is a caveat: It is not known if the 85% formula applies to cities within a county. In other words, even though there is a "floor" on what needs to be spent by the RTA by county, it may not be uniformly applied by jurisdiction within the county.

8. Observations

The City of Novi has multi-modal transportation needs which require state/federal assistance. Both these governments passed transportation funding legislation in 2015. Thoroughfare Master Plan projects proposed to be implemented over the period FY 2016-2025 include:

- Roads ($41.3 million) and intersection ($5.8 million) at $47.1 million. Beck Road widening is phased over FY 2017-2021 while expanding 10 Mile Road is phased between FY 2021-2025. Intersection improvements are programmed to occur between 2016 and 2020. Even with new state and federal programs, future funding will be tight because so much of Michigan's transportation infrastructure requires long-delayed fixes that will consume most of the new revenue.

- Sidewalk and pathway projects that are part of the plan are scheduled to be built in the period FY 2016-2022 at a cost of $4.3 million. Other top projects add $11.4 to that proposed investment.

- Continuing the Older Adults transportation program, will cost $160,000 per year, excluding inflation.

- A $45,000, six-month "trial" mall circulator project.

- Major transit developments appear to be dependent on the Regional Transportation Authority's multi-county referendum of November, 2016.

While Novi is aggressive in its road and pathways/sidewalks programs, transit in Novi is limited. Regional transit is not available because Novi "opted-out" of the tax that supports SMART. Nonetheless, more transit service may be in Novi's future if the November, 2016, vote on 1.2 mils of additional property taxes is a "regional yes". In that case, Novi's annual contribution to the regional system is estimated at $3.8 million. By legislative mandate, no county can receive transit services which cost less than 85% of what it contributes in taxes. There is a caveat: It is not known if the 85% formula applies to cities within a county.

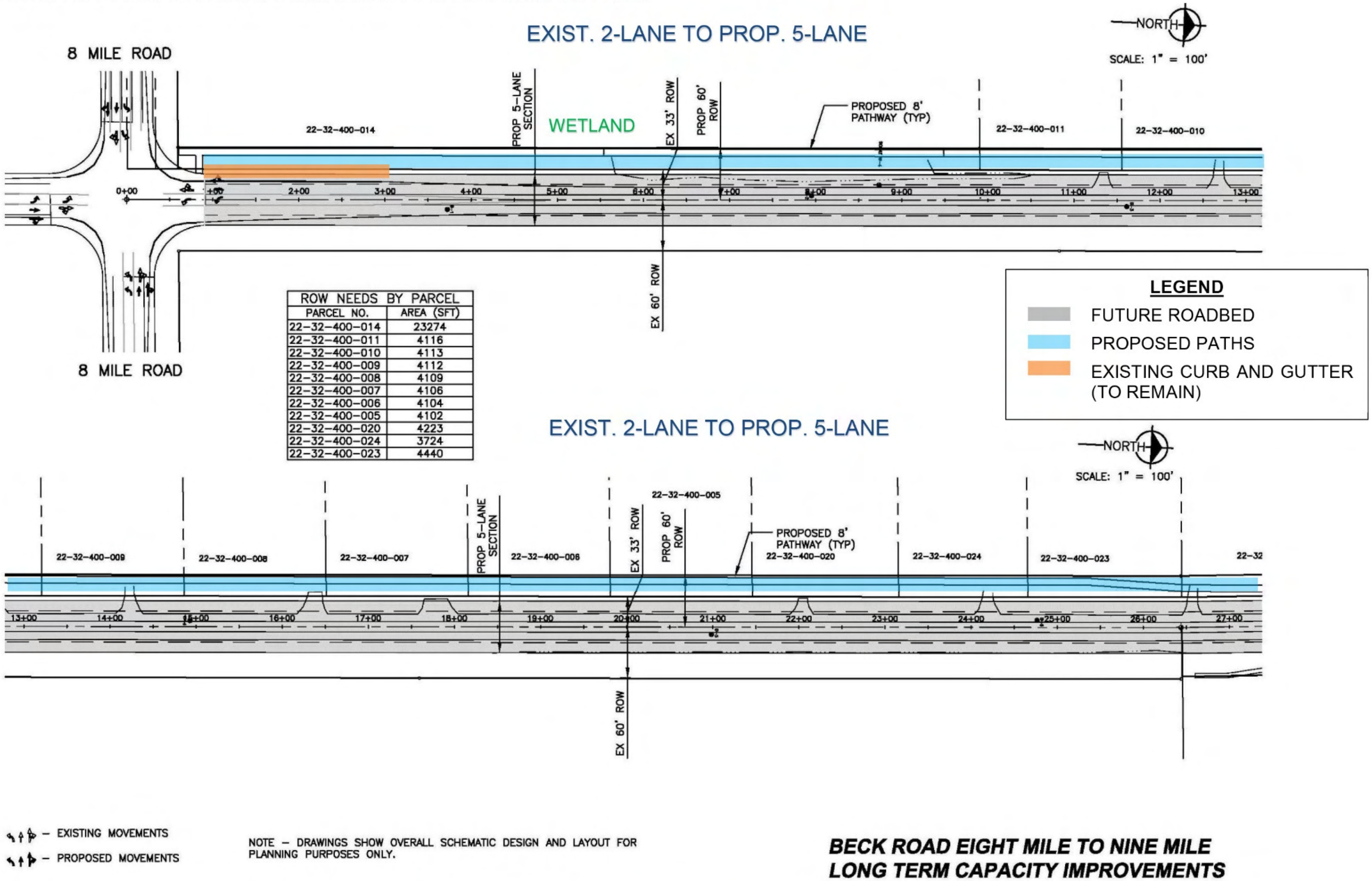
Novi's transportation future is brighter now than when the last TMP was prepared. To strengthen that outlook, Novi's officials and citizens must be aggressive with their state and federal government representatives to secure their share of funding. And they must decide how to address the RTA referendum, knowing that it will be a regional yes or no vote. There is no "opt-out" provision for individual cities or counties.

Appendix

Proposed Improvements

to Beck Road and 10 Mile Road

FIGURE 1: BECK ROAD FROM 8 MILE ROAD TO NEAR STRATFORD LANE

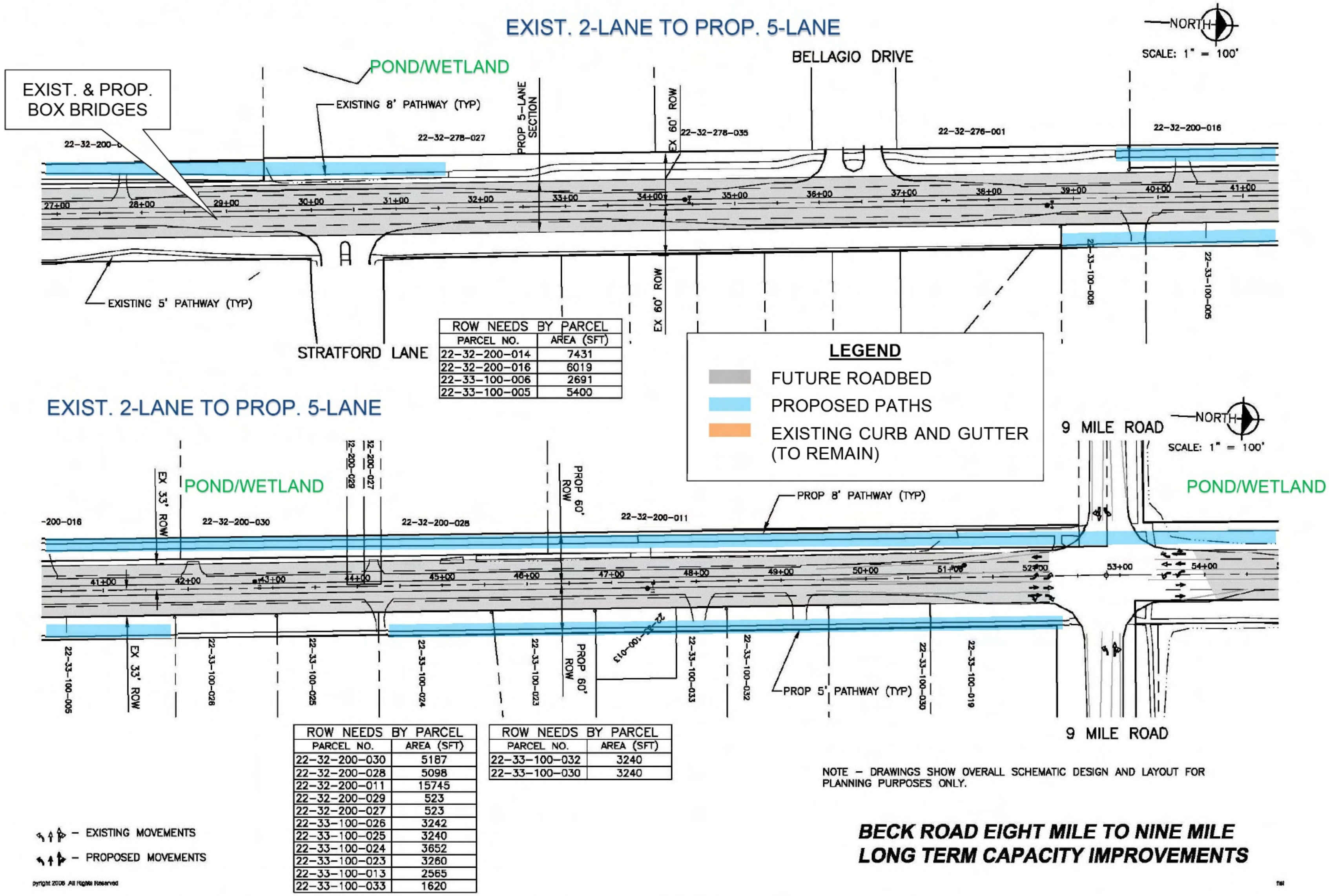


ROW NEEDS BY PARCEL

PARCEL NO.	AREA (SFT)
22-32-400-014	23274
22-32-400-011	4116
22-32-400-010	4113
22-32-400-009	4112
22-32-400-008	4109
22-32-400-007	4106
22-32-400-006	4104
22-32-400-005	4102
22-32-400-020	4223
22-32-400-024	3724
22-32-400-023	4440

Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

FIGURE 2: BECK ROAD FROM NEAR STRATFORD LANE TO 9 MILE ROAD



ROW NEEDS BY PARCEL

PARCEL NO.	AREA (SFT)
22-32-200-014	7431
22-32-200-016	6019
22-33-100-006	2691
22-33-100-005	5400

ROW NEEDS BY PARCEL

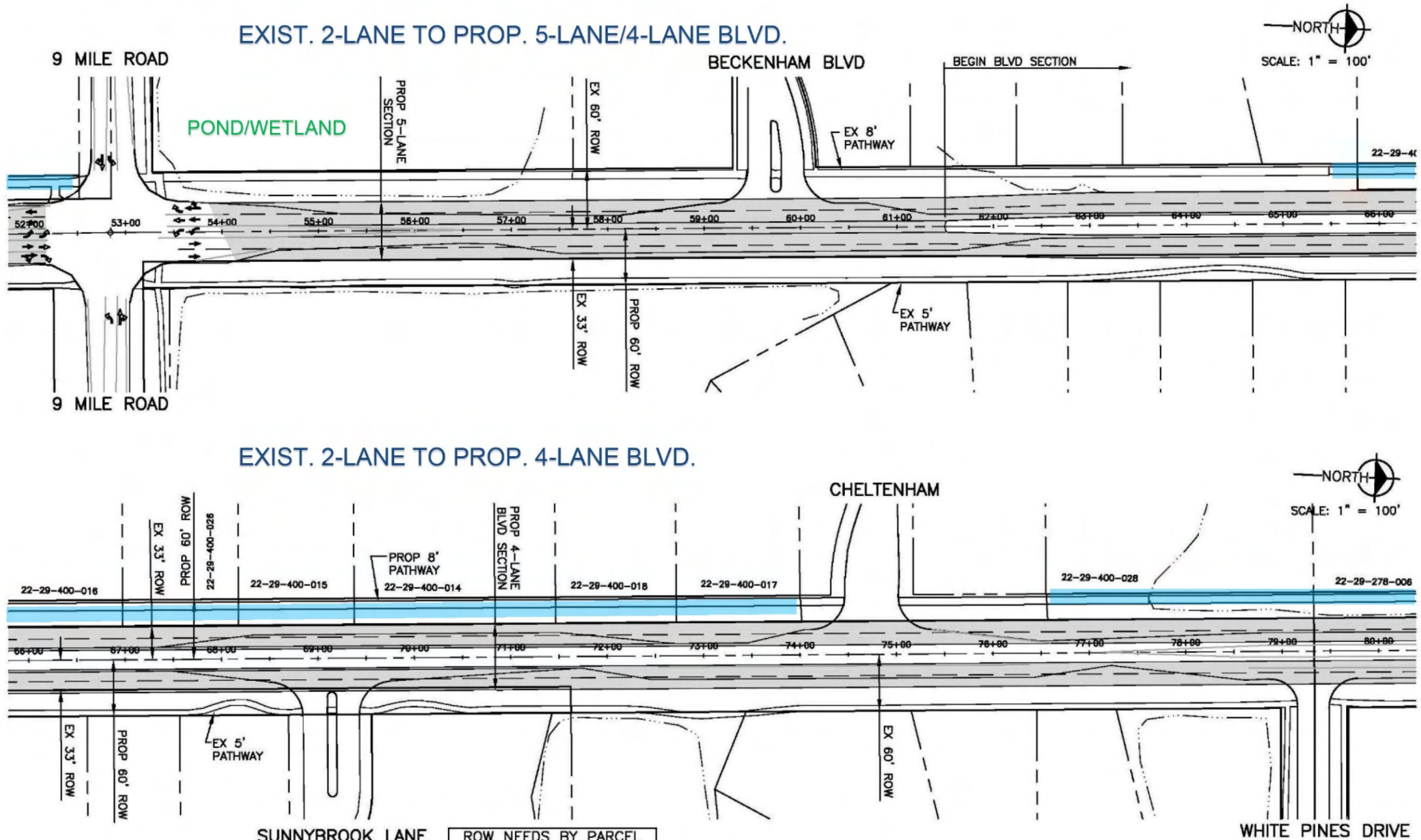
PARCEL NO.	AREA (SFT)
22-32-200-030	5187
22-32-200-028	5098
22-32-200-011	15745
22-32-200-029	523
22-32-200-027	523
22-33-100-026	3242
22-33-100-025	3240
22-33-100-024	3652
22-33-100-023	3260
22-33-100-013	2565
22-33-100-033	1620

ROW NEEDS BY PARCEL

PARCEL NO.	AREA (SFT)
22-33-100-032	3240
22-33-100-030	3240

Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

FIGURE 3: BECK ROAD FROM 9 MILE ROAD TO NEAR WHITE PINES DRIVE



LEGEND

- FUTURE ROADBED
- PROPOSED PATHS
- EXISTING CURB AND GUTTER (TO REMAIN)

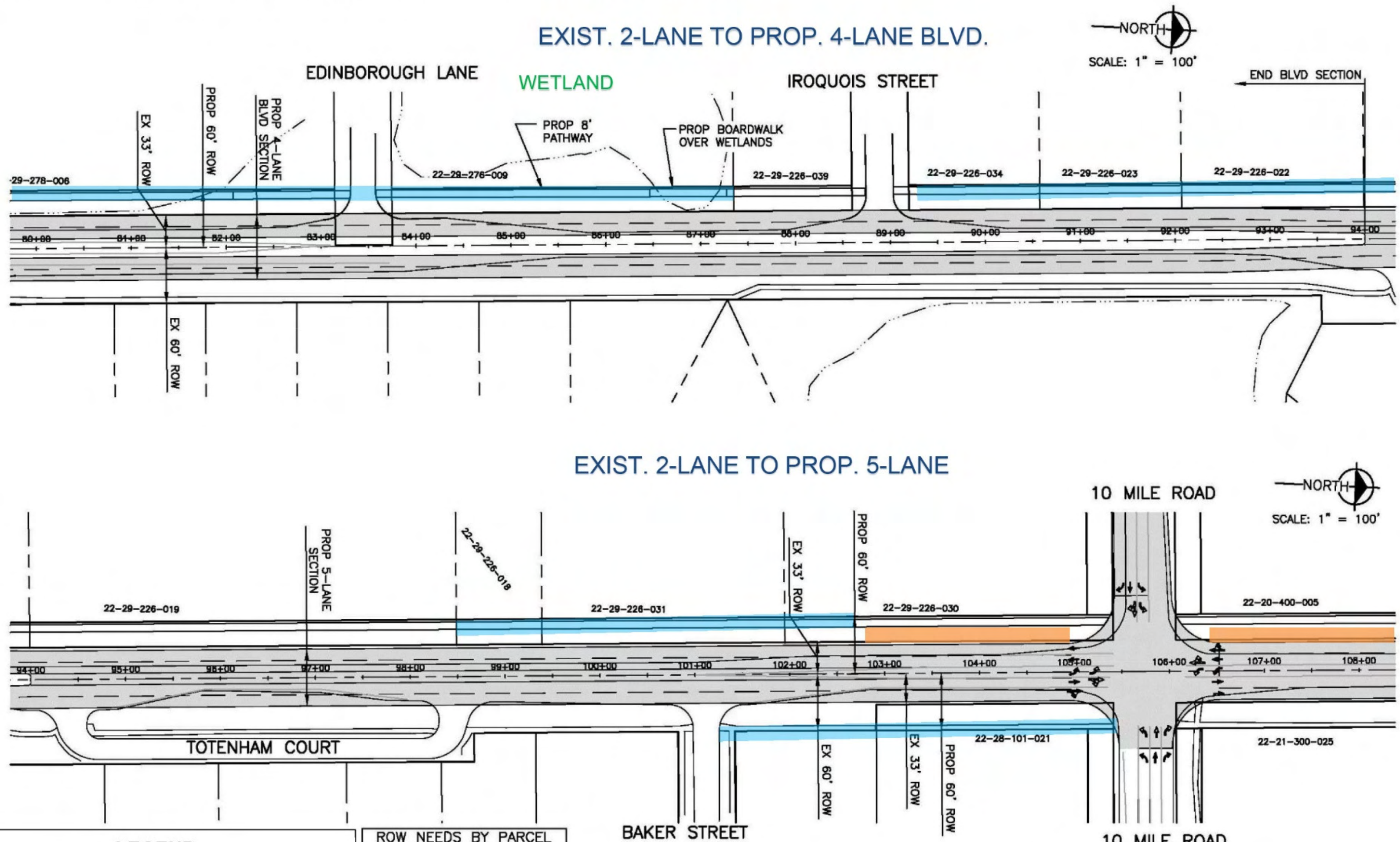
ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-29-400-016	3240
22-29-400-026	3248
22-29-400-015	3238
22-29-400-014	5632
22-29-400-018	2962
22-29-400-017	3477
22-29-400-028	7437
22-29-278-006	10142

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

BECK ROAD NINE MILE TO TEN MILE LONG TERM CAPACITY IMPROVEMENTS

Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

FIGURE 4: BECK ROAD FROM NEAR WHITE PINES DRIVE TO 10 MILE ROAD



LEGEND

- FUTURE ROADBED
- PROPOSED PATHS
- EXISTING CURB AND GUTTER (TO REMAIN)

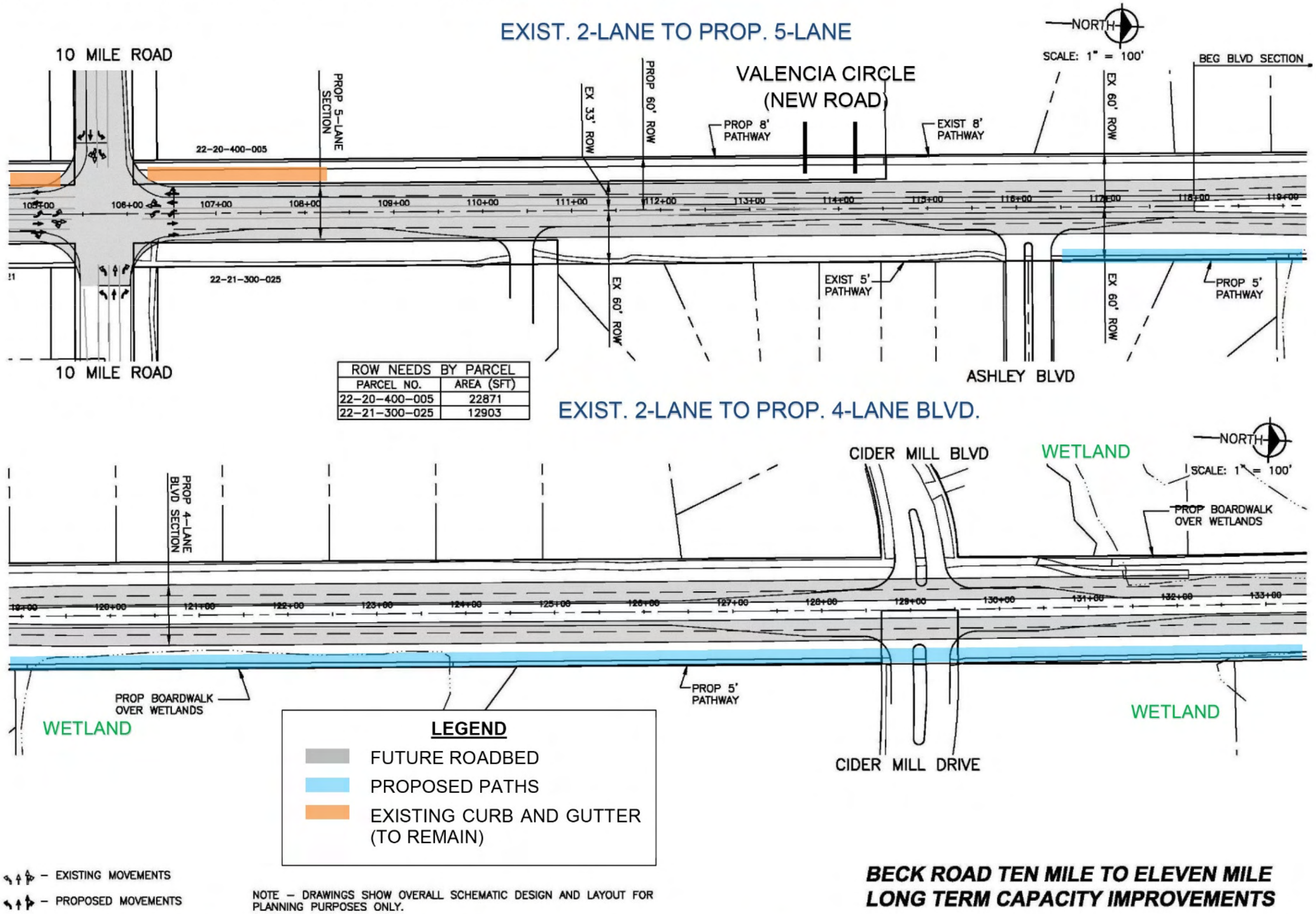
ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-29-276-009	9442
22-29-226-039	3261
22-29-226-034	3607
22-29-226-023	3911
22-29-226-022	5049
22-29-226-019	11896
22-29-226-018	2390
22-29-226-031	6816
22-29-226-030	9262
22-28-101-021	6760

NOTE – DRAWINGS SHOW OVERALL SCHEMATIC DESIGN AND LAYOUT FOR PLANNING PURPOSES ONLY.

BECK ROAD NINE MILE TO TEN MILE LONG TERM CAPACITY IMPROVEMENTS

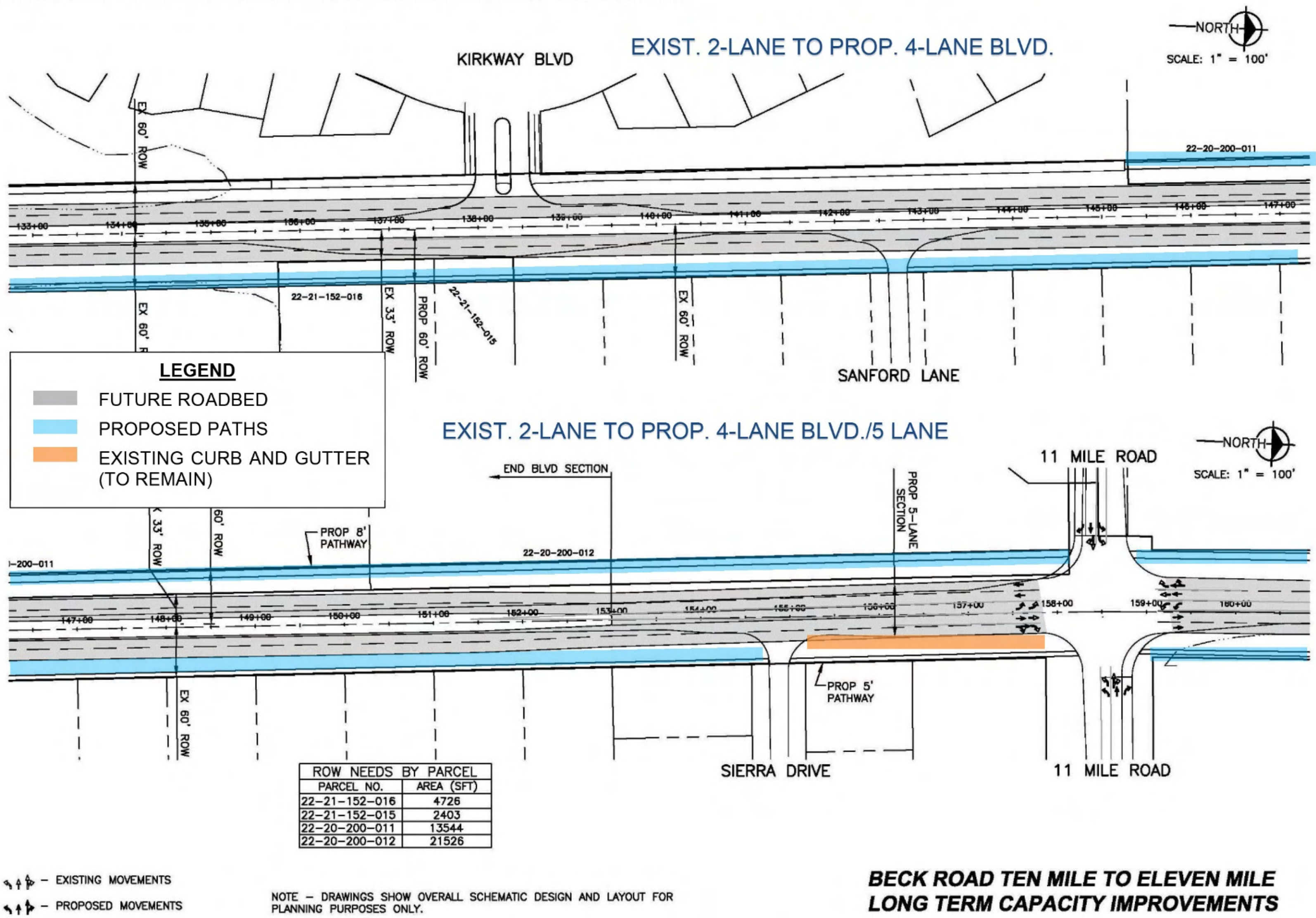
Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

FIGURE 5: BECK ROAD FROM 10 MILE ROAD TO NEAR CIDER MILL DRIVE



Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

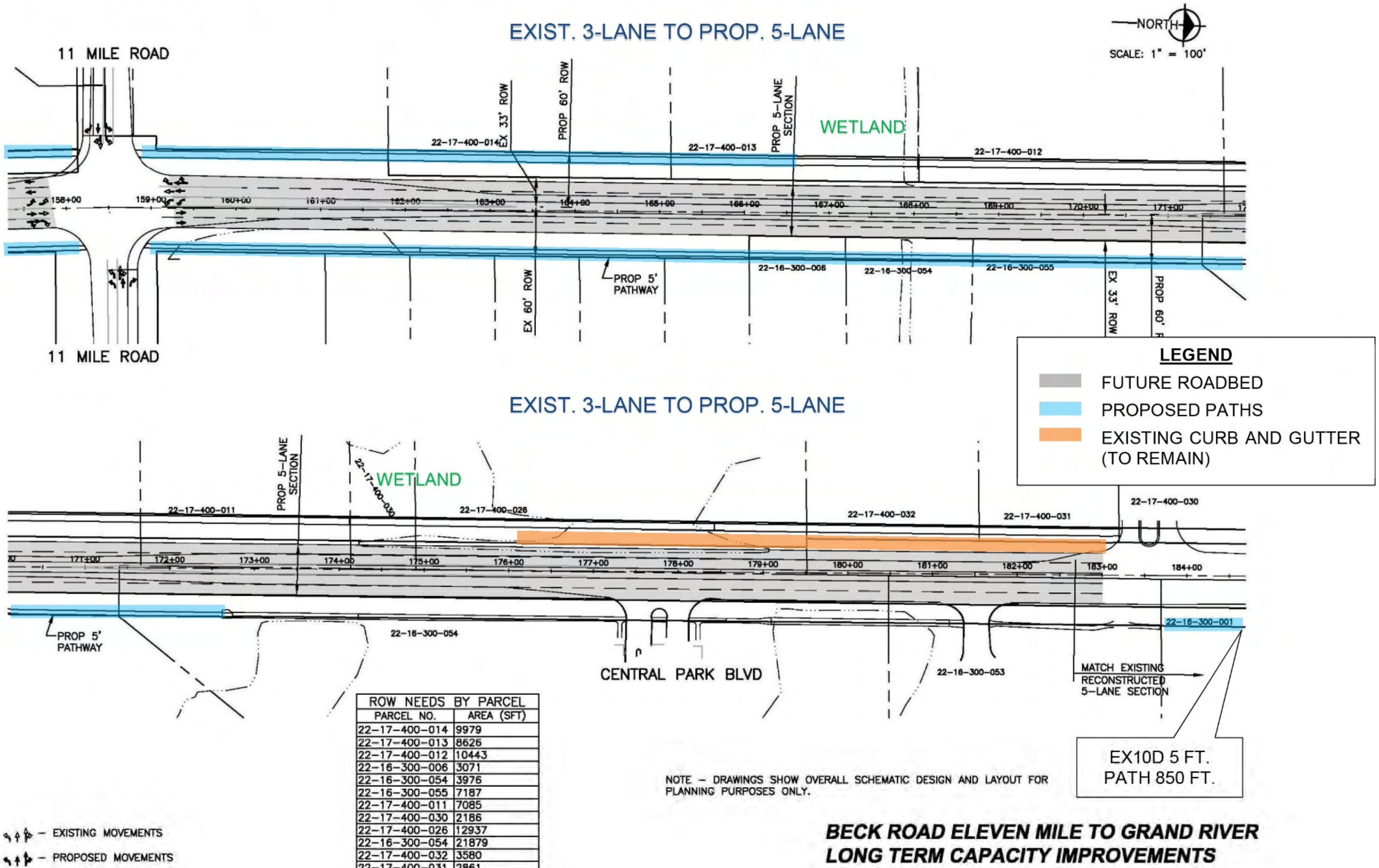
FIGURE 6: BECK ROAD FROM NEAR CIDER MILL DRIVE TO 11 MILE ROAD



ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22-21-152-016	4726
22-21-152-015	2403
22-20-200-011	13544
22-20-200-012	21526

Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

FIGURE 7: BECK ROAD FROM 11 MILE ROAD TO NEAR GRAND RIVER AVENUE



ROW NEEDS BY PARCEL	
PARCEL NO.	AREA (SFT)
22–17–400–014	9979
22–17–400–013	8626
22–17–400–012	10443
22–16–300–006	3071
22–16–300–054	3976
22–16–300–055	7187
22–17–400–011	7085
22–17–400–030	2186
22–17–400–026	12937
22–16–300–054	21879
22–17–400–032	3580
22–17–400–031	2861
22–16–300–053	7153

Source: Fishbeck, Thompson, Carr &Huber, Inc., Scoping Study Beck Road, 2006; & The Corradino Group, 2016

Route:	Beck Road
Description:	8-Mile Road to 9-Mile Road
County:	Oakland
Length:	1 Mile(s)
Date:	March 25, 2016

DESCRIPTION		TOTAL
Right-of-Way	$	270,000
Clearing and Grubbing	$	8,000
Earthwork	$	180,000
Railroad Crossing or Separation	$	-
Drainage	$	468,000
Utilities	$	-
Structures	$	158,000
Pavement Removal	$	149,000
Paving	$	1,329,000
Roadway and Pavement Appurtenances	$	324,000
Retaining Walls	$	79,000
Topsoil	$	-
Seeding	$	-
Sodding	$	29,000
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	10,000
Pavement Markings	$	15,000
Lighting	$	-
Signalization	$	75,000
Guardrail	$	25,000
Pay Item Quantity Adjustment (15%)[1]	$	467,900
Maintenance of Traffic (5%)	$	179,300
Mobilization (5%)	$	179,300
CONSTRUCTION COST (rounded)	$	3,945,500
Contingency (20%)	$	789,100
Engineering (25%)	$	986,400
TOTAL CONSTRUCTION COST (rounded)	$	5,721,000
Preliminary Engineering (10%)	$	572,100
PROJECT COST (rounded)	**$**	**6,293,100**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

Route:	Beck Road
Description:	9-Mile Road to 10-Mile Road
County:	Oakland
Length:	1 Mile(s)
Date:	April 5, 2016

DESCRIPTION		TOTAL
Right-of-Way	$	239,000
Clearing and Grubbing	$	6,000
Earthwork	$	182,000
Railroad Crossing or Separation	$	-
Drainage	$	472,000
Utilities	$	-
Structures	$	-
Pavement Removal	$	159,000
Paving	$	1,135,000
Roadway and Pavement Appurtenances	$	352,000
Retaining Walls	$	63,000
Topsoil	$	-
Seeding	$	-
Sodding	$	29,000
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	10,000
Pavement Markings	$	14,000
Lighting	$	-
Signalization	$	75,000
Guardrail	$	22,000
Pay Item Quantity Adjustment (15%)[1]	$	413,700
Maintenance of Traffic (5%)	$	158,600
Mobilization (5%)	$	158,600
CONSTRUCTION COST (rounded)	$	3,488,900
Contingency (20%)	$	697,800
Engineering (25%)	$	872,200
TOTAL CONSTRUCTION COST (rounded)	$	5,058,900
Preliminary Engineering (10%)	$	505,900
PROJECT COST (rounded)	**$**	**5,564,800**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

Route:	Beck Road
Description:	10-Mile Road to 11-Mile Road
County:	Oakland
Length:	1 Mile(s)
Date:	April 5, 2016

DESCRIPTION	TOTAL
Right-of-Way	$ 485,000
Clearing and Grubbing	$ 4,000
Earthwork	$ 185,000
Railroad Crossing or Separation	$ -
Drainage	$ 468,000
Utilities	$ -
Structures	$ -
Pavement Removal	$ 166,000
Paving	$ 1,138,000
Roadway and Pavement Appurtenances	$ 379,000
Retaining Walls	$ 74,000
Topsoil	$ -
Seeding	$ -
Sodding	$ 29,000
Rip-Rap or Slope Protection	$ -
Fencing	$ -
Signing	$ 10,000
Pavement Markings	$ 14,000
Lighting	$ -
Signalization	$ 150,000
Guardrail	$ 28,000
Pay Item Quantity Adjustment (15%)[1]	$ 469,500
Maintenance of Traffic (5%)	$ 180,000
Mobilization (5%)	$ 180,000
CONSTRUCTION COST (rounded)	$ 3,959,500
Contingency (20%)	$ 791,900
Engineering (25%)	$ 989,900
TOTAL CONSTRUCTION COST (rounded)	$ 5,741,300
Preliminary Engineering (10%)	$ 574,100
PROJECT COST (rounded)	**$ 6,315,400**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

Route:	Beck Road
Description:	11-Mile Road to Grand River Avenue
County:	Oakland
Length:	0.45 Mile(s)
Date:	March 25, 2016

DESCRIPTION	TOTAL
Right-of-Way	$ 300,000
Clearing and Grubbing	$ 6,000
Earthwork	$ 81,000
Railroad Crossing or Separation	$ -
Drainage	$ 206,000
Utilities	$ -
Structures	$ -
Pavement Removal	$ 100,000
Paving	$ 598,000
Roadway and Pavement Appurtenances	$ 132,000
Retaining Walls	$ 32,000
Topsoil	$ -
Seeding	$ -
Sodding	$ 13,000
Rip-Rap or Slope Protection	$ -
Fencing	$ -
Signing	$ 5,000
Pavement Markings	$ 7,000
Lighting	$ -
Signalization	$ 150,000
Guardrail	$ 17,000
Pay Item Quantity Adjustment (15%)[1]	$ 247,100
Maintenance of Traffic (5%)	$ 94,700
Mobilization (5%)	$ 94,700
CONSTRUCTION COST (rounded)	$ 2,083,500
Contingency (20%)	$ 416,700
Engineering (25%)	$ 520,900
TOTAL CONSTRUCTION COST (rounded)	$ 3,021,100
Preliminary Engineering (10%)	$ 302,100
PROJECT COST (rounded)	**$ 3,323,200**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

Route:	10 Mile Road - Preliminary Estimate
Description:	Upgrade to multilane from Hagerty Road to Taft Road
County:	
Length:	3 Miles
Date:	March 16, 2016

DESCRIPTION		TOTAL
Right-of-Way	$	458,000
Clearing and Grubbing	$	15,000
Earthwork	$	610,000
Railroad Crossing or Separation	$	164,000
Drainage	$	1,417,000
Utilities	$	-
Structures	$	1,403,000
Pavement Removal	$	-
Paving	$	3,987,000
Roadway and Pavement Appurtenances	$	591,000
Retaining Walls	$	112,000
Topsoil	$	-
Seeding	$	-
Sodding	$	71,000
Rip-Rap or Slope Protection	$	-
Fencing	$	-
Signing	$	30,000
Pavement Markings	$	45,000
Lighting	$	-
Signalization	$	900,000
Guardrail	$	-
Pay Item Quantity Adjustment (15%)[1]	$	1,470,500
Maintenance of Traffic (5%)	$	563,700
Mobilization (5%)	$	563,700
CONSTRUCTION COST (rounded)	$	12,400,900
Contingency (20%)	$	2,480,200
Engineering (25%)	$	3,100,200
TOTAL CONSTRUCTION COST (rounded)	$	17,981,300
Preliminary Engineering (10%)	$	1,798,100
PROJECT COST [2](rounded)	**$**	**19,779,400**

[1] *For estimating purposes pay items are adjusted for fluctuation of cost based on quantity.*

[2] *For estimating future project costs, a compounded inflation rate of 10% should be applied from the date of this estimate.*

Appendix L

10 Mile Technical Memorandum

ARCHITECTS. ENGINEERS. PLANNERS.

OHM Advancing Communities℠

Preliminary Roadway Engineering Study
10 MILE ROAD
Meadowbrook Road to Haggerty Road

Technical Memorandum

City of Novi

Road Commission for Oakland County

May 20, 2019

1. INTRODUCTION

In coordination with the city-wide 10 Mile Road Corridor Study, the City of Novi requested that OHM Advisors further analyze the one-mile segment of 10 Mile Road between Meadowbrook Road and Haggerty Road. The goal of the analysis is to collaborate with the Road Commission for Oakland County (RCOC) to explore the anticipated impacts and costs of adding a continuous center left turn lane along 10 Mile Road, from Meadowbrook Road to Haggerty Road. The detailed findings are included herein.

10 Mile Road varies between 2 and 5 lanes, with the 5 lane sections occurring at the Meadowbrook and Haggerty Road signalized intersections. The area generally consists of a mix of commercial and residential properties, with several side streets and driveways present on both sides of the roadway. The topography is somewhat rolling with a variety of open and enclosed drainage systems that outlet to Bishop Creek or the Francis Drain / Ingersol Creek. These, as well as other features, are depicted in the Conceptual Illustrative Rendering (Exhibit A). A conceptual opinion of probable design, right-of-way, and construction cost has also been attached as Exhibit B.

2. DESIGN METHODOLOGY & ASSUMPTIONS

Roadway - General

The proposed 10 Mile Road improvement concept is based on the City of Novi's interest, in collaboration with the RCOC to improve traffic operations and safety by adding a consistent center left turn lane. The proposed concept intends to maximize the use existing roadway infrastructure, by combining rehabilitation and isolated reconstruction efforts.

Non-Motorized - General

According to the City of Novi's 2011 Non-Motorized Master Plan, the 10 Mile segment has been identified as a "Balanced Corridor" that balances motorized and non-motorized users. The Annual Non-Motorized Prioritization 2016-2017 Update shows proposed pathway on the south side of 10 Mile Road and is classified as a Top 20 Priority Segment. The north side of 10 Mile Road calls for new sidewalk to complete the existing gap in the northeast quadrant at Meadowbrook Road. This study examines a concept layout for a future pathway on the south side of 10 Mile Road, but does not include design or construction costs for the pathway as a part of the project. Additional proposed ROW or easements needed for pathway construction have not been thoroughly analyzed. These costs are not included in Exhibit B.

Several ADA sidewalk ramps in the corridor that crossing side streets will require upgrades to current standards. Ramp upgrades in combination with pedestrian push button upgrades will be necessary at signalized intersections, including 10 Mile / Meadowbrook and 10 Mile / Bashian / Cranbrooke.

Roadway Design Criteria Assumptions – We anticipate the following criteria as a part of the analysis:

- Attempt to minimize ROW impacts where possible. Proposed highway easements have been based on master plan ROW when applicable.
- Lane Widths
    - Existing lanes measured 11.5', and as-built plans show 11' lanes. No changes are anticipated.
    - 10 Mile is not on the 2019 MDOT Truck Operators Map, but is listed as a Designated Spring Weight Restriction route on the RCOC's Truck Operators Map

- Use a 45mph posted speed, 50mph design speed, with 575’ merging tapers based on 50mph.
- Proposed right turn lanes based on RCOC permit guidelines (50’ tangent section and 100’ taper)
- Proposed 3.5” mill and resurface with 8” full depth HMA section in the proposed widened areas. The existing section varies with 22’ wide HMA over Concrete center section and full depth HMA additions. Future pavement cores are recommended.
- Proposed 8’ shoulder (4’ paved, 4’ aggregate) based on MDOT 3R guidelines
- Proposed 2’ ditch with 1 on 3 side slopes (flow line 6’-8’ from edge of shoulder)
- 22’ Clear Zone based on chart 7.01.11 in the MDOT Road Design Manual. Guardrail design parameters as described in the MDOT Road Design Manual and MDOT Special Details.

<u>Environmental Considerations:</u>

- No wetlands identified on the U.S. Fish and Wildlife Services (USFWS) National Wetland Inventory map. However, wetlands might be present adjacent to the watercourses.
- USFWFS lists the potential for the following threatened and endangered species: Indiana Bat, Northern Long-Eared Bat, Rayed Bean, American Beetle, Eastern Massasauga Rattlesnake and the Snuffbox Mussel.
- A State and Federal Mussel review utilizing the Michigan ArcGIS Mussel map did not reveal any mussels within the study limits. However, State Threatened mussels were identified in the same watercourse south of Meadowbrook Lake and 9 Mile Road. Should the project move further into the design process we recommend scheduling a pre-application meeting with the MDEQ / EGLE early, allowing time for a mussel search and relocation efforts should they require it.
- EGLE / OCWRC stormwater volume and water quality
  - The Francis Drain (OCWRC) ends at the north side of 10 Mile Road, presumably at the existing culvert end section. Water flows south and becomes the Ingersol Creek which is carried by the existing culvert under 10 Mile Road.
  - Bishop Creek flows southward, crossing 10 Mile Road just west of Bethany Road
  - Stormwater detention requirements due to increased impervious surface will be determined further into the design process. We anticipate a combination of infiltration and detention (underground or surface) might be required. Hydrodynamic separators or other storm water treatment will be required at stream outlets.

<u>Traffic Signals, Pavement Markings, Signs, and Construction Staging</u>

- 10 Mile & Meadowbrook (2002)
  - Existing diagonal span, camera detection, flashing red left turns, Opticom.
  - Existing ADA upgrades are needed and the existing pedestrian signals are not countdown.
  - Propose modernizing the signal to box span, ADA upgrades, and new countdown pedestrian signals. The upgrades might require a highway easement in the northeast quadrant.
- 10 Mile & Bashian / Cranbrook (2002)
  - Existing diagonal span, camera detection, Opticom.
  - Existing ADA upgrades are needed and the existing pedestrian signals are not countdown.
  - Propose modernizing the signal to box span, ADA upgrades, and new countdown pedestrian signals.
- 10 Mile & Haggerty (2015)

  - Existing box span, flashing yellow arrow left turn lanes, current ADA ramps, and existing pedestrian signals
  - Propose only minor updates and signal staging for construction maintenance of traffic.
- The two signals will be rebuilt to current RCOC design standards including 6-bolt strain poles, flashing yellow arrow (FYA) left turn signals (where required), backplates and tethers. Pedestrian signals will be countdown type and pushbuttons / sidewalks will be designed to meet current ADA requirements.
- Pavement markings and permanent signs would be replaced.
- The proposed construction staging concept consists of replacing the Bishop Creek Culvert and the Ingersol Creek Culvert under isolated closures allowing for typical traffic patterns on either side. Once the culverts have been installed the road would be constructed one side at a time maintaining one-way traffic.

Utilities

- Public utility information is shown in Exhibit A based off of City of Novi GIS and field observation.
- An analysis of underground private utility information was not performed nor shown in Exhibit A. However some private utility impacts are anticipated based on field observation and are noted herein.

3. DETAILED PROPOSED CORRIDOR CONCEPT

10 Mile Road, Meadowbrook Road to LeBost Drive

- Existing
  - ROW and Driveway Access
    - North side varies from 33’ to 60’. The south side ROW is 60’.
    - 41160 has existing parking within the ROW
    - 41075 has parking turnaround within the ROW
  - Roadway
    - 10 Mile at Meadowbrook consists of 5 lanes and reduces to 2 lanes at LeBost Dr
    - There are no turn lanes provided at LeBost Dr
  - Drainage - There is a mix of curbed and shoulder sections, with a low point near station 14+50. Stormwater drains via ditch to the low point, crosses 10 Mile Road and enters an existing storm sewer flowing east along the north side of the road.
  - Non-Motorized - The north side has existing 5’ sidewalk while the south side does not.
- Proposed
  - Center left turn lane.
  - Right turn taper lane for EB LeBost Dr. with a 25’ right turn lane allowing the existing parking at 41075 to be salvaged.
  - Curb and gutter for the missing sections:
    - Curb is proposed for the north side because an 8’ shoulder and ditch would impact the existing sidewalk and parking at parcel 41160.
    - Curb on the south side allows for future pathway and minimizes yard impacts.
  - Relocate streetlight poles at 10 Mile / LeBost.
  - No highway easements are anticipated.

<u>10 Mile Road, LeBost Drive to Bethany Way</u>

- <u>Existing</u>
  - ROW and Driveway Access
    - North side ROW is 60'. The south side ROW starts at 60' and reduces to 33.
    - 40965 has existing parking within the ROW
    - 40905 and 40891 share a combined turn around within the ROW
    - 40890 has landscaping and a fence at the back of sidewalk located within the existing ROW. The existing fence is needed at the Bishop Creek culvert.
    - 40905 and 40891 share a combined turn around within the ROW
    - 40755 is heavily landscaped and has a decorative fence within the ROW
  - Roadway –
    - Existing 2 lane roadway with no turn lanes. 10 Mile widens at Coral Ln to allow for a center left turn lane and right turn lane at Bethany Way.
    - Both the sides of the roadway have guardrail in the Bishop Creek culvert vicinity that does not meet current standards.
  - Drainage
    - Existing ditches on both sides of the road flow east towards Bishop Creek.
    - The ditch on the north side enters a catch basin at Coral Ln, which is located at the edge of the shoulder and is significantly lower than the roadway. There is an existing storm sewer on the north side that outlets into the Bishop Creek Culvert.
    - East of Coral Ln, the north side is open shoulder with flow over the sidewalk to Bishop Creek.
    - The south side is open shoulder with ditch flow ending at a storm sewer inlet near sta 23+00. Curb and gutter begins near STA 24+00 and extends to Ripple Creek
  - Bishop Creek Culvert – See discussion below.
  - Non-Motorized - The north side has existing 5' sidewalk while the south side does not.

- <u>Proposed</u>
  - Center left turn lane
  - Right turn lane for WB 10 Mile onto LeBost Dr and Bethany Way
  - No right turn lane for Coral Ln since there are only 6 homes in a cul-de-sac
  - Re-align the sidewalk on the north side that pitches toward the road and add a new fence on the back of sidewalk
  - Eliminate the north side guardrail, if clear zone is met. It appears that the existing headwall and fill slope at the Bishop Creek Culvert are outside the clear zone.
  - Curb and gutter on both sides of the roadway:
    - Curb is proposed on the north side since an 8' shoulder and ditch would impact the existing sidewalk.
    - Curb is proposed on the south side because a shoulder and ditch would impact existing parking facilities, make it more difficult to construct a future pathway, and result in more front yard impacts.
    - Proposed catch basins outlet to existing storm sewer on the north side.
    - Widen roadway approximately 6' from the existing lane line to the north and south to allow for the center turn lane.

        - From Coral Lane to Bethany Way, the addition of curb and gutter will:
            - Minimize roadway widening to approximately the width of the curb over the existing culvert.
            - Eliminate the need to widen the existing shoulder and reduce roadway drainage across private property
    - A highway easement will be required on the south side of the Bishop Creek Culvert. We anticipate RCOC pursuing master plan ROW. (60')
    - Relocate streetlight poles at 10 Mile / LeBost
    - The condition and depth of the existing sanitary sewer and water main crossing the Bishop Creek culvert are not known and might be impacted by the new culvert crossing.
    - Bishop Creek Culvert
        - Existing 8 foot box culvert built in 1925 has been evaluated by recent culvert inspections to be in fair condition (rating of "5" one above poor) with some areas in poor condition with spalling and open cracks at the joints between original culvert section and subsequent culvert extensions on both ends.
        - Repairs to the deteriorated areas would consists of raising the north side headwall, culvert concrete joint patching, and guardrail modernization. It is difficult to forecast the remaining service life of structures in this fair to poor condition and deterioration tends to progress quickly leading to costly repairs and traffic interruptions. Considering the age, condition, and uncertain remaining service life of the culvert combined with the pending south side extension for the future pathway, a new culvert is recommended.
        - It is anticipated that the replacement structure will be approximately a 12' precast concrete box culvert with precast wingwalls and headwalls and heavy riprap at both ends. The headwalls will be located outside of the clear zone, allow for future pathway / sidewalk and eliminate the need for guardrail.

Figure 1: Bishop Ck Culvert south curb line

Figure 2: Bishop Ck Culvert WB travel edge

Figure 3: Bishop Ck Culvert, south side looking west

Figure 4: Bishop Ck Culvert, north side looking east

10 Mile Road, Bethany Way to Willowbrook Drive

- Existing
  - ROW and Driveway Access
    - North side ROW varies from 33' – 60'. The south side ROW is 60'
    - The existing 5' sidewalk on parcel 40700 is outside of the existing ROW
    - The existing sidewalk is partially outside the ROW and the existing ROW cuts into the curb-line at Willowbrook Dr.
    - Parcels 40655, 40611, 40573, and 40539 have existing parking within the ROW.
  - Roadway
    - Bethany Way at 10 Mile has a center left turn lane and right turn lane. The center left extents to Ripple Creek before tapering down at Amanda Ln.
    - There is not a right turn lane at Ripple Creek or Willowbrook Drive.
    - There is a school approximately ½ mile south of 10 Mile on Willowbrook.
    - There is a WB right turn lane at Amanda.
  - Drainage
    - The drainage pattern for this segment is split by and existing high point near STA 33+00 (near Amanda Ln).
    - Bethany Way to Amanda Ln.
      - Both sides of the road are curbed west of Ripple Creek. East of Ripple Creek both sides have open shoulders. Drainage flows west toward Bishop Creek. The north side has a mix of ditches and storm sewer. The south side of the roadway has a swale behind the existing curb and gutter that eventually enters a culvert outletting near Bishop Creek. There is shoulder point drainage east of Ripple Creek.
    - Amanda Ln. to Willowbrook Dr.
      - The north side of the road has a short segment of curb and gutter at Amanda Ln ending near the high point. The remainder of the north side is shoulder point drainage toward Willowbrook. The south side of the roadway has a shallow swale that drains to the east toward Willowbrook.

- Non-Motorized - The north side of the roadway has existing 5' sidewalk while the south side does not have any pedestrian facilities.

- <u>Proposed</u>
  - Center left turn lane
  - Right turn lane at Bethany Way and Amanda Lane
  - Right turn lane and taper at Ripple Creek.
  - 25' right turn lane with 100' taper at Willowbrook Dr. salvaging the parking at parcel 40539.
  - Widened shoulder on the north side from Bethany to Amanda, and curb and gutter on the south side.
    - Existing pavement widths allow for widened shoulder section along the north side with a ditch, and without impacting the existing sidewalk.
    - Curb and gutter on the south side to minimize yard impacts, allow for future pathway construction, and avoid impacting the existing parking at parcel 40655.
  - Curb and gutter on both sides of the roadway from Amanda to Willowbrook.
    - Curb and gutter is proposed on the north side to avoid impacts to the existing sidewalk.
    - Curb and gutter is proposed on the south side to minimize front yard impacts, allow for easer future pathway construction, and avoid impacting the existing parking at parcels 40611, 40573, and 40539.
  - A highway easement is anticipated in the northwest quadrant at Willowbrook to perform ADA sidewalk ramp upgrades. A triangular sliver isolated to the ramp area is anticipated.

<u>10 Mile Road, Willowbrook Drive to Olde Orchard Street</u>

- <u>Existing</u>
  - ROW and Driveway Access
    - The ROW varies from 33' – 60' on both sides.
    - The existing 5' sidewalk on the north side is outside of the ROW for several hundred feet.
  - Roadway
    - 10 Mile Road starts and ends as a 2 lane road in this segment that widens to a center left turn lane and right turn lane at the signalized intersection of 10 Mile with Bashian Dr / Cranbrooke Dr.
    - There are right turn lanes at Willowbrook Dr and Olde Orchard Street.
    - Buckingham Ct does not have a right turn lane or taper.
  - Drainage - Both the north side and the south side of the roadway are open shoulders with drainage flowing toward the Francis Drain / Ingersol Creek. There are some areas of shoulder point drainage and others with a defined swale.
  - Non-Motorized - The north side of the roadway has existing 5' sidewalk while the south side does not have any pedestrian facilities.
- <u>Proposed</u>
  - Center left turn lane
  - Right turn lanes with 100' tapers at Willowbrook Dr, Bashian Dr, and Cranbrooke Dr
  - Willowbrook Drive to Bashian Drive / Cranbrooke Drive:

        - Open shoulder on the north side
        - Curb and gutter on the south side to minimize impacts to utilities and front yards, allow for easer future pathway construction. The existing trees adjacent to 10 Mile on 24165 Cranbrooke Dr. sit significantly higher than the existing roadway and will likely be impacted.
    - Bashian Drive / Cranbrooke Drive to Olde Orchard Street:
        - Shoulders on both sides of the road.
    - Highway easements are proposed on the north side of the roadway from Willowbrook Dr up to 24671 Olde Orchard St. (opposite Buckingham Ct). Master plan ROW (60') has been assumed to allow for ADA ramp upgrades, and to encompass the sidewalk and existing utilities. No record of an existing highway easement was available, however a future title search is recommended.

<u>10 Mile Road, Olde Orchard Street to Karmin Boulevard</u>

- <u>Existing</u>
    - ROW and Driveway Access - The north and south side have approximately 60' ROW
    - Roadway - 10 Mile Rd has 2 lanes over the Ingersol Creek. Right turn tapers at Olde Orchard St and Nilan Dr. There is guardrail on both sides. There are passing lanes near Karmin Blvd on each side.
    - Drainage
        - Open shoulders on both sides that drain to Francis Drain / Ingersol Creek. The south side of the road has existing catch basins in the flow line and a storm sewer flowing toward the creek.
        - There is an existing 48" sewer outlet on the west side of Ingersol Creek on the north side near the ROW. The Francis Drain flows from North to South and makes a near 90 degree bend before crossing 10 Mile. On the south side of the road, the creek makes a 90 degree bend to the west approximately 60' after exiting the culvert. There is an existing 12" sewer outlet into the east side of the creek approximately 15' south of the headwall.
    - Non-Motorized - The north side has existing 5' sidewalk while the south side does not. There is a crossing near Nilan Drive.
- <u>Proposed</u>
    - Center left turn lane
    - Right turn lanes at Olde Orchard St, Nilan Dr, and both sides of Karmin Blvd.
    - Curb and gutter on both sides with a short stretch of open shoulder west of Karmin.
    - New sidewalk and fence on the north side at the culvert.
    - No highway easements are anticipated, however temporary easements are likely.
    - Francis Drain / Ingersol Creek Culvert:
        - The existing culvert was built in 1925, and has been rated a "4" (poor condition) for two inspection cycles. The culvert shows deterioration at the culvert ends and scour issues noted. Spray foam has been recently placed as a temporary measure on the sections of culvert that have "rotted through" near the north end.

        - Significant repair work and extension on both ends would be required for the proposed center and right turn lanes at a minimum along with scour countermeasures placed within the channel.
        - Culvert replacement is the best long term solution at this location. It is anticipated that a proposed culvert size will increase to approximately a 16' precast concrete box culvert however the culvert size may increase based on the bankfull width determined at the EGLE pre-application meeting discussion.
        - The proposed culvert should be realigned to better match the creek alignment.
        - Extend culvert outside of the clear zone on both sides of the roadway allowing for the north side sidewalk, future south side pathway, proposed center left turn lanes, and the addition of full right turn lanes at Olde Orchard St and Nilan Dr.
        - Install riprap channel from the existing 48" storm sewer outlet to the Francis Drain / proposed north culvert wingwall.
    - The condition and depth of the existing sanitary sewer and water main crossing the Francis Drain / Ingersol Creek culvert are not known and might be impacted by the new structure.

Figure 5: Ingersol Ck Culvert, at north end

Figure 6: Ingersol Ck, north side 48 inch outlet

Figure 7: Ingersol Ck Culvert, north side

Figure 8:Ingersol Ck Culvert, north side looking west

Figure 9: Ingersol Ck Culvert, south side

Figure 10: Ingersol Ck Culvert, south side

<u>10 Mile Road, Karmin Boulevard to Haggerty Road</u>

- <u>Existing</u>
  - ROW and Driveway Access – ROW is 60’ on the north side and varies from 33’ to 60’ on the south side.
  - Roadway - 10 Mile varies from 2 lanes to 5 lanes. The driveway to the medical complex just west of Haggerty is situated within the WB outside lane drop for 10 Mile Road.
  - Drainage - Both sides of 10 Mile Rd are open shoulders with ditches flowing toward Ingersol Creek, with the exception of the 5 lane section the roadway, which is curb and gutter on both sides of the road.
  - Non-Motorized - The north side of the roadway has existing 5’ sidewalk while the south side does not have pedestrian facilities.
- <u>Proposed</u>
  - Connect a proposed center turn lane to the existing turn lane.
  - Extend the WB RT turn lane from Haggerty to Karmin, in lieu of a lane drop taper within the medical complex driveway.
  - Curb and gutter for the missing segments on the north side, and widened shoulder at parcel 39575 and 39555 with curb and gutter to the east continuing to Haggerty Rd.
  - No highway easements are anticipated.

4. CONCLUSIONS

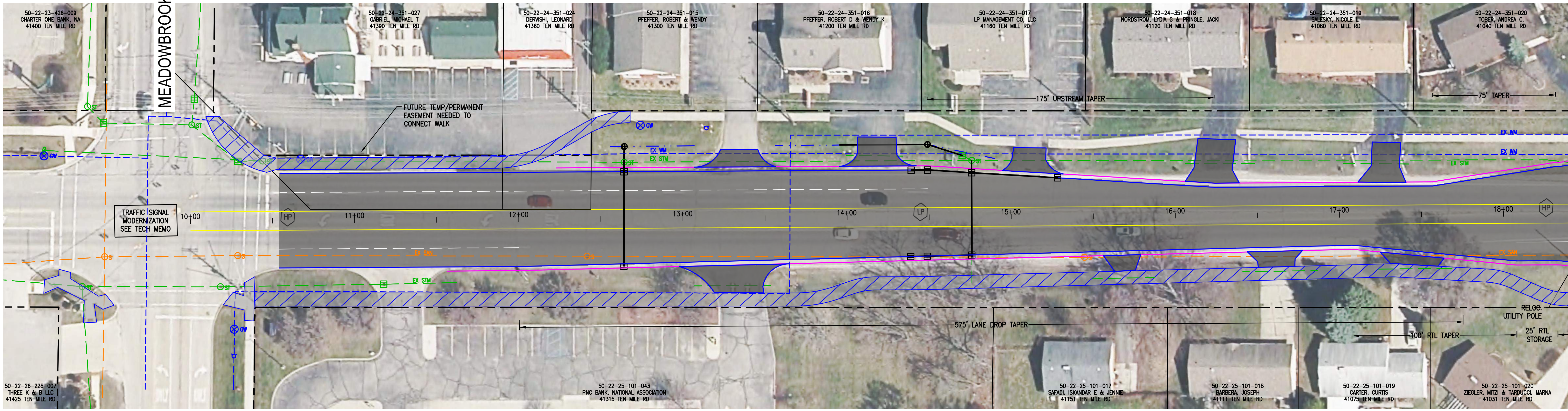
The analysis and collaboration with the RCOC revealed that the addition of the continuous center left turn lane (and the future addition of a pathway on the south side of 10 Mile Road) will necessitate other significant infrastructure improvements.

Due to the age and condition of the infrastructure, right-of-way constraints, and/or the need to enhance safety from driveway/sidestreet approaches, the following significant improvements are necessary: right turn lane additions, curb and gutter, enclosed storm sewer, 2 large culvert crossing replacements, and 2 traffic signal replacements.

In addition, approximately 5 (plus-minus) Highway Easements and several Temporary Easements will be necessary. The most significant ROW impact is at the south side of 10 Mile Road, at the Bishop Creek Culvert. Isolated public and private utility relocation might be necessary, primarily near the 2 culvert crossings.

10 MILE RD

EXHIBIT A
5/20/2019



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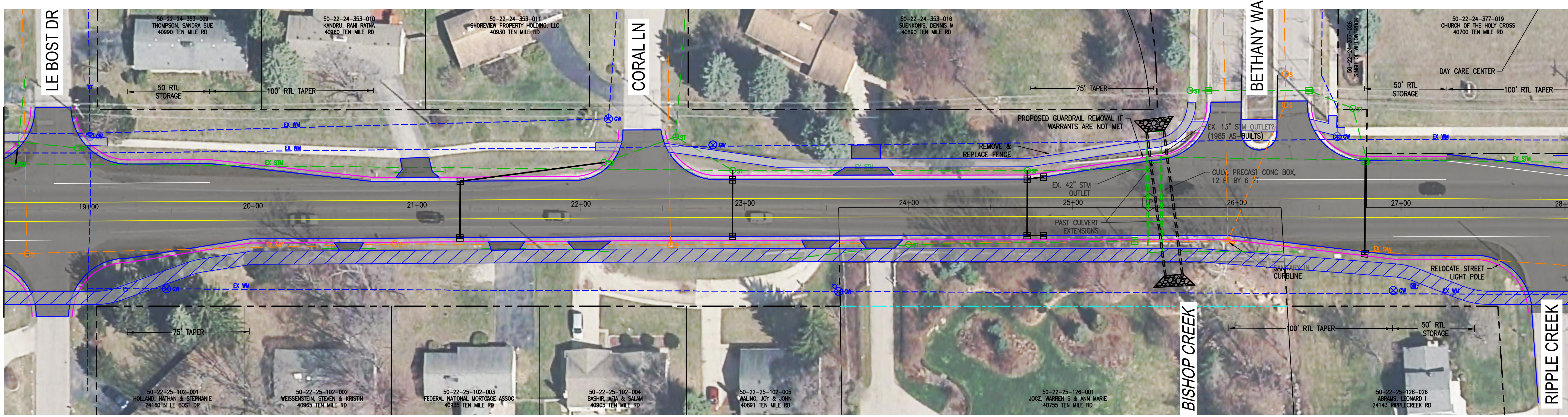

LEGEND

EXISTING ROW	PROPOSED ROADWAY
PROPERTY LINE	PROPOSED WALK
PROPOSED HIGHWAY EASEMENT	PROPOSED FUTURE PATHWAY
PROPOSED EDGE OF PAVEMENT	PROPOSED DITCH CENTERLINE
PROPOSED EDGE OF GRAVEL	PROPOSED STORM SEWER
PROPOSED BACK OF CURB	

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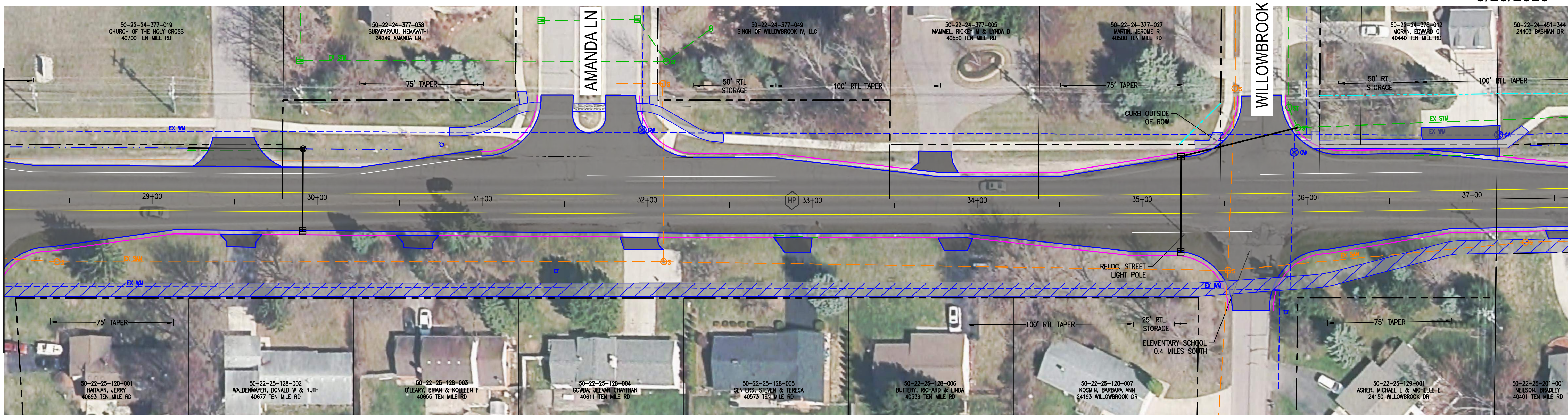
10 MILE RD

EXHIBIT A
5/20/2019



SCALE: 1" = 60'

(11x17)

OHM
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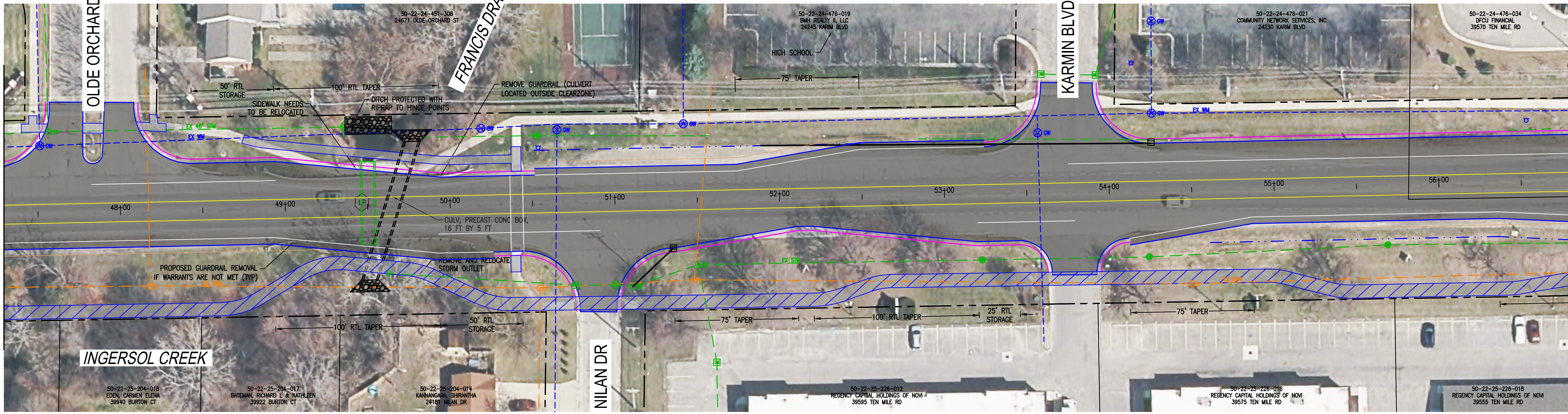
LEGEND

EXISTING ROW	PROPOSED ROADWAY
PROPERTY LINE	PROPOSED WALK
PROPOSED HIGHWAY EASEMENT	PROPOSED FUTURE PATHWAY
PROPOSED EDGE OF PAVEMENT	PROPOSED DITCH CENTERLINE
PROPOSED EDGE OF GRAVEL	PROPOSED STORM SEWER
PROPOSED BACK OF CURB	

10 MILE RD

EXHIBIT A
5/20/2019



SCALE: 1" = 60'

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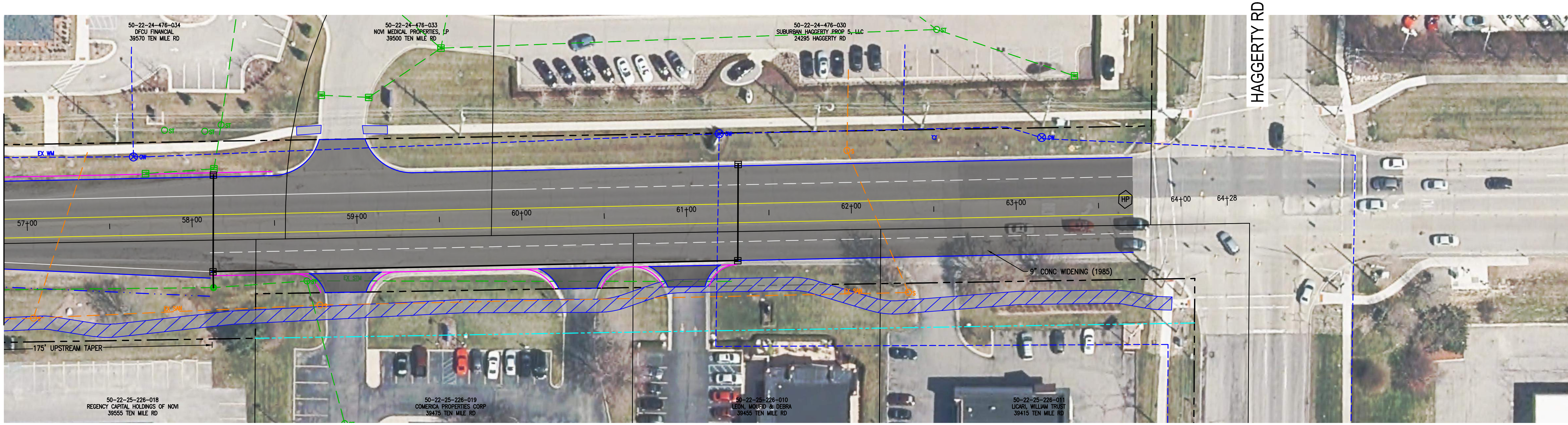


LEGEND

EXISTING ROW	PROPOSED ROADWAY
PROPERTY LINE	PROPOSED WALK
PROPOSED HIGHWAY EASEMENT	PROPOSED FUTURE PATHWAY
PROPOSED EDGE OF PAVEMENT	PROPOSED DITCH CENTERLINE
PROPOSED EDGE OF GRAVEL	PROPOSED STORM SEWER
PROPOSED BACK OF CURB	

EXHIBIT B

OPINION OF PROBABLE CONSTRUCTION COST

ORCHARD, HILTZ & McCLIMENT, INC.
34000 Plymouth Road, Livonia, Michigan, 48150
Telephone: (734) 522-6711 FAX: (734) 522-6427

PROJECT: 10 Mile Rd - Meadowbrook to Haggerty - Exhibit B
LOCATION: City of Novi
WORK: Proposed center left turn lane, road resurfacing, drainage, and traffic signals.

DATE: May 20, 2019
PROJECT #: 0163-18-0020
ESTIMATOR: ACM
CHECKED BY: DGC
CURRENT ENR: JRK

ITEM CODE	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	COST
	CATEGORY 1 -Roadway				
1500001	Mobilization, Max	LSUM	1	$ 334,000.00	$ 334,000.00
2020002	Tree, Rem, 19 inch to 36 inch	Ea	5	$ 500.00	$ 2,500.00
2020004	Tree, Rem, 6 inch to 18 inch	Ea	5	$ 150.00	$ 750.00
2030001	Culv, Rem, Less than 24 inch	Ea	16	$ 250.00	$ 4,000.00
2040020	Curb and Gutter, Rem	Ft	500	$ 6.00	$ 3,000.00
2040035	Guardrail, Rem	Ft	456	$ 1.50	$ 684.00
2040050	Pavt, Rem	Syd	795	$ 10.00	$ 7,950.00
2040055	Sidewalk, Rem	Syd	628	$ 7.00	$ 4,396.00
2040070	Utility Pole, Rem	Ea	3	$ 250.00	$ 750.00
2050010	Embankment, CIP	Cyd	4724	$ 9.00	$ 42,516.00
2050016	Excavation, Earth	Cyd	2324	$ 9.00	$ 20,916.00
2050041	Subgrade Undercutting, Type II	Cyd	2000	$ 25.00	$ 50,000.00
2057011	Excavation, Earth, RCOC	Syd	1694	$ 8.00	$ 13,552.00
2080036	Erosion Control, Silt Fence	Ft	1000	$ 2.00	$ 2,000.00
3027011	Aggregate Base, 6 inch, 21AA, RCOC	Syd	4380	$ 9.00	$ 39,420.00
3027011	Aggregate Base, 8 inch, 21AA, RCOC	Syd	5241	$ 12.00	$ 62,892.00
3077011	Shoulder, 21AA, 6 inch	Syd	914	$ 6.00	$ 5,484.00
4010641	Culv, Cl F, Conc, 12 inch	Ft	98	$ 25.00	$ 2,450.00
4020601	Sewer, Cl E, 15 inch, Tr Det B	Ft	1648	$ 65.00	$ 107,120.00
4030210	Dr Structure, 48 inch dia	Ea	34	$ 3,000.00	$ 102,000.00
4037051	Storm Detention and Treatment	LSUM	1	$ 250,000.00	$ 250,000.00
4047001	Underdrain, Subgrade, Open-Graded, 6 inch, RCOC	Ft	7282	$ 15.00	$ 109,230.00
5010002	Cold Milling HMA Surface	Syd	27864	$ 3.00	$ 83,592.00
5010005	HMA Surface, Rem	Syd	3961	$ 4.00	$ 15,844.00
5010051	HMA, 4E3	Ton	1236	$ 100.00	$ 123,600.00
5010057	HMA, 5E3	Ton	5771	$ 100.00	$ 577,100.00
5017031	HMA Approach, Commercial, 8 inch	Ton	232	$ 120.00	$ 27,840.00
5017031	HMA Approach, Residential, 6 inch	Ton	129	$ 120.00	$ 15,480.00
5017031	HMA Approach, Sidestreet, 8 inch	Ton	1183	$ 120.00	$ 141,960.00
6030090	Saw Cut, Intermediate	Ft	8627	$ 1.25	$ 10,783.75
8010005	Driveway, Nonreinf Conc, 6 inch	Syd	126	$ 32.00	$ 4,032.00
8020038	Curb and Gutter, Conc, Det F4	Ft	6743	$ 20.00	$ 134,860.00
8020050	Driveway Opening, Conc, Det M	Ft	539	$ 25.00	$ 13,475.00
8030010	Detectable Warning Surface	Ft	140	$ 35.00	$ 4,900.00
8030036	Sidewalk Ramp, Conc, 6 inch	Sft	2842	$ 7.00	$ 19,894.00
8030044	Sidewalk, Conc, 4 inch	Sft	2680	$ 3.00	$ 8,040.00
8070095	Post, Mailbox	Ea	50	$ 63.00	$ 3,150.00
8080011	Fence, Chain Link, 48 inch	Ft	250	$ 12.00	$ 3,000.00

ITEM CODE	DESCRIPTION	UNIT	TOTAL	UNIT PRICE	COST
	CATEGORY 1 -Roadway				
8107051	Pavement Marking & Signing	LSUM	1	$ 12,000.00	$ 12,000.00
8127051	Maintenance of Traffic	LSUM	1	$ 80,000.00	$ 80,000.00
8167011	Turf Establishment, THM Seed, Regular Mulch, Performance, R	Syd	5867	$ 7.00	$ 41,069.00
8230170	Water Main, DI, 16 inch, Tr Det F	Ft	500	$ 160.00	$ 80,000.00
8257001	Sanitary Sewer, 10 inch, Tr Det F	Ft	500	$ 100.00	$ 50,000.00
	CATEGORY 2 -Bishop Creek Culvert				
2040060	Structures, Rem	LSUM	1	$ 30,000.00	$ 30,000.00
2060002	Backfill, Structure, CIP	Cyd	336	$ 25.00	$ 8,400.00
2060010	Excavation, Fdn	Cyd	583	$ 20.00	$ 11,660.00
4060005	Culv Bedding, Box Culv	Cyd	64	$ 65.00	$ 4,160.00
4060147	Culv, Precast Conc Box, 12 foot by 6 foot	Ft	88	$ 2,500.00	$ 220,000.00
4067050	Precast Wingwalls	Ea	4	$ 8,000.00	$ 32,000.00
8137011	Riprap, Heavy, RCOC	Syd	89	$ 100.00	$ 8,900.00
	CATEGORY 3 -Ingersol Creek Culvert				
2040060	Structures, Rem	LSUM	1	$ 30,000.00	$ 30,000.00
2060002	Backfill, Structure, CIP	Cyd	362	$ 25.00	$ 9,050.00
2060010	Excavation, Fdn	Cyd	700	$ 20.00	$ 14,000.00
4060005	Culv Bedding, Box Culv	Cyd	64	$ 65.00	$ 4,160.00
4067001	Culv, Precast Conc Box, 16 foot by 5 foot	Ft	88	$ 2,900.00	$ 255,200.00
4067050	Precast Wingwalls	Ea	4	$ 8,000.00	$ 32,000.00
8137011	Riprap, Heavy, RCOC	Syd	267	$ 100.00	$ 26,700.00
	CATEGORY 4 -Traffic Signal Modernization				
8197051	10 Mile & Cranbrooke/Bashian Traffic Signal Work	LSUM	1	$ 175,000.00	$ 175,000.00
8197051	10 Mile & Haggerty Traffic Signal Work	LSUM	1	$ 15,000.00	$ 15,000.00
8197051	10 Mile & Meadowbrook Traffic Signal Work	LSUM	1	$ 185,000.00	$ 185,000.00

SUBTOTAL FOR CATEGORY 1 -Roadway	$ 2,616,229.75
SUBTOTAL FOR CATEGORY 2 -Bishop Creek Culvert	$ 315,120.00
SUBTOTAL FOR CATEGORY 3 -Ingersol Creek Culvert	$ 371,110.00
SUBTOTAL FOR CATEGORY 4 -Traffic Signal Modernization	$ 375,000.00
CONTINGENCY (20%)	$ 523,000.00
TOTAL OPINION OF PROBABLE CONSTRUCTION COST =	**$ 4,200,459.75**
ROW (*22,300 SFT Residential Land @ $12/sft*)	$ 267,600.00
Design Engineering @ 10%	$ 420,000.00
Less $20,500 (Corridor Study)	$ 399,500.00
Construction Engineering @ 14%	$ 588,000.00
TOTAL OPINION OF PROBABLE PROJECT COST =	**$ 5,455,559.75**

Appendix M

12 Mile Project Update

MEMORANDUM

cityofnovi.org

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: 12 MILE ROAD WIDENING PROJECT UPDATE

DATE: SEPTEMBER 16, 2020

In late 2019, City staff and the Road Commission for Oakland County (RCOC) met to discuss the project status of the 12 Mile Road reconstruction between Beck Road and Dixon Road. At the time, staff anticipated the scheduling of a spring 2020 public meeting to solicit comments on the preferred design option (attached). Due to the pandemic, the public meeting was delayed with the intent to reschedule as soon as possible.

With no clear timetable for standard public meeting accommodations, RCOC will be holding the required public comment and plan viewing via a virtual portal. A schedule for this virtual meeting is forthcoming and information will be posted on both the City's and RCOC's websites.

As there was no funding identified for the 12 Mile project beyond the Environmental Assessment (currently underway) in RCOC's Transportation Improvement Program, staff requested RCOC consider the 12 Mile project for funds in the next round of Federal Aid Committee submissions. RCOC submitted a letter to Federal Aid Committee (FAC) Chairperson Brad Knight (attached) requesting the approval of Transportation Economic Development Funds (TEDF-C) to enter the right-of-way (ROW) phase of the 12 Mile project.

Since other community projects with committed funds were delayed, it opened the opportunity for Novi to utilize the TEDF-C funds available in 2022. The FAC approved the request at the committee meeting held on September 14, 2020. The local match for estimated $3M ROW cost is 80% federal ($2.4M) and 20% local ($600K). The local share will be split between RCOC and Novi (50%/50%); therefore, Novi must commit $300K to the project in FY 21-22.

Next steps in the process are:

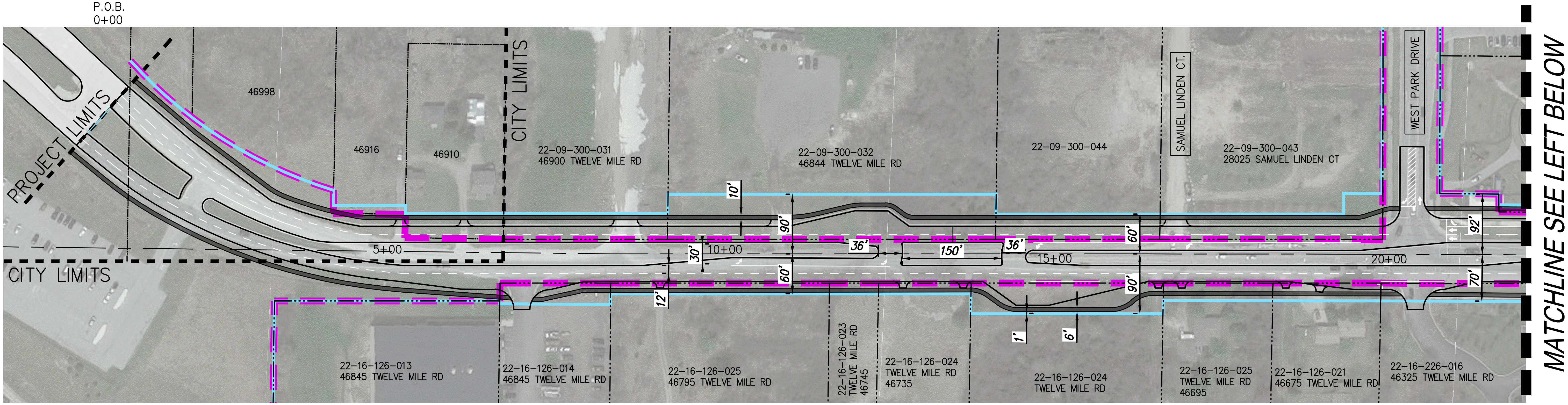
- Virtual Public Meeting for comments on design (Fall 2020)
- Draft Environmental Assessment (EA) on preferred design option (Fall 2020)
- Findings and report from EA (2020-21)
- Interlocal Cost Share Agreement with RCOC for ROW Phase(2021)
- Right-of-Way Acquisition (2022)

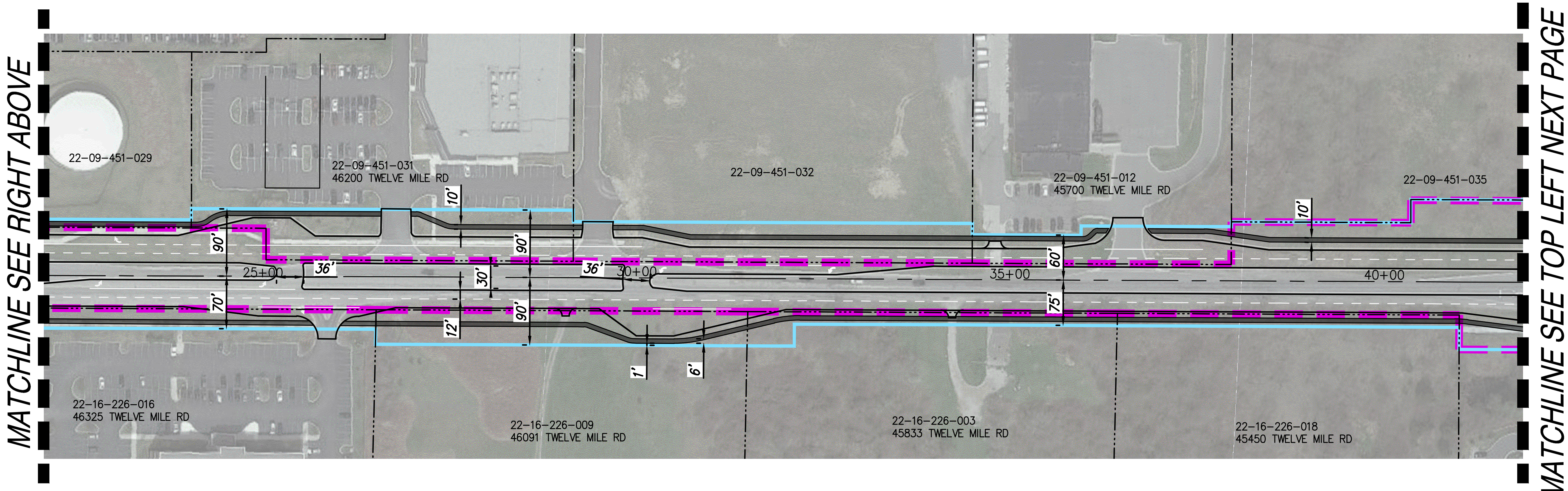
The ROW funding is an important step for this critical project to come to fruition. Staff continues to work towards solutions to fund the construction phase (estimated at $12-$14M) with RCOC. Options could include additional future TEDF-C dollars with potential for the City to prefund and advance construct, similar to the process used on the 12 Mile and Novi Road Intersection (2019) and the 10 Mile from Meadowbrook to Haggerty continuous left turn lane (2022).

Staff will forward additional information as the project continues through the process.

12 Mile Road Improvements – 4 LANE BOULEVARD – 30' MEDIAN

SPALDING DEDECKER
Engineering and Surveying
Excellence Since 1954





GRAPHIC SCALE

0 75 150 225 300

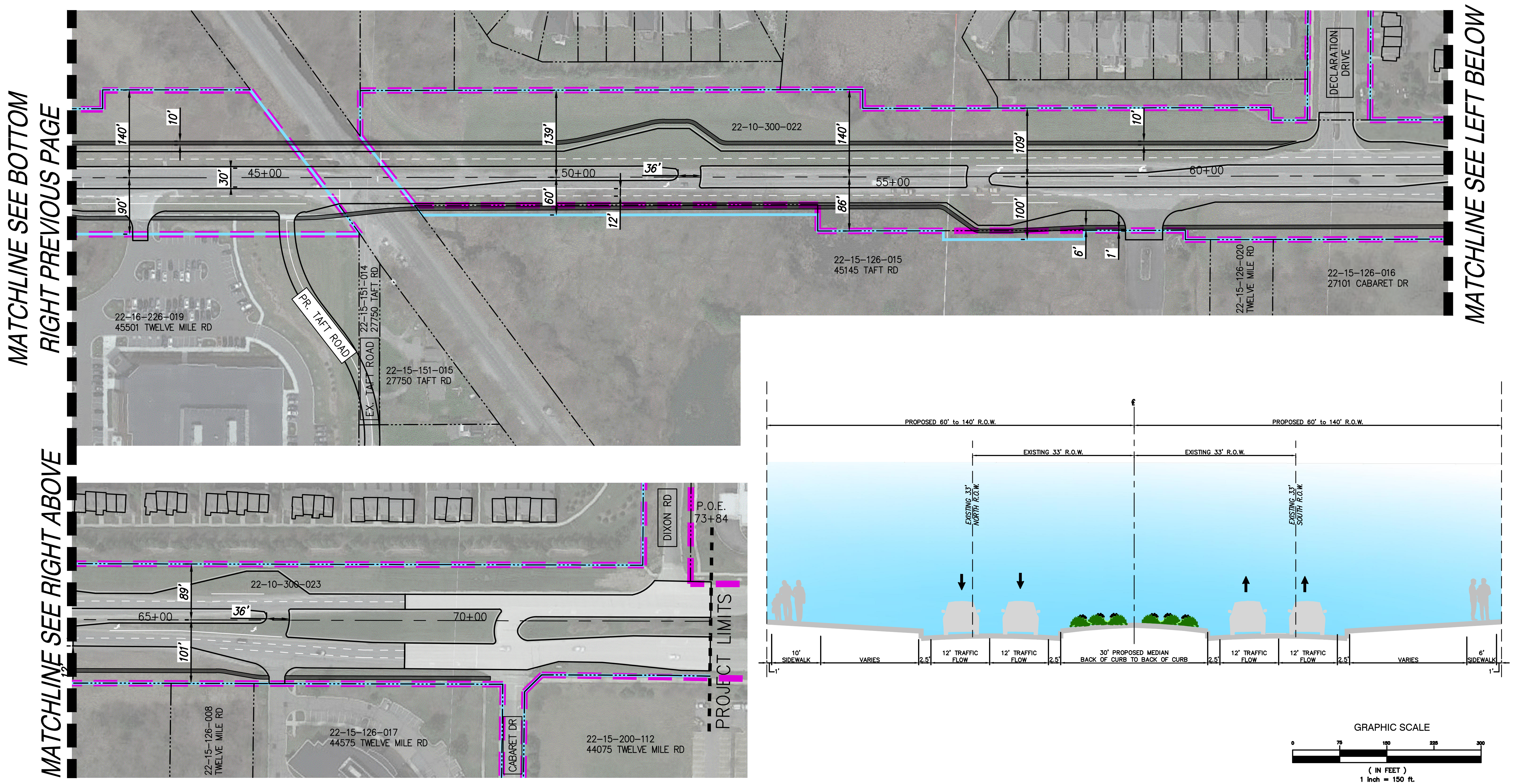
(IN FEET)
1 inch = 150 ft.

LEGEND

PROPOSED PAVEMENT   EXISTING PAVEMENT   150' PROPOSED RIGHT-OF-WAY   EXISTING RIGHT-OF-WAY   PROPOSED SIDEWALK   APPROX. PROPERTY LINES

12 Mile Road Improvements – 4 LANE BOULEVARD – 30' MEDIAN

SPALDING DeDECKER
Engineering and Surveying
Excellence Since 1954



LEGEND

PROPOSED PAVEMENT

EXISTING PAVEMENT

150' PROPOSED RIGHT-OF-WAY

EXISTING RIGHT-OF-WAY

PROPOSED SIDEWALK

APPROX. PROPERTY LINES

ROAD COMMISSION for OAKLAND COUNTY

QUALITY LIFE THROUGH GOOD ROADS:
ROAD COMMISSION FOR OAKLAND COUNTY
"WE CARE."

Board of Road Commissioners

Ronald J. Fowkes
Commissioner

Gregory C. Jamian
Commissioner

Andrea LaLonde
Commissioner

Dennis G. Kolar, P.E.
Managing Director

Gary Piotrowicz, P.E., P.T.O.E.
Deputy Managing Director
County Highway Engineer

31001 Lahser Road
Beverly Hills, MI
48025

248-645-2000

FAX
248-645-1349

www.rcocweb.org

September 9, 2020

Mr. Brad Knight
Chairperson
Oakland County Federal Aid Committee
31001 Lahser Road
Beverly Hills, MI 48025

Subject: Transportation Economic Development Fund – Category C

Dear Mr. Knight:

This is a request of the Oakland County Federal Aid Committee to approve FY 2022 Transportation Economic Development Fund – Category C (TEDF-C) funds for the right-of-way phase of the 12 Mile Road from Beck Road to Dixon Road project.

The preliminary engineering phase is currently funded, and the Environmental Assessment is nearing completion. We anticipate design to begin in early 2021 and right-of-way acquisition to begin in late 2021.

As a result, the RCOC is requesting $2.4 million in FY 2022 TEDF-C funds for the right-of-way phase of 12 Mile Road from Beck Road to Dixon Road. The required local match of $600,000 will be shared equally between the Road Commission for Oakland County (RCOC) and the City of Novi.

The RCOC recently met with the City of Troy to discuss TEDF-C funds since RCOC and the city are the only two agencies with approved TEDF-C projects in FY 2022 and beyond. Both agencies came to an agreement regarding the proposed 12 Mile Road right-of-way phase and the re-prioritization of the existing projects.

Your consideration of this request at the September 14, 2020 meeting is appreciated.

Sincerely,

Gary Piotrowicz, P.E., P.T.O.E
Deputy Managing Director
County Highway Engineer

Appendix N

RCOC Strategic Planning Update

MEMORANDUM

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: 2019 RCOC STRATEGIC PLANNING/12 MILE MEETINGS

DATE: JUNE 20, 2019

On May 6, 2019, staff met with the Road Commission for Oakland County (RCOC) for strategic planning. The RCOC holds meetings with municipalities every two years as an opportunity to discuss current and future road needs and maintenance issues. The meeting was held at the Novi Civic Center in collaboration with the City of Northville. RCOC Officials Dennis Kolar (Managing Director), Gary Piotrowicz (Deputy Managing Director/ County Highway Engineer), Brad Knight (Planning & Environmental Concerns Director) and Sarah Plumer (Transportation Planner) were in attendance, along with City of Northville representatives City Manager Patrick Sullivan and Public Works Director Loyd Cureton.

City staff Victor Cardenas, George Melistas, and Megan Mikus, and I presented the 2019 Long-Range Strategic Transportation Priorities List, which is attached. All road segments shown on the list will be reviewed and considered by the RCOC as contenders for future road improvement projects.

The items outlined in the attached agenda packet were discussed. The RCOC shared important developments regarding legislative updates, new technologies, funding opportunities, and environmental initiatives. The RCOC will keep both cities apprised of upcoming proposed and future projects in our community.

In addition to the strategic planning meeting, a special meeting regarding the progress on 12 Mile Road (between Beck and Cabaret) was also held with RCOC officials and City of Novi staff on May 13, 2019. RCOC attendees included Brad Knight, Jeff O'Brien (Design Engineer) and the consultants assigned to the project, Jason Whitten (DLZ, Senior Planner) and Larry Dropiewski, PE (SDA, Project Manager). City staff in attendance included City Manager Peter Auger, City Planner Barb McBeth, and myself.

Topics discussed included design alternatives (attached) of a five-lane cross section and four-lane boulevard, the environmental assessment, right-of-way (ROW) estimates/acquisition, pending development, and funding.

Next steps in the process are:

- Public Meeting to solidify the best design option (Fall 2019)
- Initiate Environmental Assessment (EA) on preferred design option (following Public Meeting)
- Findings and report from EA (2020-21)

Currently, there is no funding identified in RCOC's Transportation Improvement Program, which is forecasted out until 2022, and estimates for ROW acquisition are ranging from $5M-$6M. The City is requesting for RCOC to include the funding for design and ROW acquisition in the next call for projects in 2023. The request will be formalized in a letter to Mr. Piotrowicz and Mr. Knight prior to the Public Meeting in fall of 2019.

Please let me know if you have any questions regarding this memo.

cc: Victor Cardenas, Assistant City Manager
George D. Melistas, Engineering Senior Manager
Megan Mikus, Public Works Budget Analyst

ROAD COMMISSION for OAKLAND COUNTY

QUALITY LIFE THROUGH GOOD ROADS - WE CARE

2019 Strategic Plan Meeting

AGENDA

1. **Discussion**
   - Community Update
   - Community Priorities
   - Future Project Needs
2. **Lansing Update**
   - New Leadership
   - Legislative Updates
3. **Road Funding**
   - Act 51 Rewrite
   - Additional Funding
4. **What's New at RCOC**
   - Technology
   - Independence Twp Millage
5. **Existing and Future Programs**
   - Engineering Programs
   - Maintenance Programs
   - Future Programs & Innovative Techniques
6. **Leveraging Dollars and Working Within Parameters**
   - Project Selection Criteria
   - State of the System (PASER)
   - 2019 Road Improvement Program (RIP)
   - Future Road Conditions
   - Tri-Party
7. **Asset Management**
   - Data Collection
   - Data Requests
8. **Environmental Update**
   - Wetland Banking Board
   - Cooperative Invasive Species Management Area (CISMA)

This marks the 18th time since its beginning in 1985 that the RCOC has engaged communities in the strategic planning process. These meetings offer a unique opportunity for each community in Oakland County and RCOC to review road needs, concerns and to share news on recent developments.

In the past two years since the 2017 Strategic Planning meetings were held, RCOC has been busy. We will complete even more in 2019 and future years.

2017	2018	2019
• 78 miles of road work	• 127 miles of road work	• 137 miles of road work

2019 CITY OF NOVI LONG-RANGE STRATEGIC TRANSPORTATION PRIORITIES

The following is list of long-range strategic transportation priorities as provided by **City of Novi** officials at the 2019 Strategic Plan Meeting on 5/6/19:

1. **12 Mile Road widening: Beck Road to Cabaret Drive**
   - Widen this road segment from two to five lanes, including an improved at-grade crossing at the Lake State Railway tracks.
   - Project update with SDA and City to review current practical updates
2. **10 Mile Road: Haggerty to Napier**
   - City commissioned study by OHM for long range improvements
   - Operational enhancements part of 2019/2020 PPO
3. **Grand River Avenue Road widening: East of Novi Road to Haggerty Road**
   - Widen this road segment from three/four lanes to five lanes to improve traffic flow.
   - Other improvements per attached Corridor Study
4. **Novi Road widening: 9 Mile Road to 10 Mile Road**
   - Widen this road segment from two lanes to five lanes to improve traffic flow.
5. **Novi Road widening: 8 Mile Road to 9 Mile Road**
   - Widen this road segment from two lanes to five lanes to improve traffic flow.
6. **Haggerty Road widening: North of High Pointe Boulevard to 9 Mile Road**
   - Widen this road segment from four lanes to five lanes to improve traffic flow.
7. **Haggerty Road widening: North of Stonehenge Boulevard to just South of 10 Mile Road**
   - Widen this road segment from four lanes to five lanes to improve traffic flow.
8. **Haggerty Road widening: North of Regency Drive to 12 Mile Road**
   - Widen this road segment from two/three lanes to five lanes to improve traffic flow.
9. **Haggerty Road widening: North of 12 Mile Road to 14 Mile Road**
   - Widen this road segment from two/three lanes to five lanes to improve traffic flow.
10. **14 Mile Road Widening: East Lake Drive to M-5 Expressway**
    - Widen this road segment to improve traffic flow to and from M-5 Expressway.

11. Improve/Provide Crash Countermeasures and modernize the traffic signals with mast arms at the following intersections with "medium to high" accident rates.

- 8 Mile Road and Haggerty, 9 Mile Road and Haggerty, 10 Mile Road and Haggerty, 13 Mile Road and Haggerty, 8 Mile Road and Beck Road, 13 Mile and Novi Road, 14 Mile and Novi Road, 14 Mile Road at M-5, Novi Road and I-96 Interchange.

RCOC 2019 Strategic Plan: Community Survey

Community: City of Novi
Name: Jeffrey Herczeg
Title: Director of Public Works

PRIORITIES:

Please indicate up to three (3) specific transportation topics which are a priority in your community that you would like to discuss:

1. *12 Mile Road, widening Beck to Cabaret*
2. *Novi Road/Grand River and Meadowbrook/Grand River, intersection improvements*
3. *10 Mile Road, Haggerty to Napier scoping study and widening*

SERVICE EFFECTIVENESS:

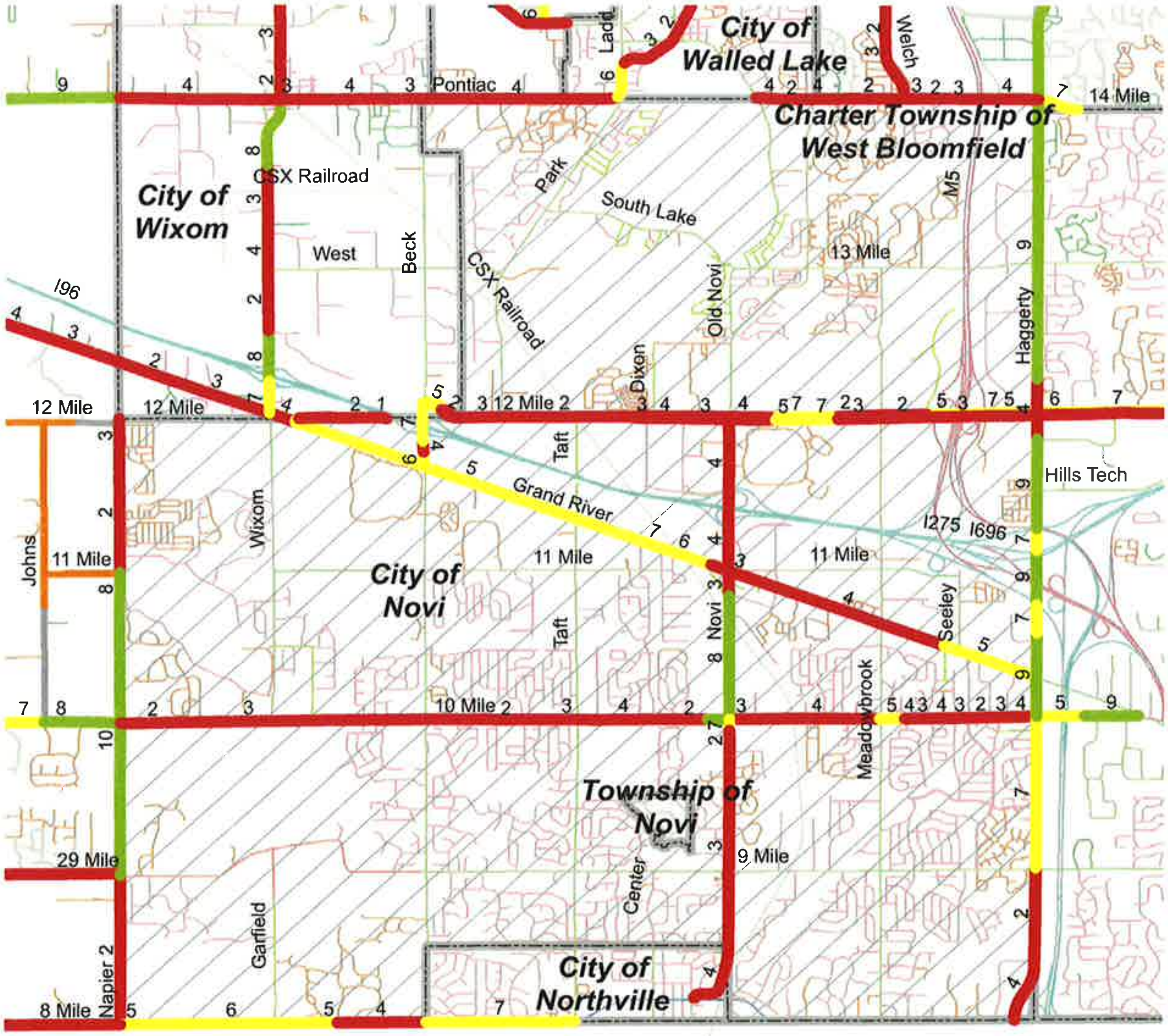
For each of the services listed below, please select the score which best describes the effectiveness of RCOC in providing that service, from 0-Not At All Effective to 5-Extremely Effective.

Please check N/A if the service doesn't apply with your community. If you would like to add a comment regarding any of your selections, please do so in the following question.

	N/A	0	1	2	3	4	5
Guardrail Maintenance/Upgrade/Installation	☐	☐	☐	☒	☐	☐	☐
Sign Maintenance/Upgrade/Installation	☐	☐	☐	☐	☒	☐	☐
Pavement Marking	☐	☐	☐	☐	☒	☐	☐
Signal Maintenance/Optimization/Modernization/Installation	☐	☐	☐	☐	☒	☐	☐
Pothole Patching, Plant Mix Patching, Joint/Crack Filling	☐	☐	☐	☐	☒	☐	☐
Base Repairs	☐	☐	☐	☒	☐	☐	☐
Gravel Grading & Maintenance	☐	☐	☐	☐	☒	☐	☐
Maintain Drainage Systems	☐	☐	☐	☐	☒	☐	☐
Curb Sweeping	☒	☐	☐	☐	☐	☐	☐
Vegetative Maintenance (cut spray brush, tree trimming)	☐	☐	☐	☒	☐	☐	☐
Snow/Ice Control -- Main Roads	☐	☐	☐	☐	☐	☒	☐
Snow/Ice Control -- Subdivision Sts (Townships Only)	☒	☐	☐	☐	☐	☐	☐
Clean/Reshape Ditch	☐	☐	☐	☐	☐	☒	☐
Clear Vision Mowing	☐	☐	☐	☐	☒	☐	☐
Dust Control	☒	☐	☐	☐	☐	☐	☐
Bridge Painting/Maintenance	☒	☐	☐	☐	☐	☐	☐
Erosion Control	☐	☐	☒	☐	☐	☐	☐
Landscaping	☐	☐	☐	☒	☐	☐	☐
Litter Pick-Up	☐	☐	☐	☐	☒	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐

Additional comments on reverse →

2018 PAVEMENT CONDITION
RCOC PAVED PRIMARY AND LOCAL ROADS



Legend
RCOC Paved Primary and Local Roads

CURRRATING
- 8 - 10 (Good)
- 5 - 7 (Fair)
- 0 - 4 (Poor)
- Municipal Boundary
- Community

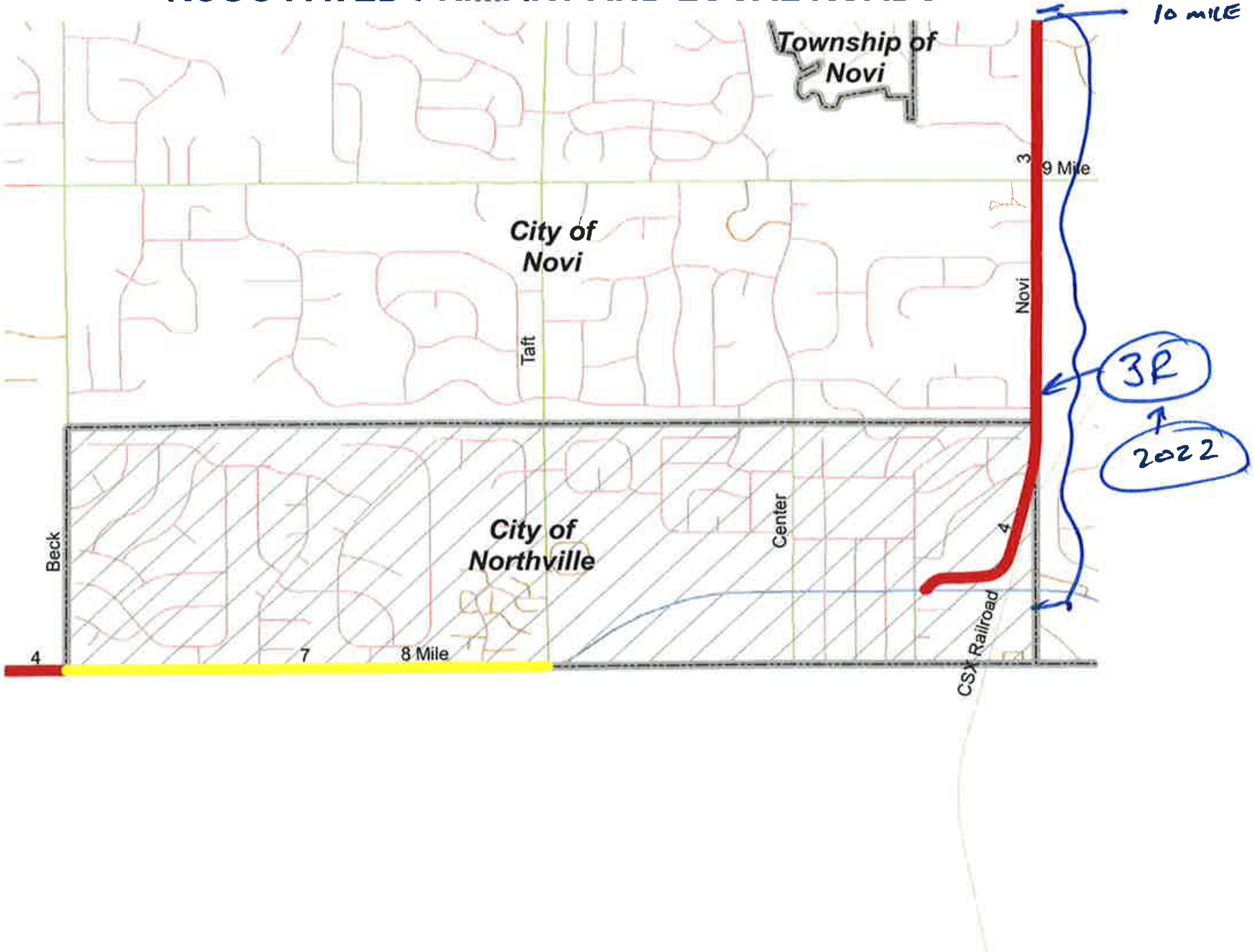
Non Rated RCOC Roads
- County Primary - Paved
- County Primary - Gravel
- County Natural Beauty - Paved
- County Naturan Beauty - Gravel
- County Local - Paved
- County Local - Gravel
- County Sublocal - Paved
- County Sublocal - Gravel
- Uncertified

Non-RCOC Roads
- Highway US
- Highway State
- Highway Interstate
- County Primary - Paved
- County Local - Paved
- County Local - Gravel
- City Major - Paved
- City Major - Gravel
- City Local - Paved
- City Local - Gravel
- City Local / County Sublocal - Paved
- Park Roads
- Private
- Unknown

N

ROAD COMMISSION for OAKLAND COUNTY

2018 PAVEMENT CONDITION
RCOC PAVED PRIMARY AND LOCAL ROADS



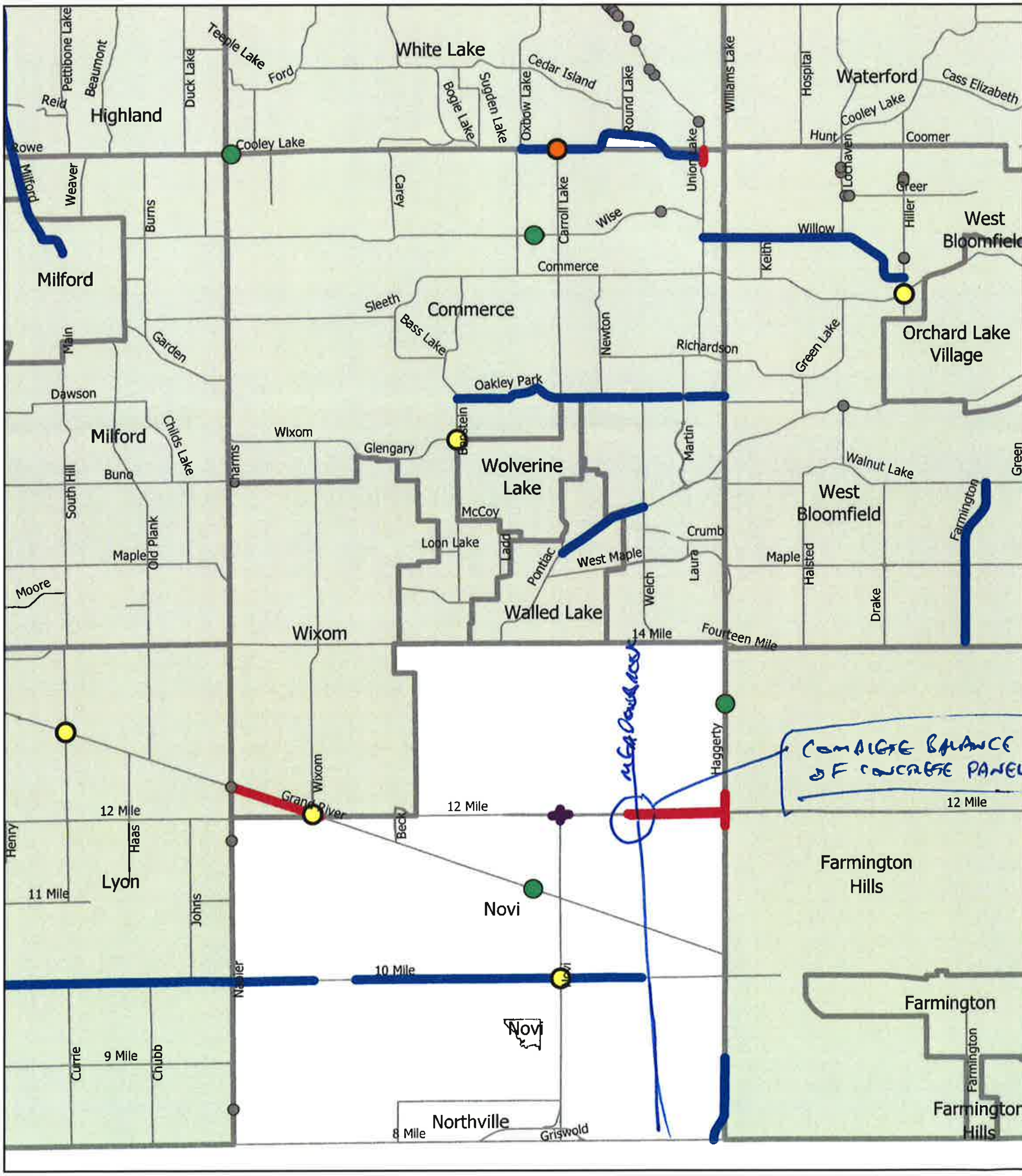
Legend
RCOC Paved Primary and Local Roads

CURRRATING	Non Rated RCOC Roads	Non-RCOC Roads
8 - 10 (Good)	County Primary - Paved	Highway US
5 - 7 (Fair)	County Primary - Gravel	Highway State
0 - 4 (Poor)	County Natural Beauty - Paved	Highway Interstate
Municipal Boundary	County Naturan Beauty - Gravel	County Primary - Paved
Community	County Local - Paved	County Local - Paved
	County Local - Gravel	County Local - Gravel
	County Sublocal - Paved	City Major - Paved
	County Sublocal - Gravel	City Major - Gravel
	Uncertified	City Local - Paved
		City Local - Gravel
		City Local / County Sublocal - Paved
		Park Roads
		Private
		Unknown

N

ROAD COMMISSION for OAKLAND COUNTY

2019 Road Construction - Novi & Northville



Bridges and Culverts
ITS Modernization
Roundabout
Spot Resurface
Concrete Patching
Preservation Overlay
Pave Gravel
RRR
Widening
Accessibility Improvement

N

ROAD COMMISSION for OAKLAND COUNTY

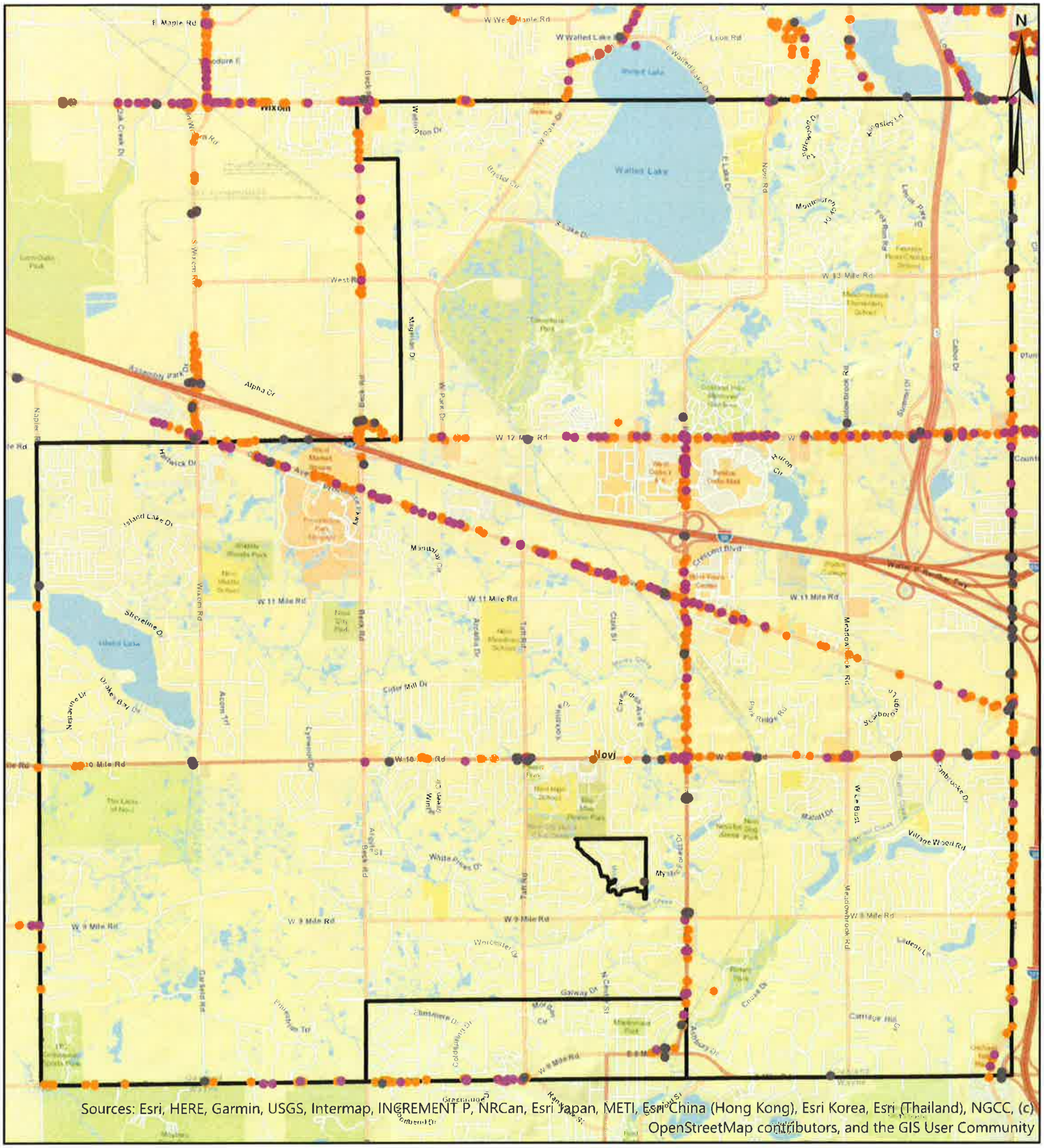
ROAD COMMISSION FOR OAKLAND COUNTY
TRI-PARTY PROGRAM

City of Novi
County Commissioner: 9- Gwen Markham

PROJECT DESCRIPTION		Date of Agrmt	Project No.	1980-2010	2011	2012	Add'l 2012	2013	2014	2015	2016	2017	2018	2019	PROJECT TOTAL
10 Mile @ Lynwood	C		35331	57,900											**57,900**
Haggerty @ Orchard Hill	C		36131	82,000											**82,000**
9 Mile @ Haggerty	C		37441	71,250											**71,250**
G.R. @ Meadowbrook	C	3/23/94	39541	97,016											**97,016**
G.R. @ Beck-add WB/SB right turn lanes	C	4/20/89	38181	168,566											**168,566**
12 @ Donelson-signal upgrade	C	6/21/90	40371	7,783											**7,783**
8 Mile (Meadowbrook-Haggerty)	C	93 & 96	40121	251,343											**251,343**
Haggerty (10-GR)	C		41801	184,469											**184,469**
8 Mile, Novi to Meadowbrook	C	93 & 96	42151	139,421											**139,421**
14 Mile @ Decker	C	5/3/95	43231	72,960											**72,960**
Beck/I-96/12 Mile	C	8/16/95	43131	20,865											**20,865**
10 Mile @ Taft SCATS signals	C	1/25/01	46201	106,893											**106,893**
Grand River over CSX Bridge Replacement	C	4/10/03	38853	1,634,557											**1,634,557**
12 Mile Rd @ Cabot Drive signal installation	C	5/24/07	49071	135,476											**135,476**
Grand River, Novi to Haggerty PE	C	4/15/09	49881	225,000											**225,000**
Novi Rd Link, 10 Mile to Grand River-CON	C	10/14/10	41531	1,517,556											**1,517,556**
Grand River, Novi to Haggerty, construction	C	8/18/11	49881	35,997	155,524										**191,521**
8 Mile - Napier to Beck	C	5/23/13	51711	0		156,293	205,438	161,697							**523,428**
Haggerty Road, south of 10 Mile Road	C	4/10/14	52321	0					159,089						**159,089**
Grand River Avenue at Beck Road	C	5/7/15	52951	0						161,038					**161,038**
Napier, 9 Mile to 10 Mile PE	C	3/24/16	52111	0							75,000				**75,000**
Napier, 9 Mile to 10 Mile ROW		12/8/16	52111	0							250,000				**250,000**
Napier, 9 Mile to 10 Mile CON		6/22/17	52111	0							1,413	325,400			**326,813**
12 Mile Road at Novi Road			54551										326,596	301,515	**628,111**
AMOUNT REMAINING FOR FUTURE PROJECT				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL				**4,809,052**	**155,524**	**156,293**	**205,438**	**161,697**	**159,089**	**161,038**	**326,413**	**325,400**	**326,596**	**301,515**	**7,088,055**
															7,088,055

C - Project complete

NOVI & NORTHVILLE STORMWATER ASSETS



- CATCH BASIN
- MANHOLE
- OUTFALL

NOVI:
79 OUTFALLS
175 MANHOLES
406 CATCH BASINS

NORTHVILLE:
6 OUTFALLS
13 MANHOLES
32 CATCH BASINS

0 0.5 1 2 Miles

ROAD COMMISSION for OAKLAND COUNTY

*RCOC IS CURRENTLY IN COLLECTION PHASE FOR CATCH BASINS AND MANHOLES. OUTFALLS WERE COMPLETED IN 2016

Michigan Wetland Board
for Local Transportation Agencies

Looks like wasteland?

LOOK AGAIN. It's driving local road projects.

One of the untold partnerships contributing to the comeback of Michigan's local transportation system is the emerging marriage of greenspace, mostly wetlands, and road projects. It makes more sense than you think!

In many cases, as new road funds arrive and long-delayed road projects take off, county road agencies, as well as cities and villages may find the improvements infringe on a wetland adjacent to the road.

According to Michigan's Natural Resources & Environmental Protection Act of 1994, most wetland disturbances must be mitigated (offset) so as to maintain ecological balance. Mitigation may be required to add a turn lane, a bike lane or shoulder, or to meet modern state requirements for safety.

MITIGATION

While it's complicated, mitigation of a wetland requires at least 1.5 acres of "new" wetland for every acre impacted by a road (or other construction) project. In some cases, it's much more.

A mitigation means the "new" wetland must be created and permanently dedicated as a wetland. Buying wetland from a commercial wetland bank can cost up to $100,000 per acre, taking money away from the actual road improvement.

PRE-MITIGATION

In most cases, county road agencies and municipalities can use pre-mitigation. This means they plan ahead for future impacts, and create replacement wetland, keeping the cost lower.

THE BACKGROUND

For decades, the **Joint Agency Transportation Committee** (JATC) on roads, consisting of the Michigan Departments of Environmental Quality and Transportation; the County Road Association of Michigan (CRA); and Michigan Municipal League, has recognized that local agencies have no program to assist with this costly environmental regulation. A few larger county road agencies can fund their own wetlands, but the vast majority of local agencies could have delayed projects to fund the mitigation or avoid mitigation costs altogether.

In 2016, Sen. Mike Green secured legislation and a budget to create a Local Agency Wetland Mitigation Fund (named MiWB), fulfilling the JATC vision. The program is funded at $2 million per year off the top of the Michigan Transportation Fund, and capped at $5 million.

Two short years later, MiWB has a seven-member board that has approved bylaws and procedures, hired a wetland manager to run the program and educated road agencies and municipalities statewide.

As of November 2018, 20 project proposals have been accepted and are in various stages of completion. Here are the stories of two of them:

GRAND TRAVERSE SITE

Five sites will be mitigated in northern Michigan as one of the first projects of MiWB, the largest an abandoned Boy Scout camp that will turn into a new conservancy-owned park for Traverse Bay-area residents. Visitors probably won't realize the wooded, natural site actually helped make local road improvements possible!

Originally proposed by the Grand Traverse County Road Commission, the 1,300-acre site contains about 350 acres of wetlands. Funds from MiWB are assisting the Grand Traverse Regional Land Conservancy in purchasing the site. Requests for mitigation and pre-mitigation credits are awarded by a steering committee from the CRA Paul Bunyan Council of 14 counties.

MiWB funds assisted with purchase of the land, created a $100,000 endowment to maintain this wetland ecology for decades to come, and invites use of the green space for public recreation. A win-win-win for roads, the environment and park visitors!

PERRY SITE

This 186-acre parcel of land was on the market for several years and was deemed too soggy to farm. The project will result in 131 acres of wetland mitigation bank credits to meet mitigation needs for most southern Michigan road projects.

The site is being managed by Niswander Environmental, one of the state's leaders in private wetland banks for the last decade. Mitigation credits should be available in early 2019 and requests will be approved by a steering committee of members from the CRA Seven County Council.

EXPERTISE

All sites are reviewed by the Department of Environmental Quality, must meet standards of the MDEQ, and will be monitored in future years by wetland experts funded from the endowment. Environmental specialists are evaluating and setting up the sites, as most county and municipal road agencies lack expertise to maintain a wetland bank.

BENEFIT TO MICHIGAN TAXPAYERS, RESIDENTS AND VISITORS

MiWB benefits Michigan residents in several ways, including:

1) **Faster delivery of road projects.** Identification and purchase of wetland pre-mitigation or mitigation credits can add delays to a project.
2) **Less costly road projects.** Commercial wetland costs $80,000 to $120,000 per acre in Southeast Michigan, as one example. MiWB wetland credits cost $20,000 to $30,000 to develop, and typically have no cost to the individual road agency due to the annual MTF appropriation to MiWB.
3) **Green space maintained, improved.** Some MiWB-purchased sites will be appropriate for public use. All sites will help maintain Michigan's ecological balance preserving environmental benefits while renewing and improving the local transportation network.

Thanks for your support of the Michigan Wetland Board for Local Transportation Agencies (MiWB), authorized by PA 246 of 2016.

Michigan Wetland Board
for Local Transportation Agencies

989-390-2378 | www.miwb.org
417 Seymour Ave. | Suite 1 | Lansing, MI 48933

QUESTIONS: Jeff Silagy, MiWB manager, at (989) 390-2378 or jsilagy@miwb.org.

Appendix O

I-96 Flex Route

MEMORANDUM

TO: JEFF HERCZEG, DIRECTOR OF PUBLIC WORKS
BEN CROY, CITY ENGINEER

FROM: REBECCA RUNKEL, PROJECT ENGINEER

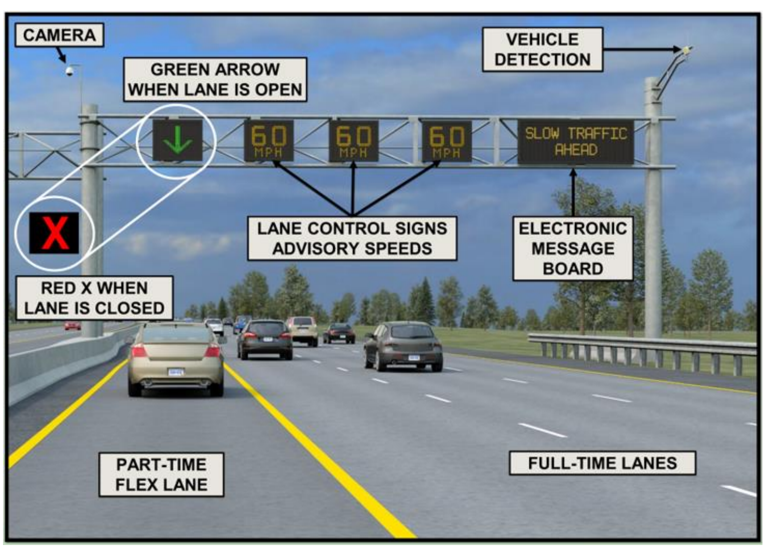
SUBJECT: I-96 FLEX ROUTE

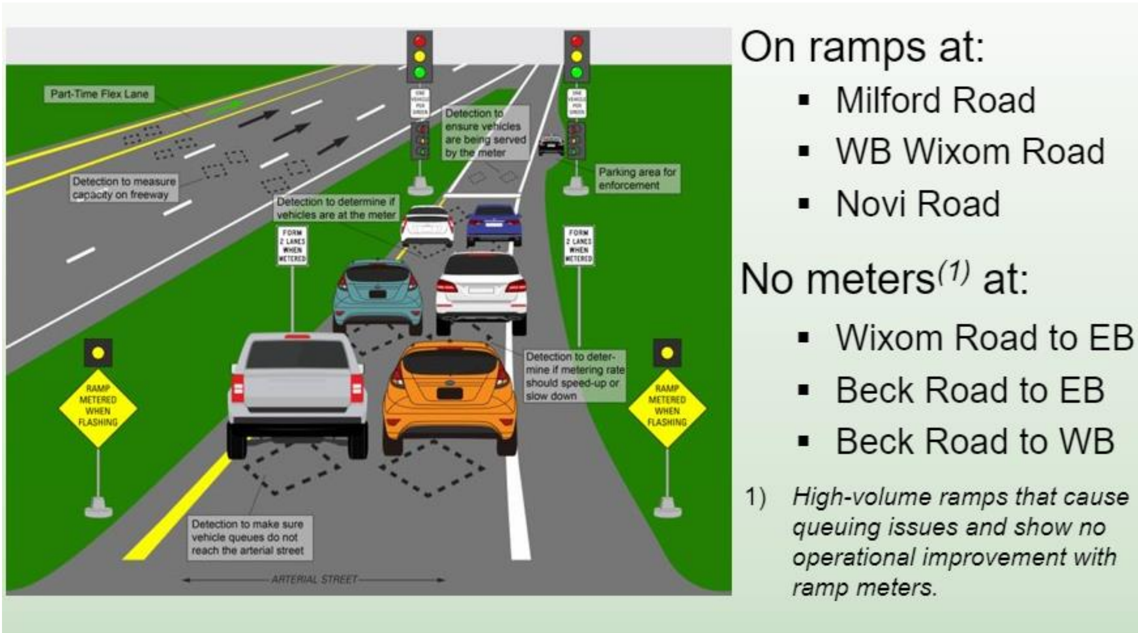
DATE: JULY 22, 2020

Background

The Michigan Department of Transportation (MDOT) identified a 12 mile segment on I-96, from Kent Lake Road to the I-275/I-696/M-5 interchange, as needing improvements. This section of I-96 carries approximately 163,000 vehicles per day, and it serves as a main corridor between Lansing and Detroit, with limited alternate routes available. Travelers on I-96 experience recurring directional congestion (eastbound in the morning, westbound in the afternoon), excessive travel times, frequent crashes, and aging pavement.

Installation of an Active Traffic Management System (Flex Lane) from Kent Lake Road to the I-275/I-696/M-5 interchange, along with a full reconstruction of all lanes and shoulders, is proposed to alleviate congestion, reduce travel time during peak hours, improve safety, and restore pavement condition. The proposed Flex Lanes would use lane control signs, message boards, and cameras to allow part-time peak-period median shoulder use. Ramp metering to regulate traffic would be used at 8 entrance ramps, and crash investigation sites would be installed along outside shoulders. The Flex Lane project would also include reconstruction and/or repairs of the Wixom Road, Beck Road, and Novi Road ramps, rehabilitation of the Beck Road Park & Ride lot, and bridge and culvert rehabilitation on 13 structures. The following images depict the Flex Lanes and ramp metering.





Timeline

MDOT is proposing six stages of construction, beginning in August of 2021 and continuing through January of 2024. MDOT plans to begin construction on the eastbound lanes and median between Kent Lake Road and Wixom Road, followed by construction of the eastbound lanes and median between Wixom to I-275/I-696. Two lanes of traffic would be maintained going in each direction, all on the westbound side of I-96.

Construction on the westbound side is estimated to begin in April of 2023, starting with Wixom Road to I-275/I-696 and finishing with Kent Lake Road to Wixom Road. All traffic would be maintained on the eastbound side of I-96 until reconstruction is completed around December of 2023. The tables below show the anticipated timeline of the proposed stages and subsequent ramp closures.

Maintaining Traffic

MDOT is proposing maintaining two (2) lanes of traffic in each direction, with all traffic shifted to one bound. This gives the contractor full access to the opposite bound, shortening the overall construction duration. MDOT looked at maintaining three (3) lanes of traffic in each direction, but that would add approximately 18 months to the construction duration.

Significant traffic backups on I-96, I-696, I-275, and M-5 are expected along with increased traffic on adjacent local roadways. The average user delay is projected to be up to 150 minutes. Anticipated impacts to the Novi area include:

- Alternating long-term ramp closures for ramp reconstruction at Wixom Road, Beck Road, entrance ramps from Novi Road and M-5 (up to 6 months per stage)

- Alternating short-term ramp closures for ramp reconstruction at exit ramps to Novi Road (up to 6 months per stage)

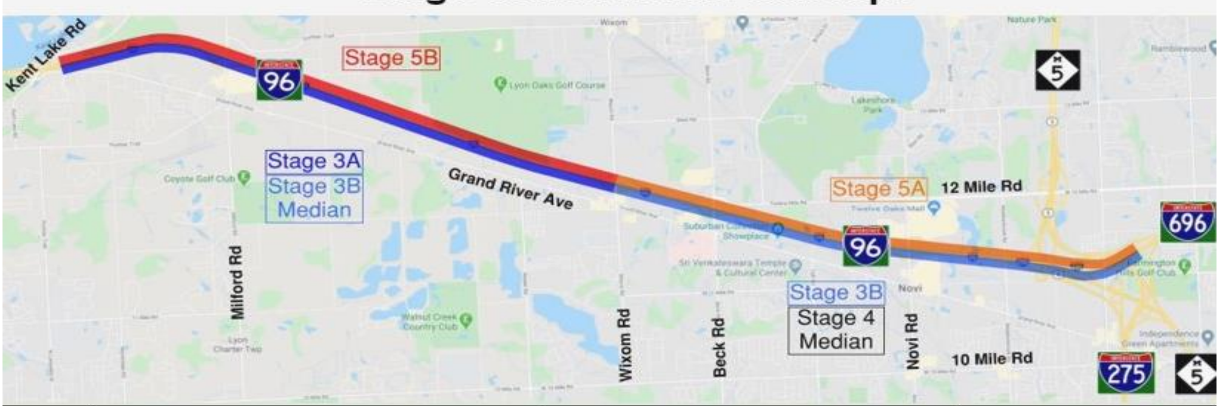
- Entrance ramps closed for duration of stages where only two (2) lanes maintained (up to 6 months per stage)

- Ramp traffic detoured via Grand River Avenue, 12 Mile Road, and M-5

- Construction between Wixom Road and I-275 during 2022 will be done concurrent with the City's Wixom Road rehabilitation project to minimize impacts to Novi Road interchange during holiday shopping season. Combined construction should mitigate impacts by:
    - Prohibiting deck work on the Wixom and Beck Road bridges while Wixom Road rehabilitation project is under construction
    - Prohibiting I-96 traffic exiting at Wixom Road from turning south into Wixom Road work zone – detour traffic north to West Road and then east to Beck Road

Please provide any comments for staff to relay back to MDOT on the proposed I-96 Flex Route project by Friday, July 31, 2020.

Stage Construction Concept



Stage	Proposed Construction	Mainline I-96 Maintaining Traffic	Estimated Duration
1 & 2	Crossovers & Shoulder Prep	2 lanes WB (off-peak) / 3 lanes EB	08/21 - 11/21 (3 mon)
3A	Reconstruct EB – Kent Lake to Wixom	2 lanes WB / 2 lanes EB all on WB	11/21 – 05/22 (6 mon)
3B	Reconstruct Median – Kent Lk to Wixom Reconstruct EB – Wixom to I-275/I-696	3 lanes WB / 3 lanes EB 2 lanes WB / 2 lanes EB all on WB	03/22 – 08/22 (6 mon)
4	Reconstruct Median – Wixom to I-275/I-696	2 - 3 lanes WB / 3 lanes EB	08/22 - 06/23 (10 mon)
5A	Reconstruct WB – Wixom to I-275/I-696	3 lanes WB / 2 lanes EB all on EB	04/23 - 08/23 (4 mon)
5B	Reconstruct WB – Kent Lake to Wixom	2 lanes WB / 2 lanes EB all on EB	07/23 - 12/23 (5 mon)
6	Complete HMA Top Course, ITS & Burn-In	Off-peak lane closures as needed	09/23 - 01/24* (4 mon)

I-96 Flex Route

Stage Construction Concept – Ramp Closures

STAGE	SEGMENT	PROPOSED RAMP CLOSURES
1	Kent Lake Road to Wixom Road	Off peak WB entrance and exit ramps when working in the vicinity of the ramp
	Wixom Road to I-275/I-696	Off peak WB entrance and exit ramps when working in the vicinity of the ramp
2	Kent Lake Road to Wixom Road	**WB I-96 entrance ramps** from Wixom Road and Milford Road
	Wixom Road to I-275/I-696	None
3A	Kent Lake Road to Wixom Road	**EB I-96 entrance ramps** from NB & SB Kent Lake Road, NB & SB Milford Road; **EB I-96 exit ramps** to Milford Road and Wixom Road; **WB I-96 entrance ramps** from Wixom Road and Milford Road
	Wixom Road to I-275/I-696	None
3B	Kent Lake Road to Wixom Road	None
	Wixom Road to I-275/I-696	**EB I-96 entrance ramps** from Wixom Road, Beck Road and NB & SB Novi Road; **EB I-96 exit ramp** to Beck Road; **WB I-96 entrance ramp** from WB M-5
4	Kent Lake Road to Wixom Road	None
	Wixom Road to I-275/I-696	**WB I-96 entrance ramp** from WB M-5
5A	Kent Lake Road to Wixom Road	None
	Wixom Road to I-275/I-696	**EB I-96 entrance ramps** from Wixom Road, Beck Road and SB Novi Road; **WB I-96 entrance ramps** from SB M-5, NB & SB Novi Road and Beck Road; **WB I-96 exit ramps** to either Beck Road or Wixom Road. (WB I-96 exit ramp open to traffic from NB I-275 only)
5B	Kent Lake Road to Wixom Road	**EB I-96 entrance ramps** from NB & SB Kent Lake Road, NB & SB Milford Road; **WB I-96 entrance ramps** from Wixom Road and Milford Road; **WB I-96 exit ramps** to NB & SB Milford Road and Kent Lake Road
	Wixom Road to I-275/I-696	None
6	Kent Lake Road to I-275/I-696	Off peak entrance and exit ramps when working in the vicinity of the ramp

Appendix P

GLWA Project Update

MEMORANDUM

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: GLWA REDUNDANCY ROUTE PROJECT UPDATE

DATE: JULY 9, 2020

The Great Lakes Water Authority (GLWA) initiated a study in February 2018 to provide redundancy from their 8 Mile Transmission Main (TM) to the Haggerty Road Pumping Station on 14 Mile Road and the 14 Mile Transmission Main. This section of the water distribution system was interrupted by the main break on 14 Mile Road (East of Drake) in October 2017. The 14 Mile Road TM supplies water to the communities of Novi, Farmington Hills, West Bloomfield, Commerce, Walled Lake, and Wixom. The 14 Mile Road TM originates near the Franklin Pump Station (FRK), which supplies the pressure and flow for this system. The transmission main traverses west along 14 Mile Road to the Haggerty Pump Station (HAG); then, it continues west to Walled Lake, resulting in a long dead-end segment with no redundancy with the rest of the GLWA system.

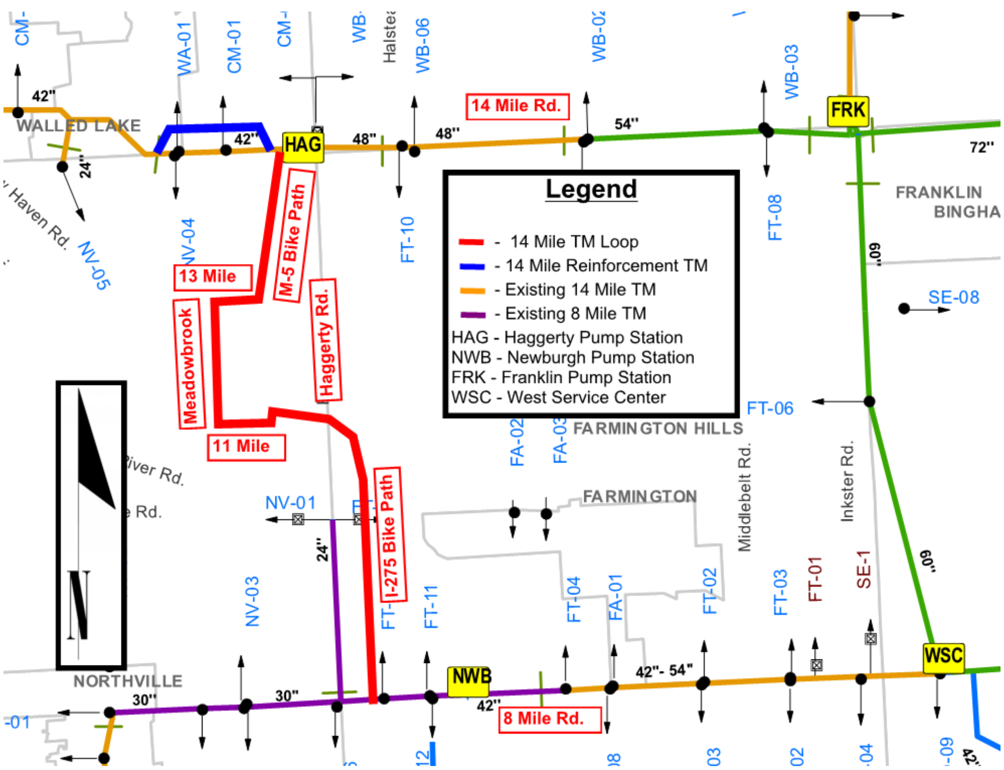


Exhibit A. Location of 14 Mile Road TM Loop and 14 Mile Reinforcement TM in GLWA's Distribution System

The proposed redundancy project (red in Exhibit A) will consist of interconnecting the 8 Mile Road TM and 14 Mile Road TM to increase the reliability in the western portion of the distribution system. This route was chosen following a study phase that considered twelve potential routes with several segments of this project traversing through Novi. This work will provide a more resilient and redundant water distribution system for the western communities of GLWA's transmission system that rely upon the 14 Mile Road TM. The finished project will provide improved operational flexibility for GLWA's system.

GLWA presented a study to City Council on September 9, 2019 outlining the proposed routes and the project impact to the city. Over the last year, staff participated in design and planning meetings with GLWA and their consultants to determine potential cost sharing options for road reconstruction projects on the 14 Mile Road TM route.

The following segments are recommended for cost sharing projects with GLWA:

- **11 Mile Road** from Seeley to Meadowbrook, and the installation of a 12" water main from Seeley to Meadowbrook

- **Meadowbrook Road** from 11 Mile Road to the I-96 bridge

- **Meadowbrook Road** from 12 Mile Road to 13 Mile Road

- **13 Mile Road** from Meadowbrook to M-5

Approximately half of each of the above roads are expected to be impacted by the pipe construction zone. GLWA pays for anything within their pipe zone; therefore, it makes sense to complete the remainder of the road reconstruction simultaneously. Additionally, three of the four segments are already marked for rehabilitation projects in the Novi CIP (**Meadowbrook** from 12 Mile to 13 Mile is exception). Additionally, the segment of **Meadowbrook** from I-96 to 12 Mile Road (not named above but in the route) will be replaced in kind by GLWA at no cost to Novi, since it was recently reconstructed in 2017 and is in good condition.

Completing the <u>four</u> projects in a cost share with GLWA amounts to an estimated $2.9M ($3.6M with water main) which is ~$200K more than the sum of <u>three</u> (of the four) road projects estimated in our CIP (below). Essentially the scale of the GLWA project allows Novi an additional mile of reconstruction (**Meadowbrook** from 12 Mile to 13 Mile) for a few hundred thousand dollars more.

Novi CIP Projects for FY 22-23 and 23-24		Estimate
11 Mile Road from Seeley to Meadowbrook		$800,000
Meadowbrook Road from 11 Mile Road to the I-96		$600,000
13 Mile Road from Meadowbrook to M-5		$1,300,000
	Total	$2,700,000

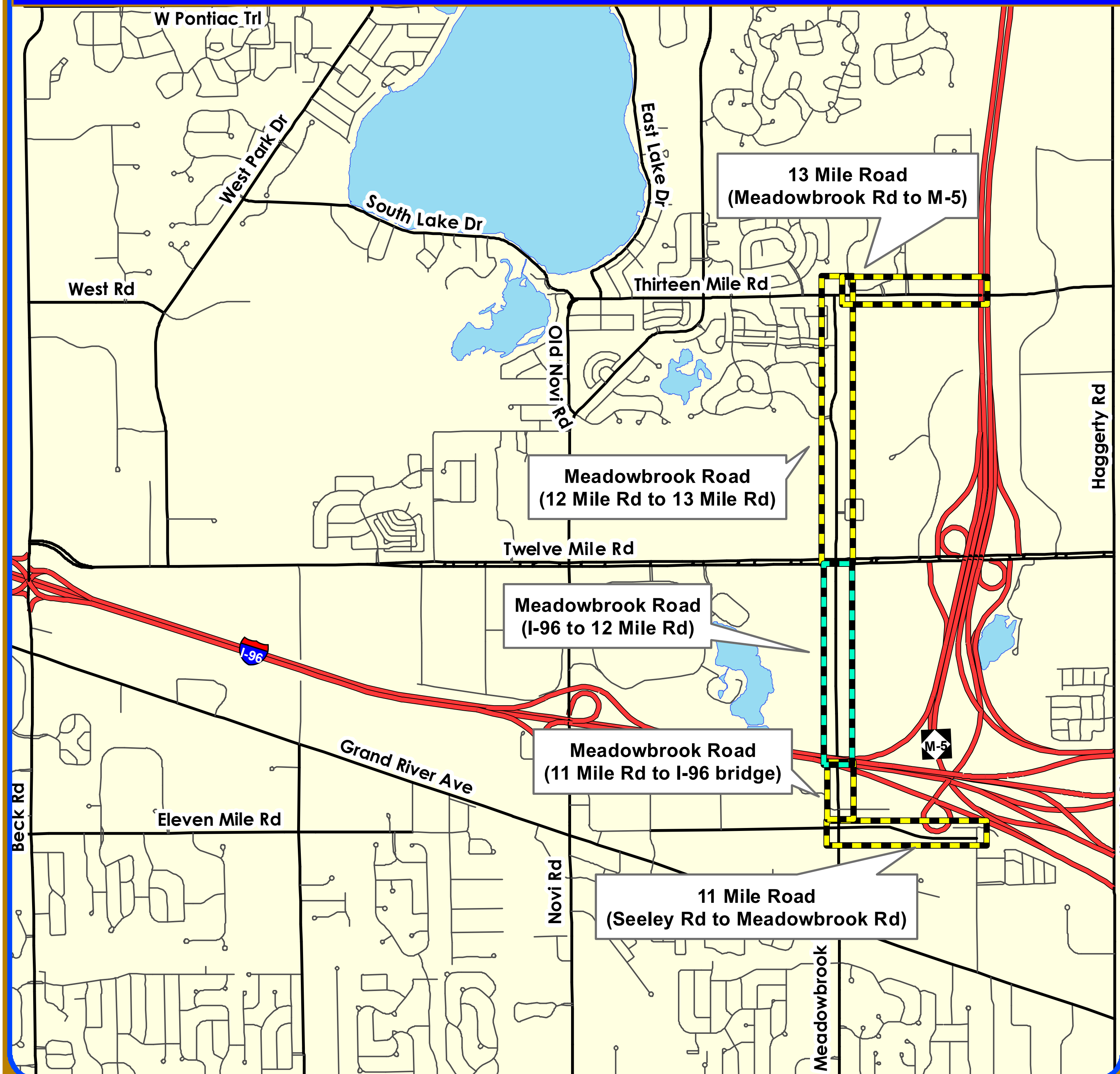
All segments will be totally reconstructed under the cost share agreement and will therefore provide a longer service life. The only up-front costs will be Novi's share of design engineering estimated at $145K (plans are currently at 40% completion), and the construction costs will be invoiced based on project progress. However, further cost savings should be realized since Novi will not be responsible for any construction engineering, administration and materials testing, as these costs will be absorbed by GLWA.

Staff is currently reviewing the proposed Intergovernmental Agreement with GLWA and plans on bringing said agreement forward for consideration to City Council. Attached (Exhibit B) are the preliminary cost estimates for the road reconstruction projects discussed herein and a Novi project map for reference. Specific project details from GLWA will be included within the final agreement when presented to City Council. Project final plans are scheduled to be delivered at the end of 2020 and construction is anticipated for 2022.

Let me know if you have any questions regarding this memo.

Great Lakes Water Authority (GLWA) Redundancy Route Project

Road Segment Location Map



Map Author: Rebecca Runkel
Date:July 7, 2020
Project: GLWA Redundancy Route
Version #: 1.0

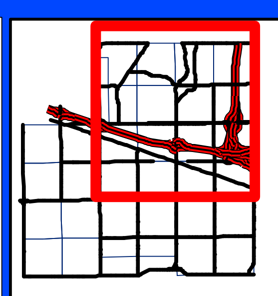
Amended By:
Date:
Department:

MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.

Road Replacement (Cost Share)

Road Replacement (No Cost Share)



City of Novi
Engineering Division
Department of Public Works
26300 Lee BeGole Drive
Novi, MI 48375
cityofnovi.org

Feet
0 550 1,100 2,200 3,300
1 inch = 2,808 feet

EXHIBIT B

PROJECT COSTS

Activity	Cost Sharing	GLWA	Novi	Total
Total Cost		**$7,010,928.29**	**$3,671,378.09**	**$10,681,507.00**
Incremental Design Costs to Add Novi Work	100% Novi		145,000.00	145,000.00
Construction Costs	See break-down below	$7,010,928.29	$3,526,378.09	$10,536,507.00
11 Mile Rd		$1,255,206.00	$1,305,503.00	$2,560,709.00
11 Mile Rd pipe installation	100% GLWA			
11 Mile Rd full pavement restoration/replacement	75% GLWA 25% Novi	$915,722.00	$305,240.00	$1,220,962.00
11 Mile Rd all subgrade costs outside pipe zone	60% Novi 40% GLWA	$186,276.00	$279,413.00	$465,689.00
FedEx entrance onto Bridge St	100% GLWA	$14,412.00		$14,412.00
12" water main installation on 11 Mile Rd	100% Novi		$720,850.00	$720,850.00
Striping plan	100% GLWA	$9,213.00		$9,213.00
Traffic control	100% GLWA	$129,583.00		$129,583.00
Meadowbrook Rd from 11 Mile Rd to I-96		$395,132.65	$515,021.35	$910,154.00
Pavement restoration/ replacement 3 lanes from 11 Mile Rd to Bridge St 2 lanes from Bridge St to I-96	55% Novi 45% GLWA	$367,533.00	$449,207.00	$816,740.00
Subgrade replacement 3 lanes from 11 Mile Rd to Bridge St 2 lanes from Bridge St to I-96	65% Novi 35% GLWA	$13,040.65	$24,218.35	$37,259.00
Signal modifications at 11 Mile Rd and Meadowbrook Rd due to west bound right turn lane	100% Novi		$37,824.00	$37,824.00
Striping plan	50% GLWA 50% Novi	$3,772.00	$3,772.00	$7,544.00
Traffic control	100% GLWA	$10,787.00		$10,787.00
Meadowbrook Rd from I-96 to 12 Mile Rd		$0.00	$0.00	$0.00
Meadowbrook Rd from I-96 to 12 Mile Rd Pipe installation and pavement restoration/replacement	100% GLWA			
Striping plan	100% GLWA			
Traffic control	100% GLWA			

Meadowbrook Rd from 12 Mile Rd to 13 Mile Rd		$3,452,797.00	$448,107.00	$3,900,904.00
Pavement restoration/ replacement 2 lanes from 12 Mile Rd to 13 Mile Rd	100% GLWA	$2,761,738.00	$0.00	$2,761,738.00
Subgrade restoration/ replacement 2 lanes from 12 Mile Rd to 13 Mile Rd	50% GLWA 50% Novi	$448,107.00	$448,107.00	$896,214.00
Striping plan	100% GLWA	$26,935.00		$26,935.00
Traffic control	100% GLWA	$216,017.00		$216,017.00
13 Mile Rd		$1,907,792.64	$1,257,746.74	$3,164,740.00
Pavement restoration/ replacement 3 lanes from 12 Mile Rd to 13 Mile Rd	66% GLWA 34% Novi	$1,419,490.06	$708,680.94	$2,128,171.00
Subgrade restoration/ replacement 3 lanes from 12 Mile Rd to 13 Mile Rd	66% Novi 34% GLWA	$266,992.59	$533,185.79	$799,379.00
Striping plan	75% Novi 25% GLWA	$5,293.00	$15,880.00	$21,173.00
Traffic control	100% GLWA	$216,017.00		$216,017.00

(End Exhibit B)

Appendix Q

2020 Roads Projects Update

MEMORANDUM

cityofnovi.org

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: 2020 ROAD PROJECTS UPDATE

DATE: MAY 15, 2020

The COVID-19 crisis has impacted city operations in various ways the last few months. Most of the current road construction projects have continued to progress with minimal disruption and the projects scheduled for 2020 are beginning to materialize despite restrictions. On April 29, 2020, the Department of Public Works (DPW) opened bids for the 2020-2021 Neighborhood Roads Program (NRP). This two-year program and the overall five-year Road Asset Management Plan (RAMP) were introduced and discussed with the newly formed Roads Committee in January and February of this year. DPW staff was anticipating another substantial NRP program and had positive input and interaction with the Roads Committee members. Unfortunately, COVID interrupted the meeting schedule and forthcoming recommendations. Furthermore, the economic instability accompanying the COVID-19 crisis has required DPW to adjust current and future projects to meet reduced revenue projections.

Neighborhood Roads Program

The 2020-2021 Neighborhood Roads Program (NRP) bids prices (eight bids) for concrete were close to the engineering estimates (1% increase on material costs), but the asphalt prices (5 bids) were (20%) higher than anticipated. Hot Mixed Asphalt (HMA) material costs for the 2018-2019 NRP were $97/ton and the low bid unit cost for 2020-2021 is $120/ton. The increase in asphalt materials costs means the funds budgeted for the 2020-2021 NRP ~$6.2M (FY 20/21 $2.8M, FY 21/22 $2.6M and ~$800K FY 19/20 rollover) falls significantly short of the program bid total of $7.5M (2020 ~$3,8M, 2021 ~$3.7M). City Council has prioritized infrastructure projects during these uncertain times, in particular the NRP program. The asphalt roads scheduled for reconstruction in 2020 and 2021 are in poor condition and are in need of repair.

Therefore, in lieu of eliminating roads from the NRP program, DPW recommends reallocating Concrete Panel Repair (CPR) funds (~$500K FY 19/20 rollover and $500K FY 21/22) to the NRP. Additionally, the project to reconstruct Lee BeGole Drive (~$1M) scheduled in the current fiscal year will be delayed and reprioritized during the next budget cycle. These budget amendments will provide enough funding to complete the entire 2020-2021 NRP program scope (see attached).

Concrete Panel Repair

The 2020 Concrete Panel Repair program was awarded via Change Order on the 2018-2019 contract at the April 20, 2020 City Council Meeting, and resulted in cost savings by maintaining 2018 unit prices. The CPR program will replace ~$900K of deteriorating concrete panels this year. Since 2020 is the final year of significant funding for this program, DPW anticipates maintenance dollars can be earmarked during the next budget cycle to continue as-needed panel replacements. Folding the existing rollover and 2021/2022 funds into the NRP facilitates a more robust NRP reconstruction program now.

Lee BeGole Drive Reconstruction

As the headwall for the drain south of the DPW facility entrance is failing, staff had planned on reconstructing the road and fixing the drain simultaneously. The new road design is 90% complete with the road geometry assuming a potential future connection to Crescent Boulevard. DPW staff has been working with the property owner on right-of-way and prospective development of the western adjacent parcels; however, those discussions have been slowed due to COVID-19. DPW had planned on reconstructing the road to the existing dead end (Gun Range entrance) this year; but, given the current circumstances, the project can be delayed.

Since the headwall repair is funded by the Drain Fund, DPW plans on completing that portion of the project now to avoid a catastrophic failure. The road portion funding of ~$1M can be reallocated to the 2020-21 NRP. While there is potential for cost savings in completing the entire Lee BeGole project at once, staff estimates the value those savings are not worth deferring NRP road reconstruction projects with more positive impact to residents. The Lee BeGole Drive fix is a reconstruction; thus, delaying the work would not change the scope of the project, but could increase future project costs. DPW would examine in the next budget cycle whether the project could be paired with other projects in the future to increase quantities and reduce costs.

Additional Factors

Also, there is ~$800K in FY 2020/21 to begin an Asphalt Capital Preventative Maintenance (CPM) Program as part of the five-year Road Asset Management Program. This program includes various maintenance solutions to asphalt roads in good/fair condition in order to extend their service life. The Asphalt CPM addresses a larger volume of lanes miles and maximizes dollars spent. This program is currently in design with start anticipated later in 2020.

The reconstruction of Cranbrooke Drive from 10 Mile Road to Village Wood Drive is estimated at $2.9M and is currently out to bid. Since this is a concrete project, staff is hopeful to see favorable unit prices. However, the final bid could have a positive or negative impact on the implementation of the Asphalt CPM. Cranbrooke construction will likely commence after July 1, 2020.

The forthcoming construction season will provide more information for staff to analyze the best options for facilitating road projects during these uncertain times. Staff will revise the five-year Road Asset Management Plan and the overall Capital Improvement Plan based on the above conditions and will continue to provide the necessary updates. Presently, DPW plans on bringing the 2020-2021 NRP program and the recommended funding reallocations to City Council for consideration at the May 18 City Council Meeting.

Let me know if you have any questions regarding this memo.

Cc: Victor Cardenas, Assistant City Manager
Megan Mikus, Deputy Director Public Works
Ben Croy, City Engineer
Carl Johnson, Finance Director/CFO

2020-2021 NEIGHBORHOOD ROAD PROGRAMS

2020			***2021***	
2020 BUDGET			2021 BUDGET	
CIP Budget FY 2020-21	$2,800,000.00		CIP Budget FY 2021-22	$2,600,000.00
plus 2020 Unencumbered	$790,000.00		plus 2021 CPR	$500,000.00
plus 2020 CPR	$500,000.00		plus Lee BeGole	$990,000.00
Total 2020 Budget	**$4,090,000.00**		**Total 2021 Budget**	**$4,090,000.00**
2020 ASPHALT			2021 ASPHALT	
Pro-Line 2020 Bid	$3,676,573.00		Pro-Line 2021 Bid	$2,096,187.00
minus 2020 Alternates	-$428,279.00		minus Agg/Grid alternate	-$106,773.00
minus 2020 Division 3 (Lift Stations)	-$55,841.00		2020 Asphalt Subtotal	$1,989,414.00
minus 2020 Division 4 (Fire Station 2)	-$84,204.00			
minus Jo Dr, Glenwood, & Agg/Grid alternate	-$566,760.00			
2020 Asphalt Subtotal	$2,541,489.00			
2020 CONCRETE			2021 CONCRETE	
Mattioli 2020 Bid	$1,060,084.00		Mattioli 2021 Bid	$1,437,940.00
2020 Concrete Subtotal	$1,060,084.00			
TOTAL 2020 (HMA/Conc) Construction	$3,601,573.00		TOTAL 2021 (HMA/Conc) Construction	$3,427,354.00
2020 OUT-THE-DOOR FEES			2021 OUT-THE-DOOR FEES	
OHM - CA/CE for 2020 Asphalt (4.75%)	$120,720.73		OHM - CA/CE for 2021 Asphalt (4.75%)	$94,497.17
OHM - CA/CE for 2020 Concrete (4.75%)	$50,353.99		OHM - CA/CE for 2021 Concrete (4.75%)	$68,302.15
TEC - Material Testing for 2020 Asphalt (1.9%)	$48,288.29		TEC - Material Testing for 2021 Asphalt (1.9%)	$37,798.87
TEC - Material Testing for 2020 Concrete (2.0%)	$21,201.68		TEC - Material Testing for 2021 Concrete (1.9%)	$27,320.86
Crew Days (already included in bids)	$0.00		Crew Days (already included in bids)	$0.00
RCOC ROW Permit Fees	$5,000.00		RCOC ROW Permit Fees	$5,000.00
2020 OTD Subtotal	$245,564.69		2021 OTD Subtotal	$232,919.04
GRAND TOTAL 2020 COST	**$3,847,137.69**		**GRAND TOTAL 2021 COST**	**$3,660,273.04**
BUDGET Remaining (Contingency) for 2020	**$242,862.31**		**BUDGET Remaining (Contingency) for 2021**	**$429,726.96**

Appendix R

Roads Committee Update

MEMORANDUM

TO: LAURA CASEY, ROADS COMMITTEE CHAIRPERSON

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: ROADS COMMITTEE UPDATE

DATE: OCTOBER 19, 2020

The Roads Committee (RC) meetings were suspended due to COVID-19, and the impact of pandemic resulted in staff revisiting budget, planning, and capital improvements previously discussed in RC meetings. This memo provides an update of the actions and changes over the last eight months, with the intention of renewing discussions and moving towards presenting the findings and recommendations of the RC to City Council. There are two additional attached references in this packet, a Project Update Memo from May 15, 2020 and the Final Road Report.

<u>Project Update Memo May 15, 2020</u>

This project update memo was provided following project bid openings prior to and during COVID-19. Most of the adjustments referred to in the memo are reflected in the Road Report (RR) and are representative of projects completed/occurring this construction season.

<u>Final Road Report</u>

The narrative of the report has basically remained intact with the following post pandemic adjustments.

- Language in the Recommendation (page 3) to emphasize flexibility
- PASER map now using 5 colors (versus 10) – we combined rating numbers 1&2, 3&4, etc. instead singular ratings1,2,3… making map more reasonable
- Out year programs (pages 19-23) were adjusted post pandemic to reflect changes made in the CIP
- Removed names of Capital Preventive Maintenance (CPM) streets (reduced and currently scoping revised program)
- Page 26+ are data which are for internal used in methodology

Overall, the recommendation of an additional $1.5M-$2M (RR, page 5) concentrated on local roads would provide and upward condition trajectory for the road network. However, given the existing unstable economic circumstances, asking for a bond or millage to close this gap should/could be postponed at the will of the RC and City Council. In the interim, implementing the recommended CPM (RR, page 4) and continuing projected capital improvements, in the least maintains and at best slightly improves, the road network conditions.

Roads Committee Updates for October 19, 2020 Meeting

Capital Improvement Projections

Staff is currently working on budget for FY 2021-22 and below are the preliminary 5-year projections (including costs for engineering design/contract administration and inspection/materials testing) on roads capital improvement projects:

ROADS FUNDS/YEAR	Y1	Y2	Y3	Y4	Y5
	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26
Major Roads Fund 202	$ 3,178,302.00	$ 3,932,723.00	$ 4,882,438.00	$ 3,833,949.00	$ 4,600,930.00
Local Street Fund 203	$ 5,973,069.00	$ 3,900,000.00	$ 3,700,000.00	$ 3,000,000.00	$ 3,000,000.00
	$ 9,151,371.00	$ 7,832,723.00	$ 8,582,438.00	$ 6,833,949.00	$ 7,600,930.00

12 Mile Road (Beck to Dixon) Right-of-Way

As discussed in previous RC meetings, staff requested RCOC to consider the 12 Mile expansion project for funds in the next round of Federal Aid Committee (FAC) submissions and RCOC submitted requesting the approval of Transportation Economic Development Funds (TEDF-C) to enter the right-of-way (ROW) phase of the 12 Mile project.

The FAC approved the request at the committee meeting held on September 14, 2020. The local match for estimated $3M ROW cost is 80% federal ($2.4M) and 20% local ($600K). The local share will be split between RCOC and Novi (50%/50%) with each entity contributing $300K.

GLWA Agreement

The City entered into a cost share agreement with Great lakes Water Authority (GLWA)to reconstruct road segments impacted by the 54” GLWA transmission main redundancy projects. Those segments are as follows:

- **11 Mile Road** from Seeley to Meadowbrook, and the installation of a 12” water main from Seeley to Meadowbrook
- **Meadowbrook Road** from 11 Mile Road to the I-96 bridge
- **Meadowbrook Road** from 12 Mile Road to 13 Mile Road
- **13 Mile Road** from Meadowbrook to M-5

Beck Road Build Grant

The City was not selected in the most recent rounds of funding for the federal BUILD Grant. The Beck Road Environmental Assessment (EA) is schedule to be complete in 2021and the project will be submitted for grant funding again in the next round.

The above items along with a general overview of this construction season and ongoing projects are included in a draft agenda for the October 19, 2020 RC Meeting attached herein.

Staff recommends to following schedule:

- RC Regroup/Update Meeting 10/19, 2020
- RC Meeting final informational and wrap up, TBD per Chairperson
    - o Requests for more information/data
    - o Input on recommendations
    - o Portal for delivery of recommendations
- RC Report Out to City Council

Appendix S

PASER

MEMORANDUM

cityofnovi.org

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: ROADS AND THE PASER SYSTEM

DATE: JUNE 5, 2020

The Pavement And Surface Evaluation Rating (PASER) system is a visual survey method for evaluating the condition of roads. The method was developed by the University of Wisconsin to provide a simple, efficient and consistent method for evaluating a road's condition. Michigan's Transportation Asset Management Council (TAMC) adopted this system for measuring statewide road conditions, and reporting this data is required to receive ACT 51 (P.A. 499 2002, P.A. 199 2007) funds.

PASER uses Roadsoft – a roadway management system for collecting, storing and analyzing data, to aid in creating a capital improvement program. During inspection, various types of pavement distresses are observed, and there is a discussion among inspectors on how various types of distresses contribute to the appropriate rating for each road segment. The goal is uniform quality: all rating teams should assign the same rating when observing a given segment of road. In order to ensure this uniformity, at least two certified PASER technicians observe and independently rate segments at the same time and compare notes for an agreed upon value.

At a local level, this data serves as ***one of the tools*** *available* to help create a cost-effective pavement maintenance strategy. In 2019 the City contracted OHM Advisors to complete a Five Year Road Report and Road Asset Management Plan which included using PASER and Roadsoft. In the past, rotating different consultants yearly and/or relying only on staff (with frequent turnover or lack of experience) ***could create*** variations in ratings. Therefore, staff elected to have one qualified consultant team (2 members) and one qualified City-staff member, complete the most recent PASER inspection. To further provide consistency moving forward, the same model will be used to complete the City PASER survey every even year (next survey fall 2020).

A draft of the Five Year Report 2020-25 using the 2018 PASER survey was presented to the Roads Committee in early 2020, with recommendations and a final report anticipated prior to 2020 construction season. However, the Roads Committee was delayed due to COVID-19 before the report could be finished, and instability in revenue impacted potential and planned projects reflected in the report. Currently staff is working with OHM to revise and edit the report based on recent project awards and anticipated funding in budget out years.

Additional information on the PASER system can be found on the city website here. Findings from the pending Five Year Report will be used to update anything currently posted since this information is based on the last road report completed in 2012.

How Staff uses PASER

The Roadsoft program breaks roads into segments at every cross street or transition in paving material (asphalt and concrete have different rating systems). This initial survey produces a large volume of data, which can be broken down into several segments with multiple ratings. Then the ratings are further condensed into reasonable stretches of pavement condition averages. A short segment of any particular road could have a low rating, but its overall condition could average out much higher. The summarized version essentially takes hundreds of segments and turns it into reasonable and usable data. The condensed "averages" for longer stretches of roads are then used to identify potential road program candidates.

PASER can also be used to identify trends in pavement deterioration and/or longevity which helps to create cost effective and efficient capital improvements. Roadsoft can also use historic data and adjust for better modeling and analytics. Information can be input to create multiple year road programs that make the best use of available funding (used to help create the Five Year Road Report).

More than just PASER

While PASER is a uniform and useful tool, it is also just ***one tool*** in the proverbial "tool-box" used in road selection and programming. Staff and consultants also consider the following factors when planning capital road improvements.

- **Total funding available**
    - What are the anticipated budgets for roads and estimates for the fixes
- **Type of fix**
    - Reconstruction, Rehabilitation or Preventative Maintenance
    - Cost saving methods, i.e., mill and overlays; panel replacements; interlayers and geogrids, etc.
- **Geotechnical surveys**
    - Soil borings and pavement cores to determine existing bearing strengths, subbase components, insufficient paving materials like alkali-silica reactivity (ASR), etc.
- **Historical knowledge**
    - Past observations of the trend of pavement deterioration can help determine priority level for rehabilitation
- **Cost of maintenance**
    - How much does the road cost us to maintain right now with in-house or contracted services

- **Economies of scale**
    - Combine large segments and save dollars on mobilization and get better unit prices for volume
    - Combining streets with different values within the same subdivision
- **Traffic movement and interruptions**
    - How do we impact residents and commuters traffic flow and access
- **Other capital improvement projects**
    - Are there other capital improvements to align with road construction (drains, water/sewer, sidewalks/pathways, RCOC, MDOT, GLWA)
- **Resident or Business Owner Complaints**
    - Tracked by Cityworks for frequency and severity

Complicated Process

No doubt the process can be confusing and complicated. With ~300 lane miles in the Novi network to maintain, it just isn't possible to touch every street that deserves attention every year. The forthcoming Road Report will provide a deeper and more comprehensive look at the current conditions, planned programs and recommendations. This report will be updated and analyzed annually to reflect the previous construction year and prepare for the budget season.

Appendix T

Roads Prioritization

MEMORANDUM

TO: PETE AUGER, CITY MANAGER

FROM: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

SUBJECT: ROAD PRIORITIZATION

DATE: APRIL 8, 2019

In response to direction from City Council to create a road prioritization plan for discussion purposes at the upcoming budget session, the Department of Public Works has compiled information on major roads from the capital improvement plan (CIP), existing scoping/traffic studies, and City Council Goals & Objectives. This road prioritization focuses on the major corridor roads, which are owned and operated by the City of Novi, and includes roads under the jurisdiction of the Road Commission for Oakland County (RCOC) and the Michigan Department of Transportation (MDOT).

The City is currently engaged in assembling a transportation asset management plan (TAMP) with engineering consultant OHM Advisors. The plan will contain the results from the 2018 road rating (PASER) survey and recommendations for road maintenance, repair, and/or reconstruction. The existing and historical roadway network data will be modeled, and the data collected will provide optimal recommendations for a five-year period (2020-2024). Existing roadway conditions, potential treatment options, and budget considerations will be reviewed with City staff in order to create the TAMP report. The TAMP will be utilized to formulate the City's yearly road maintenance and capital improvement plans. A final version of road prioritizations resulting from City Council and administrative staff input will be included as a basis of information for the draft TAMP. A draft for staff review and input is expected early summer 2019.

It should be noted, the prioritization does not completely align with the recommended CIP since projects were submitted for the proposed FY 2019-20 budget document in October 2018. During the last seven months changes in project scopes, availability of federal funding, completion of various scoping studies, and discussions with RCOC and Great Lakes Water Authority (GLWA) have impacted the timelines for several projects currently in the CIP. Furthermore, the information and discussion herein does not include neighborhood roads. However, neighborhood road reconstruction programs (NRP) and neighborhood road maintenance programs will be included as part of the TAMP. This memo includes a ***first draft*** of major road ***"ranking"*** (attached spreadsheet) created using the following ***factors***:

- **Budget/CIP -** The major road prioritization includes effort to schedule projects with a realistic chance of meeting budgeting projections. Staff estimates **$3-4M/FY** for major road projects and an additional **$3-3.5M/FY** for other projects (NRP, intersections/signals, sidewalks/pathways, and streetlighting) and uses the combined assumptions of **$6.5-7.5M/FY** for all capital improvement projects in the road funds.

Below are the forecasted costs of the major road prioritization that impact the road funds:

TOTALS BY CONSTRUCTION YEAR

Construction Year	Est. Totals	Notes
2019	3,920,030	CIA Fund support of Crescent Boulevard (NW Ring Road) has been removed
2020	3,610,464	
2021	4,896,447	FAC funding for Wixom Road ($1.5 million) has been removed
2022	10,780,924	FAC funding for Taft Road would need to be removed if awarded
2023	7,858,724	
2024	3,394,299	
2025	8,866,665	Taft Road Bridge-Phase 1 only
Average (2019-2025)	6,189,650	
Future	47,315,397	Taft Road Bridge- Phase 2/ Beck Road Widening

Adding the **$3.5M** to each FY for ***other*** projects budgeted in the road funds, results in exceeding total funding forecasts **($6.5-7.5M)** in some fiscal years. However, potential outside funding sources could mitigate overall expenses (see below), or the time frame for projects could be stretched out over more fiscal years. Overall, the prioritization attempts to assign projects a reasonable construction year and stay within the total road funding available each fiscal year.

- **Outside Funding Sources –** The **Federal Aid Committee (FAC)** awarded approximately **$1.5M** for the reconstruction of Wixom Road (10 Mile to city limits) in FY 2022. Taft Road Reconstruction (city limits to 10 Mile) fell just outside the latest award list; thus, suggesting funding is likely for FY 2023. Staff also applied for **Highway Safety Improvement Program (HSIP)** funding for a roundabout at the Taft/9 Mile intersection in FY 2023. Both Wixom and Taft Roads have been recommended within the projected funding year. **Local Road Improvement Program (LRIP)** funds have been secured for the Flint/Bond Street SW Ring Road and will be applied for on the Lee BeGole/Crescent Ring Road (Crescent to 11 Mile, 11 Mile to Grand River) extension. Staff will also continue to pursue other funding sources to facilitate projects moving forward within the prioritization.

- **Other Entities Projects –** Staff worked with Road Commission for Oakland County (RCOC) and Michigan Department of Transportation (MDOT) to assign city-share costs associated with their respective upcoming projects in Novi. The most recent developments are the RCOC 10 Mile Road pavement preservation with operational enhancements between Haggerty and Meadowbrook Roads in 2019-2020 and the advanced reconstruction of the 12 Mile/Novi Road intersection in 2019. MDOT is performing an overlay on the I-96/Novi Road bridge, which includes city share of costs, and construction of a pedestrian path on the west side of Novi Road over I-96 to complete non-motorized network gaps. These projects have been factored in the prioritization.

Potentially the ***Great Lakes Water Authority (GLWA) could be performing a redundancy project (42" water main) in Novi*** on Meadowbrook Road or through the Cranbrooke/Bashian/Seeley/11 Mile corridor. The route is currently under study by

GLWA. These roads have been placed in the prioritization; however, the timeline of the projects could be impacted by GLWA's redundancy route.

- **Development –** The construction timeline of future development, such as those below, have been taken into consideration as to the impact of construction and future traffic:
  - **LAKEVIEW** Site Location: east and west of Old Novi Road, south of Thirteen Mile Road, 20 Single-Family Homes
  - **ADELL CENTER** Site Location: south of I-96, west of Novi Road, northwest of Crescent Boulevard, iFLy, Planet Fitness, Farifield Inn & Suites, Texas Roadhouse, Carvana
  - **THE BOND** Site Location: west side of Flint Street (Bond Street) in southwest corner of Grand River Avenue and Novi Road, Two four-story multi-family residential buildings with total of 253 apartments
  - **ONYX PLAZA** Site Location: west side of Novi Road, north of Ten Mile, 9-Screen Movie Theater
  - **EMERSON PARK** Site Location: west of Novi Road, north of Ten Mile, 120 Units Multi-Family Residential
  - **ASIAN VILLAGE** Site Location: east of Town Center Drive, north of Grand River and south of Eleven Mile**,** ~25,000 square foot market, retail and restaurant uses, etc.

- **Seasonal Constructability, Traffic Disruption, and Condition –** Staff always considers how much is possible to construct in a season and what are the effects on local traffic. In an effort not to have the entire city under construction at one time, major road projects are arranged with a realistic completion schedule, alternative routes, and the overall condition (PASER, inspection, complaints, etc.) of the road.

- **Preparation for Mega-Project(s) –** Finally, staff arranged the prioritization by considering the discussions around the prospective mega-projects on Beck and Taft Roads. The recently submitted Beck Road scoping study provided a realistic plan to widen Beck to a four-lane boulevard from 8 Mile Road to Grand River Avenue. There has also been interest in connecting Taft Road over I-96 and including a pedestrian pathway. Both projects would improve traffic flow considerably.

  The prioritization offers completed reconstruction projects for alternative north/south routes (Wixom 2022, Taft 2023, Meadowbrook 2020 pending GLWA route) and the east/west 11 Mile Road (2023-25) before either of the mega-projects would be considered. From a timing perspective, both Beck and Taft Roads require significant engineering, right-of-way acquisition, funding, and planning to bring to fruition. However, staff is optimistic one of the mega-projects is feasible by 2026.

  Other potential widening projects on east/west corridors include 10 Mile Road (upcoming scoping study commissioned by City) and 12 Mile Road (RCOC considering design options), which are under the jurisdiction of RCOC, but are included with estimated cost shares from the City when applicable. The regional traffic study on the Novi/Grand River corridor submitted and presented to City Council in 2018, also identified widening options to RCOC-owned Novi Road and Grand River Avenue. Staff will present all traffic scoping study information and this road prioritization to RCOC on May 6, 2019 at the biennial regional strategic planning meeting. Results of the regional planning meeting will be considered and reported back to City Council for more direction.

Regarding the ***"rankings"*** *in* column A of the attached spreadsheet,

- a ranking that appears with a decimal (i.e. 6.1) means the corresponding project is slated for more than one phase of construction;
- a ranking of **0 (zero)** are projects in design, are about to be bid/advertised, or have begun construction;
- projects ranked at **16-20** are imminent RCOC or MDOT projects with potential City participation costs, but the City has no jurisdictional or timeline control;
- projects **1-15** are qualified by the aforementioned ***factors***.

Notes/progress/schedule for all projects can be found in column M.

This prioritization should be considered a living document and information for specific projects can be provided as necessary. Please let me know if you have any questions regarding this memo.

cc: Victor Cardenas, Assistant City Manager
Carl Johnson, Finance Director/CFO
Megan Mikus, Public Works Budget Analyst
George Melistas, Engineering Senior Manager

Department of Public Works

Major Roads Prioritization

April 5, 2019

Ranking	Group	DESCRIPTION	2019	2020	2021	2022	2023	2024	2025	FUTURE	City-Share Only TOTAL	NOTES / PROGRESS / SCHEDULE
0	Commercial/ Industrial	ENG009 Cabot Drive Reconstruction (12 Mile Road to 13 Mile Road) Lewis Drive Reconstruction (Cabot Drive to Haggerty Road)	Construction								$ 1,492,322	Costs are net of design. Condition deterioration has affected recommended course of action.
0	Commercial/ Industrial	082-16 Trans-X Road Rehabilitation (Novi Road to Terminus)	Construction								$ 526,637	Condition deterioration has affected recommended course of action.
0	MDOT	ENG035 Novi Road Bridge over I-96 Repairs		Construction							$ 115,442	MDOT Project; Total is the 20% City share costs only
0	RCOC	12 Mile/ Novi Roads Intersection Improvements	Construction								$ 100,000	RCOC Project estimated at $1 million; Total is the City's share only; Will be reimbursed from RCOC $381,259 in FY2021
0	RCOC	12 Mile Road Concrete Patching (E of Meadowbrook Road to Haggerty Road)	Construction								$ -	RCOC Project estimated at $600,000; No City share costs
0	RCOC	Haggerty Road Pavement Preservation Overlay (8 Mile Road to 9 Mile Road)	Construction								$ -	RCOC Project estimated at $350,000; No City share costs
0	RCOC	10 Mile Road Pavement Preservation Overlay (Napier Road to Haggerty Road, except Gaps)- Phase 1	Construction Phase 1								$ -	RCOC Project; Gaps include: Wixom Road to 0.5 mile east and Meadowbrook Road to Haggerty Road
0	RCOC	10 Mile Road Pavement Preservation Overlay & Operational Enhancements (Napier Road to Haggerty Road- Gaps Only)- Phase 2		Construction Phase 2							$ 100,000	RCOC Project; City to fund design costs for operational enhancements; Gaps include: Wixom Road to .5 mile east and Meadowbrook Road to Haggerty Road
0	Ring	Northwest Quadrant Ring Road 082-03 Crescent Blvd Reconstruction (Novi Road/Grand River Avenue intersection bypass)	Construction								$ 5,666,256	Anticipated substantial construction completion: November 2019
0	Ring	Southwest Quadrant Ring Road 092-50 Flint Street Realignment/Reconstruction - (Novi Road/Grand River Avenue intersection bypass)- Phase 1	Construction Phase 1								$ 1,801,071	Secured LRIP Funds: $244,897; funding award has been removed from total
0	Ring	Southwest Quadrant Ring Road ENG038 Flint Street Realignment/Reconstruction - (Novi Road/Grand River Avenue intersection bypass; future Bond Street connection to Crescent Blvd)- Phase 2								Construction Phase 2 (TBD)	$ 738,058	Dependent on property acquisition
1.1	Ring	ENG036 Lee BeGole Drive Extension (Terminus to Crescent Boulevard)- Phase 1		Construction Phase 1							$ 1,400,000	Conservative estimate; will pursue LRIP funding
1.2	Ring	ENG008 Lee BeGole Drive Realignment & Roundabout at 11 Mile Road- Phase 2			Construction Phase 2						$ 1,400,000	Conservative estimate; will pursue LRIP funding
1.3	Ring	NEWTBD Lee BeGole Drive Extension (11 Mile Road to Grand River Ave) - Phase 3				Construction Phase 3					$ 1,500,000	Conservative estimate
2	Wixom	092-22 Wixom Road Rehabilitation & Left Turn Lane Addition (10 Mile Road to 11 Mile Road) 152-13 Wixom Road Rehabilitation (11 Mile Road to City Limits)			Construction						$ 2,057,705	Estimate submitted to the City; awarded FAC Funding in FY2022 (estimated secured funding $1.5 million); funding award has been removed from the total
3	Taft	162-02 Taft Road Rehabilitation (City Limits to 9 Mile Road) ENG042 Taft/ 9 Mile Roundabout (Taft Road and 9 Mile Road) 102-05 Taft Road Rehabilitation (9 Mile Road to 10 Mile Road)				Construction					$ 4,033,616	Estimate submitted to the City; applying for FAC funding in FY2023
4	Meadowbrook	ENG010 Meadowbrook Road Rehabilitation (Cherry Hill Road to Grand River Avenue) ENG013 Meadowbrook Road Reconstruction (Grand River Avenue to 11 Mile Road) 132-05 Meadowbrook Road Right-Turn Lane Addition (Southbound at 11 Mile Road) ENG018 Meadowbrook Road Rehabilitation (11 Mile Road to I-96)		Construction (TBD) GLWA project							$ 1,995,022	Estimate submitted to the City; could be affected by GLWA redundancy route
5	13 Mile	ENG037 13 Mile Road Rehabilitation (Old Novi Road to Novi Road) 102-04 Old Novi Road Rehabilitation (Novi Road to 13 Mile Road)			Construction						$ 1,438,742	Estimate submitted to the City
6.1	11 Mile	082-30 11 Mile Road Rehabilitation (Beck Road to Taft Road)- Phase 1					Construction Phase 1				$ 2,093,246	Design work is underway; Estimate submitted to the City
6.2	11 Mile	132-27 11 Mile Road Rehabilitation (Taft Road to Clark Street)- Phase 2						Construction Phase 2			$ 1,287,193	Design work is underway; Estimate submitted to the City
6.3	11 Mile	132-26 11 Mile Road Rehabilitation (Wixom Road to Beck Road) - Phase 3							Construction Phase 3		$ 1,512,729	Design work is underway; Estimate submitted to the City
7	Novi	ENG011 Novi Road Rehabilitation (13 Mile Road to 14 Mile Road)					Construction				$ 2,601,829	Estimate submitted to the City
8.1	Commercial/ Industrial	ENG017 Seeley Road Rehabilitation (Grand River Avenue to 11 Mile Road)- Phase 1				Construction Phase 1 (TBD) GLWA project					$ 905,520	Estimate submitted to the City; could be affected by GLWA redundancy route
8.2	Commercial/ Industrial	ENG020 11 Mile Road Rehabilitation (Meadowbrook Road to Seeley Road)- Phase 2					Construction Phase 2 (TBD) GLWA project				$ 799,486	Estimate submitted to the City; could be affected by GLWA redundancy route
9	12 Mile	152-10 12 Mile Road Reconstruction and Sidewalk (Medina Boulevard to City Limits)				Construction					$ 1,135,512	Estimate submitted to the City
9	13 Mile	ENG015 13 Mile Road Rehabilitation (Meadowbrook Road to M-5) ENG016 13 Mile Road Rehabilitation (M-5 to Haggerty)				Construction (TBD) GLWA Project					$ 2,601,240	Estimate submitted to the City; could be affected by GLWA redundancy route
11.1	West Park	132-28 West Park Drive Rehabilitation (West Road to Pontiac Trail)- Phase 1					Construction Phase 1				$ 2,364,163	Estimate submitted to the City
11.2	West Park	152-11 West Park Drive Rehabilitation (12 Mile Road to West Road)- Phase 2						Construction Phase 2			$ 2,107,106	Estimate submitted to the City
12	9 Mile	ENG041 9 Mile Road Regrading (Napier Road to Beck Road)								Construction (TBD)	$ 1,494,087	Estimate submitted to the City
13	Ring	112-01 Sixth Gate Reconstruction (Paul Bunyan to Grand River Avenue)								Construction (TBD)	$ 402,269	Project on hold in order to coincide with nearby development

Department of Public Works

Major Roads Prioritization

April 5, 2019

Ranking	Group	DESCRIPTION	2019	2020	2021	2022	2023	2024	2025	FUTURE	City-Share Only TOTAL	NOTES / PROGRESS / SCHEDULE
14.1	Taft/MDOT	ENG040 Bridge over I-96 (Taft Road)- Phase 1a Nonmotorized Pathway (on bridge)- Phase 1b							Construction Phase 1		$ 7,353,936	MDOT Participating Project for the bridge portion; City share unknown; estimated total project cost $14.7 million
14.2	Taft/MDOT	ENG040 Taft Road (paving from Grand River Avenue to new bridge & new bridge to 12 Mile Road)- Phase 2a Nonmotorized Pathway (Grand River Avenue to new bridge & new bridge to 12 Mile Road)- Phase 1b								Construction Phase 2	$ 7,353,936	MDOT Participating Project for the bridge portion; City share unknown; estimated total project cost $14.7 million
15	Beck	132-25 Beck Road Widening (8 Mile Road to 9 Mile Road); includes signal modernizations 162-03 Beck Road Widening (9 Mile Road to 10 Mile Road); includes signal modernizations 162-06 Beck Road Widening (10 Mile Road to 11 Mile Road); includes signal modernizations 162-07 Beck Road Widening (11 Mile Road to Providence Drive/Central Park Boulevard)								Construction (TBD)	$ 37,327,047	Scoping study completed for this work in 2018, which estimates total project at $31 million (2018 dollars); will pursue FAC/CMAQ funding
16.1	RCOC	Novi Road Rehabilitation (9 Mile to 10 Mile)- Phase 1				Construction Phase 1					$ 187,500	RCOC Project; Phase 1 (estimated $1.875 million); Total is estimated City's share of the local costs
16.2	RCOC	Novi Road Rehabilitation (8 Mile to 9 Mile) - Phase 2								Phase 2 TBD by RCOC	$ 212,500	RCOC Project; Phase 2 (estimated $2.125 million) on RCOC FAC/TIP list for funding; Total is estimated City's share of the local costs
17	RCOC	ENG012 14 Mile Road Rehabilitation (Novi Road to M-5) ENG021 14 Mile Road Rehabilitation (East Lake Drive to Novi Road)								TBD by RCOC	$ -	RCOC Project; cost estimated by Novi at $3.1 million; City share is unknown
18	RCOC	162-01 12 Mile Road Widening (Beck Road to Cabaret Drive) 142-05 12 Mile Road Boulevard Extension (Declaration Drive to Cabaret Drive)								TBD by RCOC	$ -	RCOC Project; Environmental Assessment complete and under review; total project cost estimated by Novi at $20.4 million; City share is unknown
19	MDOT	ENG039 I-96 and I-696 Rehabilitation (Novi Road to City Limits)				Construction (TBD)					$ 417,536	MDOT Project; City share 12.5%
20	MDOT	NEWTBD I- 96 Flex Route Lanes from Kent Lake to M-5/275 (City Limits)			Construction (TBD)						$ -	MDOT Project; City share unknown; Estimated construction timeline: 2020 to 2021

Appendix U

Novi Corridor Traffic Study

MEMORANDUM

cityofnovi.org

TO: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

FROM: GEORGE D. MELISTAS, ENGINEERING SR. MANAGER

SUBJECT: NOVI ROAD CORRIDOR TRAFFIC OPERATIONS AND IMPROVEMENTS – 10 MILE TO TWELVE OAKS MALL

DATE: OCTOBER 8, 2018

City Council has set a long-term goal to relieve traffic congestion along the Novi Road Corridor from 10 Mile Road to Twelve Oaks Mall as well as implement recommendations from the Transportation Master Plan of 2015. The City's Department of Public Works and Community Development have been working collaboratively with the City's Traffic Engineering Consultant, AECOM, to analyze traffic conditions along this corridor. This analysis includes identifying areas for improvement, locating opportunities to implement any recommended measures and developing future concepts for improving the transportation infrastructure in the area while planning for future developments.

The City has endeavored two recent transportation studies to the Novi Road corridor: the 2016 Thoroughfare Master Plan (*Attachment 1*) and recently the Grand River/Novi Road Region-wide Traffic Impact Study (currently underway; *Attachment 2*).

2016 Thoroughfare Master Plan

In 2016, the Corradino Group of Michigan completed a thoroughfare master plan for the City that identified areas where congestion is anticipated in 2040 and made recommendations for improvements. Congestion is anticipated along Novi Road between 10 Mile Road and Twelve Oaks mall. The study recommends the following solutions to reduce the congestion:

- Widen Beck Road from 8 Mile Road to Grand River Avenue
- Widen Beck Road from 12 Mile Road to Pontiac Trail
- Provide a transit circulator between the Twelve Oaks Mall area and Town Center Area

Novi Road Corridor Traffic Operations and Potential Improvements Study

The concurrent planning for development of numerous parcels in the vicinity of the Grand River Avenue and Novi Road intersection led the City to undergo an in-depth traffic study to consider the impacts of the developments collectively, rather than through individual studies. The study includes 15 developments in the general area and analyzes conditions at 11 signalized and 5 unsignalized intersections under existing and future conditions. One key factor that was studied is known as level-of-service (LOS). LOS is a qualitative rating ranging from A to F which measures traffic factors such as speed, travel time and safety.

Under existing (2018) conditions, the intersections of Novi Road and Grand River Avenue, the I-96 westbound off-ramp, and West Oak Drive South had overall and/or individual turning movements operating with levels of service less than D. These findings indicate the current need for additional capacity along Novi Road near the I-96 interchange, including the potential for additional turn lanes at the Novi Road/Grand River Avenue intersection.

Under future (2028) conditions, additional turning movements are projected to operate with levels of service less than D at the following intersections:

- Novi Road and 10 Mile Road
- Novi Road and Main Street
- Novi Road and Bond/Flint Street
- Novi Road and Crescent Boulevard
- Novi Road and the I-96 eastbound off-ramp

AECOM and the RCOC are currently working in collaboration to mitigate some of the traffic congestion along this corridor via signal timing adjustments.

Currently, the traffic volume along Novi Road exceeds its capacity during the peak travel periods which leads to a poor LOS. Additionally, there are some turning movements that experience long queues and increased delays. To mitigate some of these concerns, the study recommends mitigation opportunities such as:

- Traffic signal timing and phasing adjustments;
- The connection of the northwest ring road, Crescent Blvd, from Novi Road to Grand River;
- The connection of the southwest ring road, Flint/Bond Street, between Novi Road and Grand River;
- The construction of Taft Road over the I-96 Expressway to create a connection between Grand River and Twelve Mile Road;
- A potential connection of Fountain Walk Avenue to the west to Twelve Mile Road;
- Considering additional transit connections to serve other areas of the city beyond the Twelve Oaks and Town Center areas.

Ten Mile Road Scoping Study

The City is currently working with their Engineering Consultant, OHM Advisors to study the Ten Mile Road Corridor from Napier Road to Haggerty Road to identify opportunities for additional capacity and improved operations. The results of this study are not available at this time but may have an impact on the Novi Road corridor traffic operations.

Engineering Solutions

The City's Engineering Division has been working diligently to plan for and implement several of the recommendations from the 2016 Thoroughfare Master Plan, especially safety-related improvements. Particular to the Novi Road corridor, safety-related improvements that have been incorporated include enhanced crosswalks at the intersection of Novi Road and Grand River, and LED street lighting upgrades. The City also maintains close coordination with AECOM and RCOC regarding on-going and recommended improvements along the Novi Road corridor. Recent Novi Road corridor-related initiatives include the following:

- **Novi Road and Crescent Blvd**: installed right-turn green arrows for the westbound approach to enable more optimal use of the signal timing.
- **Novi Road and Twelve Oaks/West Oaks**: adjusted the signal phasing to alleviate some of the non-compliant, safety-related issues that have been occurring at the intersection.
- AECOM is working in collaboration with the RCOC to review and refine timings along Novi Road. The timing adjustments may provide slight improvements in traffic operations but are not expected to improve LOS significantly across the corridor.
- The City and RCOC are in communication with the Michigan Department of Transportation (MDOT) regarding future plans to modernize or incorporate traffic signal timing adjustments at the I-96 and Novi Road intersection.
- The City of Novi has already prepared construction plans for the northwest ring road connection of Crescent Blvd between Novi Road and Grand River.
- The City of Novi and AECOM are currently designing the southwest ring road connection of Flint/Bond Street between Novi Road and Grand River.

The City will work with AECOM to review the recommendations and define a plan to incorporate the applicable measures into the City's Capital Improvement Program (CIP). The City's recent attention to the Novi Road corridor is a valuable step in addressing the City Council long-term goals to relieve traffic congestion along the Novi Road Corridor from 10 Mile Road to Twelve Oaks Mall. Continued coordination with AECOM, RCOC and MDOT to develop and implement strategies is expected to further enhance traffic operations.

Please let me know if you have any questions or comments regarding this memorandum.

cc: Peter Auger, City Manager
Victor Cardenas, Assistant City Manager
Ben Croy, PE, Water and Sewer Senior Manager
Danielle Deneau, PE, RCOC Signal Operations Engineer
Kelsey Gragg, PE, MDOT Transportation Engineer (MDOT Oakland TSC)
Barbara McBeth, AICP, City Planner
David Molloy, Director of Public Safety/Chief of Police
Aaron Staup, Construction Engineer
Jerry Tremblay, Roadway Asset Manager
Matt Wiktorowski, Field Operations Senior Manager

Appendix V

Top 15 Dangerous Intersections

MEMORANDUM

TO: JEFFREY HERCZEG, DIRECTOR OF PUBLIC WORKS

FROM: GEORGE D. MELISTAS, ENGINEERING SR. MANAGER

SUBJECT: TOP 15 CRASH INTERSECTIONS – SAFETY COUNTERMEASURES STUDY

DATE: SEPTEMBER 26, 2018

The City's latest Thoroughfare Master Plan, released in 2016, included a preliminary intersection crash analysis referencing two previous crash analyses performed on City intersections. The City's former Traffic Engineering Consultant, Birchler Arroyo Associates (BAA), performed the first analysis in 2012, which identified 12 intersections (Table 1) with the highest crash rates and fatalities based on five years of crash data (2006 to 2010). In 2015, the Corradino Group built upon BAA's analysis while also identifying three other intersections with a high crash rate or high severity index (Table 1). Both studies recommended safety improvements for the 15 intersections.

Table 1. 2018 Top 15 Crash Intersections

ID	Intersection*	Average Crashes per Year (Before Improvements)	Expected Crashes per Year (with Improvements)**	Annual Crash Reduction %
1.	Pontiac Trail and Beck Road	28.7	21.5	25%
2.	14 Mile Road and Haggerty Road	32.3	21.6	33%
3.	10 Mile Road and Napier Road	18	8.7	51%
4.	Grand River Avenue and Novi Road	45.7	44.7	2%
5.	Grand River Avenue and Beck Road	33.7	33	2%
6.	8 Mile Road and Beck Road	22.3	16.8	24%
7.	Grand River Avenue and Haggerty Road	15.7	10.6	32%
8.	10 Mile Road and Novi Road	32	31.3	2%
9.	I-96 Ramps and Beck Road	27.7	27.7	0%
10.	8 Mile Road and Haggerty Road	48.3	48.3	0%
11.	12 Mile Road and Haggerty Road	18.3	14.6	20%
12.	12 Mile Road and Novi Road	25.7	21.2	18%
13.	12 Mile Road and West Park Drive	9.7	8.2	15%
14.	10 Mile Road and Beck Road	29.7	25.2	15%
15.	14 Mile Road and M-5 Expressway	39.9	33.9	15%

* Intersections in no particular rank order

** Per AASHTO Highway Safety Manual Methods

Since the initial study in 2012, the City has planned or performed improvements at several of the intersections. In early 2018, the City's Engineering Consultant, AECOM performed an observational evaluation of the planned and completed improvements to determine the expected and actual effect on the safety. AECOM based their evaluation on the average of three years of crash data before and after the improvement(s) and includes recommended countermeasures for each intersection. Countermeasure examples include: adjusting the traffic signal timing, increasing police presence, and traffic signal modernization upgrades.

AECOM's 2018 report details each of the Top 15 Crash Intersections, the BAA and Corradino Group recommended improvements, and any improvements completed including the improvement years.

In addition, intersections are a crossroads of converging traffic, which require management through proper engineering, regulatory guidelines and law enforcement. Excessive speeding upon approaching, slippery pavement, unexpected stopping, inadequate signal timing, red-light running, and distracted driving can all be causes for crashes.

Summary

For each of the Top 15 Crash Intersections, rear-end crashes accounted for 54% of annual crashes. Theoretically, the aforementioned improvements produce an average of 14.1% less crashes per year for these intersections. There is a relationship between the nature of the incident, crash frequency, traffic volumes and increased distractions while driving. There are not many countermeasures that directly affect the number of rear-end crashes, aside from potential access management strategies, typically handled when the business in question decides to redevelop the site. Rear-end crashes, which account for the increase in accident frequency, are the result of human or mechanical error as opposed to an intersection design flaw.

The City will certainly continue its efforts in implementing the recommended traffic safety improvements at each of the intersections as well as monitor the crash rates with the goal of improving the safety, health, welfare and quality of life for our residents and motorists who frequent the City of Novi on a daily basis.

Please let me know if you have any questions or comments regarding this memorandum.

cc: Peter Auger, City Manager
Victor Cardenas, Assistant City Manager
Ben Croy, PE, Water and Sewer Senior Manager
Danielle Deneau, RCOC Signal Operations Engineer
Kelsey Gragg, MDOT Transportation Engineer (MDOT Oakland TSC)
Barbara McBeth, AICP, City Planner
David Molloy, Director of Public Safety/Chief of Police
Aaron Staup, Construction Engineer
Jerry Tremblay, Roadway Asset Manager
Matt Wiktorowski, Field Operations Senior Manager

Appendix W

Traffic Signal Backplates

MEMORANDUM

TO: VICTOR CARDENAS, ASSISTANT CITY MANAGER/ INTERIM DPS DIRECTOR

FROM: GEORGE D. MELISTAS, ENGINEERING SR. MANAGER

SUBJECT: PROPOSED TRAFFIC SIGNAL REFLECTIVE BACKPLATES AT FOUR NOVI INTERSECTIONS

DATE: NOVEMBER 13, 2017

Traffic signal modernization is a high priority for the City at intersections with high crash rates and casualty ratios. A cost-effective and intuitive solution to improve the safety, health, and welfare of both the motoring public and pedestrians is to install backplates with retroreflective borders on the perimeter of traffic signals.

Early in the morning and late in the afternoon as the sun crosses directly behind a traffic signal (primarily in the eastbound and westbound direction), the color of the traffic signal light can be difficult to see due to the glare of the sunlight. As a result, many motorists rely on the motorist in front of them for guidance. At other times of the day, the sky can cause the signal to become lost due to low contrast between the two, making it difficult for the motorist to figure out who has the right-of-way. Retroreflective backplates resolve these issues by creating a greater contrast between the signal light and the background of the sky.

Retroreflective backplates are already installed and working, as intended, at various intersections within the city (e.g. Novi Road and Grand River Avenue). Traffic signal backplates are thin plates of material that surround the traffic signal. They are intended to improve the visibility of a traffic signal by providing a consistent and controlled-contrast background. To enhance further the visibility of traffic signals, narrow strips of retroreflective tape are added around the border of the backplates.

Red-light running is one of the most serious traffic problems in the country today. According to data obtained from the Southeast Michigan Council of Governments (SEMCOG), in 2016, a total of 4,083 traffic crashes occurred due to red-light running at signalized intersections in Southeast Michigan. A total of 23 of these incidents were fatal.

Novi Road and Grand River Avenue intersection with retroflective backplates already installed on traffic signals.

Studies from the Federal Highway Administration (FHWA) Office of Safety show that this simple visual enhancement to traffic signals ultimately leads to fewer crashes at signalized intersections.

Four intersections have been identified for retroreflective backplate improvements. They are as follows:

- Twelve Mile Road and Novi Road
- Beck Road and Ten Mile Road
- Twelve Mile Road and West Park Road
- Thirteen Mile Road and Meadowbrook Road

Three of the four aforementioned intersections were identified as having high crash rates or casualty ratios in the City's Thoroughfare Master Plan as prepared by the Corradino Group in January 2016.

The City will be working in collaboration with the Road Commission for Oakland County to have this work completed by the end of 2017. Engineering has appropriated monies for additional traffic signal backplate installations in up to eight more high crash rate intersections to be split between FY18-19 and FY20-21.

Please let me know if you have any questions or comments regarding these proposed improvements.

cc: Joseph Akers, Staff Civil Engineer
Aaron Staup, Construction Engineer
Matt Wiktorowski, Field Operations Senior Manager