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Attachment A - Eastbound M-14 Barton Drive Interchange Planning and Environmental Linkages Study (PEL)

Existing Conditions Report

Michigan Department of Transportation

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Notice

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This document has 78 pages including the cover.

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Author-ised	Date
Rev 1.0	Existing Conditions Report	KW	RI	PC	JB	5-20-22
Rev 2.0	Existing Conditions Report	KW	SF	PC	JB	12-16-2022
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Rev 4.0	Existing Conditions Report	SF	KW	PC	JB	04-10-2023

Table of contents

Figures

Tables

Page

Introduction

The Michigan Department of Transportation (MDOT) is conducting a Planning and Environmental Linkages (PEL) study for Eastbound (EB) M-14 and Barton Drive Interchange, between North (N.) Main Street in Ann Arbor in the west and the Pontiac Trail bridge in the east, in Washtenaw County. This summary of existing conditions will be used to guide the development of the project's purpose and need, goals and objectives, and alternatives. The intent of the study is to analyze the environmental and social impacts of alternatives to improve the geometry of the EB M-14 and Barton Drive on and off ramps and to assess the future condition needs of the M-14 bridge over the Huron River.

The purpose of a PEL study is to identify transportation issues, along with environmental concerns, on a specific corridor. These studies are used to make planning decisions regarding the development and prioritization of transportation improvements. The PEL process generally is composed of five primary parts:

- Existing conditions is the first step in the PEL process. This effort analyzes and identifies the key issues along the corridor and the causes of these issues
- Purpose and need is a statement used to guide decisions and it provides the first criterion in the alternatives evaluation process. This statement defines the core reasons why the project was initiated.
- Alternatives development is the process by which different solutions to the identified issues are generated and packaged together to solve the purpose and need of the project.
- Alternatives evaluation is the process used to analyze and refine the different options identified in the alternatives development process. During this process, alternatives can be eliminated, refined, or carried forward into future phases of the PEL process.
- Project phasing is the final step in the PEL process, in which different alternatives are recommended and project implementation strategies are identified.

This report represents the initial phase of the PEL process and summarizes the existing conditions in the study area, shown in Figure 1. The study area for existing environmental conditions is shown in red and is smaller than the traffic study area shown in green on Figure 3 because the potential improvements are expected to be at or near the M-14 interchange with Barton Drive. This study will consider transportation, environmental, community, and economic goals early in the transportation planning process; use the information analysis, and services or recommendations developed during planning to inform the environmental review process; and evaluate the condition, geometric/safety, and operational needs of the Barton Drive ramps.

Figure 1: Study Area

Project goals

While the main goal of the project is to improve the geometry of the EB M-14/Barton Drive ramps, the study area will extend along M-14 from just west of the Main Street ramps to just east of the Pontiac Trail bridge. M-14 in Washtenaw County, from Main Street to Pontiac Trail, is one of the most critical links in Michigan's transportation network, providing regional and local connections as well as access to Ann Arbor's residents and businesses, the University of Michigan, and entertainment/sports venues. However, the impacts from crashes, special events in Ann Arbor, and recurring congestion make traveling on it unreliable.

The outcome of the M-14/Barton PEL study will enable MDOT, in partnership with the City of Ann Arbor, to enhance safety, improve geometrics, improve mobility, and plan for future transportation needs and changing travel behaviors through this unique area.

To accomplish the PEL study goals, it is important that the PEL study identifies the root causes of the safety issues and congestion on the corridor and finds key short-term solutions/early action items and thoughtful long-term solutions that facilitate a safe and reliable trip through and across the corridor.

Background Information

The M-14 freeway provides connection between the Ann Arbor and Detroit metropolitan areas. The M-14/Barton Drive interchange was originally built in the 1960s, and at the time, it was constructed to be a temporary access to the northside area until the City of Ann Arbor could complete the "inner beltway". This beltway was to be an extension of Huron Parkway that would ultimately connect to a new interchange northeast of the existing Barton Drive interchange.

In the 1980s, the City explored whether the segment of Huron Parkway, west of the terminus at Tuebingen Parkway, should be built. One critical issue raised at the time was the location of Leslie Park (golf course and nature center), which lies between Pontiac Trail and Tuebingen Parkway. In 1989, as a part of the Northeast Area plan, the City decided not to complete the roadway extension due to public controversy, and the full interchange for the area was never built.

In 1997, due to safety and operational concerns, the City called for a comprehensive study to relocate the interchange, and the study was funded as part of the TEA-21 federal transportation funding authorization. The study reviewed sixteen illustrative alternatives, with 4-5 practical alternatives remaining after assessing impacts and geometric viability. The outcome of the study published in 2002 recommended closing the eastbound ramps to allow only emergency vehicle access. However, when the *Northeast Ann Arbor Transportation Plan* was adopted by the Ann Arbor City Council in 2006, the recommendation was dropped, and the interchange remained open. The City of Ann Arbor Transportation Master Plan adopted in 2009 and the current 2021 revision keep this status quo. MDOT has made minor improvements over the years to the interchange ramps. In 2019, additional right-of-way (ROW) was acquired by MDOT adjacent to the eastbound M-14 on ramp.

In the spring of 2021, three crashes involving large trucks occurred in the vicinity of the interchange along M-14. One of the crashes resulted in a fatality and a fuel spill into the Huron River below. In response to these crashes, on May 3, 2021, the Ann Arbor City Council resolved to have MDOT investigate improvements. This includes participation in the engagement process if the recommendation includes closing the interchange.

Planning Context for the Study Area

The M-14/Barton Drive interchange study area lies at the junction of the City of Ann Arbor, Ann Arbor Township, and the Village of Barton Hills on the north side of the Huron River. The interchange is sited between Argo Nature Area along the Huron River south of the interchange; Onder Park on the east side of M-14; and Huron Bridge Park on the west side (which is part of Bandemer Park across the river).

Single family residential neighborhoods are adjacent to the east and west of the M-14 highway beyond the parkland. The Huron River and the adjacent parks provide abundant natural habitat and recreational opportunities.

The City of Ann Arbor's *Comprehensive Plan* serves as a guide for public and private decision-makers regarding the future physical development of the City and for the implementation of plans, policies, and programs. In addition, the *Moving Together Towards Vision Zero - Comprehensive Transportation Plan*, adopted in June 2021, set the strategies and opportunities for improving safety and enhancing mobility of the City of Ann Arbor's transportation system. Neither of these plans include major improvements or changes to the interchange beyond normal maintenance and safety measures.

In addition, these other plans provide additional context for the visions and opportunities of the communities surrounding the study area:

- Ann Arbor Township Master Plan (2015)
- Ann Arbor Township Parks, Recreation & Open Space Master Plan (2019)
- North Main Street/Huron River Corridor Vision for the Future Report (2013)
- City of Ann Arbor Master Plan Land Use Element (2009)

Land Use

Adjacent land use to the M-14/Barton Drive interchange is predominantly designated residential use. Huron Bridge Park is in the southwest quadrant of the interchange and Onder Park is located east of the interchange, as shown in Figure 2. An agricultural preservation area is located to the west of the interchange, outside of the study area. The City and the communities near the interchange have shown during past planning efforts that maintaining these uses in place is very important to them. In fact, the *Barton Hills Village Master Plan* from 2010 shows that planned future land use is the much the same as the existing land use.

Planned Developments

Numerous private developments are planned in areas around the interchange that may access the M-14 corridor. Based on information from the City' s planning staff the developments are outlined below.

Brewers Site

Located near the intersection of Pontiac Trail and Dhu Varren is the 88-acre site. It is planned for construction of 560 single family homes and provides connection to the roadway network north of the traffic study area.

Cottages at Barton Green

Barton Green is a 32 acre site currently under development. It is just south of the North Sky development and includes 211 apartment / cottage units with direct access to Pontiac Trail.

Residential Development

The North Sky and Nixon Farms development are residential sites which are well underway and near build out. Presently most of the anticipated traffic growth is realized but they may contribute some additional future traffic. The number of remaining units is unknown.

Other Development

Although less directly linked to the network at the project study area. The following could impact traffic growth within the interchange. University of Michigan hospital system is planning a new in-patient tower. This will consist of 264 new beds in a new 12 story building. The beds are to be partially offset by reductions in older parts of the campus and expected to net 164 beds with minimal impact.

Downtown densification continues with multi-story development in the Downtown Development Authority area. This development would primarily impact N. Main Street but indirectly impact Barton Drive.

Figure 2: Land Use in the Study Area

Traffic and Transportation Conditions

The traffic and transportation discussion that follows includes vehicular traffic, bicycle facilities, pedestrian facilities, and transit. Results of the data collection and analysis for each of these categories are presented.

Traffic Study Area

The primary study area for the M-14 / Barton Drive PEL includes M-14 and the ramp system to Barton Drive and Whitmore Lake Road. For this project, the traffic analysis area includes the transportation network beyond the immediate interchange area, including Barton Drive east of the interchange to Pontiac Trail, Whitmore Lake Road to Barton Shores / M-14 westbound (WB) ramps and on N. Main Street (US-23BR) southerly to Summit Street. Figure 3 depicts the traffic analysis area.

The traffic analysis area is larger than the study area because traffic within the study area is influenced by, and influences, the surrounding transportation network, which extends beyond the study area. The traffic analysis area was created to capture the impact of project on the arterial roadway system out to the first signalized intersection.

Figure 3: Traffic Analysis Area

Vehicular Traffic

Vehicular Traffic Data Collection and Analysis

For the purposes of the traffic analysis, the study used three primary datasets. These include origin-destination data, speed and travel time data, and traffic count data. A brief description of each data type, including its source and use is discussed in the following sections.

Origin-Destination Data

Origin-destination (O-D) data provides information about where each trip starts—its origin—and where it ends—its destination. This is important to know because it provides insights as to why people choose the route within the network they do. For this study, O-D data were obtained from two sources. The first was the Southeast Michigan Council of Governments (SEMCOG) regional travel demand model (TDM). This model uses a diverse range of data, including socioeconomic information, land use data, travel surveys, etc., to statistically model existing travel patterns.

To supplement this model, additional O-D information was obtained from StreetLight. StreetLight is a third-party vendor that collects and compiles travel information from a variety of data sources—including mobile device information, GPS tracking information, and more—to determine where trips start and end.

Speed and Travel Time Data

Speed and travel time data were collected along roadway segments to provide a baseline for how well those segments are operating. By comparing the speed and travel times of a roadway during the peak travel periods to the posted speed limit and free-flow travel times, conclusions about the roadway operations can be made. For this study, speed and travel time data were collected from INRIX and using in-the-field data collection efforts.

Traffic Count Data

Traffic count data are collected along roadways and at intersections to provide information about how many vehicles travel along the roadway or how many vehicles, bicyclists, and pedestrians pass through an intersection. This information helps to identify travel patterns and traffic volumes throughout the day. It should be noted that Covid-19 drastically altered travel during 2020, as well as portions of 2021, and the level of travel going forward is unclear. For this study previously collected traffic count information was used and no new data was collected.

Vehicle Volumes

Traffic count data was provided by the MDOT and the City of Ann Arbor. This included data residing in the MDOT TDMS, 24-hour volumes and turning movement counts at select locations.

The data shows that the annual average daily traffic (AADT) on M-14 in the area ranges between 66,000 vehicles per day (vpd) and 71,000 vpd, depending on the location along the corridor. Generally, daily traffic is greatest in the section between N. Main Street (US-23BR) and Barton Drive. West of N. Main Street volumes are much lower. Table 1 shows the M-14 AADT and truck percentages by location.

Figure 4: Historic Average Daily Traffic

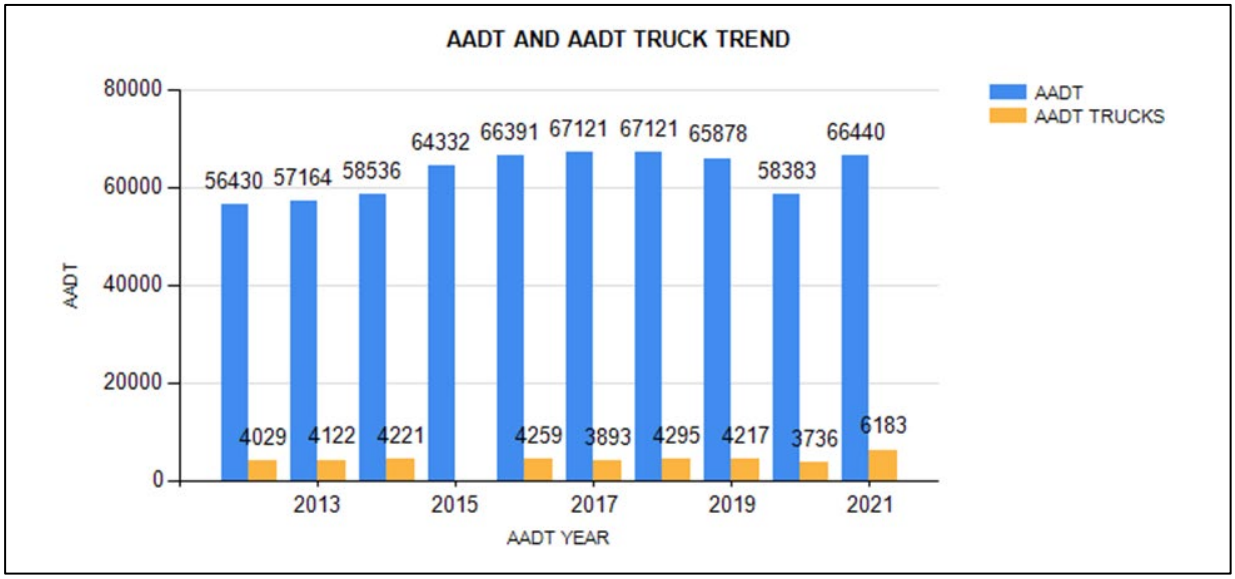


Table 1: Annual Average Daily Traffic and Truck Percentages on M-14

Location	Annual Average Daily Traffic	Truck Percentage
M-14 North of Barton Drive	66,440	7%
M-14 between N. Main St. and Barton Dr.	71,316	7%
M-14 between Maple Rd. and N. Main St.	38,301	9%
NB N. Main Street to EB M-14 Ramp	11,371	14%
EB M-14 to Barton Drive Ramp	6,342	13%
Barton Drive to M-14 Ramp	2,927	12%

Source: Calculated AADT for 2021 from MDOT Transportation Data Management System

Eastbound M-14 Vehicle Volumes

The eastbound M-14 volume is approximately 34,000 vpd over the Huron River bridge; of that total 7.0% consist of truck traffic. The highest hourly volume occurs between 4-5 PM, consistent with the commuting pattern in the area.

Historic Traffic Volumes

The volumes reported are generally taken from counts taken in 2019. Historically, the traffic volume in this area has grown over time; however, a significant drop was reported in 2020 due the Covid-19 pandemic. As illustrated in Figure 4, subsequent counts in 2021 have increased to near the levels of 2018.

Truck volumes in the segment have increased over time and are reported as significantly higher in 2021. This increase is likely due to the rise in commercial traffic (shopping/home delivery) because of Covid-19.

Turning Movement Volumes

The MDOT and City of Ann Arbor provided additional traffic volume data regarding the arterial street network. This included AM and PM peak hour volumes for intersections along Barton Drive and N. Main Street (US-23BR). The count data consisted of volume counts collected between 2016 and 2019.

Vehicle Speeds and Travel Time

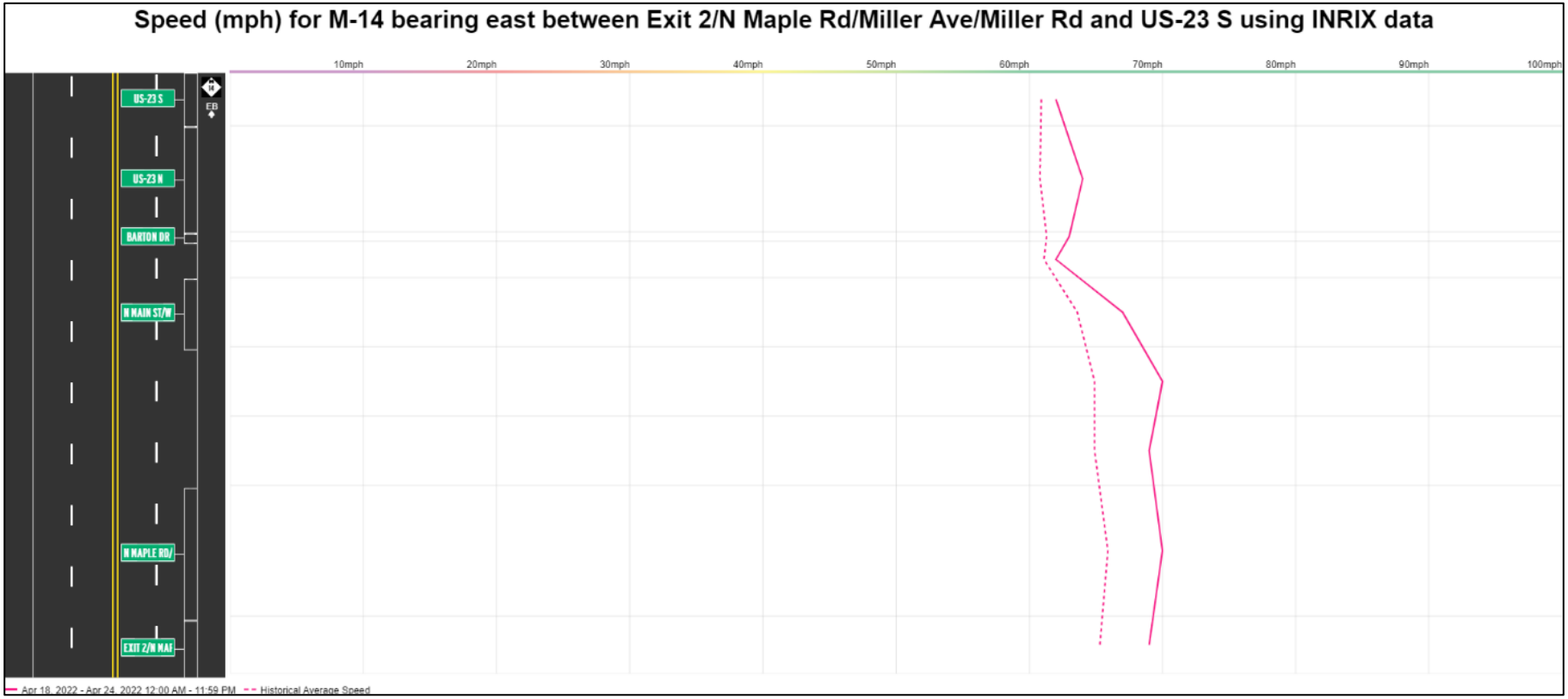
Vehicle Speeds

The current posted speed limit in the study area is 65 mile per hour (mph), between a point 0.6 miles west of Barton Drive to a point 0.5 miles east of Barton Drive. The 65-mph limit was put into effect in 2007 and previously was posted at 55 mph. The speed limit is 70 mph outside of the limits of this zone. The Barton Drive exit ramp is posted an advisory speed of 15 mph and the N. Main Street on ramp is 45 mph.

Vehicle speed data was gathered from the Regional Integrated Transportation Information System (RITIS) software. A sample data set of speed measurements was taken for a typical 48-hour period in April 2022. The segment of study included the portion of eastbound M-14 to the east of Maple Road leading up to the N. Main Street interchange ramps.

The speed data indicates a mean speed in the study area of 67.6 mph, with the 85th percentile speed being 71 mph. Within the data a minimum speed of 40 mph and a maximum speed of 70 mph was observed (Figure 5).

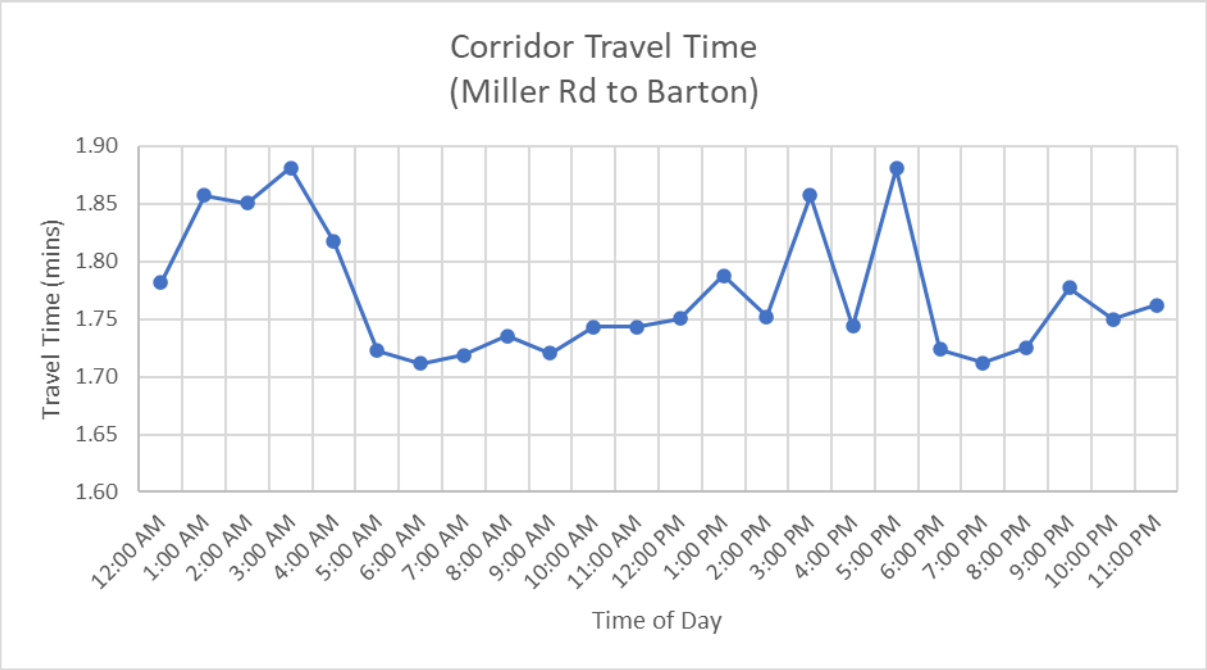
Figure 5: Speed Profile



Eastbound Travel Times

Data from RITIS was also used to examine the travel time performance of the corridor during a one-week period (April 18th - April 24th, 2022). Figure 6 illustrates the average eastbound travel times on M-14 for trips between Miller Road and Barton Drive, as well as the variability in travel time.

Figure 6: Eastbound M-14 Travel Times (from Miller to Barton)



Eastbound travellers generally experience near free-flow conditions and travel time reliability is seldom an issue. During the PM rush hour peak, there is a small increase in travel times with traffic slowdowns in the N. Main Street and Barton Drive section.

The data is similar to that present in the MDOT *Freeway Congestion & Reliability Report (2010)*. Consulting Figure 64 of the report, the level of travel time reliability is stable, except the discrete area near N. Main Street where the index reaches 1.5 (the threshold).

Additional examination of the study area was performed to gauge the Travel Time Index (Figure 7), Planning Reliability Index (Figure 8), and Buffer Index (Figure 9).

Figure 7: Travel Time Index, Free Flow Speed for Eastbound M-14 (from Miller to Barton)

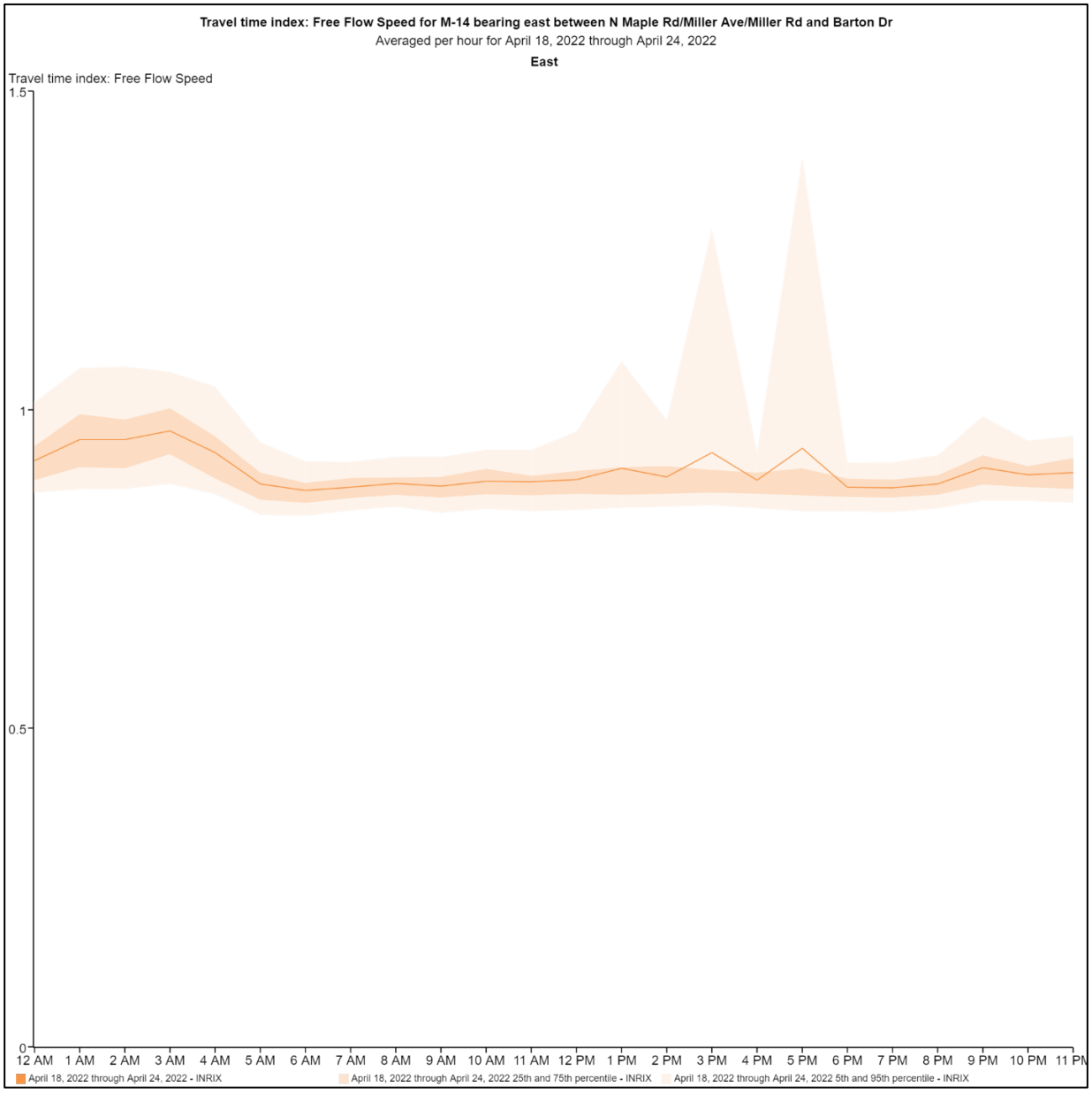


Figure 8: Planning Time Index, Free Flow Speed for Eastbound M-14 (from Miller to Barton)

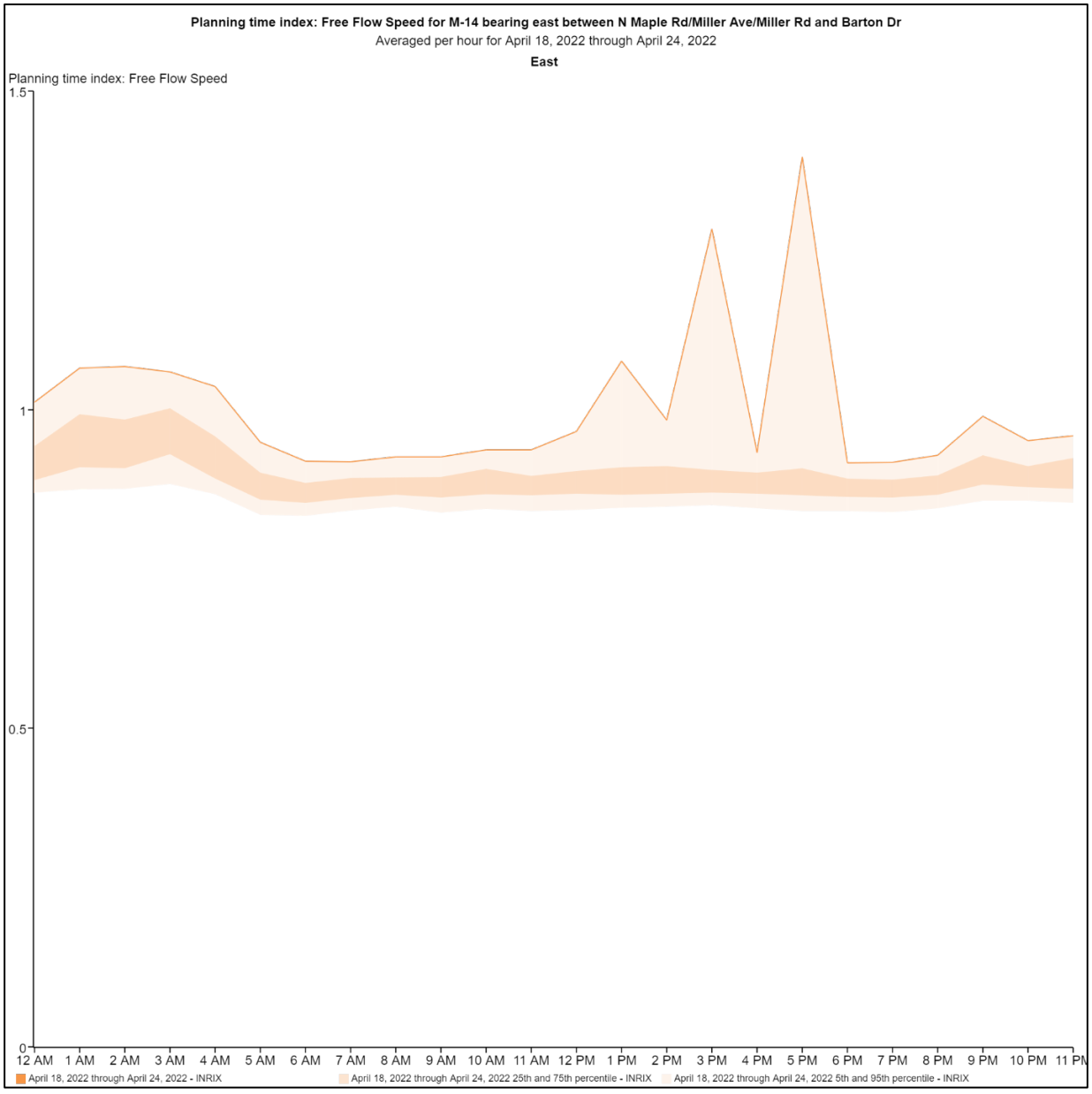
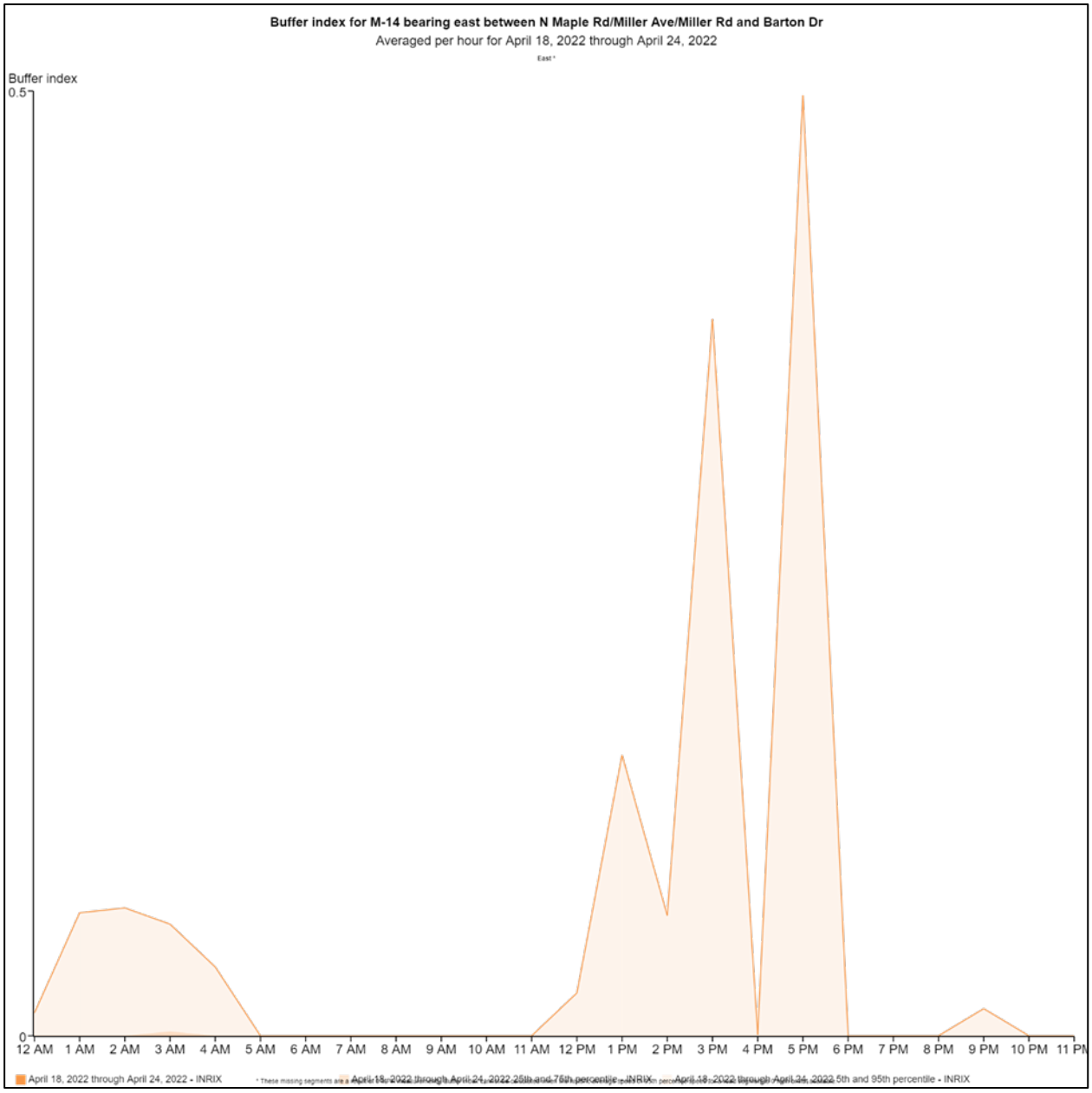


Figure 9: Buffer Index, Eastbound M-14 (from Miller to Barton)



Traffic Patterns

The MDOT provided *StreetLight* O-D data for use in the study. *StreetLight* is a third-party vendor that collects and compiles travel information from a variety of data sources—including mobile device information, GPS tracking information, and more—to determine where trips start and end.

The data set only contained AM peak hour data for relevant trip pairs in the study area. Trip distributions based the data shown in Figure 10 and 11. Of traffic on eastbound M-14, before Miller Road, approximately 14% exit to Barton Drive, 9% continue north on US-23 and 39% continue east on M-14. The traffic that enters M-14 via Barton Road is almost evenly split between US-23 north and M-14 east.

Figure 10: M-14 Eastbound Trip Distribution (AM Peak)

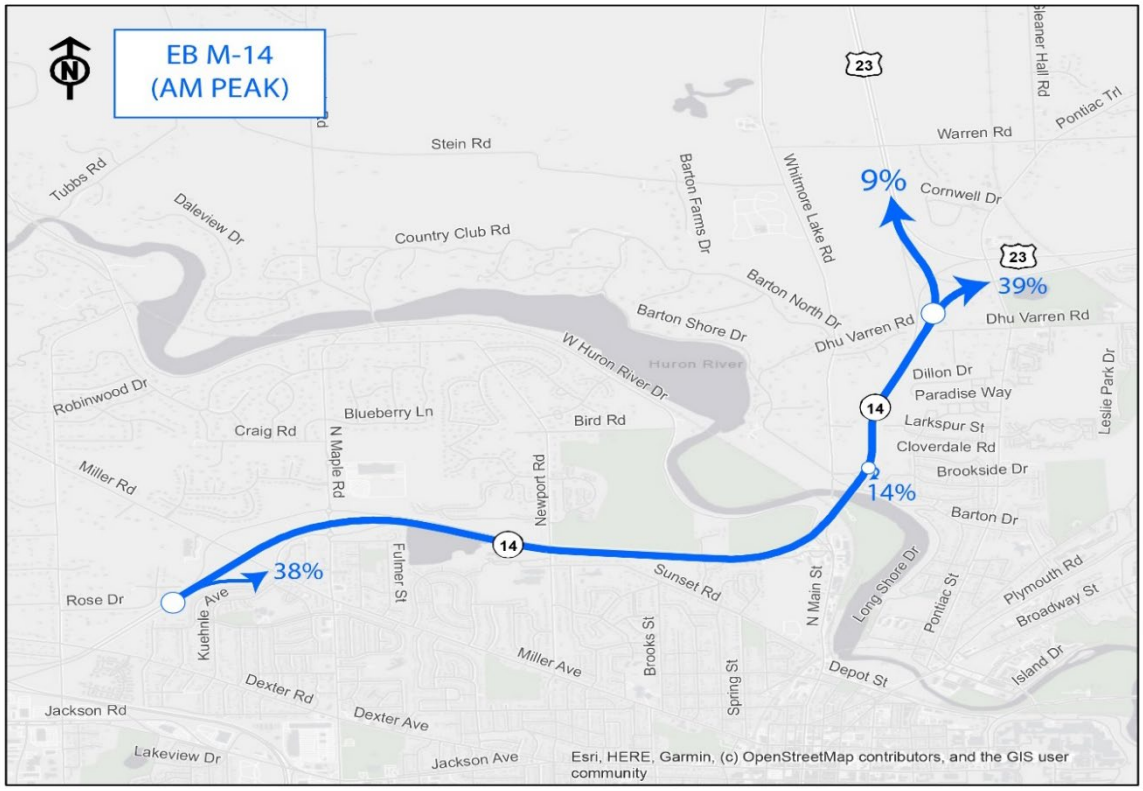
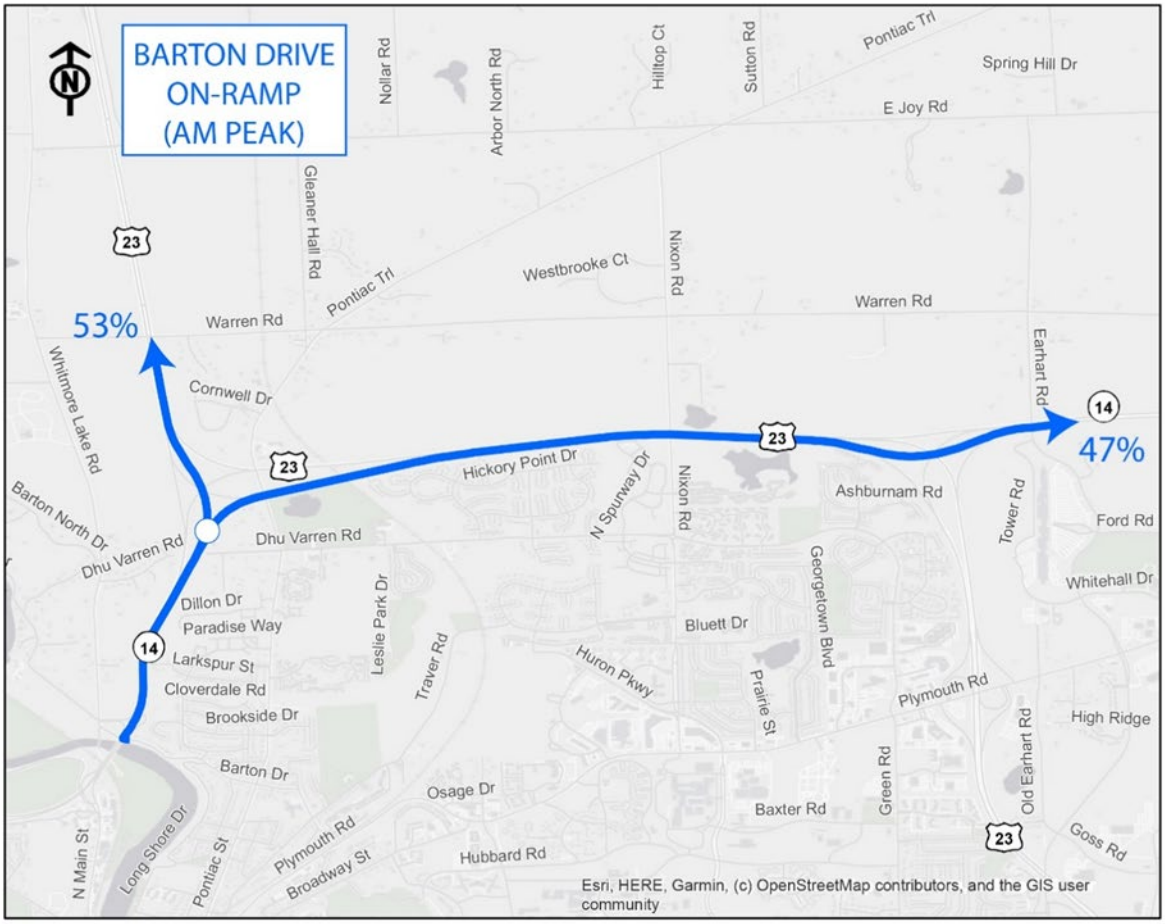


Figure 11: Barton On-Ramp Trip Distribution (AM Peak)



Existing Vehicle Level of Service

To evaluate vehicle travel conditions within the M-14/Barton PEL study area, the study used the Level of Service (LOS) methodology from the *Highway Capacity Manual, sixth edition (HCM 6)*. For freeway facilities such as M-14, the LOS is a measurement of the vehicle density along a given segment of roadway, reported as passenger cars per mile per lane (pc/mi/ln).

Mainline M-14 LOS

Table 2 shows LOS thresholds for urban freeway facilities per *HCM 6* thresholds.

The facility in the area is a basic two lane freeway, per direction, with an auxiliary lane between N. Main Street and Barton Drive. A short acceleration lane is present north of Barton Drive, and it remains two lanes up until 110 feet south of the US-23 North split.

Table 2: Urban Freeway Level of Service Thresholds – Mainline

Level of Service	Freeway Facility Density (pc/mi/ln)
A	≤11
B	>11-18
C	>18-26
D	>26-35
E	>35-45
F	>45 or any component segment with a volume-to-capacity ratio greater than 1.00

Source: Highway Capacity Manual, sixth edition.

Based on the HCM methodology, the 2 lane freeway segment outside of the interchange area provides LOS C in the AM peak and LOS D in the PM peak (as shown in Table 3 below).

Table 3: Basic Segment LOS

Time Period	Density (pc/mi/ln)	LOS
AM Peak Hour	24.0	C
PM Peak Hour	30.3	D

Weaving Section M-14 LOS

The roadway section between N. Main Street and Barton Drive is subject to weaving as vehicles enter eastbound M-14 at N. Main Street and exit the freeway at Barton Drive. There are two basic lanes on the roadway with an auxiliary lane extending from N. Main Street to Barton Drive. Based on observations, a significant number of vehicles cross the bridge and navigate straight from N. Main Street to Barton Drive (approximately 8% of total ramp volume).

The existing traffic data was used to measure the expected performance per the *HCM 6* methodology. Table 4 shows the *HCM 6* LOS methodology relationship. The AM and PM peak hours both perform at LOS D (Table 5).

Table 4: Urban Freeway Level of Service (LOS) Thresholds – Weaving

Level of Service	Freeway Facility Density (pc/mi/ln)
A	≤10
B	>10-20
C	>20-28
D	>28-35
E	>35
F	>43 or any component segment with a volume-to-capacity ratio greater than 1.00

Source: Highway Capacity Manual, sixth edition.

Table 5: Weaving Segment LOS (N. Main Street to Barton Drive)

Time Period	Density (pc/mi/ln)	LOS
AM Peak Hour	29.1	D
PM Peak Hour	34.9	D

Ramp Merge and Diverge M-14 LOS

The existing traffic data was applied to determine the expected performance per the *HCM 6* LOS methodology. This methodology relates to the LOS with the same densities as weaving shown in Table 4. The N. Main Street ramp performs at LOS C in the AM peak hour, and during the PM peak hour the level of service is LOS E (Table 6). The Barton Drive ramp performs at LOS D in the AM peak hour, and during the PM peak hour the level of service is LOS E (Table 7).

Table 6: Ramp Merge (N. Main Street to M-14) LOS

Time Period	Density (pc/mi/ln)	LOS
AM Peak Hour	23.6	C
PM Peak Hour	34.9	E

Table 7: Ramp Diverge (M-14 to Barton Drive) LOS

Time Period	Density (pc/mi/ln)	LOS
AM Peak Hour	34.8	D
PM Peak Hour	43.0	E

Ramp Terminal and Arterial Intersection LOS

For non-freeway facilities, such as local roadways, LOS is a measurement of average delay per vehicle at an intersection. Based on the density or delay, a score of A through F is assigned, with A representing the best conditions, or lowest density/smallest delay, and F representing the worst conditions, highest density/greatest delay.

As discussed previously, LOS for intersections, which include ramp terminals, is measured in average delay per vehicle. Per the *HCM 6* thresholds, LOS thresholds for intersections are shown in Table 8 below.

Table 8: Ramp Terminal Level of Service (LOS) Thresholds

Level of Service	Traffic Signal Control Delay (sec/veh)	Stop Controlled Delay (sec/veh)
A	≤10	≤10
B	<20	<15
C	<35	<25
D	<55	<35

Level of Service	Traffic Signal Control Delay (sec/veh)	Stop Controlled Delay (sec/veh)
E	<80	<50
F	≥80	≥50

Source: Highway Capacity Manual, sixth edition.

Delay and LOS results within this report only include the morning and evening single peak hour operations, found to be between 7:15 a.m. and 8:15 a.m. and 4:30 p.m. and 5:30 p.m., respectively.

Using Synchro software, the study examined the Barton Drive/Whitmore Lake Road corridor from the westbound M-14 ramps to Pontiac Trail. For the AM and PM peak hours, existing conditions were analyzed, and the existing LOS reported for select intersections. It should be noted that not all corridor intersections had volume data available and some minor intersection volumes were estimated for network creation purposes.

Table 9 illustrates the poor level of service at both the EB and WB ramp terminal intersections. The exiting ramp traffic experiences delay that is higher than the threshold for acceptable performance. Along the corridor east of the interchange, acceptable levels of service are provided, including the signalized intersection at Pontiac Trail.

Table 9: Arterial Intersection Level of Service – Barton Network

Intersection	AM Peak Hour LOS	Delay (sec/veh)	PM Peak Hour LOS	Delay (sec/veh)
WB -14 Ramps / Whitmore Lake	F	66.8	D	29.5
Barton / EB M-14 Ramps	F	52.3	F	62.2
Barton / Chandler	C	16.6	C	20.5
Barton / Pontiac Trail	C	29.2	C	31.4

Additional analysis was performed along N. Main Street, from the M-14 interchange south to the Depot Street / Summit Street signalized pair.

Table 10: Arterial Intersection Level of Service – N. Main St. Network

Intersection	AM Peak Hour LOS	Delay (sec/veh)	PM Peak Hour LOS	Delay (sec/veh)
Huron River Dr	F	53.9	C	17.2
Lakeshore Dr.	C	19.1	D	33.6
Depot St.	D	44.7	E	62.4
Summit	B	19.2	B	14.7

VISSIM Model of Area

The MDOT provided files from previous VISSIM modeling of the area used for operational analyses. The general limits of the model included the M-14 / US-23 freeway mainline from I-94 on the west, to US-23 north of the west M-14/US-23 interchange and to M-14 east of the east M-14/US-23 interchange. The geometry included mainline freeway segments, merge and weave areas, and the ramp system to the terminals.

The previous efforts are reported as a validated model, and in this step only used to confirm operations purported by the HCS analysis.

Table 11: VISSIM Output

Segment	AM Peak Hour Density	Avg Speed (mph)	PM Peak Hour Density	Avg Speed (mph)
EB M-14 N. Main Street to Barton Drive	26.2	57.2	17.4	50.6
EB M-14 west of N. Main Street	21.4	61.6	20.2	60.9
EB M-14 east of Barton Drive	31.9	45.9	21.5	51.8

Rail Facilities

The MDOT owns and maintains a rail line in the study area. Norfolk Southern and Amtrak operate on the line underneath M-14 at the southern end of the bridge, parallel to the Huron River.

Currently, Norfolk Southern operates 1-2 trains per day, on average, on these tracks. Amtrak also operates passenger rail on these tracks, the Wolverine Line with service between Detroit and Chicago. The line operates three (3) times per day in each direction with stops across the state. A passenger rail station is present along the line approximately 1 mile south of the M-14 underpass. Average speeds on the track in this area ranges from 5-50 mph with an allowed speed of 70 mph.

Pedestrian and Bicycle Facilities

Non-motorized facilities within the study area exist as a mix of sidewalk, shared use paths and crosswalks. Along the Huron River, south of Barton Drive a shared use path and boardwalk is in place connecting Argo and Bandemer park facilities while providing non-motorized mobility east-west in the area. There are no sidewalks along Barton Drive or Whitmore Lake Road, except for a short connection to the boardwalk through a crosswalk at the Barton Drive ramp terminal intersection.

An unofficial bike trail exists 800 feet north of the Barton Drive ramp intersection with M-14. It crosses under M-14 through the abandoned M-14 / Huron Parkway extension. The trail connects through to Whitmore Lake Road on the west side of the interchange and Pontiac Trail on the east (near Leslie Woods Nature area).

Safety

To understand the safety issues within the existing EB M-14/Barton Drive interchange area, crash data was collected for a five-year period between 2015 and 2019. Using this crash data, a safety analysis was performed. An overview of the analysis results is provided below.

Safety within the interchange area is an important consideration, as there has been a recent spike in truck crashes including ones where hazardous spills leaked into the Huron River. The safety assessment was conducted to establish a baseline of existing crash patterns along the corridor and to determine the presence of causal relationships, if any, among each facility type and road users. Ultimately, the findings from the safety assessment will assist the project team with identifying and selecting the appropriate design alternatives under consideration as part of the EB M-14 / Barton Drive PEL Study.

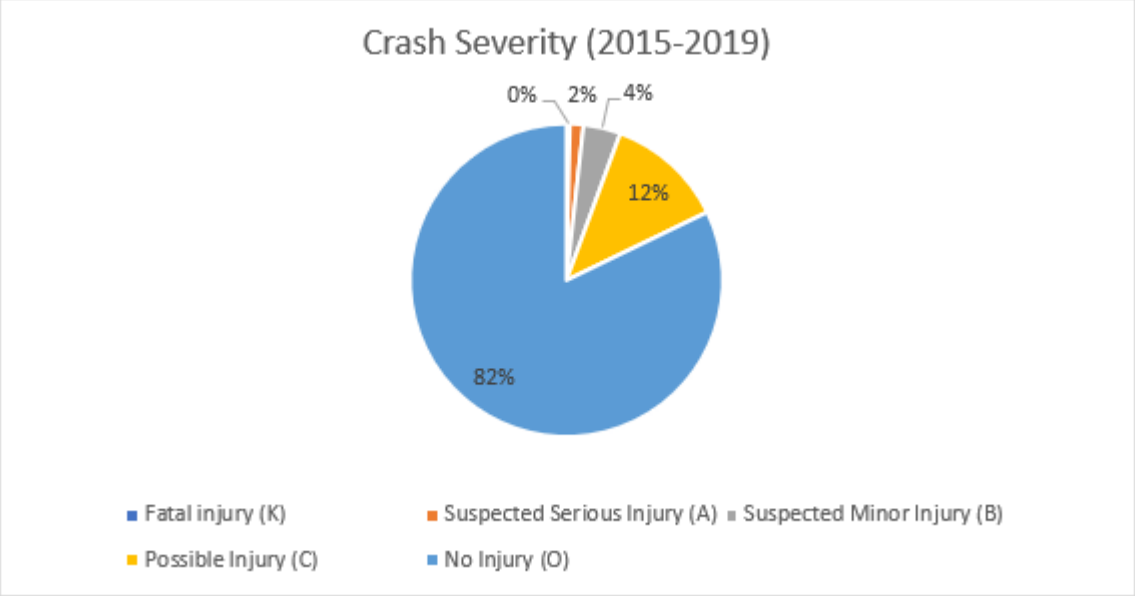
For the purposes of this report, the crash data and analysis are discussed in three sections. This includes a summary of all crash data, a discussion of crash data by facility type, and finally a brief discussion on the conclusions drawn from the data.

Overview of Crashes

Traffic crash information was extracted from the Michigan Traffic Crash Facts site for the study. During the five-year analysis period (2015-2019), there were a total of 290 documented crashes within the mainline corridor (1000 feet west of Main Street to 1000 feet east of Barton Drive). Traffic crash data from the year 2020 was excluded from analysis due to the impact of Covid-19 outbreak. The 2020 crash data was examined for the sake of pattern identification; however, not documented in this report.

The crash history reports were cleaned and properly located to ensure the data set. Crash types included one (1) fatal crash, 51 injury crashes, and 238 property damage only (PDO) crashes. A summary of the crash severity is shown in Figure 12.

Figure 12: Crash Severity



Additionally, the crash history was examined for the Barton Dive and Whitmore Lake Road ramp terminals from M-14. A total of 48 crashes occurred at Whitmore Lake Road and M-14 WB ramps. The Barton Drive and EB M-14 Ramps experienced a total of 20 crashes over the 5-year period.

Mainline Crashes

Crash history was categorized by year to determine if trends show an increase in crashes in recent years. In general, the current trend is showing increased frequency. As shown in Table 12, there is year-to-year variation with the last two years showing a crash frequency above the average.

Table 12: Crash Frequency by Year

Year	Crash Frequency	Fatal Crashes	Injury Crashes	PDO Crashes
2015	75	0	8	67
2016	30	0	5	25
2017	33	0	5	28
2018	66	0	7	59
2019	86	1	14	71

Truck Crashes

The frequency of truck crashes follows the overall trend with increased frequency in the last few years. As a percent of the total number of crashes, the last three years have been above average.

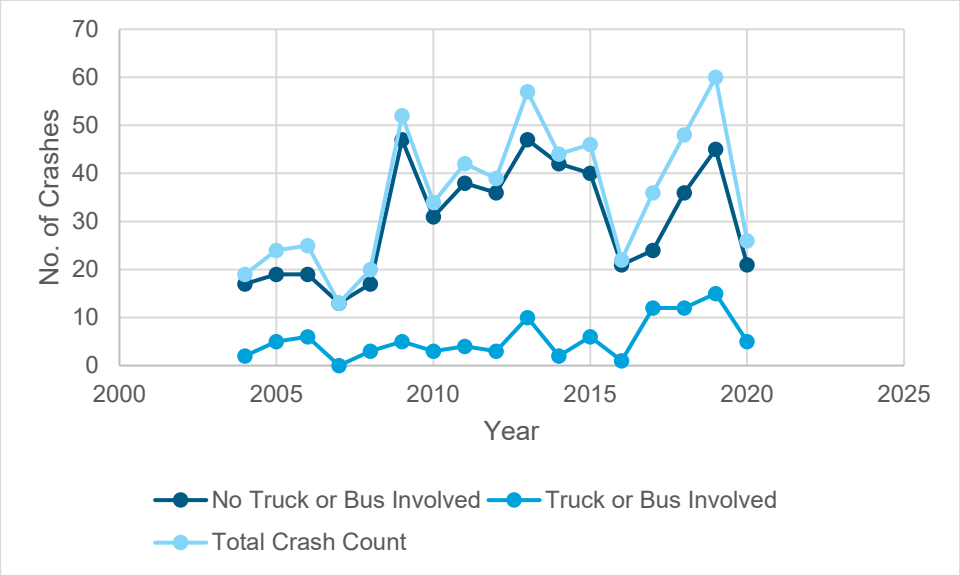
Table 13: Truck Crash Frequency by Year

Year	Number of Truck Crashes	Percent of Total
2015	6	8.0%
2016	1	3.3%
2017	12	36.4%
2018	12	18.2%
2019	15	17.4%

Crash Rate

The crash rate for the segment was calculated in crashes per 100 million vehicle miles (100MVM). The segment of interest is 0.68 miles long and eastbound daily traffic is 34,000 vpd. With a 5-year average of 58 crashes per year, this yields a crash rate of 685.3 per 100MVM.

Figure 13: Annual Crashes (2004-2020)



Crash by Time Period

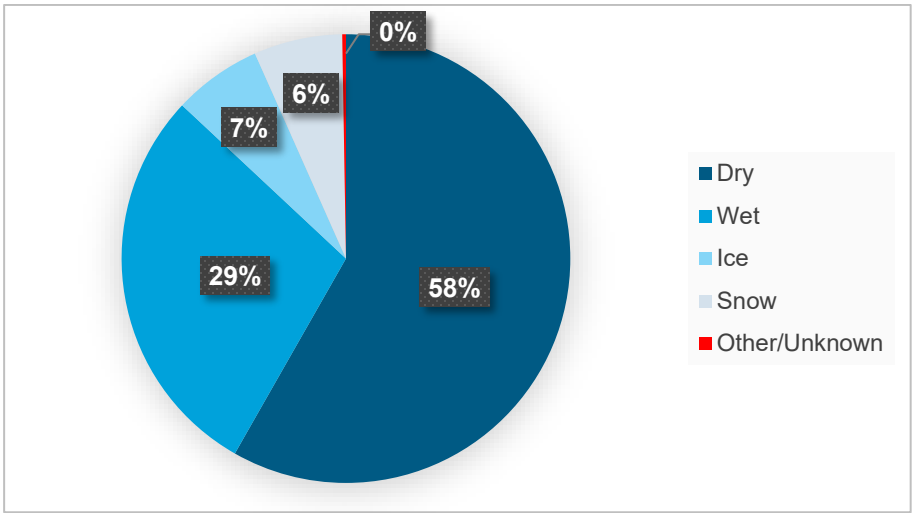
October and January were the most common months for crashes. This is likely related to the increased school traffic period (October) and the weather-related roadway conditions (January).

The frequency of crashes in the study area was highest on Fridays. Over the 5-year period, approximately 19 percent of crashes occurred on Fridays. The highest period was 5 to 6:00 p.m., followed closely by 4 to 5:00 p.m. Overall, 32 percent of crashes occurred between 4 and 7:00 p.m., which coincides with peak volume travel periods.

Crash by Pavement Condition

Crash frequency was examined for comparison of the pavement conditions at the time of the crash as a possible factor. As shown in Figure 14, approximately 58 percent of crashes occurred with dry pavement conditions, while 42 percent occurring on wet /snowy / icy pavement conditions. The percentage of wet pavement crashes (29 percent) appears to be slightly higher than normal, with a statewide average of 20 percent for freeway facilities during the time.

Figure 14: Crashes by Pavement Condition

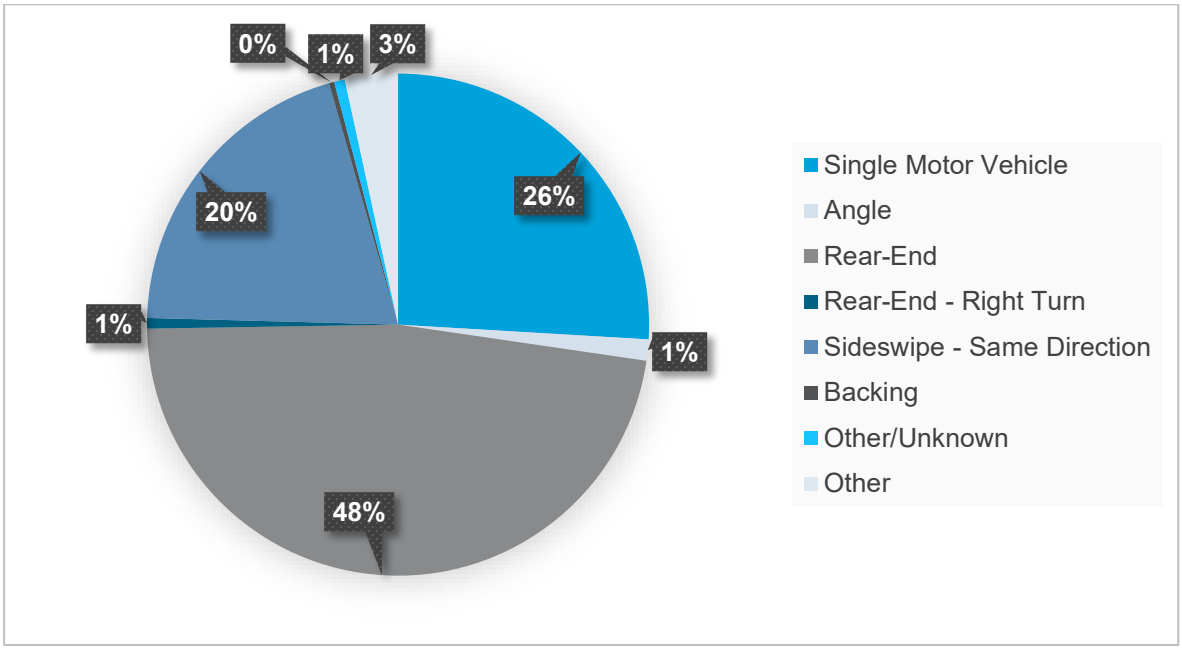


Crash Type and Crash Patterns

The type of crash was examined and tabulated as a part of the study. Using the corrected crash information, a collision diagram(s) of the segment of M-14 was constructed, reference **Appendix A – Collision Diagrams**. These are useful tools to quickly assess patterns and relationship to the roadway.

The predominant crash type is rear-end type crashes, followed by fixed object crashes, and side-swipe same crashes (Figure 15). Rear-end crashes generally occur east of Main Street where traffic is slowing and/or stopping due to congestion and the offending vehicle fails to stop in an assured clear distance. Weaving vehicles between N. Main Street and Barton Drive typically involve side-swipe crashes. While many single vehicle crashes are those that fail to negotiate the curve on the Barton Drive off ramp, there is a reoccurrence of vehicles performing avoidance maneuvers and striking the barrier wall either on the median side or on the bridge structure.

Figure 15: Percent Crashes by Type



Crash Locations

The crash reports were analyzed to remove mislocated crash reports and the location corrected as needed. Based on the corrected locations, heat maps were produced to stratify the intensity of crashes for all vehicles, trucks only, and by the severity of crashes.

In general, crash patterns identified a concentration of crashes near the N. Main Street and Barton Drive ramps as well as in the middle of the bridge structure. These are shown in Figures 16-18.

Figure 16: Crash Heat Map for the Study Area (2015-2019)

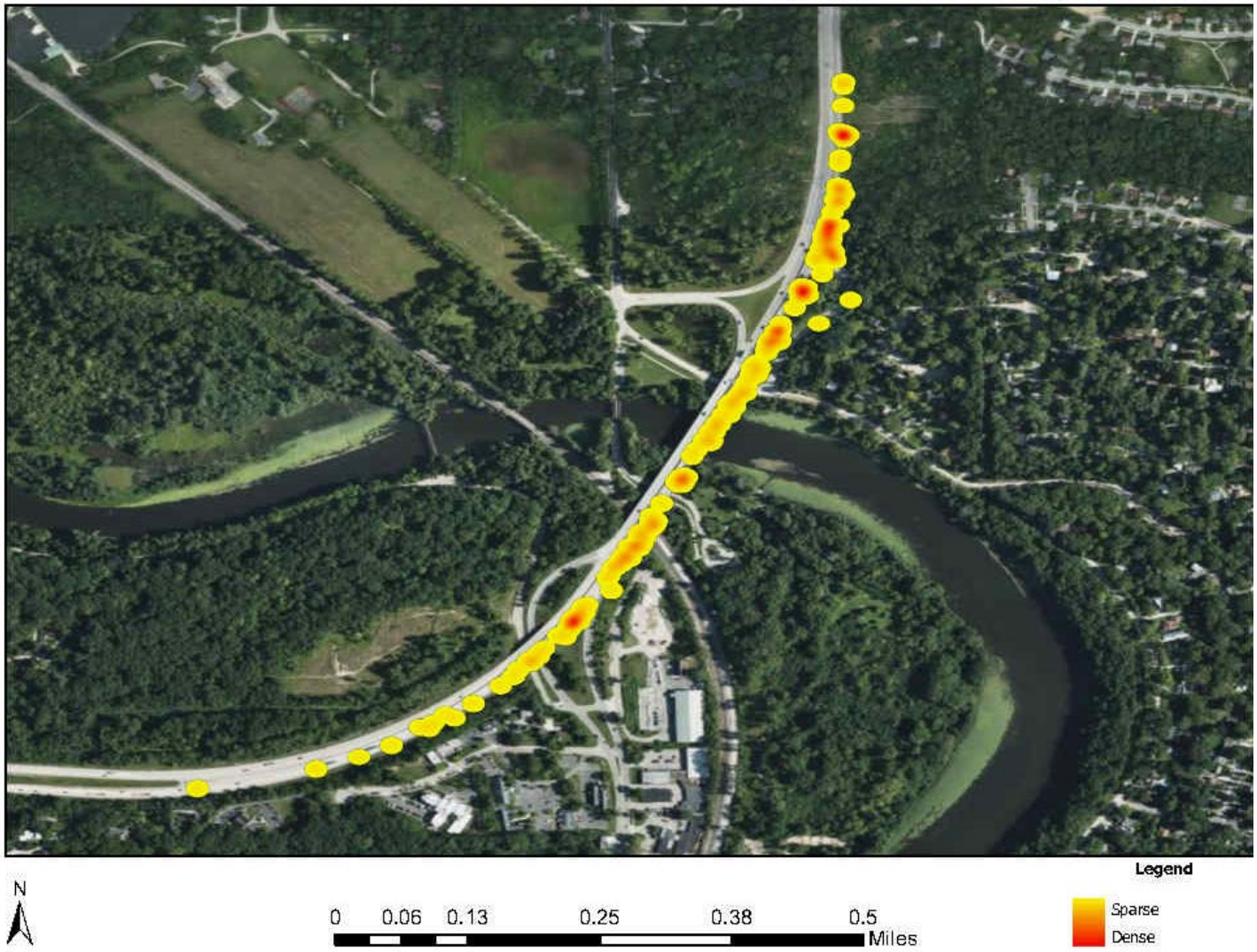
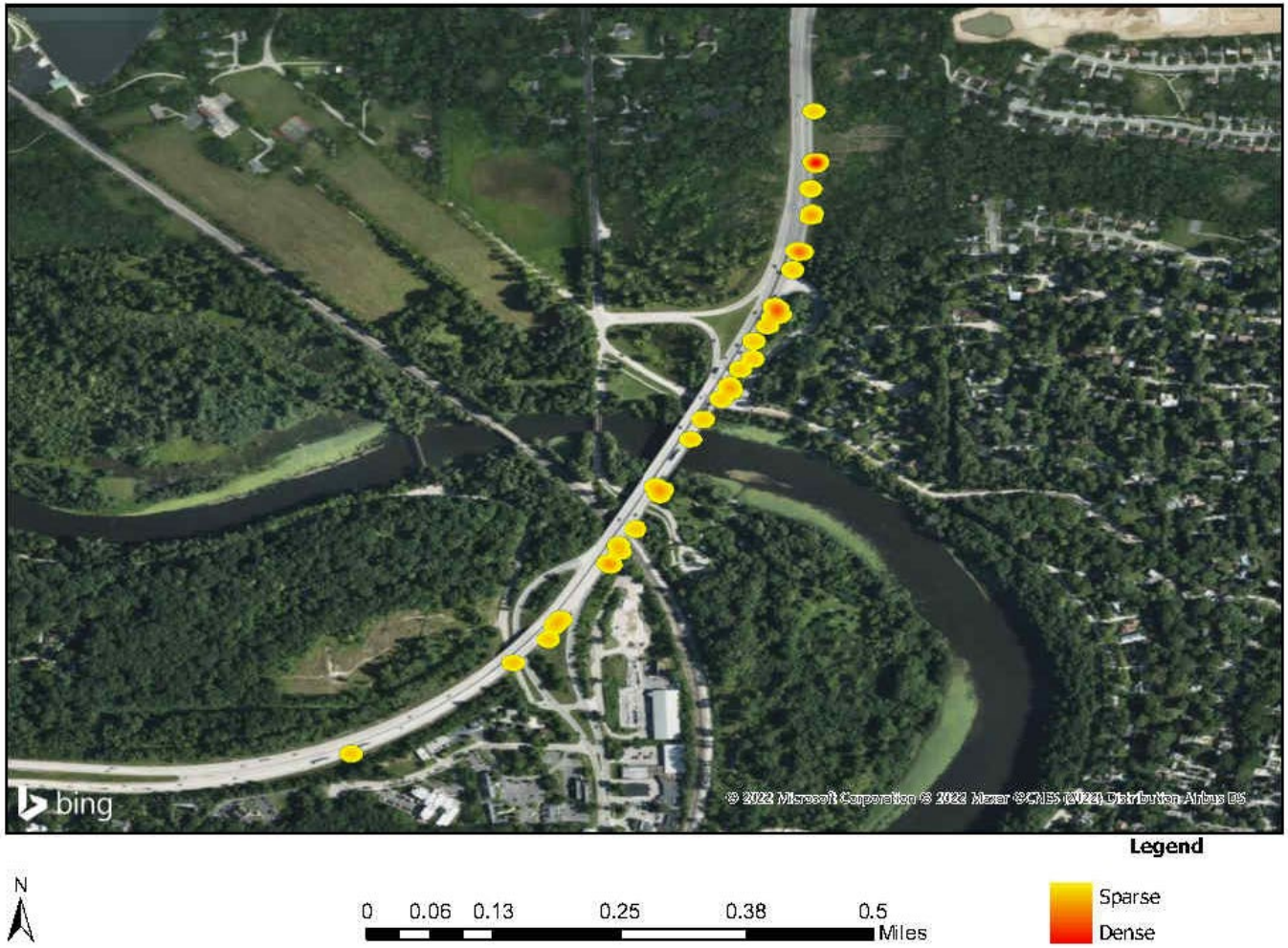


Figure 17: Truck Crash Heat Map (2015-2019)

Figure 18: Fatal & Injury Crash Heat Map (2015-2019)



Environmental Overview of the Study Area

This chapter includes a high-level overview of the existing environmental conditions within the study area. These environmental resources include both the natural and built environment and are aligned with the environmental resources analyzed under the National Environmental Policy Act (NEPA) process. Environmental resources existing conditions data were collected within the study area, which encompasses the M-14 and Barton Drive Interchange where improvements are expected to occur. The study area for individual resources may extend beyond the project limits, to cover all potential impacts of the project.

Air Quality

Air pollution comes from many different sources: stationary sources such as factories, power plants, and dry cleaners; mobile sources such as cars, buses, planes, trucks, and trains; and naturally occurring sources such as windblown dust. Air quality can be affected in many ways by the pollution emitted from these sources.

The National Ambient Air Quality Standards (NAAQS) are heath-based pollution standards set by Environmental Protection Agency (EPA) for six of the most common air pollutants-carbon monoxide, lead, ground-level ozone, particulate matter, nitrogen dioxide, and sulfur dioxide. Areas of the state that have measurements below the NAAQS levels are called attainment areas. Of the six criteria pollutants listed above, four are in attainment across all of Michigan: carbon monoxide, lead, nitrogen dioxide, and particulate matter. The sulfur dioxide non-attainment areas are located outside of Washtenaw County. Ozone is the only pollutant of concern in Washtenaw County, which is in the ozone non-attainment area. Because ozone is created in the atmosphere from precursor pollutants in the presence of solar radiation, it is considered a regional pollutant, and there are no mitigation measures available at the project level.

Traffic, local emission sources, topography, climate, and regional background concentrations affect the local air quality in the project area. The freeways in Ann Arbor carry high volume of vehicles, including trucks. As vehicle technology improves, so does air quality. Stricter Corporate Average Fuel Economy (CAFE) standards for fuel efficiency in vehicles and cleaner fuels have all contributed to improved air quality in the study area.

As numerous studies have shown, air pollution from mobile sources is most likely to affect receptors close to roadways, since the concentration of air pollutants steadily diminishes as it moves out past 400 feet from the highway. Beyond 400 feet, the concentration of air pollutants matches the background concentrations. Locations where people spend extended periods of time and places where people spend time outdoors are likely to be the most sensitive receptors, including homes, schools, parks, and hospitals. Several of these receptors exist in the study area, along M-14 on both the east and west sides.

Greenhouse Gas Emissions

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide (CO_2) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane (CH_4) and nitrous oxide (N_2O).

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because atmospheric concentration of GHGs continues to climb, our planet will continue to experience climate-related phenomena. For example, warmer global temperatures can cause changes in precipitation and

sea levels. According to EPA Greenhouse Gas Reporting Program, reporting, Michigan emitted approximately 67 metric tons of carbon dioxide equivalent.

To date, no national standards have been established regarding GHGs, nor has the EPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO2 under the Clean Air Act. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate Change, the US National Academy of Sciences, and EPA and other Federal agencies. GHGs are different from other air pollutants evaluated in Federal environmental reviews because their impacts are not localized or regional due to their rapid dispersion into the global atmosphere, which is characteristic of these gases. The affected environment for CO2 and other GHG emissions is the entire planet.

In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad scale actions such as actions involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project's emissions.

Noise

Noise is generally defined as unwanted sound. Sound levels are expressed in dimensionless units called decibels (dB). Noise is emitted from many natural and man-made sources. Noise can affect daily activities, especially those that occur outdoors. Noise from traffic on roadways can be very disruptive at high levels if it is not mitigated.

A noise sensitive receptor is any property on which frequent human use occurs and highway traffic noise may be detrimental to the enjoyment and/or function of the property. This includes residences, schools, parks, hospitals, and businesses. MDOT has established noise levels for noise sensitive receptors based on activity categories. These measures are called Noise Abatement Criteria (NAC) (see Table 14). Noise above these levels requires the analysis of noise abatement measures. MDOT also defines a substantial noise increase as a 10 dB(A) increase between the existing noise level to the design year predicted noise level. Either condition identifies a noise impact.

Table 14: MDOT Noise Abatement Criteria

Activity Category	Activity Leq (h)*	Evaluation Location	Activity Description
A	56 dBA	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	66 dBA	Exterior	Residential.
C	66 dBA	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	51 dBA	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or

Activity Category	Activity Leq (h)*	Evaluation Location	Activity Description
			nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	71 dBA	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in Activity Category A through D or F.
F	N/A	N/A	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	N/A	N/A	Undeveloped lands that are not permitted for development.

Leq(h) = the equivalent steady state noise level that contains the same amount of sound energy for a sixty minute period.

A review of the existing conditions was performed, using desktop tools such as Google Maps and existing land use data, to identify noise sensitive activities within the study area. The area for noise analysis extends 500 feet west and east of the M-14 corridor within the project limits. Some portions of the noise analysis area were extended to include areas that potentially could be affected by interchange improvements associated with the project.

The existing noise-sensitive areas within the study area are single family residential neighborhoods on both the east and west sides of M-14 between the Huron River and Pontiac Trail. There are twelve dwelling units on E. Barton Lane and Dhu Varren Drive on the west side, and 23 dwelling units on E. Bateson Court, Brookside Drive, and Barton Drive, on the east side, all NAC Activity Category B land uses.

Between the Huron River and Main Street, there is only one NAC Category F land use. Bandemer Park is also located on both sides of the river along M-14, which is considered NAC Category C land use.

Socioeconomic Data

Social resources contribute to the quality of life in the project corridor and define the character of a neighborhood. The social resources of a neighborhood are important because impacts that may occur from the proposed project may impact the character or liveability of a neighborhood.

Economic resources that contribute to the economic conditions in the study area include employment and tax base, businesses, housing, infrastructure and public services, and property values. The economic resources of a neighborhood are important because impacts that may occur from the proposed project may increase or decrease business activity, property values, and tax revenues; thus, impacting the community's economic livelihood.

The study area intersects with several neighborhoods that are in a low-density suburban setting within a major city. These neighborhoods include almost entirely single-family units. There are no commercial, industrial, and high-density multi-family resident land uses in the study area, However, the Barton Drive interchange provides access to these zones in other parts of Ann Arbor. Residents in the study area travel outside of the study area for work. The regional population also uses the M-14 and the Main Street exit to travel to Downtown Ann Arbor, the University of Michigan for work, or for longer-distance travel to other locations outside of the Ann Arbor area.

Environmental Justice

Environmental justice analyzes impacts to minority and low-income populations. Minority, as it applies to environmental justice, is defined as a person who is Black or African American, Asian American, American Indian or Alaskan Native, and Native Hawaiian or Pacific Islander. Additionally, those who

identify themselves as Hispanic or Latino regardless of their race are considered to be part of the minority population.

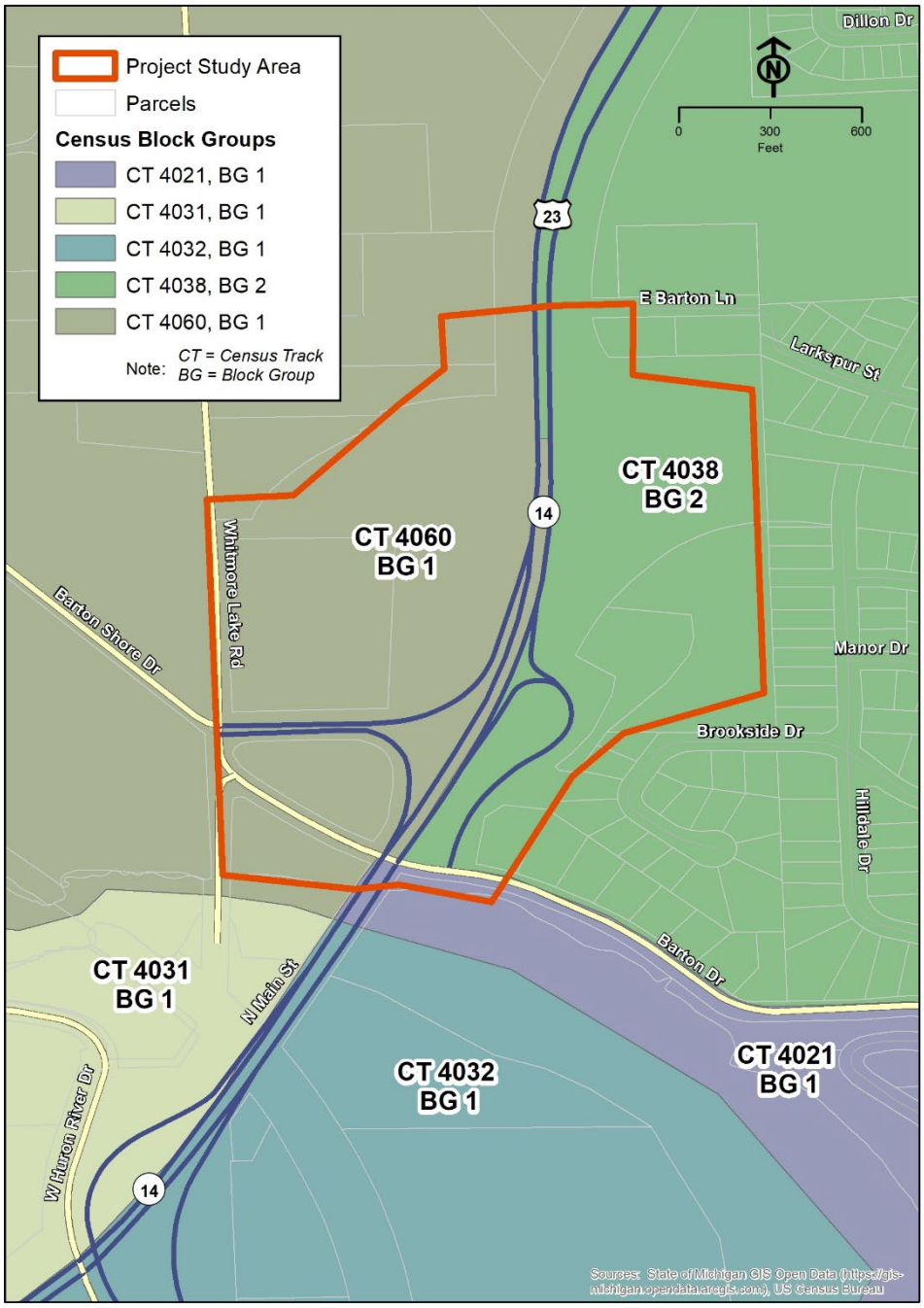
Low income is defined as a household income at or below the U.S. Department of Health and Human Services poverty guidelines. Low-income populations are determined within a study area by calculating the low-income threshold for the median household income in the county. Data from the Southeast Michigan Council of Governments (SEMCOG) Community Profiles was used to review the population statistics in the study area, as shown in Table 15. Block groups are shown in Figure 19. The poverty data for 2020 Census has not been published at the block group level, but the poverty rates at the county, city, and township level remained the same between the 2010 and 2020 Census, and it can be assumed to be true for the block groups in the study. The study area has an overall lower percentage of minority and low-income populations than the surrounding communities; therefore, environmental justice is not a concern.

Table 15: Demographic Profiles

Census Area	Population	White	Black	Asian	Multi-racial/ other	Hispanic	Poverty
Washtenaw County	372,258	68%	11%	9%	6%	6%	14%
Ann Arbor	121,093	67%	7%	17%	9%	5%	23%
Ann Arbor Township	3,809	72%	1%	20%	7%	4%	4%
Barton Hills	389	73%	2%	6%	19%	2%	2%
Census tract 4021, Block Group 1	771	74%	3%	7%	10%	6%	N/A
Census tract 4031, Block Group 1	1,542	78%	3%	8%	8%	4%	N/A
Census tract 4032, Block Group 1	1,279	75%	8%	3%	9%	4%	N/A
Census tract 4038, Block Group 1	987	67%	6%	12%	8%	7%	N/A
Census tract 4060, Block Group 1	1,393	75%	2%	13%	6%	5%	N/A

Source: SEMCOG, 2022.

Figure 19: Census Block Groups in the Study Area



Hazardous Materials

The EPA defines hazardous material as anything causing harm to people, plants, or animals when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. Regulatory records were analyzed to determine presence of environmental concerns located in the study area that would be expected to have an impact to human health or the environment.

Records consulted include MDOT's Dynamic Environmental Geographic Information System (GIS) Resource (DEGR) and the Michigan Department of Environment, Great Lakes, and Energy's Water Well viewer (EGLE).

According to data retrieved from DEGR, no contamination sites are located within 500 feet of the study area. DEGR provided data for sites of contamination from superfund; Part 111 Hazardous Waste; Part 115 Solid Waste Disposal; Part 3201 Environmental Contamination; Part 211 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulated storage tanks; and Part 213 Leaking Underground Storage Tanks (LUST). The nearest DEGR contamination sites are located 900 feet to the west of the study area and include:

- One open Part 211 CERCLA regulated storage tank
- One closed Part 213 LUST

Due to the distance from the study area, these sites are not expected to have an impact on the project activities.

According to data retrieved from EGLE, two water wells are located approximately 260 feet east of the current north-south alignment of BUS-23 and approximately 250 feet northeast of the eastern entrance/exit ramp.

- Well ID 81000004884 is a household well that was completed in 1986 to a depth of 94 feet. It is located at 75 Barton Road in Ann Arbor, MI 48105.
- Well ID 81000004883 is a dry hole well completed to a depth of 212 feet in 1970. It is also located at 75 Barton Road in Ann Arbor, MI 48705.

Although not within the boundary of the study area, three wells are of note due to proximity to the project. These wells are located fairly close to the northeastern boundary of the study area.

- Located approximately 50 feet east of the study area boundary, Well ID 81000021831 is a household well that was completed in 2007 to a depth of 101 feet. It has since been abandoned and plugged. This site is located at 203 East Barton Lane in Ann Arbor, MI.
- Located approximately 80 feet east of the study area boundary, Well ID 81000004887 is a household well that was completed to a depth of 101 feet in 1979. It is located at 230 East Barton Lane in Ann Arbor, MI.
- Located approximately 150 feet east of the study area boundary, Well ID 81000004888 is a household well that was completed to a depth of 96 feet in 1985. It is located at 242 East Barton Lane in Ann Arbor, MI.

These wells are not expected to have an impact on the project activities.

Floodplains

A floodplain is the area surrounding a waterway that will be inundated during a flooding event. Any construction that could affect the delineation of these floodplains must prevent any increase to the elevation of flood waters and any adverse spreading of these flood waters.

The Federal Emergency Management Agency (FEMA) has different classifications for floodplain delineation, according to zone and percent chance of flooding every year and whether flood water surface elevations or Base Flood Elevations (BFEs) have been established.

The study area covers three different FEMA floodplain categories. These categories are described in Table 16.

Table 16: FEMA Floodplain Categories

Zone	Description
A	• Areas subject to flooding in a 1-percent-annual-chance flood as determined by approximate methodologies. • No BFEs or flood depths have been established.
AE, Floodway	• Areas subject to flooding in a 1-percent-annual-chance flood as determined by detailed methodologies. • BFEs have been established. • Area must be kept free of encroachment so that floodwaters can be carried without substantial increases in flood heights
X	• Areas outside the 0.2-percent-annual-chance flood. • Areas subject to flood depths of less than 1 foot in a 1-percent-annual-chance flood. • Areas protected by levees from a 1-percent-chance-annual flood.

The Huron River within the study area is a Zone AE floodplain with floodway. This means that the area is subject to inundation by the 1-percent-annual-chance flood event and BFEs have been established by FEMA. The boundaries of the floodplain in the study are all within the boundaries of the parks adjacent to the river, and do not overtop or affect M-14 or the ramps of the interchange.

Biological Resources

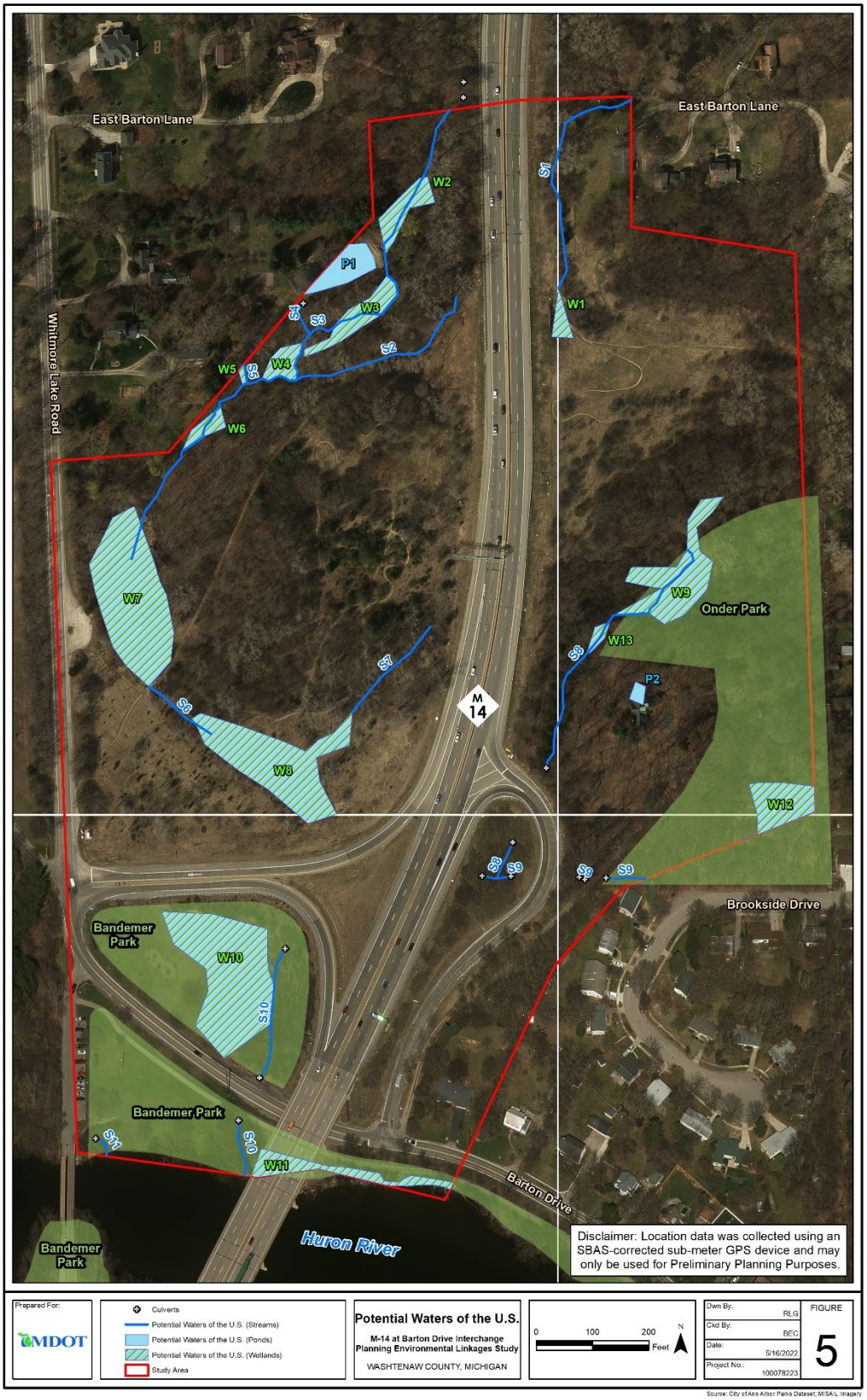
This section identifies and categorizes environmental resources including wetlands, streams, and woodland forests within the study area. The information has been summarized from the Environmental Resources Report prepared for the project, found in Attachment B of the PEL.

Streams and Surface Waters

Streams within the study area were identified based on methods outlined in the Michigan Stream Quantification Tool Data Collection and Analysis Manual (2020) with supporting materials adapted from the North Carolina Division of Water Quality Methodology for Identification of Intermittent and Perennial Streams and Their Origins (2010).

Twelve streams were identified (including the Huron River) within the study area with their locations shown in Figure 20. All streams identified are within the 8-digit Hydrologic Unit Code (HUC) 04100013. The length, classification (intermittent versus perennial), representative channel width, bank height, water depth, and substrate values are provided in Table 17. Field forms for each site (except the Huron River) can be found in Attachment B of the PEL.

Figure 20: Potential Waters of the US in the Study Area



Additionally, two surface water features (ponds) were identified during the field investigation. Pond P1 is located west of M-14 along the western boundary of the study area. The outflow from Pond P1 serves as the headwaters for perennial Stream S4. Pond P2 is located on the east side of M-14 in the vicinity of Stream S8 and Wetland W13. This pond is the site of former homestead which has since been demolished. A direct surface connection from Pond P2 to Stream S8 or any other environmental resources was not observed.

Table 17: Characteristics of Streams in the Study Area

Map ID	Length (ft.)	Classification	Channel Width (ft.)	Bank Height (ft.)	Depth (ft.)	Substrate
S1	431	Intermittent	3	1	2	Silt/Sand
S2	352	Intermittent	3	1	1	Silt/Sand
S3	1,139	Perennial	7	2.5	2	Sand/Small gravel
S4	64	Perennial	5	1.5	1	Sand/Silt
S5	34	Intermittent	4	0.5	2	Sand/Silt
S6	140	Perennial	3	1	8	Sand/Small gravel
S7	206	Intermittent	3	2	2	Sand/Small gravel
S8	618	Perennial	6	1	2	Sand
S9	107	Intermittent	3	0.5	1	Silt/Sand
S10	340	Perennial	3	2	4	Sand/Small gravel
S11	42	Perennial	10	3	2	Sand/Large gravel
Huron River	366	Perennial	300	5	144	Sand/Small gravel

Wetlands

Thirteen wetlands were identified within the study area (locations shown in Figure 20). Atkins staff examined existing wetland and hydrography geospatial data including the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (2021) dataset, the EGLE Michigan Resource Inventory System (MIRIS) Wetland Classes dataset (2021), and the U.S. Geological Survey's (USGS) National Hydrography Dataset (NHD) (2022). There were no listed wetlands located within the study area boundary based upon these datasets. The Huron River was the only listed stream or surface water feature included within the NHD dataset and was classified as R2UBH on west side of bridge, L1UBHh on east side of bridge in the NWI dataset.

Atkins' scientists conducted field surveys on May 2-5, 2022, to identify and delineate any wetland, stream, or surface water boundaries located within the study area and to verify the datasets. Wetlands within the study area have not been verified by the USACE, and a jurisdictional determination has not been made. The Cowardin classification and acreage values are provided in Table 18. Michigan Rapid Assessment Method (MiRAM) data forms for each wetland are available in Attachment B of the PEL. Field photographs taken at each site are available in Attachment B of the PEL. The wetlands identified are included in Table 18.

Table 18: Characteristics of Wetland in the Study Area

Map ID	Cowardin Classification	Area in Study Area (Acre)
W1	Palustrine emergent (PEM)	0.07
W2	Palustrine scrub-shrub/forested	0.11
W3	Palustrine scrub-shrub/forested (PSS/PFO)	0.14
W4	Palustrine emergent (PEM)	0.07
W5	Palustrine emergent (PEM)	0.01
W6	Palustrine scrub-shrub/emergent (PSS/PEM)	0.05
W7	Palustrine emergent (PEM)	0.67
W8	Palustrine emergent (PEM)	0.53
W9	Palustrine emergent/scrub-shrub (PEM/PSS)	0.33
W10	Palustrine emergent (PEM)	0.70
W11	Palustrine emergent (PEM)	0.15
W12	Palustrine scrub-shrub/emergent (PSS/PEM)	0.18
W13	Palustrine emergent (PEM)	0.02
	Total	**3.00**

Woodland Forests

For this evaluation, woodland forests were defined using the City of Ann Arbor's Unified Development Code (2022):

> *A forested area of 1/2 acre or more with a gross basal area of 30 square feet per 1/2 acre, containing 20 trees per 1/2 acre greater than 6 inches in Diameter at Breast Height (DBH), or a plantation of 1/2 acre or more with a minimum average DBH of 10 inches.*

The Unified Development Code (2022) also classifies woodlands into three distinct categories: native forest fragments, urban woodlands, and pioneer woodlands. These classification categories are used to determine protection priorities with respect to development, with the highest protection given to areas that qualify as native forest fragments.

Woodland forests were initially identified using a GIS desktop evaluation. Woodland boundaries were then field verified/surveyed on May 2-5, 2022. Boundaries were delineated based upon several factors, including category type (native forest fragment, urban woodland, pioneer woodland), successional stage/stand age, and species composition. Information including category type, successional stage, and species composition were recorded.

There are a total of twelve woodland forests located within the study area, totaling approximately 25.67 acres. There is an additional forested area (F13) which did not meet the 0.5-acre size requirement to be considered a woodland. This area is comprised predominantly of planted park trees. There is one potential native forest fragment (F9) within the study area boundary, located between Onder Park and M-14. The remainder of the study area does not qualify as a native forest fragment with past agricultural or residential land uses, as observed in the 1949 aerial photograph. Figure 21 shows the location of each stand and locational points associated with field photos. A description of each stand and field photos taken within stands are available in Attachment B of the PEL.

Figure 21: Forest Stands in the Study Area

Endangered Species

Atkins conducted a desktop analysis to identify threatened and endangered species that may be impacted by the proposed project. The desktop analysis used threatened and endangered species databases, including the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) Report (2022), MDOT Dynamic Environmental GIS Resource (DEGR) tool (2022), and Michigan State University Michigan Natural Features Inventory County Element Data (n.d.(a)). Critical habitat geospatial data from the USFWS Threatened & Endangered Species Active Critical Habitat Report dataset (2022) were acquired for each species, when applicable, to determine whether any overlap or proximity exists to the study area boundary. The MDOT conducted seasonal threatened and endangered species field surveys in 2022. All state and federal listed species were surveyed for during these field assessments.

Based on the USFWS IPaC report, there are no threatened and endangered species critical habitat located within the project area. In addition, no federal threatened and endangered species were identified during the MDOT field surveys. The state threatened Oval ladies'-tresses (Spiranthes ovalis) was observed during the mid-late season survey within the project study area. The project area is located within the range for the northern long-earedbat (NLEB) (Myotis septentrionalis) and Indiana bat (Myotis sodalis). Washtenaw County has three known NLEB roost locations and no known hibernacula locations. The NLEB roost sites are located outside of the project study area in Lyndon Township and Pittsfield Charter Township (USFWS, 2017). Michigan has a single known Indiana bat hibernaculum located outside of the project study area in Manistee County (USFWS, 2022). Potential suitable roost habitat including forested areas exist within the project area for both of these species.

Cultural Resources

Historic Resources

Historic resources include buildings, structures, object, sites, districts, or objects that are significant to history or prehistory. Historic resources are defined as being listed in or eligible for listing in the National Register of Historic Places. This may include resources that are listed in the State Register of Historic Places or that are recognized as historically significant at the municipal or county level (such as a local historic district). Per 36 CFR 60.4, cultural resources may be considered eligible for listing on the National Register of Historic Places (NRHP) if they meet the following criteria:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present in the districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association.*

Types of historic resources possible within the Environmental Study Area include buildings, bridges, districts, sites, and parks.

The study area includes mostly undeveloped and forested land, park land, a few residential buildings, and portions of some subdivisions, including Long Shore Park and Winters Park. It also includes two bridges, the M-14 and US-23BR bridge that spans the Huron River and the bridge that carries Whitmore Lake Road between Bandemer Park and Huron Bridge Park.

MDOT's Historic Preservation staff conducted a preliminary, informal windshield-level reconnaissance survey of the study area and adjacent areas in 2020. Based on initial interchange alternatives, MDOT's preliminary survey included houses fronting Barton Hills Drive (Long Shore Park subdivision), Winters Park subdivision, much of Hilldale Drive, and Larkspur St./Barton Lane. As concepts were further developed, it eliminated the alternative option that posed significant impacts to Winters Park. New options focus on Whitmore Lake Road from Barton Hills Drive north to Barton Lane; there is one Washtenaw County designated historic house that may be NR eligible and several other older, potentially historic houses fronting the roadway. There are two known extant buildings in the study area: 135 Barton Drive and 230 E. Barton Lane. 135 Barton Drive was constructed in 1950 and is a brick-veneered single-family dwelling with a Minimal Traditional Form. The wood-frame single-family Ranch house at 230 E. Barton Lane was constructed ca. 1947. Based on preliminary research, neither property is likely to be eligible for listing in the NRHP, nor are the two bridges. There are potential

resources on Whitemore Lake Road that may require further study, in addition to Winters Park and Hill Dale Drive neighbourhoods.

Figure 22: Potential Historic Properties in the Study Area

Archaeological Resources

Archaeological sites consist of the material evidence of past human activity. In Michigan, archaeological sites ranging from as old as approximately 15,000 years to as recent as the modern day have been documented. Under the National Historic Preservation Act of 1966 (as amended), archaeological sites are one category of cultural resources that must be considered as part of the environmental planning process for federal undertakings.

The following data are the results of a research request submitted to the Michigan State Historic Preservation Office (SHPO) in May 2022. Two previously recorded archaeological resources are present within the study area.

Site 20WA239 is a prehistoric findspot, apparently consisting of a single stone projectile point, that was found eroding out of the east bank of the Huron River under the M-14 bridge.

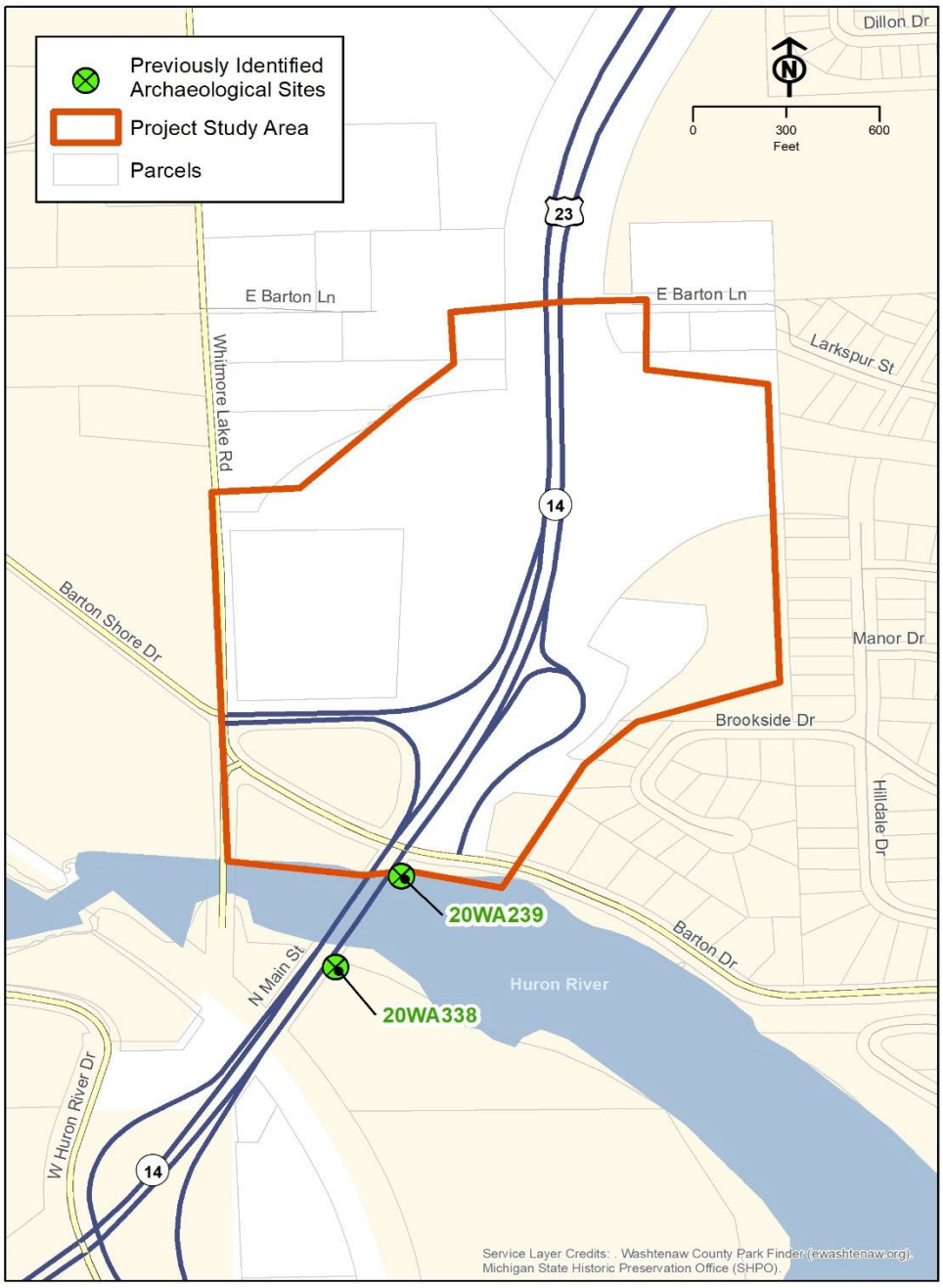
Site 20WA338 is a 19th-century refuse dump located on the west bank of the Huron River under the M-14 bridge.

These two sites are summarized in Table 19 and shown on Figure 22. Neither site has been formally evaluated for NRHP eligibility.

Table 19: Archaeological Sites within the Study Area

Site Number	Township	Time Period	Function/Site Type	NRHP Status
20WA239	Ann Arbor Township	Prehistoric	Findspot	Not Evaluated
20WA338	Ann Arbor Township	Historic	19th Century Dump	Not Evaluated

Figure 23: Archaeological Sites within the Study Area



Parks and Recreational Resources and Section 4(f) and 6(f) Protected Properties

Recreation resources, including parks, open space, and major trail networks, are important community facilities that provide environmental, aesthetic, and recreational benefits. Section 4(f) of the Department of Transportation Act affords protection to publicly owned land in the form of a public park, recreation area, or wildlife and/or waterfowl refuge of national, state, or local significance, and publicly or privately historic sites. Section 4f treats parks, recreation areas, wildlife and waterfowl refuges and historic sites as distinct entities. Section 4(f) protected properties usually are considered in two categories: historic

and non-historic. Section 4(f) non-historic properties include existing and planned publicly owned recreation facilities, where recreation is the significant purpose of the facility. “Planned” means specific facilities are identified in an appropriate master planning document.

Section 6(f)(3) of the Land and Water Conservation Fund (LWCF) Act of 1965 contains provisions to protect properties that are purchased or improved with grant monies from the LWCF. Section 6(f) applies to all transportation projects that could involve possible conversion of the use of these public outdoor recreational properties. The City of Ann Arbor’s Parks and Recreation Open Space Plan and the LWCF Coalition website confirm there are no 6(f) properties in the study area.

The City of Ann Arbor’s Parks and Recreation Open Space Plan (2017) provides an overview of the parks located in the study area. In addition, GIS data were obtained through the Washtenaw County Park Finder to identify parks, open space and greenway trails, and Section 6(f) resources within the study area boundary. Identified resources within the study area all are managed by the City of Ann Arbor and are shown in Figure 23.

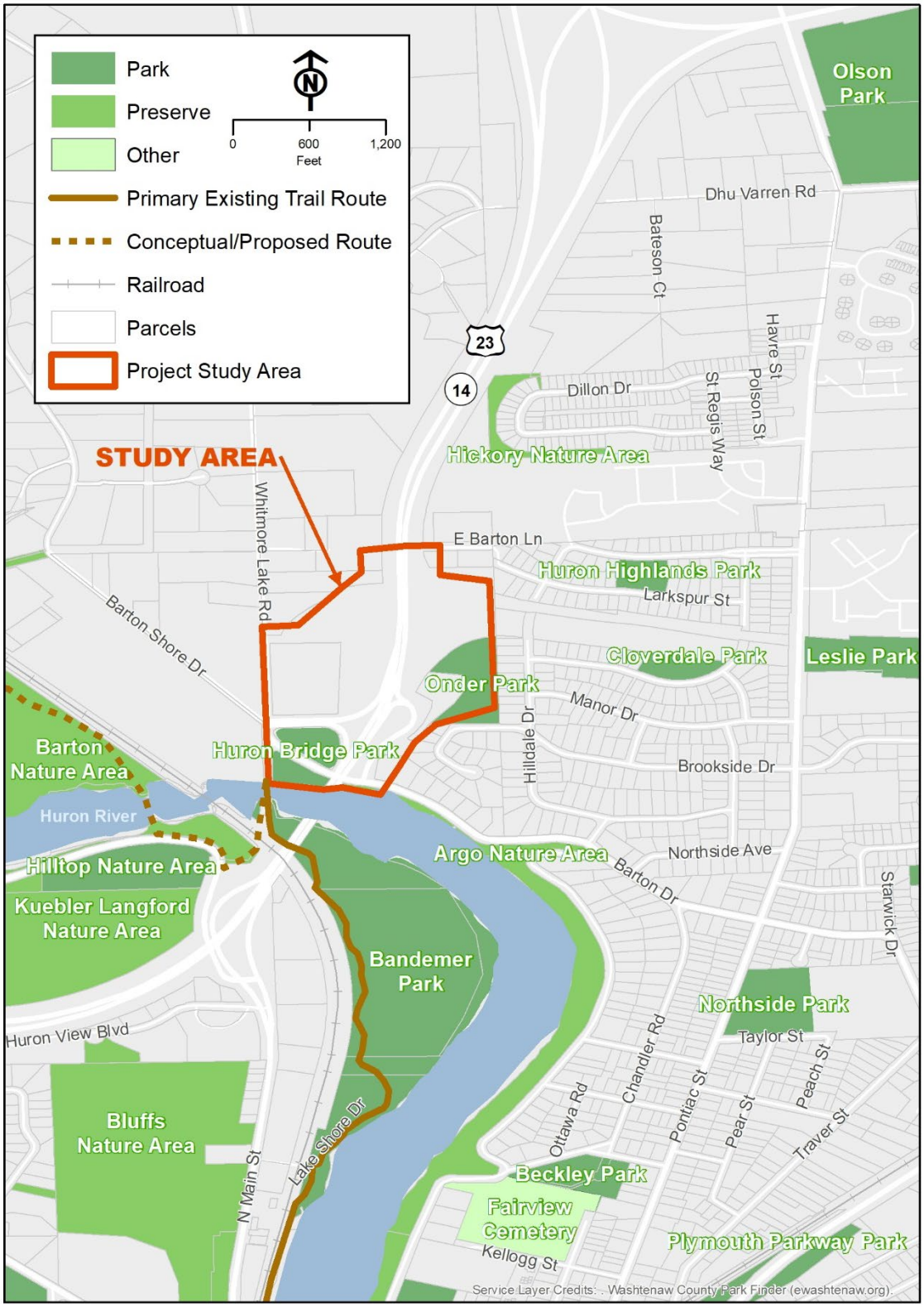
Argo Park & Nature Area is a 22-acre linear park on the east side of the Huron River. The Argo Canoe Livery at the south end of the park, located outside of the study area, is a busy spot drawing people looking to rent canoes, kayaks, and rafts to paddle down the Huron River. The Livery area of the park includes restrooms, unpaved parking lots, and boat launch. The Park also includes an unpaved woodland trail and a shoreline boardwalk for hiking or running, that runs the length of the park along the river.

Bandemer Park is a 38-acre natural area and park on west bank of the Huron River, just outside of the study area. The Huron Bridge Park on the east bank of the river and within the study area is considered a part of Bandemer Park. The Park has two main entrances with parking available at each. Bandemer Park features paved and unpaved trails through the main body of the park, a portion of the Argo Pond walking loop, restrooms, benches, accessible canoe dock, fishing dock, disc golf course, shelter, picnic areas, and grills. Bandemer also contains Ann Arbor's only dirt bike jump course. Bandemer Park is on Washtenaw County's Border-to-Border (B2B) trail and is itself a B2B trailhead. Huron Bridge Park contains paved and unpaved trails and parking facilities.

Onder Nature Area is a 4.2-acre park located in the study area east of M-14. One of this park's most important ecological features is its location. Onder serves as a “green corridor," providing important habitat connectivity. There are two small streams and many pockets of wooded wetlands. The Park has entry locations on both Brookside and Hilldale Drives with on street parking. A hiking/biking trail linking the neighborhood with a local trail system was created by volunteers, including a small boardwalk.

In addition, the large parcel surrounding the interchange owned by the MDOT contains informal trails used by local residents. These trails are not maintained or managed as recreational facilities and are therefore not considered Section 4(f) property.

Figure 24: Parks and Trails in the Study Area



Agriculture-Farmlands and Open Space Preservation

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. The land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government should encourage and facilitate the wise use of the Nation's prime farmland. The National Resources Conservation Service (NRCS) is responsible for keeping current an inventory of the prime farmland and unique farmland of the nation. The Michigan Department of Agriculture and Rural Development is responsible for PA 116, the Michigan Farmland and Open Space Preservation Act, a law that works to preserve farmland by offering incentives to farmers who are willing to participate.

According to the Washtenaw County MapWashtenaw website, the study area is underlain by Group B sandy loam soils and is considered farmland of local importance by the NRCS. The open space land owned by the City of Ann Arbor west of Whitmore Lake Road and south of Barton Shore Drive is the only land cleared for agricultural production; however, is outside of the study area. The rest of the study area is either not drained or covered in woodland and is not in agricultural production. No PA116 enrolled parcels are located within 500 feet of the project. City of Ann Arbor adjacent zoning is multiple family dwelling, public land, single family dwelling and township parcels. Ann Arbor township adjacent zoning is surface waters, single family suburban residential, City, Village of Barton hills and general agriculture. Final design and alternative selection will determine if there will be a need for farmland conversion impact rating for impacts to agricultural designated lands adjacent to the project in the Ann Arbor Township.

Water Quality and Stormwater

There are four overlapping jurisdictional agencies that regulate stormwater management within the project study limits: EGLE, MDOT, Washtenaw County Water Resources Commissioner (WCWRC), and the City of Ann Arbor. The drainage area extends from the southern end of the M-14/US-23BR interchange, south approximately 5,000 feet to the Huron River (97.89 acres). The overland flow is primarily in a southerly direction. The proposed project study areas are within MDOT's M-14 right-of-way, between the Huron River and approximately 3,600 feet north. The drainage area surrounding the project study sites ultimately flows to the Huron River and includes several swampy areas and small ponds. The existing drainage facilities convey the stormwater runoff include ditches, spillways, drainage structures at ramps, median, and at-bridge approaches, storm sewer, median culverts, and a direct outlet to the Huron River via a sewer south of the exit ramp to Barton Drive. There does not appear to be any designed storm water basin within the project study area or the drainage area.

Proposed alternatives that will require new interchange design and construction within the study area will have soil disturbance impacts greater than one or more acre and will increase impervious surface. New drainage facilities are proposed to detain and treat runoff associated with the increase in impervious area. The proposed drainage infrastructure recommended for the two new interchange concepts include an infiltration basin, vegetated filter strips/ditches, and catch basins with deep sumps. All of the above elements can be placed within MDOT's current M-14 right-of-way. Best Management Practices will be determined for the preferred alternative and will follow requirements set forth in *MDOT's Drainage Manual*, *Washtenaw County Water Resources Commissioner Procedures & Design Criteria for Stormwater Management* and *City of Ann Arbor Storm Water Management Guidelines for Public Street Construction and Reconstruction Systems.*

There is no bridge work or bridge replacements proposed for the M-14 bridge over the Huron River. There is a Total Maximum Daily Load (TMDL) due to phosphorus covering the entire project, because of this non-phosphorus fertilizer must be used on slope restoration.

Coastal Zone Consistency

No impact. This project will take place outside of the Coastal Zone Management Boundary. Coastal Zone consistency review is not required.

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Appendix A. Collision Diagrams