

MEDC M-96: Final Traffic Impact Study and Preliminary Project Scoping Reports

Prepared for: Calhoun County, Michigan Department of Transportation (MDOT), and Michigan Economic Development Corporation (MEDC) in relation to the Marshall Mega Site Project.

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1 Project Description

The Marshall Mega Site in Emmett and Marshall Townships, Michigan, has had various developers, requiring large-scale operation ('Mega'), express interest in developing the site. The site is approximately 1,934 acres. The purpose of this study is twofold:

1. **Traffic Impact Study:** will analyze existing and future traffic conditions to determine what roadway improvements would be necessary to mitigate the additional traffic volumes to/from the proposed Mega sites. The analysis includes existing conditions, crash analyses, trip generation/distribution, alternative modeling, build operational analyses, and proposed mitigations.
2. **Preliminary Scoping Report:** will document the recommended geometric improvements that resulted from the traffic study including alternatives developed and vetted during the process, establish preliminary design layouts, cost and design hours estimates and provide schematic cross-sections and plan diagrams to aid in future design. A high-level Environmental review was also conducted.

The subsequent report compiles the overarching project narrative and findings. Detailed Appendices accompany this document to support the traffic and design outcome presented here.

2 Project Limits

The project is located in Emmett and Marshall Townships in Calhoun County. The following study area shown in **Figure 2-1** encompasses both the Marshall Mega Site and the potential Sackrider Mega Site. The analysis study limits include:

- I-94 from Beadle Lake to Partello Road
- I-69 from just north of I-94 to M-96 (Michigan Avenue)
- M-96 (Michigan Avenue) from Wheatfield Parkway to West Drive
- The following local roadways:
 - Verona Road from 15 Mile Road to 11 Mile Road
 - 11 Mile Road from Verona Road to B Drive North
 - 15 Mile Road from Verona Road to M-96 (Michigan Avenue)
 - C Drive North
 - Wheatfield Parkway



Figure 2-1: Study Area

2.1 Existing Land Use

Currently, both proposed site locations consist of primarily farmland or rural residential. The majority of land uses along the M-96 (Michigan Avenue) corridor are similar in nature. Some significant trip generators that exist within the project area include multiple major truck stop/gas stations at the I-94 and M-311 (11 Mile Road) interchange, which bring considerable truck traffic through that location. In addition, the Firekeeper's Casino and Hotel is located on M-96 (Michigan Avenue) just east of the M-311 (11 Mile Road) intersection, and there is a Flex-N-Gate facility on F Drive North. The City of Marshall is just east of the I-69 and M-96 (Michigan Avenue) interchange on the east end of the project limits.

2.2 Existing Freeway Segments (I-94 and I-69)

The existing I-94 cross-section is an interstate with two 12-foot-wide lanes, a 10-foot outside shoulder, and an 8-foot inside shoulder (5-foot paved) in both the eastbound and westbound directions. The roadway is drained through a median ditch and ditches along the outside of the roadway. There are intermediate culverts to drain the median to the outside ditches. Interchange entrance and exit ramp lanes are present at the I-94 at M-96/M-311 (11 Mile Road), Exit 104 interchange as well as entrance and exit ramp lanes, and collector-distributor roads at the I-94/I-69 interchange. The crown point is located between the two mainline travel lanes with a cross slope of 1.5% to 2.0%.

The I-94/I-69 interchange, collector-distributor roads, and a portion of I-94 extending 350-feet west of 15 Mile Road was reconstructed in 2022/2023. The I-94 geometrics remained the same, while the interchange ramps were brought up to current standards.

Based on the available as-built plans and field reviews, the existing pavement consists of 10-inch reinforced concrete with an HMA overlay. The recently reconstructed pavement consists of 11-inch HMA pavement.

The existing I-69 cross-section is an interstate with two 12-foot-wide lanes, a 11-foot outside shoulder, and an 8-foot inside shoulder (4-foot paved) in both the northbound and southbound

directions. The roadway is drained through a median ditch and ditches along the outside of the roadway. There are intermediate culverts to drain the median to the outside ditches. Interchange entrance and exit ramp lanes are present at the I-69 at M-96 (Michigan Ave), Exit 36 as well as entrance and exit ramp lanes, and collector-distributor roads at the I-94/I-69 interchange. The crown point is located between the two mainline travel lanes with a cross slope of 2.0%.

Based on the available as-built plans and field reviews, the existing pavement consists of 11½-inch non-reinforced concrete.

2.3 Existing Non-Freeway Segments (M-96 and M-311 (11 Mile Road))

The existing M-96 (Michigan Ave) cross-section is a 2-lane major connector from M-311 (11 Mile Road) to the I-69 at M-96 (Michigan Avenue), Exit 36 interchange. East and west of this segment the roadway is classified as an Other Principal Arterial. West of the Firekeepers Casino the cross section widens to 4-5-lanes with a center left-turn lane. At the east end of the corridor, a 4-lane boulevard is developed that crosses I-69 and proceeds easterly to the City of Marshall. All lanes within the corridor are 12-foot wide. The majority of the roadway is flanked by 8-foot paved shoulders and open ditches, although intermittent curb and gutter with enclosed drainage is present, particularly at the east and west ends of this segment. The crown point is located between the two bounds with a cross slope of 2.0% and in the boulevard section the crown point is located between the two travel lanes. Based on the available as-built plans and field reviews, the existing pavement is HMA of various thickness. There are three bridge structures within this segment: S05 of 13082 I-94BL crossing I-94, S16 of 13073 (I-69 crossing I-94BL (EB)) and S08 of 13073 (I-69 crossing I-94BL (WB)).

The existing M-311 (11 Mile Road) cross-section varies from 2-lanes to 5 lanes and is classified as an Other Principal Arterial. All lanes are 12-foot wide. The crown point is located between the two bounds with a cross slope of 2.0% and in the boulevard section the crown point is located between the two travel lanes. Based on the available as-built plans and field reviews, the existing pavement is HMA of various thickness. There is one bridge structure within this segment: S06 of 13082 M-311 (11 Mile Road) crossing I-94.

2.4 Existing Interchanges

I-94 at M-294 (Beadle Lake Road), Exit 100 is a full access diamond interchange. All existing ramps are a single lane with widenings at the ramp terminals for the exit ramps. The existing ramp widths are 16-feet wide with 10-foot outside shoulders and 4-foot inside paved shoulders. There is curb and gutter at the ramp terminals with open ditching throughout the remainder of the ramp.

The intersection of M-294 (Beadle Lake Road) at the I-94 EB/WB Ramps is controlled by STOP signs at the off ramps. Where the eastbound ramps meet Beadle Lake Road, the eastbound off ramp has two (2) lanes, one (1) right-turn lane and one (1) left-turn lane. The northbound

approach on Beadle Lake Road has a single through-right turn lane and the southbound approach has two (2) lanes, one (1) left-turn lane and one (1) through lane. Where the westbound ramps cross Beadle Lake Road, the westbound off ramp has two (2) lanes, one (1) right-turn and one (1) left-turn lane.

I-94 at M-96/M-311 (11 Mile Road), Exit 104 is a full access interchange with two slip ramps and two loop ramps all on the east side of M-311 (11 Mile Road). All existing ramps are a single lane with widenings at the ramp terminals for the exit ramps. The existing ramp widths are 16-foot wide with 7-foot outside shoulders and 6-foot inside shoulders (3-foot paved). There is curb and gutter at the ramp terminals with open ditching throughout the remainder of the ramp.

The intersection of I-94 WB Ramps/Wheatfield Parkway at M-311 (11 Mile Road) is controlled by a two-phase traffic signal. All approaches to the intersection are marked as two (2) lanes with a left-turn lane and a through-right turn lane. Field observations noted that the northbound through/right-turn lane on M-311 (11 Mile Road) was being driven as a 2-lane approach with one (1) through lane and one (1) right-turn lane for a short length for passenger vehicles. The Synchro model was designed to account for this driver behavior. Field observations also noted heavy truck traffic volumes that completed left turns on red, particularly for the southbound left. The posted speed limit on both M-311 (11 Mile Road) and Wheatfield Parkway is 35 MPH.

I-94/I-69 interchange is a full system to system interchange with four slip ramps, 4 loop ramps, and collector-distributor roads along I-94. All existing ramps are single lane free flow ramps that are 16-foot wide, with 7-foot inside and 6-foot outside shoulders (4-foot paved). The existing interchange was reconstructed during the 2022/2023 construction seasons.

I-69 at M-96 (Michigan Avenue), Exit 36 is a full access diamond interchange. All existing ramps are a single lane with widenings at the ramp terminals for the exit ramps. The existing ramp widths are 16-foot wide with 7-foot outside shoulders and 6-foot inside shoulders (3-foot paved). There is curb and gutter at the ramp terminals with open ditching throughout the remainder of the ramp.

The intersection of M-96 (Michigan Avenue) at the I-69 SB Ramps is controlled by a STOP sign on the southbound approach of the I-69 SB Off Ramp, as well as YIELD control for the southbound direction in the median. The M-96 (Michigan Avenue) corridor is a boulevard section with two (2) lanes eastbound and two (2) lanes westbound. On eastbound M-96, at the I-69 SB Ramps, there is a right-turn taper that allows vehicles to leave the travel lane to complete their right turn. The westbound approach on M-96 (Michigan Avenue), at the I-69 SB ramps, is marked as one (1) left-turn lane and two (2) through lanes. The I-69 SB Ramp has two (2) approach lanes, one (1) through/left lane and one (1) right-turn lane. M-96 (Michigan Avenue) is posted 45 MPH.

The intersection of M-96 (Michigan Avenue) at the I-69 NB Ramps is controlled by a STOP sign on the northbound approach of the I-69 NB Off Ramp, as well as YIELD control for the

northbound direction in the median. The M-96 (Michigan Avenue) corridor is a boulevard section with two (2) lanes eastbound and two (2) lanes westbound. The eastbound approach on M-96 (Michigan Avenue) is marked as one (1) left-turn lane and two (2) through lanes. On westbound M-96, just east of the I-69 NB Ramps, there is a right-turn slip ramp that allows westbound access onto the freeway. The I-69 NB Ramp has two (2) approach lanes, one (1) through/left lane and one (1) right-turn lane. M-96 (Michigan Avenue) is posted 45 MPH.

I-94 and Old US-27, Exit 110 is a full access interchange with four slip ramps and one loop ramp on the east side of Old US-27. All existing ramps are a single lane with widenings at the ramp terminals for the exit ramps. The existing ramp widths are 16-foot wide with 8-foot outside shoulders and 6-foot inside shoulders (3-foot paved). There is curb and gutter at the ramp terminals with open ditching throughout the remainder of the ramp.

The I-94 at Old US-27 interchange is controlled by STOP signs at the off ramps. Where the eastbound ramps meet Old US-27, the eastbound off ramp has two (2) lanes; one (1) right-turn and one (1) left-turn lane. The northbound approach on Old US-27 has three (3) lanes with two (2) through lanes and one (1) right-turn lane. The southbound approach has two (2) lanes with one (1) left-through lane and one (1) through lane. Where the westbound ramps cross Old US-27, the westbound off ramp has two (2) lanes; one (1) right-turn and one (1) left-turn lane. On northbound Old US-27, just south of the I-94 WB off ramp, there is a right-turn slip ramp that allows northbound access to the freeway. The southbound approach has three (3) lanes with one (1) right-turn lane and two (2) through lanes. Old US-27 has an unposted prima facie speed 55 MPH.

I-94 and I-94BL (Partello Road), Exit 112 is a full access interchange with four slip ramps and one loop ramp on the west side of I-94BL (Partello Road). All existing ramps are a single lane with widenings at the ramp terminals for the exit ramps. The existing ramp widths are 16-foot wide with 8-foot outside shoulders and 6-foot inside shoulders (3-foot paved). There is curb and gutter at the ramp terminals with open ditching throughout the remainder of the ramp.

The I-94 at I-94BL (Partello Road) interchange is controlled by STOP signs at the off ramps. Where the eastbound ramps meet I-94BL (Partello Road), the eastbound off ramp has two (2) lanes; one (1) right-turn and one (1) left-turn lane. The northbound approach on I-94BL (Partello Road) has two (2) lanes with one (1) through lane and one (1) right-turn lane and the southbound approach has one (1) left-through lane. Where the westbound ramps cross I-94BL (Partello Road), the westbound off ramp has two (2) lanes, with one (1) right-turn and one (1) left-turn lane. The northbound approach on I-94BL (Partello Road) has one (1) left-through lane, while the southbound approach has two (2) lanes with one (1) through lane and one (1) right-turn lane. The posted speed on I-94BL (Partello Road) is 45 MPH.

2.5 Existing Intersections

M-96 (Michigan Avenue) and Wheatfield Parkway

The intersection of M-96 (Michigan Avenue) at Wheatfield Parkway is controlled by a STOP sign on Wheatfield Parkway. The M-96 (Michigan Avenue) corridor is a 3-lane cross section with one (1) through lane eastbound, one (1) two-way left-turn lane, and one (1) through lane westbound. On M-96 (Michigan Avenue), at Wheatfield Parkway, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. On the Wheatfield Parkway approach, there are two (2) lanes, a left-turn lane, and a right-turn lane. M-96 (Michigan Avenue) is posted 55 MPH and Wheatfield Parkway is posted 35 MPH.

M-96 (Michigan Avenue) and M-311 (11 Mile Road)

The intersection of M-96 (Michigan Avenue) at M-311 (11 Mile Road) is controlled by a traffic signal with protected leading northbound/southbound left turns. The northbound approach on M-311 (11 Mile Road) has a 3-lane approach with one (1) left-turn lane, one (1) through lane, and one (1) right-turn lane. The southbound approach on M-311 (11 Mile Road) has a 4-lane approach with dual left-turn lanes, one (1) through lane, and one (1) right-turn lane. The westbound approach on M-96 (Michigan Avenue) has three (3) lanes with one (1) left-turn lane, one (1) through lane, and one (1) right-turn lane. The eastbound approach has three (3) lanes with one (1) left-turn lane, one (1) through lane, and one (1) through-right turn lane. The posted speed limit on M-311 (11 Mile Road) is 35 MPH north of M-96 (Michigan Avenue) and 55 MPH south of M-96 (Michigan Avenue). M-96 (Michigan Avenue) is posted 55 MPH.

M-96 (Michigan Avenue) and Firekeeper's Casino Main Entrance

The intersection of M-96 (Michigan Avenue) at the Firekeeper's Casino main entrance is controlled by a STOP sign on the casino driveway. The M-96 (Michigan Avenue) corridor is a 4-lane cross section in this area with two (2) through lanes eastbound, one (1) two-way left-turn lane, and one (1) through lane westbound. On M-96, at the Firekeeper's Casino main entrance, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. On the Firekeeper's Casino main entrance approach, there are two (2) lanes, a left-turn lane, and a right-turn lane. For modeling, this was designed as a left-through lane and a right-turn lane. There is a private development to the south which has a two (2) lane approach with one (1) right-turn lane and one (1) left-turn lane. M-96 (Michigan Avenue) is posted 55 MPH.

M-96 (Michigan Avenue) and Firekeeper's Middle Access Driveway/Pit Stop Gas Station Access Drive

The intersection of M-96 (Michigan Avenue) at the Firekeeper's middle access driveway and Pit Stop Gas Station Access Drive is controlled by a STOP sign on the casino driveway. The M-96 (Michigan Avenue) corridor is a 3-lane cross section in this area with one (1) through lane

eastbound, one (1) two-way left-turn lane, and one (1) through lane westbound. On M-96 (Michigan Avenue), between the Firekeeper's middle entrance and the Firekeeper's east entrance, there is a full width marked shoulder that allows vehicles to leave the travel lane to complete their right turn. On the Firekeeper's middle entrance approach, there are two (2) lanes, a left-turn lane, and a right-turn lane. M-96 (Michigan Avenue) is posted 55 MPH.

M-96 (Michigan Avenue) and Firekeeper's Casino East Entrance

The intersection of M-96 (Michigan Avenue) at the Firekeeper's Casino east entrance is controlled by a STOP sign on the casino driveway. The M-96 (Michigan Avenue) corridor is a 3-lane cross section west of this intersection with one (1) through lane eastbound, one (1) two-way left-turn lane, and one (1) through lane westbound. East of this location, the M-96 (Michigan Avenue) corridor is two (2) lanes with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at the Firekeeper's Casino east entrance, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. On the Firekeeper's Casino east entrance approach, there is one (1) left-right turn lane. M-96 (Michigan Avenue) is posted 55 MPH.

M-96 (Michigan Avenue) and Ackerson Drive

The intersection of M-96 (Michigan Avenue) at Ackerson Drive is controlled by a STOP sign on southbound Ackerson Drive. The M-96 (Michigan Avenue) corridor is a 2-lane cross section with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at Ackerson Drive, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. Ackerson Drive has one (1) left-right turn lane. M-96 (Michigan Avenue) is posted 55 MPH and Ackerson Drive is posted 25 MPH.

M-96 (Michigan Avenue) and Ceresco Road (12 Mile Road)

The intersection of M-96 (Michigan Avenue) at Ceresco Road (12 Mile Road) is controlled by a STOP sign on northbound Ceresco Road (12 Mile Road). The M-96 (Michigan Avenue) corridor is a 2-lane cross section with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at Ceresco Road (12 Mile Road), there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. Ceresco Road (12 Mile Road) has one (1) left-right turn lane. M-96 (Michigan Avenue) is posted 55 MPH and Ceresco Road (12 Mile Road) has an unposted prima facie speed 55 MPH.

M-96 (Michigan Avenue) and 13 Mile Road

The intersection of M-96 (Michigan Avenue) at 13 Mile Road is controlled by STOP signs on northbound and southbound 13 Mile Road. The M-96 (Michigan Avenue) corridor is a 2-lane cross section with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at 13 Mile Road, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn for both eastbound and westbound traffic. The northbound and southbound approaches on 13 Mile Road have one (1) left-through-right turn lane. M-96

(Michigan Avenue) is posted 55 MPH and 13 Mile Road has an unposted prima facie speed 55 MPH.

M-96 (Michigan Avenue) and Eden Street

The intersection of M-96 (Michigan Avenue) at Eden Street is controlled by a STOP sign on northbound Eden Street. The M-96 (Michigan Avenue) corridor is a 2-lane cross section with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at Eden Street, there is a short right-turn taper that allows vehicles to leave the travel lane to complete their right turn. Eden Street has no pavement markings at the approach and was modeled as a single left-right turn lane. M-96 (Michigan Avenue) is posted 55 MPH. Eden Street does not have a posted speed limit but is residential in nature; therefore, a prima facie speed of 25 MPH was utilized in the modeling. This roadway/intersection will be removed and included in the proposed Marshall Mega site.

M-96 (Michigan Avenue) and 15 Mile Road North

The intersection of M-96 (Michigan Avenue) at 15 Mile Road North is controlled by STOP signs on northbound and southbound 15 Mile Road North. The M-96 (Michigan Avenue) corridor is a 2-lane cross section with one (1) eastbound and one (1) westbound lane. On M-96 (Michigan Avenue), at 15 Mile Road North, there is a right-turn taper that allows vehicles to leave the travel lane to complete their right turn for both eastbound and westbound traffic. The northbound and southbound approaches on 15 Mile Road North are unmarked but are wide enough for a short two (2) lane section which was modeled as one (1) left-through lane and one (1) right-turn lane. M-96 (Michigan Avenue) is posted 45 MPH. North of M-96 (Michigan Avenue), 15 Mile Road North is posted 45 MPH. South of M-96 (Michigan Avenue), 15 Mile Road North continues for 500 feet before it ends at C Drive North. This section of roadway is unposted, but due to the short length and businesses on both sides of the road, it was modeled as 25 MPH.

M-96 (Michigan Avenue) and C Drive North

The intersection of M-96 (Michigan Avenue) at C Drive North is controlled by a STOP sign on northbound C Drive North. The M-96 (Michigan Avenue) corridor transitions to a boulevard section at C Drive North with two (2) lanes eastbound and two (2) lanes westbound. On eastbound M-96 (Michigan Avenue), at C Drive North, the travel lane widens so that there are two (2) receiving lanes on the east end of the intersection; therefore, the eastbound approach was modeled as two (2) lanes with one (1) through lane and one (1) short right-turn lane. The westbound approach on M-96 (Michigan Avenue) is marked as one (1) left-turn lane, one (1) through lane, and one (1) lane is dropping as part of the lane merge. The lane drop was modeled as occurring just after C Drive North as the roadway width is wide enough for 2 through westbound lanes at the intersection. C Drive North has one (1) left-right turn approach lane. M-96 (Michigan Avenue) is posted 45 MPH and C Drive North has an unposted prima facie speed 55 MPH.

M-96 (Michigan Avenue) and 15 Mile Road South

The intersection of M-96 (Michigan Avenue) at 15 Mile Road South is controlled by a STOP sign on northbound 15 Mile Road South, as well as STOP control for both directions in the median. The M-96 (Michigan Avenue) corridor is a boulevard section with two (2) lanes eastbound and two (2) lanes westbound. On eastbound M-96 (Michigan Avenue), at 15 Mile Road South, there is a right-turn taper that allows vehicles to leave the travel lane to complete their right turn. The westbound approach on M-96 (Michigan Avenue) is marked as one (1) left-turn lane and two (2) through lanes. 15 Mile Road South widens as it approaches M-96 (Michigan Avenue) which allows for two (2) approach lanes, one (1) through lane and one (1) right-turn lane, which is how it was modeled. M-96 (Michigan Avenue) is posted 45 MPH and 15 Mile Road South has an unposted prima facie speed 55 MPH.

M-96 (Michigan Avenue) and the Crossovers West of M-227 (West Road)

There are two (2) crossovers on M-96 (Michigan Avenue) west of M-227 (West Road), and both are controlled by a YIELD sign. In this area, the M-96 (Michigan Avenue) corridor is a boulevard section with two (2) lanes eastbound and three (3) lanes westbound. Both crossovers are single lane. M-96 (Michigan Avenue) is posted 45 MPH.

M-96 (Michigan Avenue) and M-227 (West Road)

The intersection of M-96 (Michigan Avenue) at M-227 (West Road) is controlled by a traffic signal. On eastbound M-96 (Michigan Avenue), at M-227 (West Road), there are three (3) lanes; two (2) through lanes and one (1) right-turn lane. The westbound approach on M-96 (Michigan Avenue) is marked as two (2) through lanes and one (1) through-right turn lane. Northbound M-227 (West Road) has two (2) approach lanes, one (1) through lane and one (1) through-right-turn lane. Southbound M-227 (West Road) has two (2) approach lanes, one (1) through lane and one (1) right-turn lane. The eastbound, westbound, and southbound approaches are marked that no left turns are allowed. M-96 (Michigan Avenue) is posted 45 MPH and M-227 (West Road) is posted 35 MPH.

M-96 (Michigan Avenue) and the Crossovers East of M-227 (West Road)

There are two (2) crossovers on M-96 (Michigan Avenue) east of M-227 (West Road), and both are controlled by a YIELD sign. In this area, the M-96 (Michigan Avenue) corridor is a boulevard section with two (2) lanes eastbound and two (2) lanes westbound. Both crossovers are single lane. M-96 (Michigan Avenue) is posted 45 MPH.

3 Existing Conditions

3.1 Existing Crash Analysis

A crash analysis of the study area was performed for a five-year period ranging from January 1, 2016 to December 31, 2020 and is presented in **Appendix E**. Crashes were obtained from Michigan Traffic Crash Facts (michigantrafficcrashfacts.org) for the following segments:

- I-94 East from mile marker (MM) 99 to MM 113
- I-94 West from MM 113 to MM 99
- I-69 North from MM 35 to MM 40
- I-69 South from MM 40 to MM 35
- M-96 (Michigan Avenue) from west of Wheatfield Parkway to east of West Drive
- I-94 at M-294 (Beadle Lake Road), Exit 100 Interchange
- I-94 at M-96/M-311 (11 Mile Road), Exit 104 Interchange
- I-94/I-69 Interchange
- I-94 at Old US-27, Exit 110 Interchange
- I-94 at I-94BL (Partello Rd), Exit 112 Interchange

The overall summary of the Fatal (Type K) and Suspected Serious Injury (Type A) crashes for the study area are presented in **Table 3-1**.

Table 3-1: Summary of Fatal (Type K) and Suspected Serious Injury (Type A) Crashes

Segment Name	Type of Crashes	
	Fatal (Type K) Injury	Suspected Serious (Type A) Injury
I-94 East from MM 99 to MM 113	2	7
I-94 West from MM 113 to MM 99	1	8
I-69 North from MM 35 to MM 40	1	2
I-69 South from MM 40 to MM 35	1	0
M-96 (Michigan Avenue) from west of Wheatfield Parkway to east of West Drive	2	6
I-94 at M-96/M-311 (11 Mile Rd), Exit 104 Interchange	0	1
I-94/I-69 Interchange	1	2
Total	8	26

3.2 Existing Traffic Conditions

An existing conditions analysis was prepared using Synchro 11 and MDOT “Electronic Traffic Control Device Guidelines” methodology. Data was collected at each of the study intersections. Given that the sites developed will have one (1) hour of traffic entering and exiting the site during a peak shift change, a single peak hour for M-96 (Michigan Avenue) was chosen. The surrounding freeway network also selected the same peak hour. The locations within the study

area were tallied and the highest total volume on the network system occurred from 16:15 PM-17:15 PM.

The complete Traffic Impact Study and supplemental documentation supporting its development is presented in **Appendix H**.

4 Geometric Alternative Development

A No Build model, which is typical with traffic studies, was not completed due to the expedited way the Mega sites would be developed/constructed/fully implemented and its impacts to the existing roadway network. A broader approach of capacity identification, interchange alternative analysis, and traffic modeling was undertaken in conjunction with safety, environmental impacts, and cost.

A Matrix of the geometric alternatives (**Appendix A**) was developed, and each alternative was ranked using a 1 (lowest ranking) – 3 (highest ranking) scale in the supporting criteria. cursory schematics of the alternatives were also developed. Alternatives 1-19 were vetted across the criteria presented, whereas Alternatives “a-m” all presented a fatal flaw during the vetting process and are included for reference only.

The final Alternatives that MDOT moved forward with are highlighted in the matrix.

5 Proposed Conditions

Driven by traffic operational results and environmental constraints a final proposed configuration of the network was established. This includes the following improvements:

- Diverging Diamond Interchange at I-69/M-96 (Michigan Avenue)
- 3 lane boulevard (3x3) with indirect left turns along M-96 (Michigan Avenue) between site entry at C Drive North and I-69 interchange
- Reroute of M-96 just west of 15 Mile Road (North leg) to accommodate direct access into the Marshall Mega site for trucks and passenger vehicles
- Direct access off C Drive North
- Improvements at adjacent local roadway intersections to handle inbound/outbound traffic
- Widening of I-69 to 3-lanes between I-94 and M-96
- System interchange improvements at I-69 and I-94 including widening the EB I-94 to SB I-69; NB I-69 to EB I-69 and build a fly-over ramp for NB I-69 to WB I-94.
- 2 lane boulevard (2x2) with indirect left turns along M-96 (Michigan Avenue) between M-311/11 Mile Rd and M-96/Main Entrance to site.
- Pedestrian enhancements along M-96 (Michigan Avenue)
- Diverging Diamond Interchange at I-94/M-96 (Michigan Avenue)/M-311 (11 Mile Road)
 - Combination of 11 Mile Road and M-96 (Michigan Avenue) over I-94

- 3 lane boulevard with indirect left turns along M-96 (Michigan Avenue)/11 Mile Road between I-94 interchange and M-96 east leg connection
- Widening of 11 Mile Road (2x2 lanes)
- Widening of I-94 to 3-lanes (in each direction) between M-311 and I-69 with median barrier. MDOT is anticipating a subsequent separate future widening to 3-lanes (in each direction) from Calhoun County Line to M-311 when Sackrider site is developed
- Wheatfield connection to existing truck stop facilities along 11 Mile Road
- Verona at 11 Mile Road: Dual northbound left-turn lane

The proposed configuration of the study area can be found in **Appendix F**. The following sections document the proposed improvements in further detail.

5.1 Proposed Freeway Segments (I-94 and I-69)

I-94 will be reconstructed to accommodate three 12-foot-wide travel lanes with a 12-foot inside shoulder (including the 4-foot valley gutter) and a 12-foot outside shoulder (10' paved). The median will be replaced with an enclosed drainage system and double-faced concrete barrier wall between the eastbound and westbound directions. The 2% crown point will be located on the lane line between the two inside lanes.

I-69 will be widened to include a third travel lane within the median and a 10-foot shoulder (8-foot paved). The transition areas south of I-69 at M-96 (Michigan Avenue), Exit 36 and at the I-94/I-69 interchange will be fully reconstructed. The existing drainage patterns within this segment will be maintained.

All freeway segments will be designed to meet a design speed of 75 mph. The proposed pavement section consists of 11-inches of non-reinforced concrete on 16-inches open graded drainage course with open-graded underdrains throughout. **Appendix B** presents Final Design Criteria for freeway segments.

5.2 Proposed Non-Freeway Segments (M-96 and M-311 (11 Mile Road))

M-96 (Michigan Avenue) will be reconstructed to a 4-lane boulevard, include single and double lane median crossovers throughout the corridor, based on traffic needs. The travel lanes and median crossover lanes will be 12-foot wide. Curb and gutter will be constructed on the inside of the boulevard with an 8-foot paved shoulder on the outside. Median crossovers will be designed per MDOT GEO-670. A 5-foot concrete sidewalk will extend from West Drive easterly through the I-69 at M-96 (Michigan Avenue), Exit 36 interchange and terminate at 15 Mile Road.

The design speed for this segment varies. From M-311 (11 Mile Road) to 15 Mile Road the design speed is 55 mph, east of 15 Mile Road the design speed is 45 mph. The proposed pavement section consists of 11-inches of non-reinforced concrete on 16-inches open graded drainage course, with open-graded underdrains throughout.

M-311 (11 Mile Road) will be realigned and reconstructed to a 4-lane boulevard between F Drive and the tie in point on M-96 approximately 2,000 feet northwest of I-94. The segment includes single lane median crossovers throughout, as well as direct turning access to the proposed M-96. The travel lanes and median crossover lanes will be 12-foot wide. Curb and gutter will be constructed on the inside of the boulevard with an 8-foot paved shoulder on the outside. Median crossovers will be designed per MDOT GEO-670.

The design speed for this segment is 55 mph, except for the first curve north of the interchange, this curve will have a design speed of 30 mph to limit impacts to the surrounding properties. The proposed pavement section consists of 11-inches of non-reinforced concrete on 16-inches open-graded drainage course with open-graded underdrains throughout.

Two lane roadways will be constructed to maintain access to the existing network on M-311 (11 Mile Road) both north and south of I-94. **Appendix B** presents Final Design Criteria for non-freeway segments.

5.3 Proposed Interchanges

The I-94/I-69 interchange will be modified to include a two-lane ramp from eastbound I-94 to southbound I-69, both lanes will be 12-foot-wide with an 8-foot outside shoulder (7-foot paved) and 6-foot inside shoulder (4-foot paved). The northbound I-69 to westbound I-94 loop ramp will be eliminated and replaced with a two-lane flyover ramp between the northbound I-69 to eastbound I-94 ramp and the southbound I-69 to westbound I-94 ramp. Both lanes for this ramp will be 12-foot wide with an 8-foot outside shoulder and 6-foot inside shoulder; new bridge structures will be constructed over I-94 and I-69 to accommodate this ramp. Portions of the northbound and westbound collector-distributor roads will be removed where they are no longer needed. The remaining interchange ramps will remain however may be relocated to provide optimal geometrics.

The I-94 at M-96/M-311 (11 Mile Road), Exit 104 interchange will be reconstructed between the two existing structures for M-96 and M-311 (11 Mile Road) over I-94 as a diverging diamond interchange. The existing structures will be demolished allowing for the construction of two-lane exit ramps and single lane entrance ramps for each bound. Single lane ramps will be 16-foot wide, while two lane ramps will have 12-foot-wide lanes, shoulder widths will be 8-foot outside shoulder (7-foot paved) and 6-foot inside shoulder (4-foot paved). Three 12-foot lanes will cross through the interchange in each direction with curb and gutter on both sides. Two new structures will be constructed to carry the interchange over I-94. The structures must extend north of the Dickson Creek to prevent impacts. Culverts beneath the ramps servicing westbound I-94 will be constructed with culverts to accommodate the Dickinson Creek, the culvert lengths will be minimized to prevent unnecessary enclosure of the Creek.

The I-69 at M-96 (Michigan Avenue), Exit 36 interchange will be modified to a diverging diamond interchange. The ramps along southbound I-69 will be realigned closer to the

interstate to accommodate boulevard median crossovers to the west of the interchange. Ramps will be reconstructed to allow two lane ramps north of M-96 (Michigan Avenue) and single lane ramps to the south. Single lane ramps will be 16-foot-wide, while two lane ramps will have 12-foot-wide lanes, shoulder widths will be 8-foot outside shoulder (7-foot paved) and 6-foot inside shoulder (4-foot paved). Two 12-foot lanes will cross through the interchange in each direction, with an additional auxiliary lane between the ramp terminals; curb and gutter will be present on both sides of the road. The existing structures over I-69 will be widened to accommodate the additional travel lane and shoulder widths of the interchange. The existing park-n-ride lot in the southwest quadrant will be removed, while the Marshall TSC, located in the southeast quadrant will be retained with a modified driveway location.

The proposed section for all interchange pavement consists of 11-inches of non-reinforced concrete on 16-inches open graded drainage course with open-graded underdrains throughout.

See **Appendix F** for existing and proposed cross sections.

5.4 Design Exceptions

Multiple design exceptions may be required for this project as described below.

Horizontal Curve Radius:

There is one curve each along EB M-96 and WB M-96, to the north of the proposed M-311 (11 Mile Road) interchange, that require design exceptions for radius less than the minimum. The minimum radius per MDOT Standard Plan R-107 Series is 1008 ft. To limit the amount of right-of-away acquisition, reduced radius curves were utilized. Advanced warning signs will be necessary to warn motorists.

Vertical Clearance:

The vertical clearance for S07 of 13082 (I-94 under Verona Road) will need to be confirmed during design. The existing bridge is not posted, therefore minimum vertical clearance is anticipated to exceed 16'-0". The shape of the variable depth concrete T-beams results in reduced vertical clearance at the pier locations, if vertical clearance does not meet a minimum of 16'-0" a design exception will be required.

5.5 Proposed Traffic Operations

The improvements presented above were included in the traffic modeling of the Proposed (Build) scenario. **Appendix H** details the Build LOS and delay for both the surface street and freeway network for all scenarios, Marshall Mega Site Only (M1 to M4) and combined Marshall Mega and Sackrider Sites (M1&S1 to M4&S2). **Table 5-1** and **Table 5-2** presented below provides a high-level overview of the operational results based on the proposed mitigations for the freeway and surface street networks. The larger M3 and M4 scenarios (including combined

Sackrider) begin to fail with the proposed infrastructure. At a minimum, the following infrastructure improvements would be needed for these scenarios to operate but would still have substantial congestion:

- I-94 widening to three (3) lanes in each direction westward to the Calhoun County Line
- Four (4)+ lanes within DDI at I-69; Southbound I-69 Off-ramp four (4) right turn lanes
- Four (4)+ lanes within DDI at I-94
- Surface Network:
 - M-96 boulevard four (4)+ lanes in each direction
 - Widening of M-311/11 Mile Rd to more than two (2) lanes in each direction
 - Widening of 15 Mile Rd to two (2) lanes in each direction
 - Widening of Verona Rd to two (2) lanes in each direction
- Intersections:
 - M-96 at M-96/C Drive/Main Entrance: southbound M-96 four (4) left turn lanes
 - M-96/M-311/11 Mile Rd at M-96: westbound M-96 three (3)+ right turn lanes
 - Verona at 15 Mile Rd: Dual northbound left turn lanes, dual eastbound right turn lanes
 - Verona at 11 Mile Rd: requires more than dual northbound left turn lanes, dual eastbound right turn lanes

Table 5-1: Operational Results for Proposed Freeway Infrastructure by Scenario

Matrix of the Proposed Infrastructure Improvements by Each Scenario																		
Location	Proposed Infrastructure Improvements	Marshall Mega Site Scenarios						Combined Marshall Mega and Sackrider Mega Site Scenarios										
		M1	M2	M3	M4	M2 (In)	M2 (Out)	M1 &S1	M2 &S1	M3 &S1	M4 &S1	M1 &S2	M2 &S2	M3 &S2	M4 &S2	M2 &S2 (In)	M2 &S2 (Out)	
I-94 Mainline	Widening to 3-lanes (in each direction) between M-311 and I-69 with median barrier	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
I-94/M-96/ M-311 Interchange	DDI with 3 lanes in each direction	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	√	√
I-94/I-69 Interchange	System interchange improvements including: 2 lane ramp from EB I-94 to SB I-69; 2 lane fly-over ramp for NB I-69 to WB I-94	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
I-69 Mainline	Add auxiliary lane between I-94 and M-96 (Michigan Avenue) on/off-ramps	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	
I-69/M-96 Interchange	DDI with 3 lanes in each direction	√	√	X	X	√	√	√	√	X	X	√	√	X	X	√	√	

X Indicates proposed infrastructure failed to accommodate the additional traffic

√ Indicates proposed infrastructure can accommodate the additional traffic

Table 5-2: Operational Results for Proposed Surface Street Infrastructure by Scenario

Matrix of the Proposed Infrastructure Improvements by Each Scenario																	
Location	Proposed Infrastructure Improvements	Marshall Mega Site Scenarios						Combined Marshall Mega and Sackrider Scenarios									
		M1	M2	M3	M4	M2 (In)	M2 (Out)	M1 &S1	M2 &S1	M3 &S1	M4 &S1	M1 &S2	M2 &S2	M3 &S2	M4 &S2	M2 &S2 (In)	M2 &S2 (Out)
Surface Network	Maximum two left/right turn lanes at any intersection*	√	√	X	X	√	√	√	√	X	X	√	√	X	X	√	√
M-96 (Michigan Ave)	3 lane boulevard (3x3) with indirect left turns between I-69 interchange and C Drive/Main Site Entrance	√	√	X	X	√	√	√	√	X	X	√	√	X	X	√	√
	2 lane boulevard (2x2) with indirect left turns between M-96 (Michigan Avenue)/Main Entrance to site and M-311/11 Mile	√	√	X	X	√	√	√	√	X	X	√	√	X	X	√	√
	3 lane boulevard (3x3) with indirect left turns between M-96 (Michigan Avenue) east leg connection and 11 Mile Rd (north connection)	√	√	√	√	√	√	√	√	√	√	√	√	X	X	√	√
	2 lane boulevard (2x2) with indirect left turns ends just to the west of 11 Mile Rd (north connection)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
M-311/11 Mile	Widening of M-311 (2x2 lanes) between site entry and M-96 (Michigan Avenue) east leg connection	√	√	√	√	√	√	√	√	√	√	√	√	X	X	√	√
Local Roads/ Intersections	Realign 11 Mile Rd between H Drive N and M-96 (Michigan Avenue) west leg connection	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Verona Rd at 11 Mile Rd - Dual northbound left-turn lane and expanded WB receiving lanes on Verona Rd.	√	√	X	X	√	√	√	√	X	X	√	√	X	X	√	√
	15 Mile Rd (North) at Verona Rd - signalize intersection	√	√	√	X	√	√	√	√	√	X	√	√	√	X	√	√

* The I-69 SB off-ramp to M-96 (Michigan Avenue) requires 3 right turn lanes to operate. This has been approved by MDOT. A splitter island is recommended as well as lane tracks.

X Indicates proposed infrastructure failed to accommodate the additional traffic
√ Indicates proposed infrastructure can accommodate the additional traffic

5.6 Proposed Safety Improvements

Due to the nature of crashes as inherently random, a guarantee of collision free access is impossible anywhere. However, there are a number of proven strategies and designs to reduce the likelihood of crashes overall as well as the severity of those crashes that do occur. The proposed infrastructure improvements focus on providing a roadway network that promotes safety and mobility using a boulevard section with indirect lefts, diverging diamond interchanges, and additional safety enhancements along the surrounding local road network. A detailed analysis of safety improvements can be found in **Appendix E**, Section 3.0.

6 Drainage

The existing M-96 (Michigan Avenue) roadway is primarily a 2-lane rural section with 3-foot shoulders along most of its length. As Michigan Avenue approaches I-69 at the east end of the project, the roadway transitions to a divided four-lane rural boulevard section. Near the west limits between 11 Mile Road and Ackerson Drive, the roadway transitions to a partial urban section with two eastbound lanes and a median-turn lane to accommodate traffic near Firekeepers Casino.

Throughout the corridor, existing ditches are very shallow and appear to have filled in since the original construction of the roadway. It is anticipated that several driveway culverts have also been buried as a result.

The project limits are within three major subwatersheds. The area from the west limits to Sackrider Farms, east of Ackerson Drive, drains to Dickinson Creek. From Sackrider Farms to 15 Mile Road it drains to Pigeon Creek, and to the east limits drains to Bear Creek. See **Appendix G.1** for the Drainage Overview Map.

Where available, drainage information was compiled from existing plans and as-builts. Culverts were surveyed at the following major drainage crossings:

- Dickinson Creek at Michigan Avenue
- Dickinson Creek at 11 Mile Road
- Dickinson Creek at 11 Mile Road to I-94 WB Loop
- Dickinson Creek at I-94 WB to 11 Mile Road Ramp
- Pigeon Creek at Michigan Avenue
- Pigeon Creek at 13 Mile Road
- Bear Creek at Michigan Avenue

For the Bear Creek crossing at M-96 (Michigan Avenue), the existing design was found to be adequate. The culvert passes both the 50 and 100-year storms while maintaining freeboard, and the outlet velocities for the 50-year storm are less than 6 feet/second. The Pigeon Creek crossing at M-96 (Michigan Avenue) provided adequate freeboard for the 50 and 100-year storms but failed to provide adequate capacity. The Pigeon Creek crossing at 13 Mile Road did not meet both capacity and freeboard requirements. For both culverts, outlet velocities during the 50-year storm were greater than 6 feet/second. Along Dickinson Creek, all four culverts failed to provide adequate freeboard during the 50-year design storm, with all but the crossing at M-96 exceeding the shoulder elevation during the design event, and all culverts impacting the roadway during the 100-year event. Additionally, outlet velocities exceeded 6 feet/second at all but one location during the 50-year storm. Results from the existing conditions analysis are summarized in **Table 7-1**.

Table 6-1: Existing Culvert Result Summary

Location	Size (inch)	Length (ft)	50-Year Check			100-Year Check
			Headwater 1.5-ft from Shoulder?	Pressure Flow	Velocity (fps)	Velocity (fps)
Dickinson Creek at M-96	84	254.4	NO	YES	9.3	10.69
Dickinson Creek at 11 Mile Road	84	154.6	NO	YES	6.76	5.05
Dickinson Creek at I-94 WB Loop Ramp	84	106.9	NO	YES	6.33	5.67
Dickinson Creek at I-94 WB Ramp	84	103.4	NO	YES	5.92	5.62
Pigeon Creek at M-96	84X60	131.7	YES	YES	10.14	12.13
Pigeon Creek at 13 Mile Road	36	55.4	NO	YES	13.99	14.27
Bear Creek at M-96	144X60	163.31	YES	NO	9.3	10.1

To provide a more accurate cost estimate for improvements at these locations, proposed culverts were sized at these locations. Lengths were estimated based on the increased width of the proposed section, and all culverts were assumed to have a 2-foot embedment below the flow line to provide a natural flow surface.

At Bear Creek, the existing size provides adequate design for both capacity and outlet velocities. Accounting for a 2-foot embedment, the proposed size was increased to 12-foot x 7-foot. At Pigeon Creek, both existing culvert sizes failed to provide sufficient capacity to not cause impacts to the roadway. Additionally, excessive outlet velocities during the design event may pose an erosion concern. Hence, the crossing at M-96 was increased to 12-foot x 8-foot with a 2-foot embedment. No improvements were made to the culvert at 13 Mile Road along Pigeon Creek as it will most likely fall beyond the project area. At Dickinson Creek, due to the change in the alignment of the proposed roadway corridor, the number of culvert crossings was reduced from four to two. To meet headwater and outlet velocity design requirements recommended sizes were increased to 12-foot x 8-foot with a 2-foot embedment for both locations. Culvert performance for these proposed sizes is summarized in **Table 7-2**.

Table 6-2: Proposed Culvert Result Summary

Location	Size (inch)	Length (ft)	50-Year Check			100-Year Check
			Headwater 1.5-ft from Shoulder?	Pressure Flow	Velocity (fps)	Velocity (fps)
Dickinson Creek at I-94 WB Merging Ramp	144X96	46.0	YES	NO	5.09	6.22
Dickinson Creek at I-94 WB off Ramp	144X96	87.0	YES	NO	4.94	5.73
Pigeon Creek at M-96	144X96	173.0	YES	NO	6.14	7.26
Bear Creek at M-96	144x84	205.0	YES	NO	4.15	5.09

The project also has the potential to greatly increase the impervious area from expanding the roadway infrastructure in each of the three subwatersheds noted earlier. Sizing of the detention facilities was completed by computing the total additional impervious area that will be added to each of the subwatersheds. The detention was sized to detail any increase in stormwater discharge over the existing condition for the 100-year/24-hour event. Routing calculations and preliminary siting should be conducted during the ROW acquisition phase to make sure that land is allocated sufficiently for detention.

Approximate sizes are provided in **Table 7-3** and an exhibit showing the size and potential location of the detention facilities is provided in **Appendix G.1**.

Table 6-3: Detention Summary Table

DETENTION FACILITY	STATIONING	REQUIRED FLOW TO BE DETAINED Q100 (cfs)	REQUIRED AREA OF DETENTION FACILITY (AC)
Dickinson Creek	I-94 Ramp B Sta 6+00 to 10+00	25.32	1.02
Pigeon Creek	M-96 Sta 180+00 to 183+00	9.37	0.37
Bear Creek	I-69 Ramp B Sta 64+00 to 70+00	43.84	1.63

A full summary of the drainage design assumptions is provided in **Appendix G.1** in the Drainage Technical Memo.

7 Environmental Issues

A preliminary environmental review was completed for M-96's project area and initial coordination with EGLE (Environment, Great Lakes, and Energy), the primary environmental permitting agency for Michigan was conducted. The team performed these initial reviews of the following items to identify any overarching concerns should the project area be developed.

- Wetlands and Inland Lakes & Streams
- Threatened and Endangered Species
- Noise Assessment
- Desktop State Historic Preservation Office (SHPO)/Archaeological Review

At one point, adding a new interchange at I-94 and 13 Mile Road was being evaluated to determine the feasibility for infrastructure improvements for the development. 13 Mile Road has prevalent wetlands and the Pigeon Creek stream crossing. Initial coordination with EGLE noted that Dickinson Creek at 11 Mile Road and I-94 is a high-quality cold-water stream. They asked the team to evaluate the environmental impact differences between 11 Mile Road and 13 Mile Road at I-94.

The preliminary design of the 11 Mile Road interchange took into consideration options that would reduce impacts to Dickinson Creek. EGLE reviewed the preferred design alternative at 11 Mile Road and noted that stream mitigation will be likely at 11 Mile Road but overall would have fewer resource impacts at 11 Mile Road in comparison to 13 Mile Road, should an interchange and roadway widening be developed there.

It is recommended that the next study phase include further evaluation of Dickinson Creek to identify the potential stream mitigation measures and continue coordination with EGLE to make sure the proposed interchange improvements will address EGLE's concerns minimizing environmental impacts.

See **Appendix G.1, G.2, G.3. and G.4** for the:

- Drainage Technical Memo
- Michigan Avenue Cultural Resources Red Flag report
- Wetland Technical Memo
- M-96 Scoping – Summary of Potential Environmental Impacts for Future Permitting

8 Right-of-Way Needs

The existing right-of-way varies throughout the project.

Permanent right-of-way will need to be acquired to accommodate the new I-94 at M-96/M-311 (11 Mile Road), Exit 104 interchange, including:

- The agricultural field in the northwest quadrant of the interchange and behind the Pilot Travel Center.
- The abandoned property in the southwest quadrant of the interchange and behind the existing Citgo gas station.

Permanent right-of-way along M-96 (Michigan Avenue) is located on the south side of the roadway and will be included in the property acquisition for the proposed development.

Additional properties that will be impacted include:

- Residential properties south of M-96 (Michigan Avenue) near 15 Mile Road
- Imperial Motel (14978 W. Michigan Avenue)
- Tire City Tire Pros & Auto Repair (13550 Myron Avery Drive)
- DIY Equipment Rental and Storage (15100 W Michigan Avenue)
- Calhoun County Farm Bureau (15151 C Drive North)
- Highway Horticulture (15325 W. Michigan Avenue)
- Arbor Inn of Historic Marshall (15435 W. Michigan Avenue)

Additional Consents to Grade may be needed throughout out the project based on the detail design.

See **Appendix F** for right-of-way needs and areas of impacts.

9 Detail Cost Summary

The total cost of the project construction (including Preliminary Engineering (PE) & Construction Engineering (CE) costs) in 2023 dollars is approximately \$253,500,000. This cost includes the immediate construction needs for the proposed development that are the responsibility of the Michigan Department of Transportation. In Table 10.1, Tasks 1E and 5A will be necessary as the entire development is built out, which would bring the project construction cost to \$387,000,000.

Of the total cost, it is anticipated that the Calhoun County portion of the project will cost \$6.9 million. The following locations are included in this cost:

- 11 Mile Road south of F Drive North
- 11 Mile Road and Verona Road intersection
- 15 Mile Road, north of the relocated M-96 (Michigan Avenue)
- 15 Mile Road and Verona Road intersection

Cost include removals, new pavement, signals, and associated signing and pavement markings.

Detailed cost estimates for each task can be seen in **Appendix C**. A breakdown of anticipated design hours is presented in **Appendix D**.

Table 9-1: Design Cost by Phase & Construction Phasing

Design Phasing - Marshall, Michigan Site			
Project Design	Number	Design Stage Description	Approximate Cost
	A	Consultant Authorization	\$ 0
	B	NEPA Environmental Assessment	\$ 1.5M
	C	Survey and Preliminary Design	\$ 1.5M
	D	Secure D/B & Award	\$ 0
	E	Project Design	\$ 30.0M
	F	Property Acquisition	N/A
	G	Construction Engineering	\$ 31.0M

Estimated Engineering Phase Total \$ 64.0M

Construction Phasing - Marshall, Michigan Site				
Construction Segment	Number	Construction Stage Description	Description of Necessary Improvements	Approximate Cost
1 (Michigan Ave Extension & I-69 DDI)	A	Site Preparation for access during construction	Add temporary signal at SB I-69 to WB M-96 and at site entrance at M-96 and first Entrance Drive. Construct by-pass lane for WB M-96. <i>Recommend that MDOT procure separately through as-needed contracts.</i>	\$ 1.0M
	B	Build out M-96 to newly realigned boulevard from 15 Mile Road west to Marshall Mega Main Entrance. Build new M-96 connection.	Build boulevard along the existing C Drive North to route full traffic to final built condition. Work includes the 15 Mile Road intersection and the new connection of M-96 into the boulevard north to the existing M-96 alignment.	\$ 15.0M
	C	Widen existing M-96 bridges for DDI	Widen existing bridges through winter in anticipation of spring interchange construction.	\$ 11.0M
	D	Build DDI at M-96 and I-69 and complete boulevard to 15 Mile Road	Complete the interchange upgrade to a diverging diamond interchange to accommodate full traffic in final built condition.	\$ 16.0M
2 (I-69 & I-94 Widening and I-69/I-94 Interchange)	A	Widen I-69 to 3-lanes between I-94 and M-96.	Widen I-69 to 3-lanes to accommodate the interchange work at I-94 and the M-96 DDI for the additional traffic.	\$ 12.0M
	B	Widen three slip ramps at the I-69 and I-94 interchange.	Widen the EB I-94 to SB I-69; NB I-69 to EB I-69; and SB I-69 to WB I-94 ramps.	\$ 8.0M

	C	Build fly-over ramp for NB I-69 to WB I-94	Build a fly-over ramp for NB I-69 to WB I-94, includes curved steel bridge elements.	\$ 22.5M
	D	Widen I-94 to 3-lanes between M-311 and I-69	Widen I-94 to 3-lanes to accommodate traffic volumes along the I-94 corridor for developments.	\$ 68.0M
3 (Michigan Avenue Widening)	A	Build EB M-96 into a boulevard section from M-96/Marshall Mega Main Entrance to Firekeepers Casino	Construct EB M-96 into a 2-lane boulevard between M-311 and the new M-96/Marshall Mega Main Entrance. Build at the same time as I-94 work.	\$ 19.0M
	B	Rehabilitate WB M-96 into a boulevard section from M-96/Marshall Mega Main Entrance to Firekeepers Casino	Rehabilitate WB M-96 into a boulevard between M-311 and the new M-96/Marshall Mega Main Entrance.	\$ 22.0M
4 (M-311/ I-94 Improvements)	A	Build DDI bridges offline	Build new interchange bridges offline allowing for traffic to continue in existing pattern.	\$ 23.0M
	B	Build southern half of DDI interchange	Build southern half of interchange, allow for existing traffic to be maintained on existing 11 Mile roadway.	\$ 16.5M
	C	Build northern half of DDI interchange	Build northern half of interchange, closing the existing roadways and completing the geometric upgrades.	\$ 17.0M
	D	Widen out local roads at 11 Mile and I-94 to accommodate DDI and S2 traffic	Build out local roadways and connections at M-96 to the east of 11 Mile Road, F Dr N, H Dr N and M-311. Will most likely happen with DDI interchange construction.	\$ 6.0M
5 (Complete regional work)	A	Widen I-94 to 3-lanes between I-194 and M-311 DDI.	Widen I-94 to 3-lanes to accommodate traffic volumes along the I-94 corridor and developments.	\$ 95.5M

Estimated Construction Total Excluding Regional Work \$ 257.0M

Estimated Construction Total Including Regional Work \$ 353.0M