No comment - CEM 12/17/2020

I-375 GEOMETRIC TECHNICAL MEMORANDUM

MARCH 6, 2020

MDOT Michigan Department of Transportation

Table of Contents

Figures

Tables

Appendices

1 Introduction

The purpose of this Technical Memorandum is to document the Geometric Analyses associated with the alternative development process for the Interstate 375 (I-375) Environmental Assessment project in the City of Detroit, Wayne County, Michigan.

I-375 is an urban freeway approximately one mile in length which connects Interstate 75 (I-75) to Jefferson Avenue in Downtown Detroit. The study limits run along I-75 from Woodward Avenue to Mack Avenue including the I-75/I-375/Gratiot Avenue Connector Interchange; along I-375 from Gratiot Avenue to Jefferson Avenue; and along Jefferson Avenue from Woodward Avenue to Rivard Street. See **Figure 1**.

Figure 1. I-375 Study Corridor

Design Criteria

Roadway geometrics were evaluated using current versions of the MDOT Road Design Manual, MDOT Bridge Design Manual, MDOT Geometric Design Guides and A Policy on Geometric Design of Highways and Streets, AASHTO, 2011 6th Edition. See Appendix A-1, I-375 Design Criteria for definition of criteria for traffic, the roadway cross section, and horizontal and vertical alignments.

2 Existing Conditions

2.1 I-375 Corridor

Originally built in the 1960's, the I-375 corridor needs repair. The depressed (below grade) freeway, contained within a 350-foot wide right-of-way, consists of three (3) through lanes in each direction between I-75 and Lafayette Avenue, and two through lanes in each direction between Lafayette Avenue and Jefferson Avenue. The southbound I-375 third lane drops into the off-ramp to Jefferson Avenue East, and the third lane for northbound I-375 is added with the Jefferson Avenue East on-ramp.

The I-375 facility includes one (1) full access interchange at I-75/Gratiot Avenue Connector, and three (3) partial access interchanges at Madison Avenue, Lafayette Avenue, and Jefferson Avenue East. The corridor also consists of seven overhead roadway bridges at Madison Avenue, Gratiot Avenue, Monroe Street, Lafayette Avenue, Larned Street, Jefferson Avenue, and Hastings Street.

Along the primary segment of southbound I-375, access is limited to exit ramps at Lafayette Avenue and Larned Street, which also provide service drive connections to Monroe Street, Congress Street, and Jefferson Avenue. No access from southbound I-375 to Macomb Street or Clinton Street exists. Northbound I-375 connects only to I-75 and the Gratiot Avenue Connector.

At its southern terminus, southbound I-375 interacts with Jefferson Avenue through separate, indirect movements. Access to westbound Jefferson Avenue is limited to the Jefferson Curve, while traffic accessing eastbound Jefferson Avenue is required to exit the freeway and turn left via an at-grade signalized intersection, just east of Beaubien Street. The northbound I-375 service drive can be accessed from Jefferson Avenue via direct, at-grade movements.

2.1.1 Facility Condition

Pavement condition surveys and bridge scoping will not be performed for the I-375 Corridor during this phase of planning and design for the project. However, in 2017, MDOT rated the I-375 freeway pavement as fair according to MDOT's Pavement Condition Measure (PCM) Data Viewer, available online at http://featuredmaps-mdot.opendata.arcgis.com.

See **Table 1** for a condition summary of the seven bridges in the I-375 corridor.

Table 1. Existing Bridge Condition Ratings at I-75/I-375 Interchange

Bridge	Year Built	Last Rehab	Bridge Condition Rating: Deck	Deck Bottom	Super-structure	Sub-structure
Madison Avenue over I-375 (S02 of 82251)	1964	N/A	5	5	7	5
M-3 (Gratiot Avenue) over I-375 (S01 of 82251)	1963	1996	7	7	7	5
Monroe Avenue over I-375 (S01 of 82111)	1959	1996	7	6	7	7
Lafayette Avenue over I-375 (S02 of 82111)	1960	1990	7	7	7	6
Larned Street over I-375 (S03 of 82111)	1960	2005	4	4	6	4
Jefferson Avenue over I-375 (S04 of 82111)	1962	N/A	4	N	7	6
Hastings Street over I-375 (S05 of 82111)	1962	N/A	4	4	6	5
Rating Scale: 9 = New, 7-8 = Good, 5-6 = Fair, 4 = Poor, ≤ 3 = Critical, N = Not visible due to 80% false decking						

2.1.2 Geometric Deficiencies

A Road Safety Audit (RSA) was conducted for the I-375 corridor during a previous phase of this study. The RSA documented the following geometric deficiencies:

1) **The existing horizontal curve at the south end of I-375.** This curve requires southbound I-75 traffic to decelerate from a posted speed limit of 55 mph along I-375 to a posted advisory of 35 mph at the curve. A large concentration of fixed object crashes has been observed at this curve.
2) **Weave/merge distance at southbound I-375 Exit Ramp to Lafayette Avenue.** Southbound ramp traffic is required to cross two lanes of the southbound Service Drive to turn right onto Macomb Street and into the casino parking structure. In addition, the short distance between the ramp and signalized intersection at Monroe Street results in queues onto southbound I-375 during the AM peak hour.
3) **Weave/merge distance at southbound I-375 Exit Ramp to Larned Street.** Traffic from the parking structure just north of Larned Street stops on the southbound Service Drive waiting for gaps in exit ramp traffic to merge to the left

lane of the Service Drive. This causes congestion along the exit ramp and southbound Service Drive.

4) **Deficient horizontal sight distance on southbound I-375 at the Exit Ramp to Lafayette Avenue.** A retaining wall along the existing horizontal curve just south of Gratiot Avenue limits sight distance on the exit ramp to Lafayette.
5) **Weave length on southbound I-375 between the Entrance Ramp from northbound I-75 and the Exit Ramp to Lafayette.** Heavy traffic volumes use both movements within this weave, which at approximately 720 feet is shorter than desirable. However, expected frequency and severity of crashes due to this deficiency is low.
6) **Merge from northbound Service Drive to northbound I-375.** Merging onto northbound I-375 from the Service Drive ramps south of the I-75 interchange is difficult and causes backups along northbound I-375. The issue is attributed to the weave between the northbound I-375 entrance ramp from Monroe Street and the northbound I-75/Gratiot Avenue exit ramp. However, expected frequency and severity of crashes due to this deficiency is low.
7) **Delineated turn from southbound Service Drive to westbound Macomb Street.** Curb in place at this location requires southbound Service Drive traffic to turn right onto Macomb Street. The curb has low visibility and extends through the path of pedestrian crossing on Macomb Street.

2.2 I-75/I-375 Interchange

The I-75/I-375 Interchange provides full access between I-75, I-375 and Gratiot Avenue. To the south, Madison Avenue connects to I-375 via left-hand entrance and exit ramps utilizing a flyover structure to cross southbound I-375.

The existing I-75/I-375 Interchange is configured such that the Gratiot Avenue Connector is the predominant through-traffic movement. Northbound and southbound I-75 through traffic use two-lane turning roadways with geometry and design speeds similar to exit ramps. The northbound I-75 turning roadway meets a 30 mph design speed and is posted for 25 mph advisory speed limit. The southbound I-75 roadway meets 40 mph design speed and is posted for 30 mph advisory speed limit.

The eastbound Gratiot Avenue Connector begins as two lanes diverge from northbound I-75 along a tangent. Three successive entrance ramps then merge on to the right-hand side of the Gratiot Avenue Connector between I-75 and the signalized intersection at Gratiot Avenue. The entrance ramp from Brush Street merges via a tapered entrance. Approximately 640 feet downstream, the entrance from southbound I-75 merges as an additional lane, creating a three-lane section. The entrance ramp from northbound I-375 merges via a tapered entrance, 495 feet further downstream. The three-lane eastbound Gratiot Avenue Connector then terminates on a skew angle of 25 degrees at a signalized intersection with Gratiot Avenue.

The westbound Gratiot Avenue Connector begins as two lanes diverge from westbound Gratiot Avenue as a two-lane tapered exit. A series of ramps on the right-hand side then provide access between the Gratiot Avenue Connector and I-75, I-375 and Eastern

Market. At the eastern end of the westbound Gratiot Avenue Connector, a ramp from Orleans Street enters as an auxiliary lane to create a three-lane section. Approximately 750 feet downstream, a ramp providing access to northbound I-75 and southbound I-375 diverges as two lanes including the auxiliary lane and a decision lane. After the divergence, the westbound Gratiot Avenue Connector narrows to one lane for approximately 1,810 feet before a ramp from northbound I-375 merges as an additional lane. The two-lane section then merges on a tangent along the left-hand side of southbound I-375, creating a four-lane section.

Just south of the I-75/I-375 Interchange, a flyover structure carries two ramps connecting Madison Avenue and I-375 to the north. The inside lane of southbound I-375 becomes the exit ramp to Madison Avenue, reducing southbound I-375 from four lanes to three. Access to Gratiot Avenue from this ramp is provided via a left turn at St. Antoine Street. The ramp from Madison Avenue to northbound I-375 merges as a tapered entrance on the left-hand side of the three-lane freeway. This geometric configuration does not provide direct connections from eastbound Gratiot Avenue to northbound I-75/I-375, from northbound I-75 to Madison Avenue or westbound Gratiot Avenue, nor from Madison Avenue to southbound I-375.

Existing geometry within the I-75/I-375 Interchange and the Madison Avenue flyover ramps meet current MDOT design criteria except as noted in Section 3.2.2.

2.2.1 Facility Condition

Pavement condition surveys and bridge scoping will not be performed for the I-75/I-375 Interchange during this phase of planning and design for the project. However, in 2017, MDOT rated some roadway pavements within the interchange with results shown on to MDOT's Pavement Condition Measure (PCM) Data Viewer, available online at http://featuredmaps-mdot.opendata.arcgis.com/. This site shows northbound I-75 rated as mostly fair with short lengths of roadway rated as poor. The I-375 pavement is rated as mostly fair with short lengths of roadway rated as good.

See **Table 2** for a condition summary of the bridges in the I-75/I-375 corridor.

Table 2. Existing Bridge Condition Ratings in the I-375 Corridor

Bridge	Year Built	Last Rehab	Bridge Condition Rating			
			Deck	Deck Bottom	Super-structure	Sub-structure
NB I-75 E Turn Rd over I-375 (S03 of 82251)	1964	2007	6	5	7	7
NB I-75 E Turn Rd over I-375 (S04 of 82251)	1964	2007	7	8	7	7
Brush St over NB I-75/SB I-375 (S05 of 82251)	1970	2000	7	6	5	5
NB I-75 over ramp SB I-75 to M-3 (S07-1 of 82251)	1970	1998	7	8	7	7
SB I-75 over ramp SB I-75 to M-3 (S07-2 of 82251)	1970	1998	7	8	7	7
M-3 Connector over ramp NB I-75 to M-3 (S08-1 of 82251)	1964	2007	5	8	6	7
M-3 Connector over ramp M-3 to SB I-75 (S08-2 of 82251)	1964	2007	7	8	7	7
EB M-3 Connector over I-75/I-375 ramp (S09-3 of 82251)	1964	1998	7	7	5	6
WB M-3 Connector over I-75/I-375 ramp (S09-4 of 82251)	1964	1998	7	7	5	6
I-375 NW Turn over I-75 (S11 of 82251)	1963	1998	7	7	5	6
Ramp from M-3 to SB I-375 over I-75 (S12 of 82251)	1963	2007	7	8	7	8
Wilkins St over I-74 (S13 of 82251)	1961	2007	8	8	7	7
Division pedestrian over I-75 (P02 of 82251)	*	*	*	*	*	*
Rating Scale: 9 = New, 7-8 = Good, 5-6 = Fair, 4 = Poor, ≤ 3 = Critical, N = Not visible due to 80% false decking, * Bridge rating information not available at time of publishing this document						

2.2.2 Geometric Deficiencies

To supplement the RSA of the I-375 Corridor, an analysis of existing key geometric elements is provided in Appendix A-2, Analysis of Existing Geometry. The analysis compares existing geometrics with current MDOT design criteria. The results show the following additional deficiencies to be considered:

1) **Left-hand entrance to northbound I-375 from Madison Avenue and left-hand exit from southbound I-375 to Madison Avenue.** MDOT's Road Design Manual

states “left-hand entrances and exits are contrary to the concept of driver expectancy. Therefore, extreme care should be exercised to avoid left-hand entrances and exits in the designing of interchanges.”

2) **Deceleration length and taper rate at the exit ramp from northbound I-75 to southbound I-375.** The existing taper rate provides an approximate deceleration length of 250 feet, where a minimum of 300 feet is recommended in current MDOT Geometric Design Guidelines (GEO-130).
3) **Acceleration length and taper rate at the entrance ramp to southbound I-375 from northbound I-75.** The existing taper rate provides an approximate acceleration length of 188 feet, where a minimum of 550 feet is recommended in current MDOT Geometric Design Guidelines (GEO-100).
4) **Acceleration length and taper rate at the entrance ramp to the eastbound Gratiot Avenue Connector from northbound I-375.** The existing taper rate provides an approximate acceleration length of 141 feet, where a minimum of 550 feet is recommended in current MDOT Geometric Design Guidelines (GEO-100).
5) **Shoulder widths along the Gratiot Avenue Connector between Brush Street and Gratiot Avenue.** Inside shoulder widths vary between 4 and 12 feet along this section of the Gratiot Avenue Connector, where a minimum of 10 feet should be provided.
6) **Horizontal Curve Lengths throughout I-75/I-375 interchange.** See Appendix A-2, Analysis of Existing Geometry for a list of eight horizontal curve lengths that are below MDOT’s desirable value.
7) **Rates of Vertical Curvature on sag curves throughout the corridor and interchange.** See Appendix B, Analysis of Existing Geometry for a list of six vertical curve rates that are below MDOT’s desirable value. All six deficiencies are on sag vertical curves. Adequate stopping sight distance is provided on crest vertical curves throughout the interchange and corridor.

3 Illustrative Alternatives

In the previous phase of this project, six alternatives were developed for the I-375 corridor and two alternatives were developed for the I-75/I-375 Interchange. The development of these alternatives is described in the Final Planning and Environmental Linkages (PEL) report titled “Future 375 – I-375 Alternatives Study”.

3.1 I-375 Corridor

Six Illustrative Alternatives were developed for the I-375 corridor and a description of each is provided in this section.

3.1.1 Alternative 1 – Reconstructed Freeway As-Is with Ramp Improvements

Alternative 1 is a reconstruction of the freeway corridor in its current configuration. This includes removal and replacement of freeway mainline, ramp and service drive pavement

as well as all the existing bridges. Proposed ramp improvements and widening of the southbound off-ramps at Lafayette Avenue and Larned Street/East Jefferson Avenue are the only changes proposed under Alternative 1.

3.1.2 Alternative 2 – Reconstructed Freeway with Riverfront Connection

Alternative 2 includes the same features as Alternative 1 along the corridor, but adds a surface-level riverfront connector roadway from East Jefferson Avenue to Atwater Street. Bicycle lanes and pedestrian improvements are proposed for surface streets.

3.1.3 Alternative 3 – Freeway Transitions to Surface Street at Larned

Alternative 3 proposes a transition from freeway to surface-level boulevard south of Lafayette Avenue with four lanes in each direction. The new surface street would include signalized intersections at Larned Street and Jefferson Avenue and connects directly to Atwater Street. The freeway section shifts to the west and the northbound I-375 Service Drive becomes a two-way local roadway with bike lanes. A shared-use path with stormwater management is proposed to separate service drive and freeway.

3.1.4 Alternative 4 – East Edge Boulevard

Alternative 4 converts the I-375 freeway to a surface-level boulevard with four lanes in each direction south of Gratiot Avenue. The freeway would transition from its existing depressed grade at Gratiot Avenue to local street grade at Clinton Street. Both I-375 service drives would be eliminated under this Alternative. The proposed boulevard section shifts to the east (neighborhood) side and continues as a local street south of Jefferson Avenue, connecting directly to Atwater Street. A shared use path with a landscaped buffer between the path and the neighborhood side right-of-way line is also proposed, connecting the Riverwalk on the south end to Antietam Street on the north end.

3.1.5 Alternative 5 – West Edge Boulevard

Alternative 5 is similar to Alternative 4, converting the I-375 freeway to a surface-level boulevard with four lanes in each direction south of Gratiot Avenue. However, Alternative 5 proposes the boulevard shift to the west (central business district) side of the corridor. The boulevard continues as a local street south of Jefferson Avenue, connecting directly to Atwater Street. The southbound service drive would be eliminated and the northbound I-375 Service Drive would be converted to a two-way local road with bicycle lanes. Bicycle lanes would extend from the Riverwalk on the south end to Antietam Street on the north end.

3.1.6 Alternative 6 – One-Way Pair of Surface Streets and Below-Grade Greenway

Alternative 6 converts the I-375 freeway to surface-level one-way streets with four lanes in each direction south of Gratiot Avenue. The surface level streets would be aligned with the existing I-375 service drives. The space between streets would be filled by a

proposed greenway with a shared use path extending from Gratiot Avenue on the north end to the Riverwalk on the south end. The new local streets converge south of Jefferson Avenue and continue to Atwater Street. The shared use path would cross local streets below grade, with new bridges proposed at Monroe Street, Lafayette Avenue, and Larned Street.

3.2 I-75/I-375 Interchange

The Final PEL report presents concepts for two alternatives for the interchange area.

3.2.1 Interchange Alternative 1

Interchange Alternative 1 proposes elimination of the left-hand ramps to Madison Avenue, and converts the Gratiot Avenue Connector to surface-level roadway with a signalized intersection at Russell Street. The turning roadway configuration in the I-75/I-375 Interchange would match closely with existing. The reconfiguration of ramps at Gratiot Avenue results in potential right-of-way impacts along the east side of the corridor, between Gratiot Avenue and the Gratiot Avenue Connector. This alternative is compatible with all six of the Illustrative Alternatives described above.

3.2.2 Interchange Alternative 2

Interchange Alternative 2 features a complete reconfiguration of the interchange, in which I-75 becomes a through-traffic movement. I-375 would transition to a surface-level roadway south of the interchange, with a signalized intersection at Gratiot Avenue. This would eliminate the need for the Gratiot Avenue Connector. New direct access points would be created to Brush Street from southbound I-75 and from Brush Street to northbound I-75, and access to Madison Avenue would be maintained. The reconfiguration of I-75 and the southbound exits to I-375 and Brush Street result in right-of-way impacts to the Brewster-Douglass properties on the northwest quadrant of the interchange. This alternative is compatible only with Illustrative Alternatives 4, 5, and 6, described above.

4 Practical Alternatives

The Illustrative Alternatives and two Interchange Alternatives presented in the PEL study were evaluated through an alternatives screening process. An Alternatives Screening Memo describes this process, through which the following Practical Alternatives were developed.

4.1 No-Build Alternative – Reconstructed Freeway As-Is

The no-build alternative consists of reconstruction of the I-375 corridor and I-75/I-375 Interchange in their current configurations. This would include replacement of the existing

pavement and bridges on the freeway mainline, ramps and service drives along the corridor and within the interchange.

4.2 Practical Alternative 4 – East Edge Boulevard with Reconfigured I-75 Interchange

Practical Alternative 4 proposes reconstruction of the I-75/I-375 Interchange and the I-375 Corridor. The Corridor geometry is similar to Illustrative Alternative 4, described in Section 4.1.4., with the I-375 freeway transitioning to a surface-level boulevard with four lanes in each direction south of Gratiot Avenue, shifted to the east (neighborhood) side. The I-75/I-375 Interchange is similar to Interchange Alternative 2, described in Section 4.2.2.

4.2.1 I-375 Corridor

The Practical Alternative 4 design of the I-375 Corridor, shown in **Figure 2**, includes several refinements to Illustrative Alternative 4, listed below:

1) Modifications to the boulevard alignment at the south end to align with Schweizer Street. This minimizes impacts to adjacent properties between Jefferson Avenue and Atwater Street, including the Christ Church historical resource.
2) Addition of a local access road on the west side to minimize direction connections to the boulevard section from local roads.
3) Addition of a crossover in the boulevard section at Macomb Street to improve access from northbound I-375.
4) Revision of the Gratiot/Madison area to allow for a more intuitive connection and a more traditional interchange at I-375.
5) Re-alignment of the connection from the northbound I-375 Boulevard to Antietam Street to tie directly to Gratiot Avenue at a new signalized intersection. Antietam Street is re-aligned, creating a T-intersection with the new connector between the northbound Boulevard section and Gratiot. This allows for local surface street and shared-use path connections on the east side of the right-of-way between Atwater Street and Gratiot Avenue.

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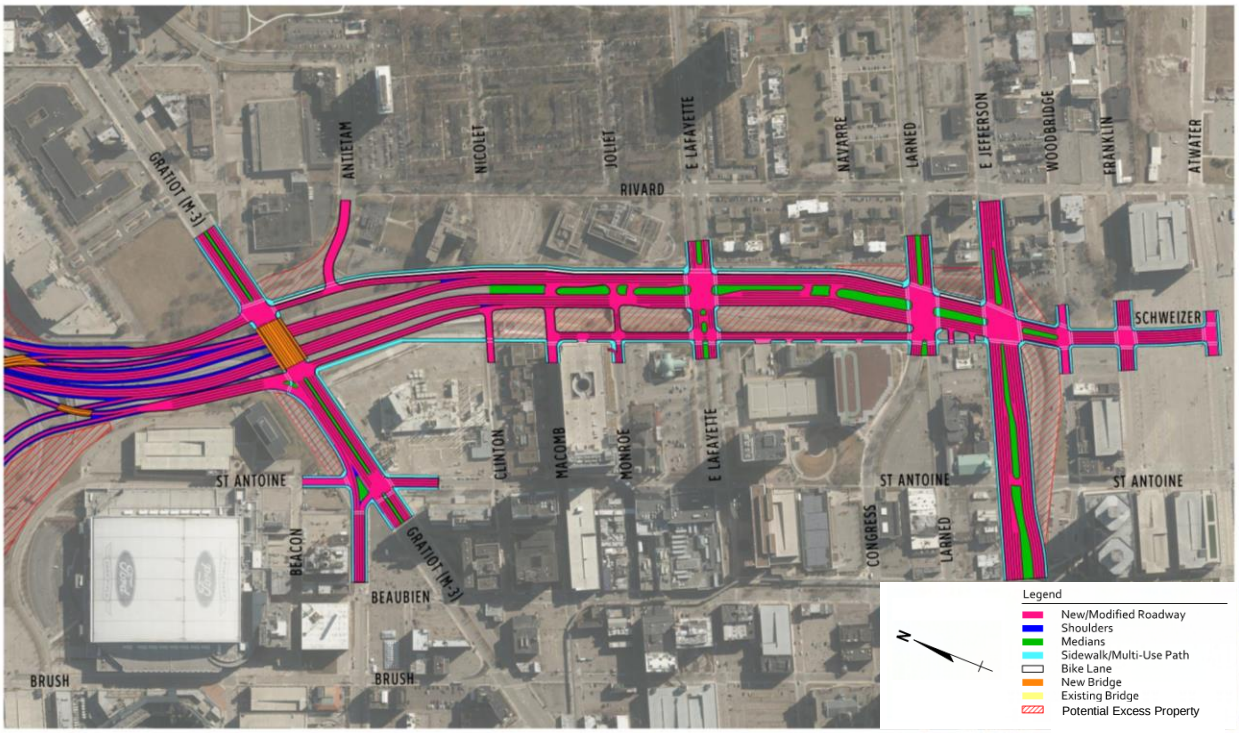
Figure 2. Practical Alternative 4: East Edge Boulevard Section



4.2.2 I-75/I-375 Interchange

Practical Alternatives 4 and 5 propose to completely reconstruction the I-75/I-375 Interchange with I-75 reconfigured as the through-traffic movement, similar to Interchange Alternative 2, with upgrades described herein. The left-hand ramps to Madison Avenue would be eliminated, resulting in a more traditional interchange configuration at Gratiot Avenue. The proposed interchange geometry is shown in plan view in **Figure 3** with 3D renderings shown in **Figure 4** and **Figure 5**.

The geometric design for the I-75/I-375 Interchange is mostly the same in Practical Alternatives 4 and 5, and is similar to Interchange Alternative 2 described in Section 4.2.2. The following improvements are proposed under the Practical Alternatives:

1) Gratiot Avenue would be grade-separated from I-375, similar to Interchange Alternative 1 described in Section 4.2.1. This results in a traditional interchange style with ramps connecting to and from both directions of I-75.
2) Elimination of the flyover ramp from Madison Avenue to northbound I-375. This movement is provided with a connection from Madison Avenue to Gratiot Avenue via T-intersection west of I-375 and then to northbound I-375 via entrance ramp from Gratiot Avenue.
3) Re-alignment of the I-375 freeway mainline through the interchange, reducing separation between the northbound and southbound roadways. This reduces right-of-way impacts and reduces the number of bridges required for the Gratiot Avenue to southbound I-75 ramp to cross I-375.

4) Re-alignment of the I-75/I-375 roadways on the north side of the interchange to reduce right-of-way impacts to the Brewster-Douglass property in the NW quadrant of the interchange.
5) Re-alignment of the convergence of northbound I-75 and northbound I-375, such that northbound I-75 enters from the right. This improves safety and reduces congestion in the area by facilitating the northbound I-75 exit to Mack Avenue, which has a higher volume than the northbound I-375 exit to Mack Avenue. Added features related to this revision include:
    a. I-75 would be configured with two continuous lanes through the convergence with northbound I-375 to north of Mack Avenue. Further analysis is required to determine the appropriate location for the lane drop from five to four lanes along northbound I-75 north of Mack Avenue.
    b. Addition of a tapered exit ramp from northbound I-75 to Mack Avenue. The exit would also be shifted slightly to the north to create separation from the northbound I-75 curve to the south, improving safety and the ability to appropriately sign the exit.
    c. Barrier separation between northbound I-75 and northbound I-375 through the convergence and north of Mack Avenue. This improves safety and reduces congestion by prohibiting the weave between northbound I-75 traffic and vehicles exiting from northbound I-375 to Mack Avenue.
6) Re-alignment of the divergence of southbound I-75 and southbound I-375, such that southbound I-75 departs from the right. This would eliminate the need for a bridge carrying southbound I-75 and the exit to Brush Street over southbound I-375. It is also consistent with the configuration of the northbound roadways, which should improve the user experience.
7) Reconfiguration of the ramps to and from Brush Street to provide direct connections to and from I-75 to the north. The movements to and from Brush Street will be heavy during special events, with the majority of vehicles using I-75 as the primary route into and out of the area. Direct access between the two roadways would improve safety by reducing congestion and confusion. Further, the new configuration would allow the entrance from Brush Street to northbound I-75 to merge on the righthand side. This improves safety over previously proposed Interchange Alternative 2, which showed the ramp merging on to northbound I-75 from the left.
8) Addition of separate connections from I-75 to Gratiot Avenue and from I-75 to the southbound I-375 Boulevard Section. This will reduce congestion by providing separate direct connections from I-75 to the Event Area and to the Downtown Areas, including the Renaissance Center.

Figure 3. Practical Alternative 4: I-75/I-375 Interchange

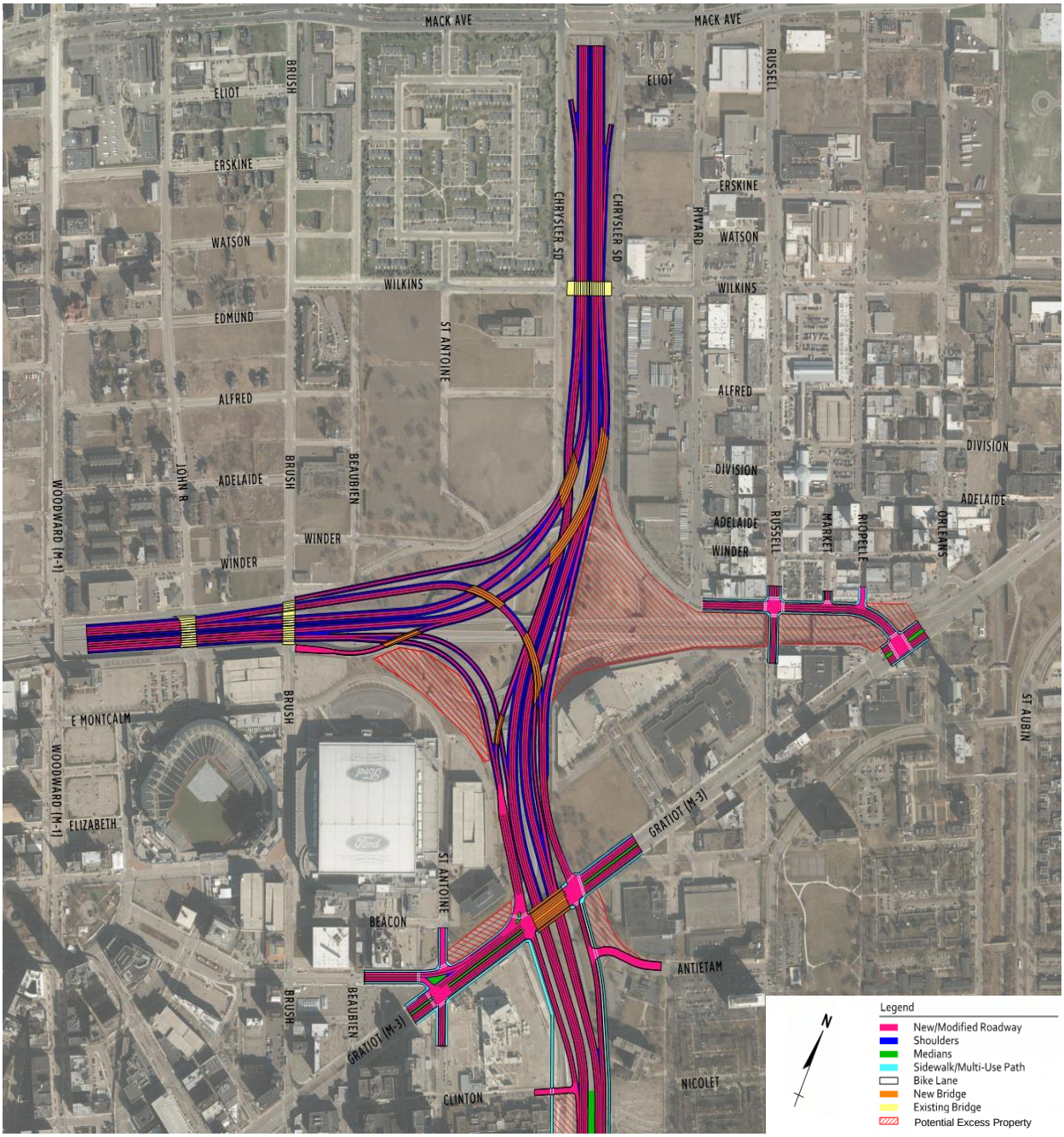


Figure 4. 3D Rendering of Practical Alternative: I-75/I-375 Interchange - Looking Northeast

Figure 5. 3D Rendering of Practical Alternative: I-75/I-375 Interchange - Looking Southeast

4.2.3 Gratiot Avenue and Madison Avenue Interchange

Practical Alternatives 4 and 5 propose the same changes to the Gratiot/Madison area to eliminate the flyover from Madison Avenue to northbound I-375, improve access, and reduce confusing routes. This includes reconstruction of Gratiot Ave, Madison Avenue, St. Antoine Street, and the freeway connections as shown in **Figure 6**. The geometric revisions to roadways in this area are described below:

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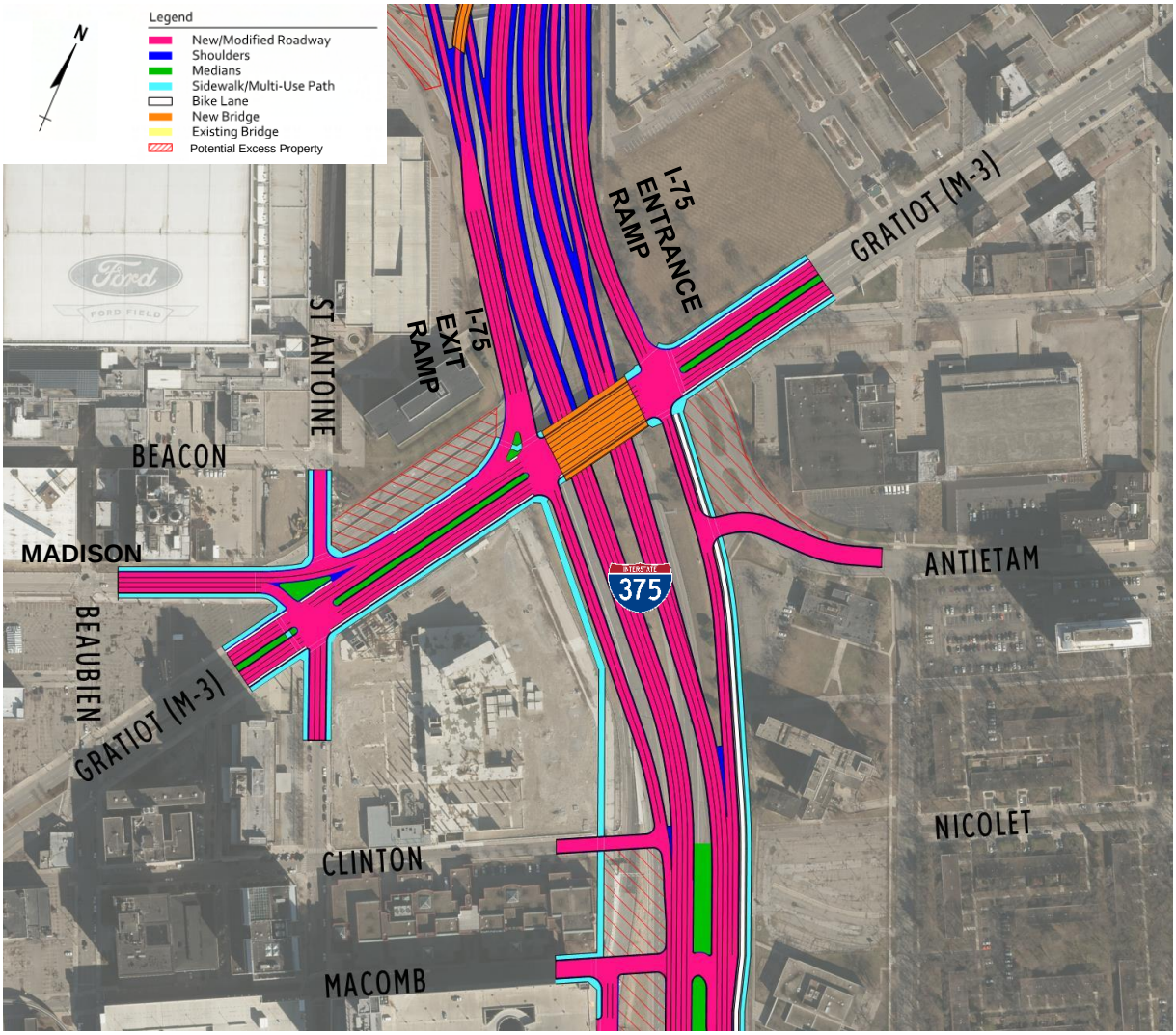
Figure 6. Practical Alternative 4: Gratiot/Madison Interchange



1) Re-align eastbound Madison Avenue to tie directly to Gratiot Avenue in a T-intersection just west of St. Antoine Street. This eliminates the need for a flyover ramp from Madison Avenue to northbound I-75. Eastbound Madison Avenue traffic has access to northbound and southbound I-75 via ramps from Gratiot Avenue. Eastbound Madison Avenue traffic can access the Downtown and Renaissance areas via southbound St. Antoine Street or the Service Drive on the east side of the Corridor.
2) Ramps from northbound I-75 and southbound I-375 would tie directly to Gratiot Avenue, with dual right turn lanes provided for access to both westbound Gratiot Avenue and Madison Avenue. This would create a five-lane section along Gratiot Avenue between I-375 and St. Antoine Street. The northernmost lane would provide direct access to westbound Madison Avenue from northbound I-75 and southbound I-375. The adjacent, inside, right turn lane would be a decision lane between westbound Gratiot Avenue and a split to westbound Madison Avenue.

4.2.4 Future Considerations

There are issues that have been identified in the Illustrative Alternative layout that have not yet been addressed in the Practical Alternative. These include the following:

1. The boulevard section median width of 44 feet is designed to accommodate passenger vehicles and does not allow for city buses or box trucks (SU-40) to complete a U-turn or “Michigan Left” movement from the proposed turn lanes.
2. On-street parking is not included on the boulevard or the local access roads.
3. Access for deliveries is not provided along the boulevard or the local access roads.

These issues are partially addressed in the Preferred Alternative. However, further coordination with MDOT and the City of Detroit is required to resolve issues related to on-street parking.

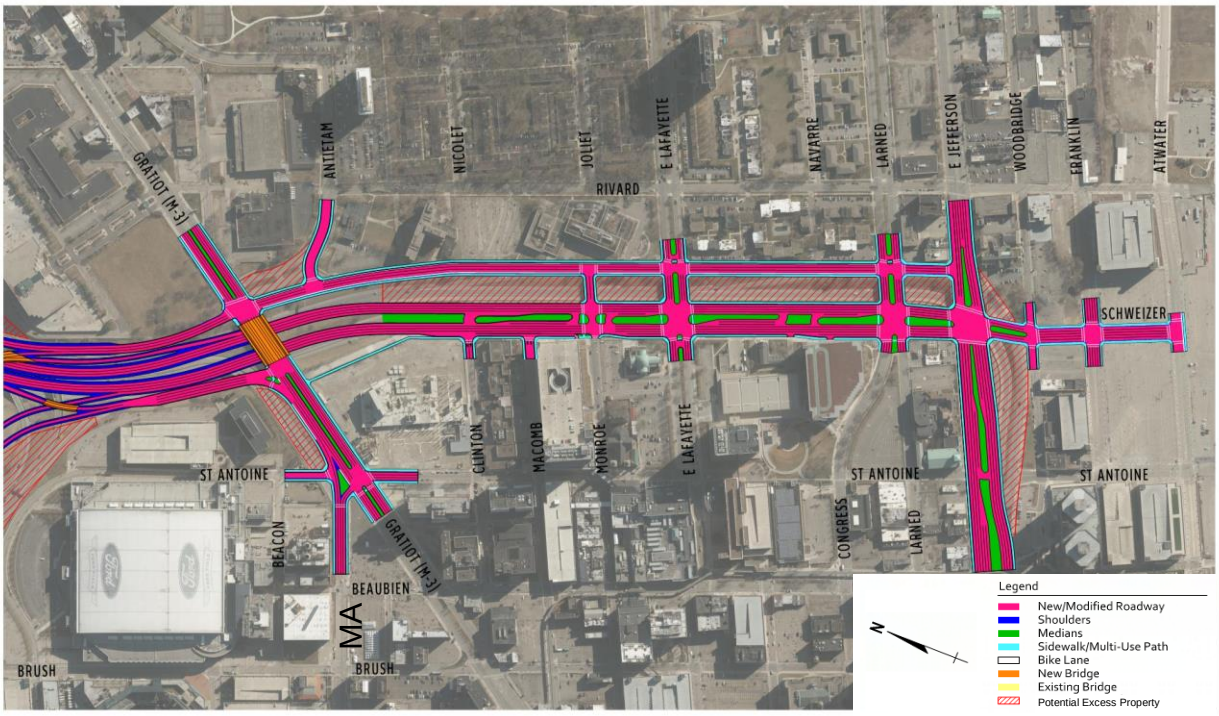
4.3 Practical Alternative 5 - West Edge Boulevard with Reconfigured I-75 Interchange

Practical Alternative 5 proposes reconstruction of the I-75/I-375 Interchange and the I-375 Corridor. The Corridor geometry, shown in **Figure 7**, is similar to Illustrative Alternative 5, described in Section 4.1.5., with the I-375 freeway transitioning to a surface-level boulevard with four lanes in each direction south of Gratiot Avenue, shifted to the west (downtown) side. The I-75/I-375 interchange is mostly the same as Practical Alternative 4 described in Section 4.2.2.

4.3.1 I-375 Corridor

The I-375 Corridor geometry is as described in Section 4.2.1., with the I-375 freeway transitioning to a surface-level boulevard with four lanes in each direction south of Gratiot Avenue, shifted to the west (CBD) side. A three-lane, two-way local access road is provided on the east side of the boulevard between Jefferson Avenue and Gratiot Avenue.

Figure 7. Practical Alternative 5: West Edge Boulevard Section



Refinements included within the boulevard section proposed under Practical Alternative 5 are as follows:

1. Re-alignment of the connection from the northbound I-375 Boulevard section to Antietam Street to tie directly to Gratiot Avenue at a new signalized intersection. This is the same modification at Antietam Street described under Practical Alternative 4.
2. Addition of a crossover in the boulevard section at Macomb Street to improve access from northbound I-375.

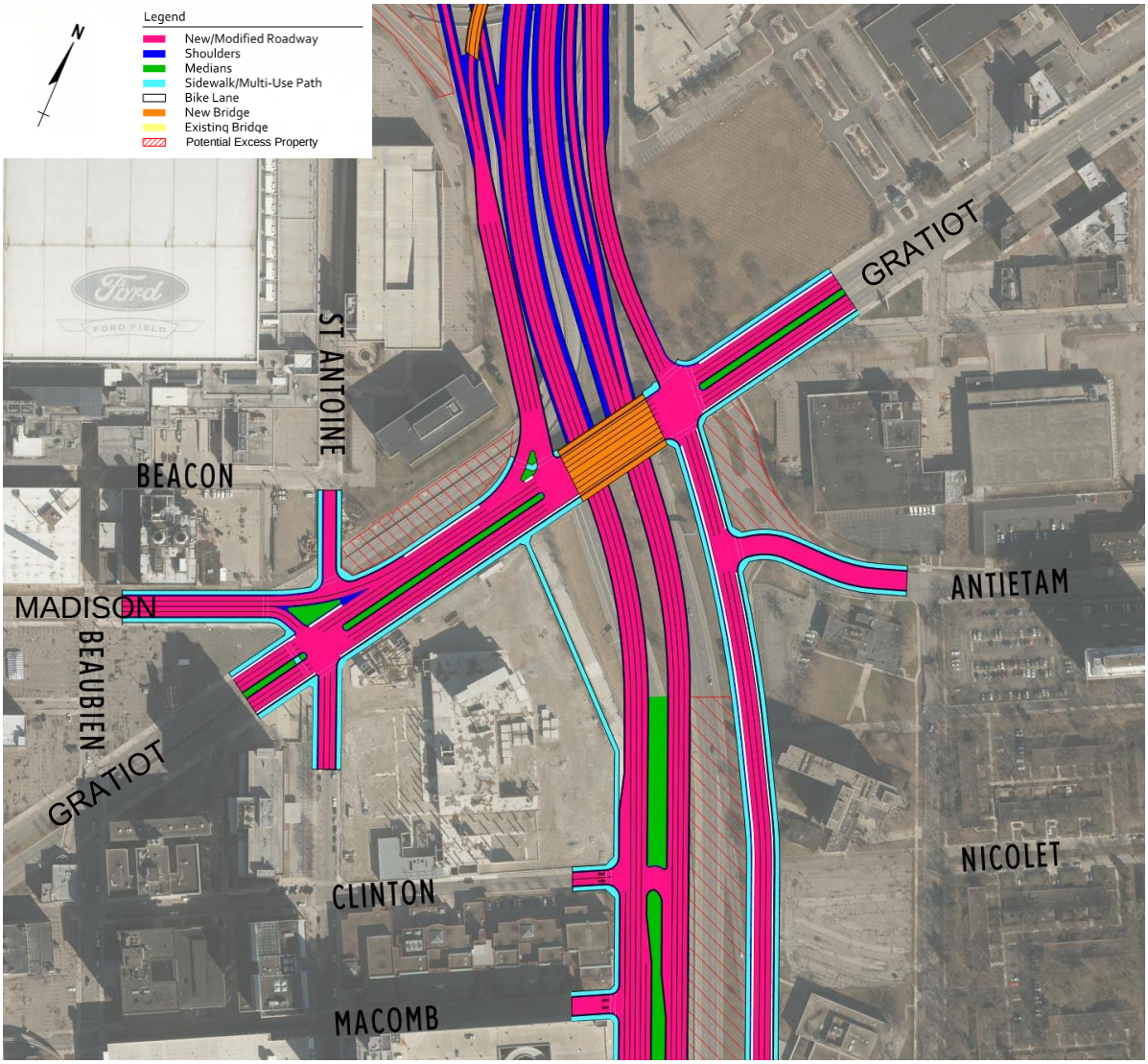
4.3.2 I-75/I-375 Interchange

The I-75/I-375 Interchange is as described under Section 4.2.2 for Practical Alternative 4, with minor revisions to mainline freeway geometry and transitions at the south end to accommodate the boulevard shift to the west in Practical Alternative 5.

4.3.3 Gratiot Avenue and Madison Avenue Interchange

The Gratiot Avenue/Madison Avenue interchange configuration, shown in **Figure 8,** would be configured exactly as described under Section 4.2.3 for Practical Alternative 4, with the following exception. Due to the westward shift of the boulevard alignment in Practical Alternative 5, the connection from Gratiot Avenue to the southbound boulevard is omitted. Further analysis is required to determine if this connection is required to improve operations. If so, geometric analysis of the mainline and ramps is required due to right-of-way constraints in the vicinity.

Figure 8. Practical Alternative 5: Gratiot/Madison Interchange



4.3.4 Future Considerations

The issues related to median width, on-street parking, and delivery access described under Section 4.2.4 for Practical Alternative 4 are also present in Practical Alternative 5. These issues are partially addressed in the Preferred Alternative. However, further coordination with MDOT and the City of Detroit is required to resolve issues related to on-street parking.

4.4 Refined Practical Alternatives 5A and 5B

Based on positive stakeholder feedback collected as part of a robust engagement effort with local stakeholders, Practical Alternative 5 was carried forward for further evaluation. Further refinements were made to Practical Alternative 5 based on stakeholder input.

These refinements were defined through a series of workshops with MDOT, the City of Detroit, and the Southeast Michigan Council of Governments (SEMCOG), see **Table 3**, and the LAC/GAC meetings and one-on-one stakeholder meetings described in Chapter 6.

Table 3: Preferred Alternative Agency Coordination Workshops

Date	Agencies Present
February 21, 2018	MDOT, City of Detroit, SEMCOG
March 12, 2018	MDOT, City of Detroit
March 29, 2018	MDOT, City of Detroit, SEMCOG
April 16, 2018	MDOT, City of Detroit, SEMCOG
May 16, 2018	MDOT, City of Detroit, SEMCOG
August 17, 2018	MDOT, City of Detroit, SEMCOG
December 3, 2018	MDOT, City of Detroit, SEMCOG
January 22, 2019	MDOT, City of Detroit
February 8, 2019	MDOT, City of Detroit
August 8, 2019	MDOT, City of Detroit
September 6, 2019	MDOT, City of Detroit

What is an indirect left or "Michigan Left"?

An indirect left, or "Michigan Left", occurs when a direct left at an intersection is not permitted. Instead, a driver proceeds through the intersection, making a U-turn at the median.

At left: Example indirect left intersection at Woodward Avenue and Seven Mile Road. Source: Google Maps, 2018

The boulevard was refined to better fit an urban context, such as fewer lanes, a smaller footprint to achieve a better experience for non-motorized traffic, and consideration for redevelopment opportunities alongside Lafayette Park on the east edge of the corridor. Further evaluation of direct and indirect left-turns along the boulevard was completed to assess traffic flow, connectivity, non-motorized access, and safety. Refinements to the boulevard include:

- The total number of through lanes along the boulevard was reduced.
  - Four through-lanes southbound and three through-lanes northbound from north of Clinton Street to Lafayette Avenue.
  - Three through-lanes southbound and northbound from Lafayette Avenue to Larned Street.

    - Two through-lanes southbound and three through-lanes northbound from Larned Street to Jefferson Avenue.
    - An example of a three-lane boulevard is shown in **Figure 9** and **Figure 10.**
- Refinement of turning lanes along the boulevard to meet traffic needs, including storage length and number of dedicated turn lanes at each intersection.
- Public comment emphasized the need to prioritize non-motorized traffic and connectivity; to better accommodate this, wider sidewalks of up to 25 feet were included in the boulevard design.
- Reduction of the proposed boulevard median width to create more potential redevelopment along the east edge of the corridor, in response to comments from the public and from the City of Detroit.
- Continuation of bike lanes along the corridor and cross streets including Lafayette Avenue, and East Gratiot and East Jefferson avenues.
- Reinstate existing on-street parking at Holy Family Roman Catholic Church.
- Continuation of Clinton Street from the boulevard to the local road to reconnect the grid of city streets.
- Accommodate two-way traffic flow for Macomb Street, which was previously a one-way street.
- The proposed local road, east of the boulevard, was trimmed to end at Monroe Avenue instead of extending south to Jefferson Avenue.
- Modification of access at Blue Cross Blue Shield to accommodate truck delivery traffic.
- Replacement of the Gratiot Avenue bridge over the Dequindre Cut Greenway

The refinements listed above result in a roadway facility that better fits the urban context. The signalized crossings for pedestrians/bicyclists will support the need to improve connectivity for all users.

Urban street elements that support the walk, transit and bicycle friendly streets Detroiters desire are defined in the National Association of City Transportation Officials' (NACTO) *Urban Streets Design Guide*. Elements aligned with the guide included along the boulevard are narrow lane widths, protected bike lanes, a narrower roadway, and street trees (NACTO, 2013). Intersection refinements include reduced curb radii, pedestrian crossing islands, high visibility crosswalks, leading pedestrian intervals, and single stage pedestrian crossings. These elements will be refined during final design to optimize safety and mobility.

These refinements reflect the feedback heard through stakeholder engagement, while meeting the Purpose and Need for the I-375 Improvement Project.

Figure 9: Example Boulevard, Grand Boulevard at Beaubien Street in Detroit, MI

Source: Google Maps, 2018

Figure 10: Example Boulevard, Grand Boulevard Cross-Section at Beaubien Street in Detroit, MI

Source: Google Maps, 2018

Stakeholder feedback also resulted in a new interchange layout. The new layout, known as Practical Alternative 5B, was introduced after stakeholders asked to reduce the size

of the interchange and improve connectivity between Gratiot Avenue, Eastern Market, Brush Park, and East Lafayette.

The two interchange alternatives with two boulevard alternatives results in the evaluation of four Practical Alternatives refined from the original Practical Alternative 5. They are:

- Practical Alternative 5A with Direct Lefts
- Practical Alternative 5A with Indirect Lefts
- Practical Alternative 5B with Direct Lefts
- Practical Alternative 5B with Indirect Lefts

The new interchange is a part of both Practical Alternative 5B with Direct Lefts and Practical Alternative 5B with Indirect Lefts. Practical Alternative 5A Direct Interchange and Boulevard was reviewed by MDOT Geometrics. The review documents with specific information on the design is included in Appendix A-3 Practical Alternative 5A Geometric Review. Practical Alternative 5B Interchange was reviewed by MDOT Geometrics the review documents with specific information on the design is included in Appendix A-4 Practical Alternative 5B Geometric Review. The boulevard review of Practical Alternative 5A Direct was considered valid for Practical Alternative 5B.

4.4.1 Practical Alternative 5A with Direct Lefts

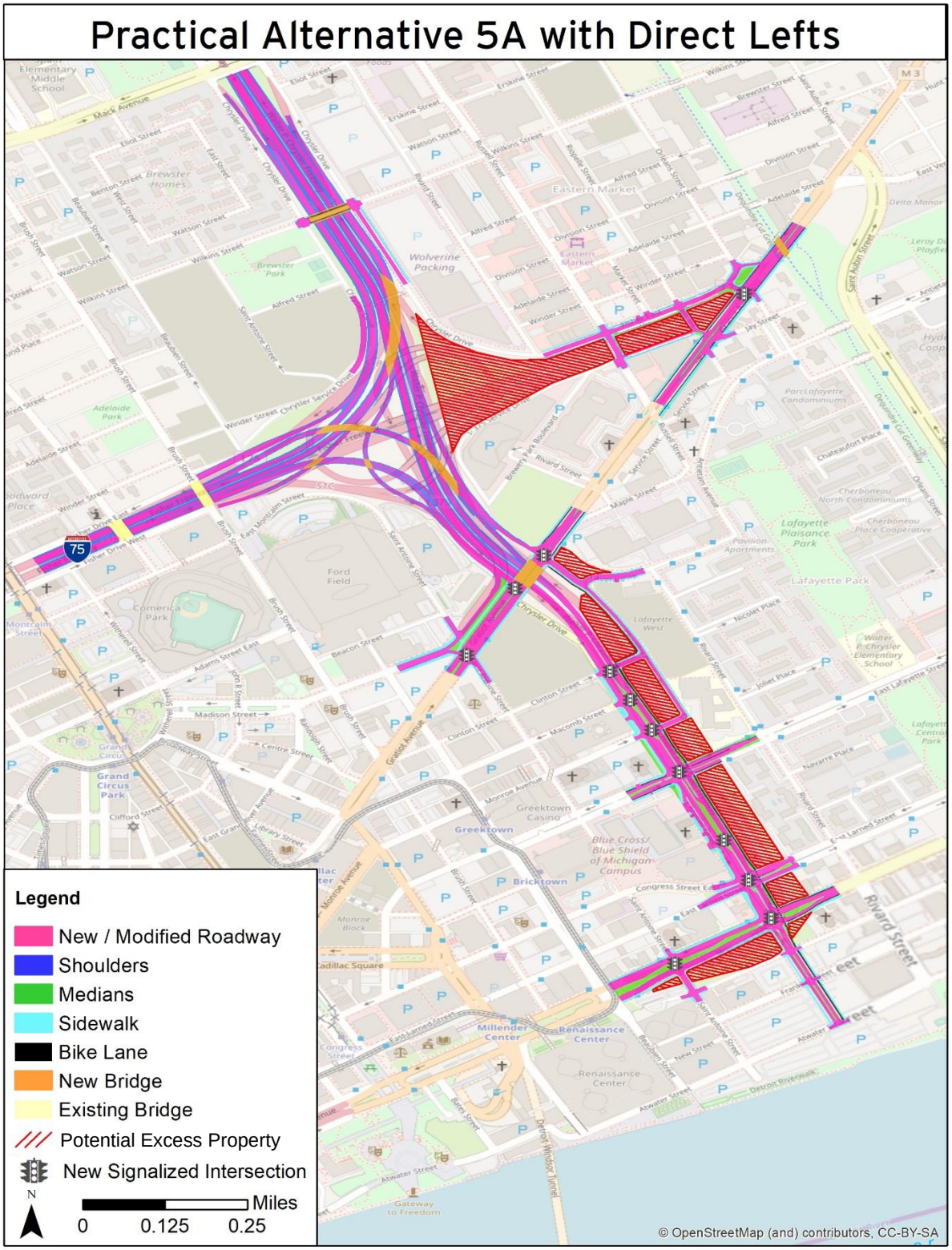
Practical Alternative 5A with Direct Lefts is a combination of the Practical Alternative 5A interchange and the boulevard with direct left-turns.

Features of this practical alternative are illustrated in **Figure 11** and include:

- Northbound and southbound I-75 are continuous roadways that are designed to allow traffic to move safely through the interchange at speeds of up to 60 mph. This improves existing conditions, where I-75 through traffic exits to the right, similar to a ramp movement.
- Large and complex bridges are required to connect the boulevard to northbound I-75 and southbound I-75.
- There is a new on-ramp and a new off-ramp to connect Brush Street directly to and from northbound I-75.
- The ramps connecting I-75 to the boulevard from the north are on the left side of the freeway. This is non-traditional and means the following for traffic movement:
    - Southbound traffic on I-75 would stay to the right to remain on I-75 or exit on the left to access the boulevard.
    - Northbound traffic from the boulevard would enter I-75 on the left.
- At the south end of the project area, vehicles would enter and exit I-75 on the right, which is more traditional.
- Ramps connect to Gratiot Avenue and Madison Avenue from northbound and southbound I-75.
- Ramps connect Gratiot Avenue to both northbound and southbound I-75.
- Connection from I-75 to Eastern Market can be made via Mack Avenue or Gratiot Avenue.

- There is a new local roadway configuration on the south side of Eastern Market, including one signalized intersection at Russell Street and East Fisher Service Drive.
- Eastbound Madison Avenue connects to southbound St. Antoine Street and Gratiot Avenue, but not directly to I-75 as it does today.
- The intersection of the boulevard and Gratiot Avenue is grade-separated, meaning the freeway runs under a bridge at Gratiot Avenue.
- South of Gratiot Avenue, the boulevard has signalized intersections with direct left-turns to and from the side streets.

Figure 11: Practical Alternative 5A with Direct Lefts



Along the boulevard there would be signalized intersections at the following locations:

- Clinton Street
- Macomb Street
- Monroe Street
- Lafayette Avenue
- Blue Cross Blue Shield (BCBS) garage
- Larned Street
- Jefferson Avenue

The median separating the northbound and southbound boulevard would be 31-feet wide. The boulevard median includes the following pedestrian features:

- Pedestrian refuge islands at each signalized intersection, with a minimum width of 9 feet.
- Pedestrians cross the boulevard in two stages, meaning:
    - Cross one bound of the boulevard in one signal stage.
    - Stop in the pedestrian refuge island and wait for another walk signal.
    - Cross the other bound in a second stage.

The east and west sides of the boulevard include the enhancements for pedestrian and bicycle use listed below:

- A 10-foot wide two-way cycle track that is located on the east side of the boulevard
    - The cycle track terminates at Gratiot Avenue in the north, connecting to on-street bicycle facilities, and Atwater Street in the south.
- A 10-foot wide sidewalk just east of the cycle track.
- A 20-foot sidewalk on the west side of the boulevard.
- All intersections along the boulevard feature pedestrian signals as well as bike signals along the east side.
- All direct left-turns from the boulevard feature a dedicated left-turn phase to enhance safety.
- Right-turns on red will be prohibited for westbound vehicles approaching the boulevard where there is a cycle track.
- Northbound boulevard right-turning traffic yield to bicycles in the cycle track, and to pedestrians in the crosswalk.
- Dedicated bicycle lanes along Lafayette Avenue. Westbound bicycles on Lafayette Avenue approaching the boulevard have the option to stay right to connect to the cycle track or go through to continue on the bicycle lane.

4.4.2 Practical Alternative 5A with Indirect Lefts

Practical Alternative 5A with Indirect Lefts is a combination of the Practical Alternative 5A interchange, as described in 4.4.1, but the boulevard features indirect left-turns to local streets, instead of direct left-turns. Features of this practical alternative are illustrated in **Figure 12** and listed below.

- The intersection of the boulevard and Gratiot Avenue is grade-separated, meaning the freeway runs under a bridge at Gratiot Avenue.
- South of Gratiot Avenue, the boulevard features signalized intersections at the following locations:
    - Clinton Street
    - Monroe Street
    - Lafayette Avenue
    - Larned Street
    - Jefferson Avenue
    - Turnaround between Lafayette Avenue and Larned Street
- Direct left-turns from the boulevard to local streets will be prohibited except at Larned Street and Jefferson Avenue.
- Indirect left-turns are made at cross-overs north of Macomb Street and south of Lafayette Avenue. A cross-over is an opening across the median that allows for one direction of traffic to make a U-turn to the opposite direction.
- Direct left-turns from local streets to the boulevard are allowed at:
    - Eastbound and westbound Lafayette Avenue
    - Eastbound and westbound Larned Street
    - Eastbound Jefferson Avenue
- No left-turns allowed for westbound Jefferson Avenue to southbound boulevard. Westbound Jefferson Avenue traffic would access the southbound boulevard via Rivard Street or St. Antoine Street, just east and west of the boulevard.
- Left-turns will be prohibited from the northbound boulevard to Larned Street, or Congress Street. Northbound boulevard traffic would access Congress Street via Jefferson Avenue and either St. Antoine Street or Beaubien Street.
- The cross-overs located north of Macomb Street and south of Lafayette Avenue accommodate left-turns to the boulevard from Clinton Street, Macomb Street, Monroe Street, and Lafayette Avenue. The northbound to southbound cross-over located north of Macomb Street is a one-lane cross-over. The southbound to northbound cross-over located south of Lafayette Avenue is a two-lane cross-over.

Practical Alternative 5A with Indirect Lefts includes signalized pedestrian crossings at:

- Clinton Street
- Lafayette Avenue
- Larned Street

- Jefferson Avenue

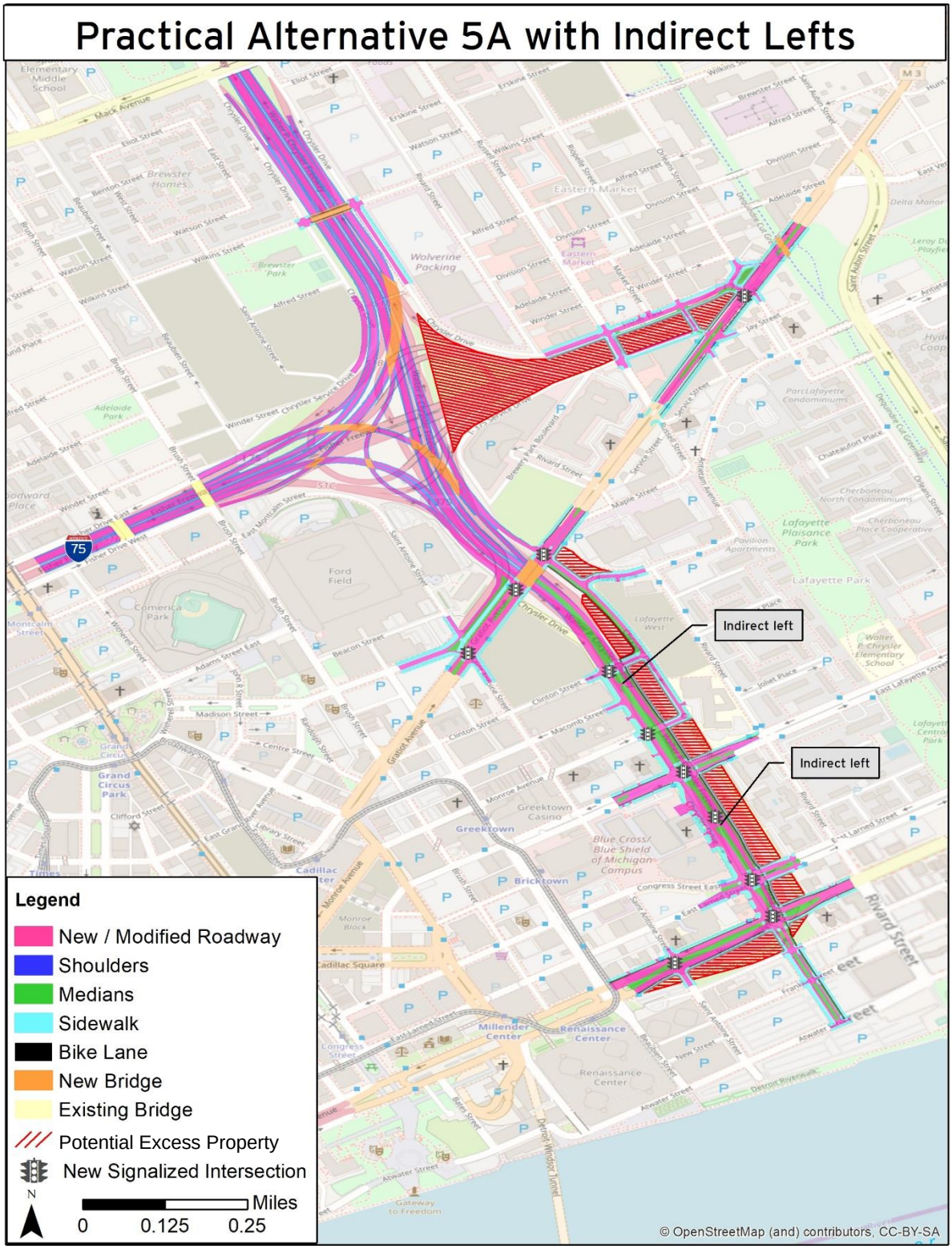
The median along the boulevard would be 44-feet wide. There are pedestrian refuge islands ranging from 10-feet to 44-feet wide at the intersections listed above. Pedestrians would cross the boulevard in two stages, meaning:

- Cross one bound of the boulevard in one signal stage.
- Stop in the pedestrian refuge island and wait for another walk signal.
- Cross the other bound in a second stage.
- This is a similar crossing to Practical Alternative 5A with Direct Lefts.

The cycle track would operate similar to Practical Alternative 5A with Direct Lefts:

- Right-turn on red will be prohibited for westbound traffic on local streets where there is a cycle track.
- Northbound boulevard right-turning vehicles would yield to bicycles crossing in the cycle track.

Figure 12: Practical Alternative 5A with Indirect Lefts



4.4.3 Practical Alternative 5B with Direct Lefts

Practical Alternative 5B with Direct Lefts is a combination of the Practical Alternative 5B interchange and the boulevard with direct left-turns to local streets south of Gratiot Avenue. Features of this practical alternative are illustrated in **Figure 13** and include the following:

- Northbound and southbound I-75 are continuous roadways that are designed to allow traffic to move safely through the interchange at speeds of up to 60 mph. This is similar to Practical Alternative 5A.
- Gratiot Avenue is an at-grade intersection with the boulevard. An at-grade intersection means the two roadways intersect at the same elevation, which matches closely with the rest of the local street grid.
    - Sidewalks and cycle track along both sides of the boulevard extend to Gratiot Avenue and north to Montcalm Street. This provides pedestrian and bicycle connectivity from the boulevard to the Events Area and Eastern Market.
    - Sidewalks extend north over Montcalm Street, over I-75, and connect to the service drive north of I-75. This provides pedestrian connectivity from the boulevard to Brush Park.
    - Left-turns will be prohibited at all legs of the Gratiot Avenue intersection during normal operations. Future consideration may allow left turn movements for special event traffic.
    - There are dual right-turn lanes for:
        - Southbound boulevard to westbound Gratiot Avenue.
        - Westbound Gratiot Avenue to northbound boulevard.
- At the north end of the Project, near Mack Avenue, the ramps connecting I-75 to the boulevard are on the right side of the freeway. This is a more traditional design, compared to Practical Alternative 5A, and means the following for traffic movement:
    - Southbound traffic on I-75 would stay to the left to remain on I-75 or exit on the right to access the service drive or boulevard.
    - Northbound traffic from the boulevard would enter I-75 on the right.
- The southbound I-75 exit allows vehicles two options:
    - Options 1: Vehicles would stay right and exit to the service drive, with access to:
        - Local connector roadway to Eastern Market, via left turn from the service drive
        - Brush Street, John R Street, Woodward Avenue and the existing service drive west of the project area.
    - Option 2: Vehicles would stay left to remain on the southbound Boulevard.
- At the south end of the project area, near Brush Avenue, the ramps connecting I-75 to the local streets are on the right side of the freeway, which is the same as in Practical Alternative 5A.
- The northbound I-75 exit to local streets allows vehicles two options:
    - Option 1: Vehicles would stay to the right to access the southbound boulevard.

    - Option 2: Vehicles would stay to the left to access the northbound Service Drive/Eastern Market.
- The northbound boulevard connects to I-75 as follows:
    - Vehicles would stay in the left three lanes to pass through the major intersection and continue to southbound I-75.
    - Vehicles would stay in the right two lanes to turn right onto the ramp to northbound I-75. The third lane from the left allows through or right turn movements.
- The ramps to and from Mack Avenue on I-75 are braided ramps. This means the ramps pass over other ramps to and from the boulevard using a bridge to separate the roadways. This separates ramp traffic and eliminates dangerous weaving and potential conflict points.
    - Impacts to local traffic related to the braided ramp layout at Mack Avenue include:
        - Vehicles coming from northbound boulevard would not able to exit to Mack Avenue.
        - Vehicles entering southbound I-75 from Mack Avenue would not able to exit to the boulevard.
        - Vehicles wishing to make the above movements would be required to use local streets.

The Practical Alternative 5B interchange changes connectivity to Madison Avenue, St. Antoine Street and Gratiot Avenue. The proposed layout is much different than existing conditions and Practical Alternative 5A, and is described below:

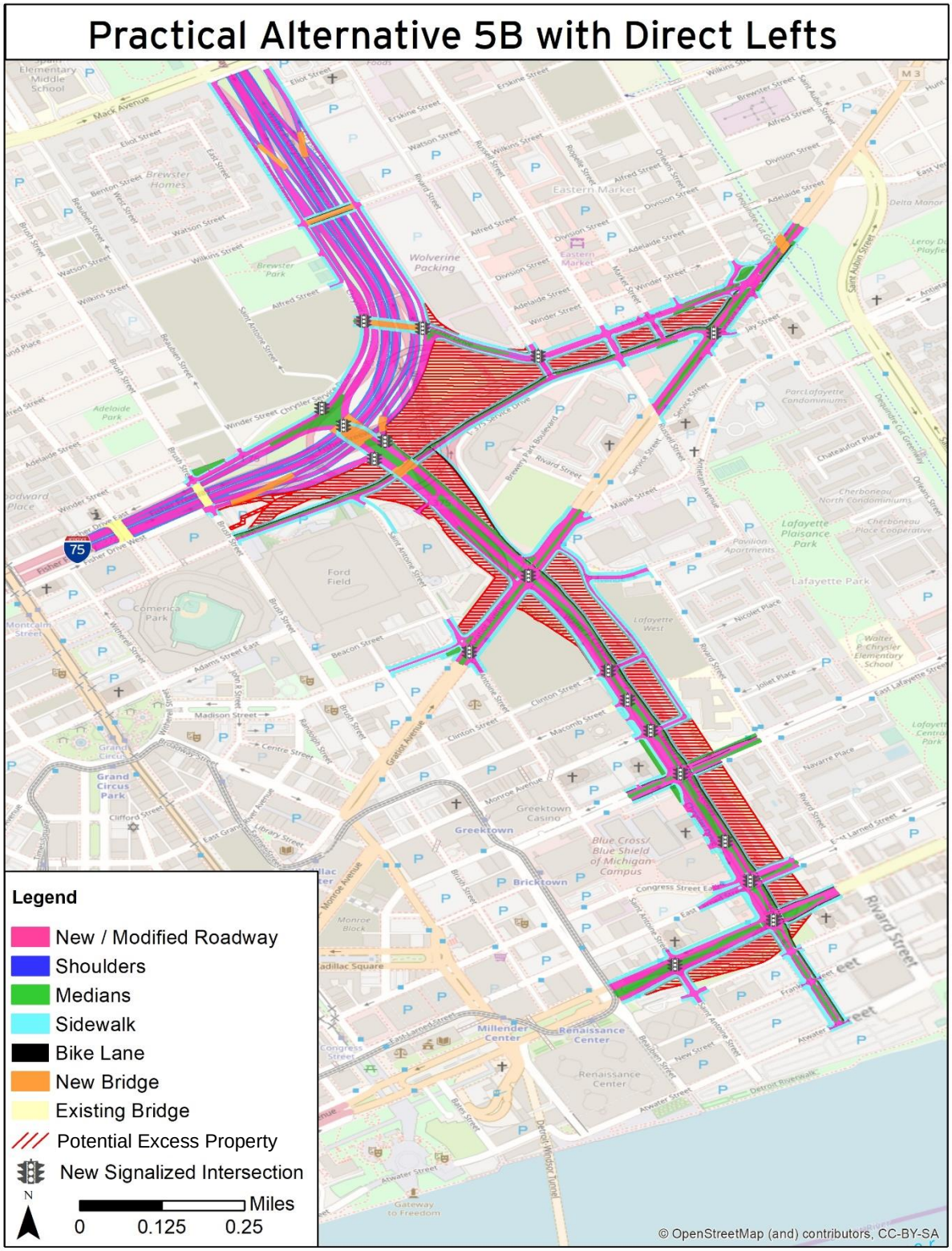
- Two lanes along southbound boulevard provide dual right-turn lanes to westbound Gratiot Avenue.
- On the westbound Gratiot Avenue approach, or section of roadway where vehicles from one direction are nearing the intersection of a crossing roadway, to the intersection of St. Antoine Street, there are three options:
    - Option 1: Vehicles would stay in the right two lanes to access westbound Madison Avenue.
        - Vehicles in the far-right lane would continue straight on westbound Madison Avenue or turn right to northbound St. Antoine Street.
    - Option 2: Vehicles would stay in the left three lanes to continue straight on westbound Gratiot Avenue.
    - Option 3: Vehicles would stay in the far-left lane to turn left on southbound St. Antoine Street, via a left-turn-only lane.
- St. Antoine Street is a two-way roadway through the intersection of Madison Avenue/Gratiot Avenue.
    - A right-turn lane on southbound St. Antoine Street provides access to westbound Madison Avenue and westbound Gratiot Avenue.
    - Left-turns will be prohibited from St. Antoine Street to Gratiot Avenue or westbound Madison Avenue.
- Madison Avenue is one-way westbound between Beaubien Street and Gratiot Avenue.

No comment - CEM 12/17/2020

    - Eastbound Madison Avenue connects to Gratiot Avenue via right-turns on either Beaubien or Brush streets.
- Left-turns are prohibited from eastbound Gratiot Avenue to St. Antoine Street or Madison Avenue.

No comment - CEM 12/17/2020

Figure 13: Practical Alternative 5B with Direct Lefts



Refinements were made to the local street design in the Eastern Market area, as described below:

- Montcalm Street extends to Jay Street, east of Gratiot Avenue, providing connectivity between neighborhoods north of Gratiot Avenue to those south of Gratiot Avenue.
    - Montcalm Street extension features one lane in each direction.
    - Parking lanes on both sides of the road.
- The New Local Connector extends east-to-west from the Southbound I-75 Service Drive to Gratiot Avenue. This provides connectivity between Brush Park and Gratiot Avenue.
    - The New Local Connector features two eastbound lanes and one westbound lane.
    - Parking lanes are on both sides of the roadway.
    - There are new signalized intersections at the following intersections:
        - Southbound I-75 Service Drive and New Local Connector
        - Northbound I-75 Service Drive and New Local Connector
        - Rivard Street and New Local Connector
        - Russell Street and New Local Connector
        - Jay Street/Montcalm Street and Gratiot Avenue
        - Southbound I-75 Off-ramp and boulevard
        - Northbound I-75 Off-ramp and boulevard
        - Northbound boulevard and Northbound I-75 On-ramp (pedestrian only)
        - Southbound I-75 Service Drive and boulevard (pedestrian only)

In this practical alternative, two-way cycle tracks are 10-feet wide, with the layout proposed as follows:

- On the east side of the boulevard, extending from Montcalm Street in the north to Atwater Street in the south.
- On the north side of Montcalm Street, extending from Brush Street in the west to the Dequindre Cut Greenway in the east.
    - The cycle track crosses Gratiot Avenue at a signalized intersection and continues north along Gratiot Avenue along Montcalm Street to connect to the Dequindre Cut Greenway.

South of Gratiot Avenue, the boulevard has signalized intersections with direct left-turns to and from the side streets. This design is the same as Practical Alternative 5A with Direct Lefts.

All pedestrians would cross the boulevard in two stages and there would be pedestrian signals. Right-turn on red will be prohibited for all westbound approaches with the cycle track. Pedestrian and bicycle path operations are the same as described for Practical Alternative 5A with Direct Lefts, in Section 3.5.1 of this document.

4.4.4 Practical Alternative 5B with Indirect Lefts

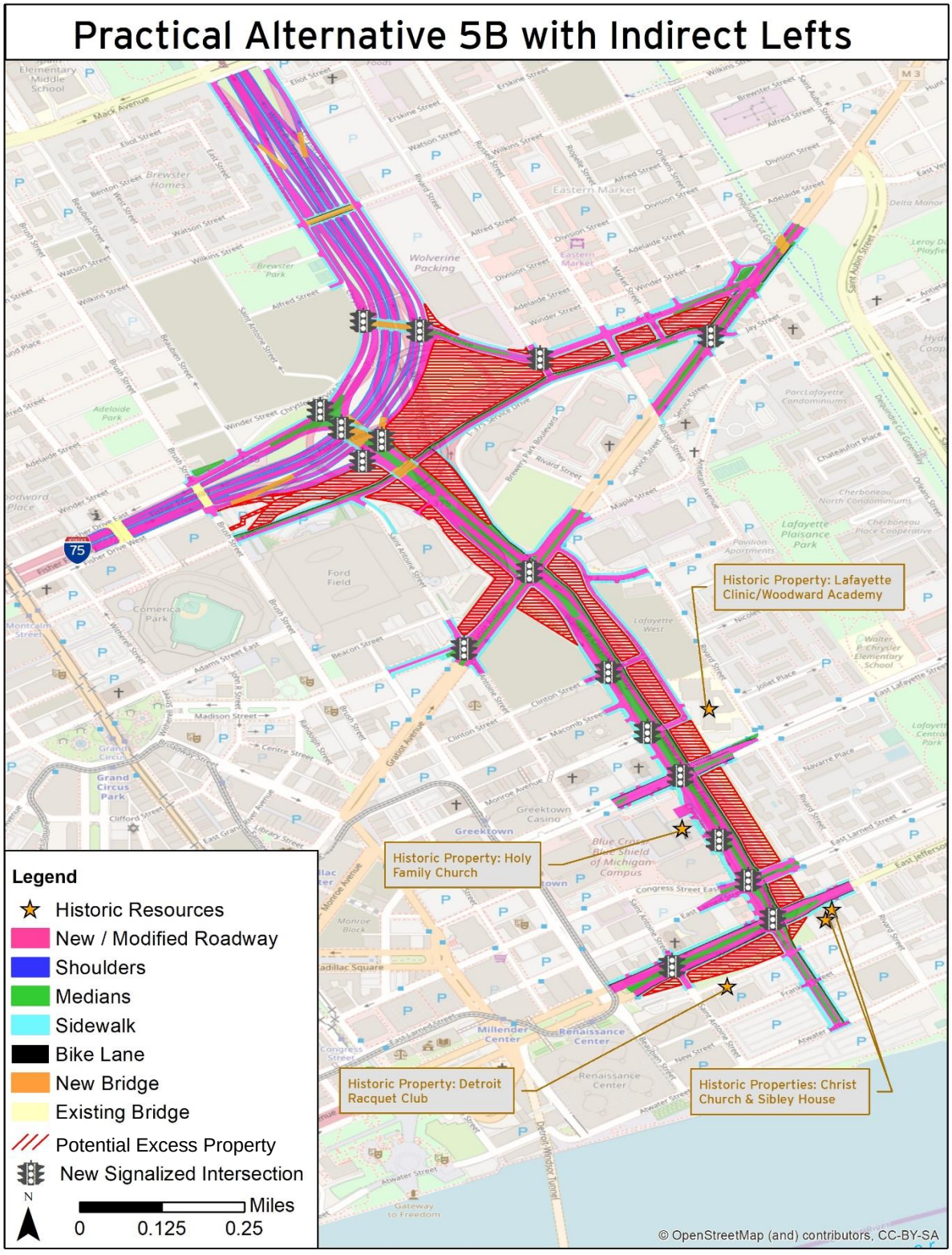
Practical Alternative 5B with Indirect Lefts is a combination of the Practical Alternative 5B interchange and the boulevard with indirect left-turns. The interchange concept is the same as Practical Alternative 5B with Direct Lefts, but the boulevard section is different south of Gratiot Avenue. The boulevard for Practical Alternative 5B with Indirect Lefts has indirect lefts in similar location as Practical Alternative 5A with Indirect Lefts, except the northbound to southbound cross-over was moved north of Clinton Street instead of south of Clinton Street.

In this practical alternative, the two-way cycle track layout is exactly the same as Practical Alternative 5B with Direct Lefts, as described in Section 3.5.3 of this document.

All pedestrians would cross the boulevard in two stages with pedestrian signals that operate exactly as proposed for Practical Alternative 5A with Indirect Lefts, as described in Section 3.5.2 of this document. **Figure 14** illustrates Practical Alternative 5B with Indirect Lefts.

No comment - CEM 12/17/2020

Figure 14: Practical Alternative 5B with Indirect Lefts



No comment - CEM 12/17/2020

5 Preferred Alternative

Each Practical Alternative was screened individually and equally throughout this process. A Final Screening of the alternatives was performed by the project Technical Team, comprised of Federal Highway Administration (FHWA), Michigan Department of Transportation (MDOT), the city of Detroit and the Southeast Michigan Council of Governments (SEMCOG). An evaluation was completed separately by each member of the Technical Team and was then calibrated collectively in a technical review session held on February 7, 2020. The purpose of this process was to create a unified outcome with input from all members of the Technical Team.

Overall, Practical Alternatives 5B Direct and 5B Indirect performed better than Practical Alternatives 5A Direct and 5A Indirect. Practical Alternative 5B better addresses the purpose of the project, safety, community access improvements, transit access, and non-motorized access.

Practical Alternative 5B with Direct Lefts outperformed Practical Alternative 5B with Indirect Lefts. The direct left turn option reduces the traffic on local streets, better accommodates truck traffic, and provides fewer unprotected conflict points and improved safety for bicyclists and pedestrians.

The results of the screening process are documented in the *I-375 Practical Alternative Screening Technical Memorandum*.

Appendix A-1 – I-375 Design Criteria

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
03/06/2020

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 /I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
	TRAFFIC								
1	Roadway Classification	AASHTO Chapter 1	Freeway (urban)	System Ramp (urban)	Arterial	Arterial	Minor Arterial	Local Roads	
2	Terrain	AASHTO Table 8-1 (p. 8-4) MDOT RDM Appendix 3A-4	Level	Level	Level	Level	Level	Level	
3	Existing ADT's (20XX)	XXXX	XX	XX	XX	XX	XX	XX	
4	Proposed AADT's (Projected to Year 2037-Peak Hour)	XXXX	XX	XX	XX	XX	XX	XX	
5	Design Level of Service	2011 AASHTO Table 2-5 (p. 2-67)	C	C	D	D	D	D	
6	Posted Speed	Field Review	55 mph (35 mph at terminal curve)	Not Posted	25 mph	375 Blvd: 35 mph Jefferson/Gratiot: 30 mph	30 mph	25 mph	
7	Design Speed	Mainline: AASHTO p. 8-1,8-2; MDOT RDM 3.06, Appendix 3A-1 Ramps: AASHTO Table 10-1 (p. 10-89); MDOT SP R-107-H; MDOT RDM 3.04.03	60 mph Desirable 55 mph Minimum (at terminal curve 40 mph; 35 mph min)	Upper Range: 50 mph Middle Range: 45 mph Lower Range: 30 mph	30 mph Desirable 25 mph Minimum	35 mph Desirable 30 mph Minimum	35 mph	30 mph	
8	Design Vehicle	MDOT RDM 3.07.01.B & AASHTO	WB-67	WB-67	WB-67	WB-67 (see note)	WB-50	CITY-BUS	For locations with limitted Right of Way (ROW), the designer should utilize compound curves and fit largest radius that avoids ROW impacts. These locations should be coordinated with MDOT Geometrics for approval.
	CROSS SECTION								
9	Median/Inside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	6'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
10	Outside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	8'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
11	Median Width	MDOT RDM Appendix 3A-2 MDOT GEO-670-E	26.67' paved if truck traffic > 250 veh DDHV 22.67' min	N/A	N/A	375 Blvd: 26' Jefferson: Match Existing Gratiot: Match Existing (22')	Match Existing (24')	N/A	
12	Curb Type	MDOT RDM Appendix 6-A MDOT RDM 7.01.34	Inside: 4' Valley Gutter adjacent to concrete barrier Outside: N/A (Fill), Type G1 (cut section)	Inside: Type D Outside: N/A (Fill), Type G1 (cut section)	Type E	Type F	Type E	Type E	MDOT preference for Type F curb, Type E provided where requested by City
13	Lane Width	Mainline - MDOT RDM Appendix 3A-1; AASHTO p. 4-7 Ramps - MDOT RDM 3.07.02.E; Appendix 6-A	12'	16'	12' desirable 11' min	12' Desirable 11' Min	Match Existing (11' min)	Match Existing (10' min) 11' for New Roadway	
14	Roadway Cross Slopes (normal section)	MDOT RDM 3.04; MDOT RDM Appendix 3A-4 MDOT SP R-107-H; AASHTO Table 4-6 (p. 4-6)	2%	2%	2%	2%	2%	2%	
15	Crown Point	MDOT RDM 6.09.01, MDOT SP R-107-H Scoping Report	TBD	N/A	TBD	Match Existing	Match Existing	Match Existing	
16	Crown Rollover	MDOT RDM 3.04	4%	4%	4%	4%	4%	4%	
17	Point of Rotation	MDOT RDM 3.04.01, MDOT SP R-107-H	TBD	Alignment edge/ Outside edge of traveled way	TBD	TBD	TBD	TBD	
18	Shoulder Cross Slopes	MDOT RDM 6.05.05.A MDOT RDM Appendix 3A-4	4%	4%	4%	4%	4%	4%	
19	Shoulder Rollover	MDOT SP R-107-H AASHTO Figure 4-2 (p. 4-3)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	
20	Gore Cross Slopes	MDOT RDM 3.07.02.B.6 MDOT GDG	8% Max.	8% Max.	8% Max.	N/A	N/A	N/A	
21	Algebraic Difference (Between Adjacent Lane & Gore)	MDOT RDM 3.07.02.B.6 MDOT GDG	6% Max. (5% Des.)	6% Max. (5% Des.)	6% Max. (5% Des.)	N/A	N/A	N/A	
22	Fill Slope	MDOT RDM 2.03.01	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	
23	Back/Cut Slope	MDOT RDM 2.03.01	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
03/06/2020

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 /I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
			HORIZONTAL ALIGNMENT						
24	Minimum Curve Length	MDOT RDM 3.03.01.B (15 times Design Speed Min./30 times Design Speed Des.)	825' Min., 1650' Des. (55 mph) 900' Min., 1800' Des. (60 mph)	450' Min, 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	375' Min, 750' Des (25 mph) 450' Min, 900' Des (30 mph)	450' Min, 900' Des (30 mph) 525' Min, 1050' Des (35 mph)	525' Min, 1050' Des	450' Min, 900' Des	
25	Minimum Curve Radii	MDOT RDM 3.04.03 / 3.07.02.D AASHTO Eqn 3-8 (p. 3-31) Ramp - MDOT SP R-107-H; RDM 03.07.02D	1008' R107, 1061' Straight (55 mph) 1263' R107 and 1333' Straight (60 mph)	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' R107, Straight (50 mph)	222' R107, 232' Straight (30 mph)	327' R107, 340' Straight (35 mph)	222' R107, 232' Straight (30 mph)	222' R107, 232' Straight (30 mph)	
26	Maximum Radius of Curve for Spiral	MDOT SP R-107-H (p. 3) AASHTO Table 3-2 (p. 3-71)	1531' (55 mph) 1822' (60 mph)	456' (30 mph) 1025' (45 mph) 1265'(50 mph)	456' (30 mph)	620' (35 mph) 456' (30 mph)	456' (30 mph)	456' (30 mph)	
27	Compound Circular Curve Ratio (Flatter to Sharper Ra	AASHTO p. 3-58 MDOT RDM 3.03.01.C	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	
28	Entrance Ramp Taper Rate (parallel)	MDOT GDG GEO-101-F AASHTO Table 10-3 (p. 10-110)	N/A	Design: 50:1 to 70:1 (AASHTO) - Uniform 50:1 to 70:1 taper where accel lane > 1,300 ft. 55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT)	N/A	N/A	N/A	N/A	
29	Entrance Ramp Taper Rate (tapered)	MDOT GDG GEO-100-F AASHTO Table 10-3 (p. 10-110)	N/A	Design: 50:1 to 70:1 (AASHTO) - Uniform 50:1 to 70:1 taper where decel lane > 1,300 ft. 55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT)	N/A	N/A	N/A	N/A	
30	Exit Ramp Taper Rate (Tapered)	MDOT GDG GEO-130-D AASHTO p. 10-112 & Figure 10-70 (10-114)	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
31	Exit Ramp Taper Rate (Parallel)	MDOT GDG GEO-131-D AASHTO Table p. 10-116	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
32	Acceleration Lane Length (one lane)	MDOT GDG GEO-101-F	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (La)	N/A	N/A	N/A	N/A	
33	Deceleration Lane Length (one lane; in weaving sections with a lane drop)	MDOT GDG GEO-130-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
34	Deceleration Lane Length (one lane)	MDOT GDG GEO-131-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
35	Ramp Terminals	MDOT GDG GEO-370-E	N/A	Detail dependent on traffic analysis	N/A	N/A	N/A	N/A	
36	Stopping Sight Distance	AASHTO Table 3-1 (p.3-4) MDOT RDM 3.03.01.D MDOT Sight Distance Guidelines - Exhibit 1 (p. 6)	570' (60 mph) 495' (55 mph)	425' (50 mph) 360' (45 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	250' (35 mph) 200' (30 mph)	250' (35 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	
37	Superelevation	MDOT RDM 3.04.03	5% Desirable/6% Maximum SB I-75 to SB I-75 6% based on straight line	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	
38	Superelevation Transition Length Split Inside Curve	MDOT SP R-107-H MDOT RDM 3.04.02	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	
39	Shoulder Cross Slope Transition Distance (to match bridge shoulder cross slope)	MDOT SP R-107-H (p. 1)	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	
40	Delta Max (Δ%)	MDOT SP R-107-H MDOT RDM 3.04.03 AASHTO Table 3-15 (p. 3-61)	.47% (55 mph) .45% (60 mph)	.50% (50 mph) .54% (45 mph) .66% (30 mph)	0.66%	.62% (35 mph) .66% (30 mph)	0.66%	0.66%	
41	Clear Zone Distances	MDOT RDM 7.01.11.C	18' (1:3 cut) 22' (1:4 - 1:5 cut), 40' (1:4 - 1:5 fill) 26' (1:6 or flatter cut), 30' (1:6 or flatter fill)	16' (1:3 cut) 18' (1:4 - 1:5 cut), 30' (1:4 - 1:5 fill) 22' (1:6 or flatter cut), 22' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	Maximum clear zone values from MDOT RDM 7.01.11.C are desirable and should be used where possible. Clear zone minimums can be used if maximums not achievable.
42	Curve Correction Factors	MDOT RDM 7.01.11.D	Varies based on radius of curve 1.2 to 1.5	Varies based on radius of curve 1.1 to 1.5	N/A	N/A	N/A	N/A	

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
03/06/2020

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 /I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
	VERTICAL ALIGNMENT								
43	Maximum grade	AASHTOTable 8-1 (p. 8-4) AASHTO 10.9.6 (p. 10-93) MDOT RDM Appendix 3A-4	4% (60 mph) 5% (55 mph)	5% Maximum	8%	7%	7%	8%	
44	Minimum grade	AASHTO p. 3-119	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	
45	K-Value (Crest)	AASHTO Table 3-34 (p. 3-155) MDOT Sight Distance Guidelines - Exhibit 5 (p. 13)	114 (55 mph) 151 (60 mph)	84 (50 mph) 61 (45 mph) 19 (30 mph)	19 (30 mph) 12 (25 mph)	29 (35 mph) 19 (30 mph)	29	12	
46	K-Value (Sag)	AASHTO Table 3-36 (p. 3-161) MDOT Sight Distance Guidelines - Exhibit 6 (p. 16)	115 (55 mph) 136 (60 mph)	96 (50 mph) 79 (45 mph) 37 (30 mph)	37 (30 mph) 26 (25 mph)	49 (35 mph) 37 (30 mph)	49	26	
47	Stopping Sight Distance	AASHTO Table 3-2 (p. 3-5) MDOT RDM 3.03.02.C MDOT Sight Distance Guidelines - Exhibit 5 & 6 (p. 13 & 16)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	
48	Minimum Vertical Curve Length	MDOT RDM 3.03.02.B (3 times Design Speed) AASHTO p. 3-153	165 (55 mph) 180 (60 mph)	150 (50 mph) 135 (45 mph) 90 (30 mph)	90 (30 mph) 75 (25 mph)	105 (35 mph) 90 (30 mph)	105	90	
49	Vertical Clearance (Final Condition)	MDOT RDM 3.12.G & Appendix 3A-4 MDOT BDM 7.01.08.A (Exempt Structures.pdf on BDM site)	16'-3" (Des) I-75 Only 16'-0" (Min) I-75 Only	14'-9" (Des) 14'-6" (Min) (Boulevard will be designated special Route)	N/A	N/A	N/A	14'-9" (Des) 14'-6" (Min)	
50	Vertical Clearance (Temporary During Construction)	Proposed Design	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	

Sources:

1. AASHTO = American Association of State Highway & Transportation Officials - A Policy on Geometric Design of Highways & Streets 2011
2. MDOT RDM = Michigan Department of Transportation Road Design Manual
3. MDOT SP = Michigan Department of Transportation Standard Plans
4. MDOT GDG = Michigan Department of Transportation Geometric Design Guide
5. MDOT BDM = Michigan Department of Transportation Bridge Design Manual

No comment - CEM 12/17/2020

Appendix A-2 – Analysis of Existing Geometry

No comment - CEM 12/17/2020

I-375 ENGINEERING EVALUATION
ANALYSIS OF EXISTING GEOMETRY FOR DEFICIENCIES

No.	Roadway	Location	II. Design Exception Element	II. Existing Condition	III. Standard for Feature	IV. Meets Criteria? (Y/N)	Notes
1	I-75 NB/SB	Mainline from Ped bridge to Mack Ave	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 200, K = 250 Sag: K = 150	Crest: K = 151 Sag: K = 136	Y	
2	I-75 NB/SB	Mainline from Ped bridge to Mack Ave	**Lane Width**	12'	12'	Y	
3	I-75 NB/SB	Mainline from Woodward to Brush	**Stopping Sight Distance (Vertical Curve - K)**	Sag: K = 150	Crest: K = 151 Sag: K = 136	Y	
4	I-75 NB/SB	Mainline from Ped bridge to Mack Ave	**Lane Width**	12'	12'	Y	
5	SB I-375	Mainline from Interchange to Monroe	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 151, 208 Sag: K = **60**	Crest: K = 151 Sag: K = 136	**Y/N**	First Sag curve fails, the rest meet or exceed standard
6	SB I-375	Mainline from Interchange to Monroe	**Lane Width**	12'	12'	Y	
7	NB I-375	Mainline from Interchange to Monroe	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 151, 163 Sag: K = **50**	Crest: K = 151 Sag: K = 136	**Y/N**	First Sag curve fails, the rest meet or exceed standard
8	NB I-375	Mainline from Interchange to Monroe	**Lane Width**	12'	12'	Y	
9	NB/SB I-375	Mainline from Monroe to Jefferson	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 235, 161 Sag: K = 166, 98, 124	Crest: K = 44 Sag: K = 64	Y	Speed drops to 35
10	NB/SB I-375	Mainline from Monroe to Jefferson	**Lane Width**	12'	12'	Y	
11	NB/SB I-375	Mainline from Monroe to Jefferson	**Horizontal Curve Radius**	R = 340'	327' R107, 340' Straight (35 mph) 464' R107, 485' Straight (40 mph)	Y	Meets Posted Straight Speed
12	NB/SB I-375	Mainline from Monroe to Jefferson	**Horizontal Curve Length**	L = 572'	525' Min 1050' Des (35 mph) 600' Min, 1200' Des (40 mph)	Y	Exceeds minimum, but higher radii is desired
13	I-75/Gratiot Connector	EB, Brush to Gratiot	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 220, Sag: K = **87**	Crest: K = 151 Sag: K = 136	**Y/N**	No Speed limit sign lowering speed. Assume 55 until the Gratiot intersection
14	I-75/Gratiot Connector	EB, Brush to Gratiot	**Inside Shoulder Width**	4'/8'/12'	10' minimum	**N**	Inside Shoulder width tightens between SB I-75/EB Gratiot Ramp and Russel. 12' should be considered
15	I-75/Gratiot Connector	EB, Brush to Gratiot	**Outside Shoulder Width**	10'	10' minimum	Y	12' should be considered
16	I-75/Gratiot Connector	WB, Gratiot to Brush	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 200, Sag: K = 100	Crest: K = 29, Sag: K = 49	Y	Assume 30 mph posted speed continuing from Gratiot
17	NB I-75 to SB I-375 Ramp	NB I-75 to SB I-375 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 42, Sag: K = 65	Crest: K = 29, Sag: K = 49	Y	

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I-375 ENGINEERING EVALUATION
ANALYSIS OF EXISTING GEOMETRY FOR DEFICIENCIES

No.	Roadway	Location	II. Design Exception Element	II. Existing Condition	III. Standard for Feature	IV. Meets Criteria? (Y/N)	Notes
18	NB I-75 to SB I-375 Ramp	NB I-75 to SB I-375 Ramp	**Horizontal Curve Radius**	Radius = 688', 550'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	Exceeds minimum, but higher radii is desired
19	NB I-75 to SB I-375 Ramp	NB I-75 to SB I-375 Ramp	**Horizontal Curve Length**	L = **305', 382'**	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**N**	Both ramps fail minimum
20	NB I-75 to SB I-375 Ramp	NB I-75 to SB I-375 Ramp	**Decel Lane Length**	Ld = 250'	GEO-130 Minimum Ld = 300'	**N**	
21	NB I-75 to SB I-375 Ramp	NB I-75 to SB I-375 Ramp	**Accel Lane Length**	La = 188'	GEO-100 Minimum La = 550'	**N**	
22	NB I-75 to NB I-75 Ramp	NB I-75 to NB I-75 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 46, Sag: K = 65, 67	Crest: K = 29, Sag: K = 49	Y	
23	NB I-75 to NB I-75 Ramp	NB I-75 to NB I-75 Ramp	**Horizontal Curve Radius**	Radius = 688', 312'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	Exceeds minimum, but higher radii is desired
24	NB I-75 to NB I-75 Ramp	NB I-75 to NB I-75 Ramp	**Horizontal Curve Length**	L = **305'**, 615'	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**Y/N**	First curve fails, second exceeds minimum, but higher radii is desired
25	NB I-75 to NB I-75 Ramp	NB I-75 to NB I-75 Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
26	NB I-75 to NB I-75 Ramp	NB I-75 to NB I-75 Ramp	**Accel Lane Length**	La = NA	GEO-110 - No La	NA	Force-merge
27	NB I-375 to EB Gratiot Connector Ramp	NB I-375 to EB Gratiot Connector Ramp	**Horizontal Curve Radius**	R = 300'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	Exceeds minimum, but higher radii is desired
28	NB I-375 to EB Gratiot Connector Ramp	NB I-375 to EB Gratiot Connector Ramp	**Horizontal Curve Length**	L = 376'	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**N**	
29	NB I-375 to EB Gratiot Connector Ramp	NB I-375 to EB Gratiot Connector Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
30	NB I-375 to EB Gratiot Connector Ramp	NB I-375 to EB Gratiot Connector Ramp	**Accel Lane Length**	La = 141'	GEO-100 Minimum La = 550'	**N**	Assuming 55 mph posted
31	NB I-375 to SB I-75 Ramp	NB I-375 to SB I-75 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 29, 63, Sag: K = **40**, 53, 150	Crest: K = 29, Sag: K = 49	**Y/N**	First Sag curve fails, the rest exceed standard
32	NB I-375 to SB I-75 Ramp	NB I-375 to SB I-75 Ramp	**Horizontal Curve Radius**	R = 312', 285', 984'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	
33	NB I-375 to SB I-75 Ramp	NB I-375 to SB I-75 Ramp	**Horizontal Curve Length**	L = 376', 1030'	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**Y/N**	First curve fails, second exceeds minimum, but higher radii is desired
34	NB I-375 to SB I-75 Ramp	NB I-375 to SB I-75 Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld

No comment - CEM 12/17/2020

I-375 ENGINEERING EVALUATION
ANALYSIS OF EXISTING GEOMETRY FOR DEFICIENCIES

No.	Roadway	Location	II. Design Exception Element	II. Existing Condition	III. Standard for Feature	IV. Meets Criteria? (Y/N)	Notes
35	NB I-375 to SB I-75 Ramp	NB I-375 to SB I-75 Ramp	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
36	SB I-75 to SB I-75 Ramp	SB I-75 to SB I-75 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 85, 49 Sag: K = 49, 87	Crest: K = 29, Sag: K = 49	Y	
37	SB I-75 to SB I-75 Ramp	SB I-75 to SB I-75 Ramp	**Horizontal Curve Radius**	R = 570', 1000'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	Exceeds minimum, but higher radii is desired for first curve
38	SB I-75 to SB I-75 Ramp	SB I-75 to SB I-75 Ramp	**Horizontal Curve Length**	L = 623', **259'**	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**Y/N**	First curve pass, second curve fails
39	SB I-75 to SB I-75 Ramp	SB I-75 to SB I-75 Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
40	SB I-75 to SB I-75 Ramp	SB I-75 to SB I-75 Ramp	**Accel Lane Length**	La = NA	GEO-110 - No La	NA	2 lane ramps don't have La
41	SB I-75 to EB Gratiot Connector Ramp	SB I-75 to EB Gratiot Connector Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 96, 69, Sag: K = 61	Crest: K = 29, Sag: K = 49	Y	
42	SB I-75 to EB Gratiot Connector Ramp	SB I-75 to EB Gratiot Connector Ramp	**Horizontal Curve Radius**	R = 582', 310', 884'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	Exceeds minimum, but higher radii is desired
43	SB I-75 to EB Gratiot Connector Ramp	SB I-75 to EB Gratiot Connector Ramp	**Horizontal Curve Length**	L = 636', 978', **329'**	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**Y/N**	First and second curve pass, last curve fails
44	SB I-75 to EB Gratiot Connector Ramp	SB I-75 to EB Gratiot Connector Ramp	**Decel Lane Length**	Ld = 372'	GEO-131 Ld = 300'	Y	
45	SB I-75 to EB Gratiot Connector Ramp	SB I-75 to EB Gratiot Connector Ramp	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
46	WB Gratiot Connector to NB I-75 Ramp	WB Gratiot Connector to NB I-75 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 90, Sag: K = 114	Crest: K = 29, Sag: K = 49	Y	
47	WB Gratiot Connector to NB I-75 Ramp	WB Gratiot Connector to NB I-75 Ramp	**Horizontal Curve Radius**	R = 526', 700'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	
48	WB Gratiot Connector to NB I-75 Ramp	WB Gratiot Connector to NB I-75 Ramp	**Horizontal Curve Length**	L = **377', 427'**	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**N**	
49	WB Gratiot Connector to NB I-75 Ramp	WB Gratiot Connector to NB I-75 Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
50	WB Gratiot Connector to NB I-75 Ramp	WB Gratiot Connector to NB I-75 Ramp	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
51	WB Gratiot Connector to SB I-75 Ramp	WB Gratiot Connector to SB I-75 Ramp	**Stopping Sight Distance (Vertical Curve - K)**	Crest: K = 66, 44 Sag: K = **40, 44**	Crest: K = 29, Sag: K = 49	**Y/N**	Crest passes, sag fails

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I-375 ENGINEERING EVALUATION
ANALYSIS OF EXISTING GEOMETRY FOR DEFICIENCIES

No.	Roadway	Location	II. Design Exception Element	II. Existing Condition	III. Standard for Feature	IV. Meets Criteria? (Y/N)	Notes
52	WB Gratiot Connector to SB I-75 Ramp	WB Gratiot Connector to SB I-75 Ramp	**Horizontal Curve Radius**	R = 538', 310'	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	Y	
53	WB Gratiot Connector to SB I-75 Ramp	WB Gratiot Connector to SB I-75 Ramp	**Horizontal Curve Length**	L = **396'**, 674'	450' Min 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	**Y/N**	First curve fails, second exceeds minimum, but higher radii is desired
54	WB Gratiot Connector to SB I-75 Ramp	WB Gratiot Connector to SB I-75 Ramp	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
55	WB Gratiot Connector to SB I-75 Ramp	WB Gratiot Connector to SB I-75 Ramp	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
56	SB I-375 to Madison Offamp	SB I-375 to Madison	**Decel Lane Length**	La = NA	GEO-131 Minimum Ld = 300'	NA	Inside Exit Ramp
57	SB I-375 to Madison Offamp	SB I-375 to Madison	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
58	Madison to NB I-375 Onramp	Madison to NB I-375	**Decel Lane Length**	La = NA	GEO-131 Minimum Ld = 300'	NA	
59	Madison to NB I-375 Onramp	Madison to NB I-375	**Accel Lane Length**	La = 270'	GEO-101 Minimum La = 550'	Y	Inside Entrance Ramp. Measured from aerial. Not correct in exhibit
60	Brush to EB Gratiot Connector Ramp	Brush to EB Gratiot Connector Ramp	**Accel Lane Length**	La = 550	GEO-100 Minimum La = 550'	Y	
61	SB I-375 to SB Service Drive Offramp	SB I-375 to SB Service Drive / Monroe	**Decel Lane Length**	Ld = NA	GEO-140 - No Ld	NA	2 lane exits don't have Ld
62	NB Service Drive to NB I-375 Onramp	Monroe / NB Service Drive to NB I-375	**Accel Lane Length**	La = NA	GEO-101 Minimum La = 550'	NA	
63	SB I-375 to SB Service Drive Offramp	SB I-375 to SB Service Drive / Larned	**Decel Lane Length**	La = NA	GEO-131 = 300'	NA	
64	NB Service Drive to NB I-375 Onramp	NB Service Drive / Larned to NB I-375	**Accel Lane Length**	La = NA	GEO-101 = 550'	NA	

No comment - CEM 12/17/2020

Appendix A-3 – Practical Alternative 5A Geometric Review

No comment - CEM 12/17/2020

I-375 Improvement Project

Comment Resolution Form

			Date	Initial
Project/Program Name	I-375 Improvement Project			
HNTB Job No.	60798			
Deliverable Name	Preferred Alternative Conceptual Geometry	**Submitted for Review**	10/12/18	MSH
Phase	Varies	**Changes Made**	10/18/18	CB
Deliverable Manager	John Baldauf, PE	**All Changes Verified**	10/19/18	MSH/JEB
Functional Group/Firm	HNTB I-375 Project Team			
Reviewer Name	Imad Gedaoun, PE			
Functional Group	MDOT			
Review Type	Client/Third Party Review			

ID	Sheet Name/Section/Para	Page/Sheet/Slide No.	Comment Made by Initials	Comment (Limit to One Item Per Row)	Agree	Response	Verified/ Initials
1	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	Super elevations should be taken from a consistent table. The current design uses a mix of the R107 (7%), the straight line (6%), and straight line urban (5%).	Agree	All supers updated to the staight line (6%) table	MSH
2	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	A (internal) design exception will be required for the SB I-75 horizontal curve proposed to be designed using e=6% vs. e=5%.	Agree	A design exception will be processed during the design phase.	JEB
3	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	The geometric plan sheet callouts and geometric table are difficult to interpret. Add ramp geometric dimensions to the plan sheet.	Agree	The ramp decel/accel dimensions were added to the interchange sheet and color coded callouts were added corresponding to the goemetric tables. A new table was created to display curve data which corresponds to the blue callouts. Ramp geometric data is displayed in the orange table which corresponds to the orange callouts on the interchange sheet.	MSH
4	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	Add information to the Brush St Police controlled entrance ramp. Set the width to 14-15' wide and add roll curb with a truck apron based on a city bus design vehicle if overtracking occurs.	Agree	The ramp geometry is based on a city bus design vehicle and has a 2-way configuration with a tight 60' radius. A curve label was added to the geometric sheet.	MSH
5	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	The Brush St exit ramp from I-75 SB is not designed to standard.	Agree	The ramp was modified based on GEO-370. The additional lanes were added to the inside of the curve to allow the radius and super elevation to meet standard.	MSH
6	Geometric meeting (10/12/2018)	Interchange Sheet	I.Gedaoun	The the first curve for the SB I-75 exit to I-375 should be designed for 55 mph, not 50 mph.	Agree	Curve updated	MSH
7	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Design Vehicle criteria should reference AASHTO, not MDOT RDM.	Agree	Design Criteria table updated.	MSH
8	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Use WB-67 for all movements except Larned and local roads. For locations with limitted Right of Way (ROW), the designer should utilize compound curves and fit largest radius that avoids ROW impacts. These locations should be coordinated with MDOT Geometrics for approval.	Agree	Design Criteria table updated.	MSH
9	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Change the classification of Larned to Minor Arterial.	Agree	Design Criteria table updated.	MSH
10	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Delete slip ramp classification column from the Design Criteria table.	Agree	Design Criteria table updated.	MSH
11	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Verify median width for the "Freeway I-75 and I-375" column is 26.67-ft, not 24.67-ft. Update accordingly.	Agree	Design Criteria table updated.	JEB
12	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Modify curb types to address the following comments: - For the System Ramp criteria, add a footnote "Cut sections use Type G1 on the outside." - For the 375 Boulevard, Jefferson, Gratiot criteria, change curb to Type F.	Agree	Design Criteria table updated.	MSH
13	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Change backslope/foreslope to 1:4 (preferred), 1:3 (min).	Agree	Design Criteria table updated.	MSH
14	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Modify clearzone offsets to high end of the table range.	Agree	Design Criteria table updated.	MSH

No comment - CEM 12/17/2020

I-375 Improvement Project

Comment Resolution Form

Project/Program Name	I-375 Improvement Project		**Date**	**Initial**
HNTB Job No.	60798			
Deliverable Name	Preferred Alternative Conceptual Geometry	**Submitted for Review**	10/12/18	MSH
Phase	Varies	**Changes Made**	10/18/18	CB
Deliverable Manager	John Baldauf, PE	**All Changes Verified**	10/19/18	MSH/JEB
Functional Group/Firm	HNTB I-375 Project Team			
Reviewer Name	Imad Gedaoun, PE			
Functional Group	MDOT			
Review Type	Client/Third Party Review			

ID	Sheet Name/Section/Para	Page/Sheet/Slide No.	Comment Made by Initials	Comment (Limit to One Item Per Row)	Agree	Response	Verified/ Initials
15	Geometric meeting (10/12/2018)	Design Criteria	I.Gedaoun	Verify turning movements for the design vehicle are accommodated for the Monroe/New Local Road intersection.	Agree	Turning movements veirified and design updated accordingly.	MSH

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
10/29/2018

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 and I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
			TRAFFIC						
1	Roadway Classification	AASHTO Chapter 1	Freeway (urban)	System Ramp (urban)	Arterial	Arterial	Minor Arterial	Local Roads	
2	Terrain	AASHTO Table 8-1 (p. 8-4) MDOT RDM Appendix 3A-4	Level	Level	Level	Level	Level	Level	
3	Existing ADT's (20XX)	XXXX	XX	XX	XX	XX	XX	XX	
4	Proposed AADT's (Projected to Year 2037-Peak Hour)	XXXX	XX	XX	XX	XX	XX	XX	
5	Design Level of Service	2011 AASHTO Table 2-5 (p. 2-67)	C	C	D	D	D	D	
6	Posted Speed	Field Review	55 mph (35 mph at terminal curve)	Not Posted	25 mph	375 Blvd: 35 mph Jefferson/Gratiot: 30 mph	30 mph	25 mph	
7	Design Speed	Mainline: AASHTO p. 8-1,8-2; MDOT RDM 3.06, Appendix 3A-1 Ramps: AASHTO Table 10-1 (p. 10-89); MDOT SP R-107-H; MDOT RDM 3.04.03	60 mph Desirable 55 mph Minimum (at terminal curve 40 mph; 35 mph min)	Upper Range: 50 mph Middle Range: 45 mph Lower Range: 30 mph	30 mph Desirable 25 mph Minimum	35 mph Desirable 30 mph Minimum	35 mph	30 mph	
8	Design Vehicle	MDOT RDM 3.07.01.B & AASHTO	WB-67	WB-67	WB-67	WB-67 (see note)	WB-50	CITY-BUS	For locations with limitted Right of Way (ROW), the designer should utilize compound curves and fit largest radius that avoids ROW impacts. These locations should be coordinated with MDOT Geometrics for approval.
			CROSS SECTION						
9	Median/Inside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	6'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
10	Outside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	8'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
11	Median Width	MDOT RDM Appendix 3A-2 MDOT GEO-670-E	26.67' paved if truck traffic > 250 veh DDHV 22.67' min	N/A	N/A	375 Blvd: 26' Jefferson: Match Existing Gratiot: Match Existing (22')	Match Existing (24')	N/A	
12	Curb Type	MDOT RDM Appendix 6-A MDOT RDM 7.01.34	Inside: 4' Valley Gutter adjacent to concrete barrier Outside: N/A (Fill), Type G1 (cut section)	Inside: Type D Outside: N/A (Fill), Type G1 (cut section)	Type E	Type F	Type E	Type E	MDOT preference for Type F curb, Type E provided where requested by City
13	Lane Width	Mainline - MDOT RDM Appendix 3A-1; AASHTO p. 4-7 Ramps - MDOT RDM 3.07.02.E; Appendix 6-A	12'	16'	12' desirable 11' min	12' Desirable 11' Min	Match Existing (11' min)	Match Existing (10' min) 11' for New Roadway	
14	Roadway Cross Slopes (normal section)	MDOT RDM 3.04; MDOT RDM Appendix 3A-4 MDOT SP R-107-H; AASHTO Table 4-6 (p. 4-6)	2%	2%	2%	2%	2%	2%	
15	Crown Point	MDOT RDM 6.09.01, MDOT SP R-107-H Scoping Report	TBD	N/A	TBD	Match Existing	Match Existing	Match Existing	
16	Crown Rollover	MDOT RDM 3.04	4%	4%	4%	4%	4%	4%	
17	Point of Rotation	MDOT RDM 3.04.01, MDOT SP R-107-H	TBD	Alignment edge/ Outside edge of traveled way	TBD	TBD	TBD	TBD	
18	Shoulder Cross Slopes	MDOT RDM 6.05.05.A MDOT RDM Appendix 3A-4	4%	4%	4%	4%	4%	4%	
19	Shoulder Rollover	MDOT SP R-107-H AASHTO Figure 4-2 (p. 4-3)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	
20	Gore Cross Slopes	MDOT RDM 3.07.02.B.6 MDOT GDG	8% Max.	8% Max.	8% Max.	N/A	N/A	N/A	
21	Algebraic Difference (Between Adjacent Lane & Gore)	MDOT RDM 3.07.02.B.6 MDOT GDG	6% Max. (5% Des.)	6% Max. (5% Des.)	6% Max. (5% Des.)	N/A	N/A	N/A	
22	Fill Slope	MDOT RDM 2.03.01	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	
23	Back/Cut Slope	MDOT RDM 2.03.01	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	
			HORIZONTAL ALIGNMENT						
24	Minimum Curve Length	MDOT RDM 3.03.01.B (15 times Design Speed Min./30 times Design Speed Des.)	825' Min., 1650' Des. (55 mph) 900' Min., 1800' Des. (60 mph)	450' Min, 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	375' Min, 750' Des (25 mph) 450' Min, 900' Des (30 mph)	450' Min, 900' Des (30 mph) 525' Min, 1050' Des (35 mph)	525' Min, 1050' Des	450' Min, 900' Des	
25	Minimum Curve Radii	MDOT RDM 3.04.03 / 3.07.02.D AASHTO Eqn 3-8 (p. 3-31) Ramp - MDOT SP R-107-H; RDM 03.07.02D	1008' R107, 1061' Straight (55 mph) 1412' R107 and Straight (60 mph)	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' Min, 833' Des (50 mph)	222' R107, 232' Straight (30 mph)	327' R107, 340' Straight (35 mph)	222' R107, 232' Straight (30 mph)	222' R107, 232' Straight (30 mph)	
26	Maximum Radius of Curve for Spiral	MDOT SP R-107-H (p. 3) AASHTO Table 3-2 (p. 3-71)	1531' (55 mph) 1822' (60 mph)	456' (30 mph) 1025' (45 mph) 1265'(50 mph)	456' (30 mph)	620' (35 mph) 456' (30 mph)	456' (30 mph)	456' (30 mph)	
27	Compound Circular Curve Ratio (Flatter to Sharper Rad	AASHTO p. 3-58 MDOT RDM 3.03.01.C	1.5:1	2:1	1.5:1	1.5:1	1.5:1	1.5:1	
28	Entrance Ramp Taper Rate (parallel)	MDOT GDG GEO-101-F AASHTO Table 10-3 (p. 10-110)	N/A	Conceptual: 2° Max. at Brush St Design: 55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT) 50:1 to 70:1 (AASHTO)	N/A	N/A	N/A	N/A	

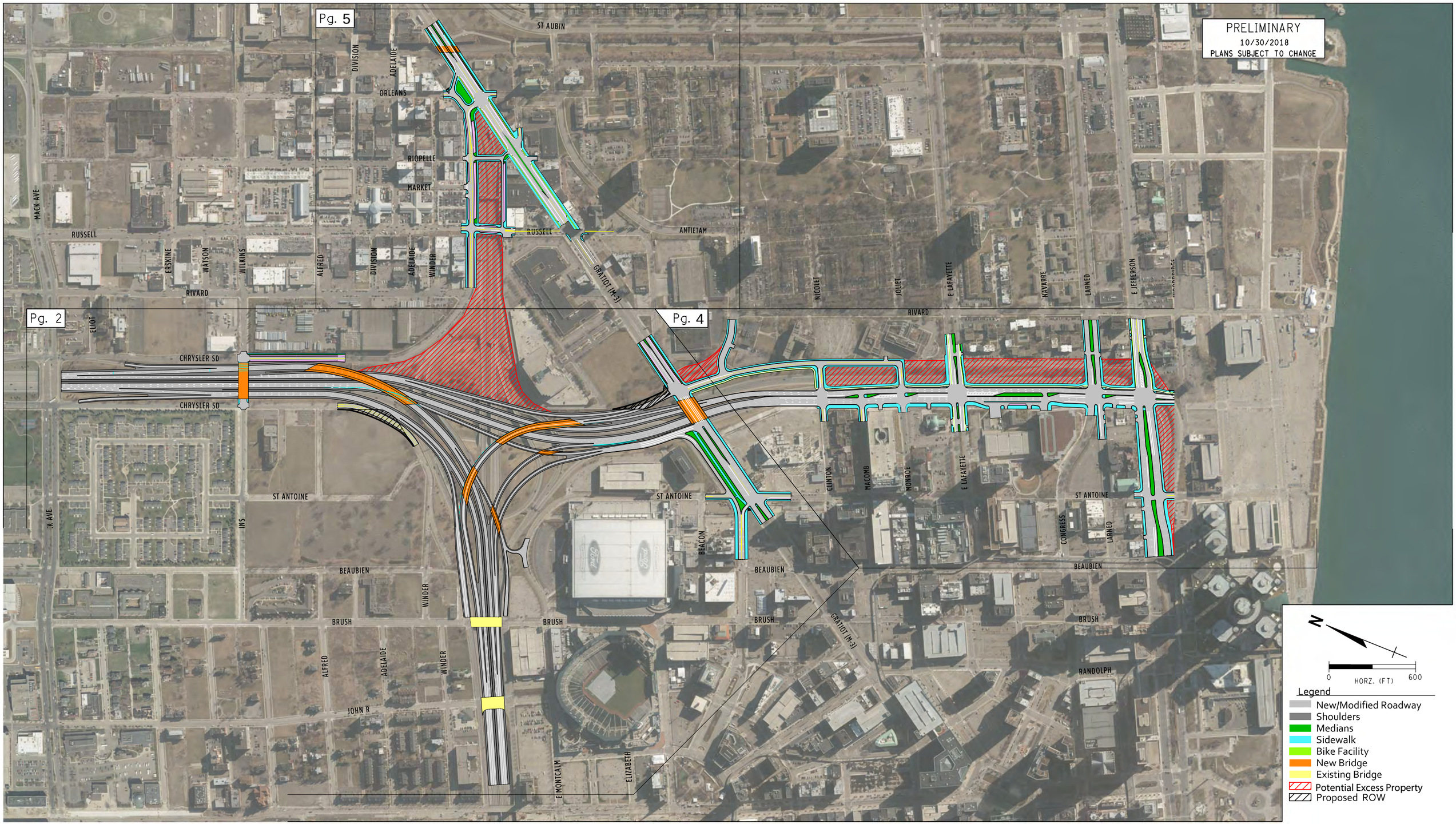
No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
10/29/2018

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 and I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
29	Entrance Ramp Taper Rate (tapered)	MDOT GDG GEO-100-F AASHTO Table 10-3 (p. 10-110)	N/A	55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT) 50:1 to 70:1 (AASHTO)	N/A	N/A	N/A	N/A	
30	Exit Ramp Taper Rate (Tapered)	MDOT GDG GEO-130-D AASHTO p. 10-112 & Figure 10-70 (10-114)	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
31	Exit Ramp Taper Rate (Parallel)	MDOT GDG GEO-131-D AASHTO Table p. 10-116	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
32	Acceleration Lane Length (one lane)	MDOT GDG GEO-101-F	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (La)	N/A	N/A	N/A	N/A	
33	Deceleration Lane Length (one lane; in weaving sections with a lane drop)	MDOT GDG GEO-130-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
34	Deceleration Lane Length (one lane)	MDOT GDG GEO-131-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
35	Ramp Terminals	MDOT GDG GEO-370-E	N/A	Detail dependent on traffic analysis	N/A	N/A	N/A	N/A	
36	Stopping Sight Distance	AASHTO Table 3-1 (p.3-4) MDOT RDM 3.03.01.D MDOT Sight Distance Guidelines - Exhibit 1 (p. 6)	570' (60 mph) 495' (55 mph)	425' (50 mph) 360' (45 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	250' (35 mph) 200' (30 mph)	250' (35 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	
37	Superelevation	MDOT RDM 3.04.03	5% max SB I-75 to SB I-75 6% based on straight line	5% Maximum	5%	5%	5%	5%	
38	Superelevation Transition Length Split Inside Curve	MDOT SP R-107-H MDOT RDM 3.04.02	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	
39	Shoulder Cross Slope Transition Distance (to match bridge shoulder cross slope)	MDOT SP R-107-H (p. 1)	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	
40	Delta Max (Δ%)	MDOT SP R-107-H MDOT RDM 3.04.03 AASHTO Table 3-15 (p. 3-61)	.47% (55 mph) .45% (60 mph)	.50% (50 mph) .54% (45 mph) .66% (30 mph)	0.66%	.62% (35 mph) .66% (30 mph)	0.66%	0.66%	
41	Clear Zone Distances	MDOT RDM 7.01.11.C	18' (1:3 cut) 22' (1:4 - 1:5 cut), 40' (1:4 - 1:5 fill) 26' (1:6 or flatter cut), 30' (1:6 or flatter fill)	16' (1:3 cut) 18' (1:4 - 1:5 cut), 30' (1:4 - 1:5 fill) 22' (1:6 or flatter cut), 22' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	Maximum clear zone values from MDOT RDM 7.01.11.C are desirable and should be used where possible. Clear zone minimums can be used if maximums not achievable.
42	Curve Correction Factors	MDOT RDM 7.01.11.D	Varies based on radius of curve 1.2 to 1.5	Varies based on radius of curve 1.1 to 1.5	N/A	N/A	N/A	N/A	
	VERTICAL ALIGNMENT								
43	Maximum grade	AASHTOTable 8-1 (p. 8-4) AASHTO 10.9.6 (p. 10-93) MDOT RDM Appendix 3A-4	4% (60 mph) 5% (55 mph)	5% Maximum	8%	7%	7%	8%	
44	Minimum grade	AASHTO p. 3-119	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	
45	K-Value (Crest)	AASHTO Table 3-34 (p. 3-155) MDOT Sight Distance Guidelines - Exhibit 5 (p. 13)	114 (55 mph) 151 (60 mph)	84 (50 mph) 61 (45 mph) 19 (30 mph)	19 (30 mph) 12 (25 mph)	29 (35 mph) 19 (30 mph)	29	12	
46	K-Value (Sag)	AASHTO Table 3-36 (p. 3-161) MDOT Sight Distance Guidelines - Exhibit 6 (p. 16)	115 (55 mph) 136 (60 mph)	96 (50 mph) 79 (45 mph) 37 (30 mph)	37 (30 mph) 26 (25 mph)	49 (35 mph) 37 (30 mph)	49	26	
47	Stopping Sight Distance	AASHTO Table 3-2 (p. 3-5) MDOT RDM 3.03.02.C MDOT Sight Distance Guidelines - Exhibit 5 & 6 (p. 13 & 16)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	
48	Minimum Vertical Curve Length	MDOT RDM 3.03.02.B (3 times Design Speed) AASHTO p. 3-153	165 (55 mph) 180 (60 mph)	150 (50 mph) 135 (45 mph) 90 (30 mph)	90 (30 mph) 75 (25 mph)	105 (35 mph) 90 (30 mph)	105	90	
49	Vertical Clearance (Final Condition)	MDOT RDM 3.12.G & Appendix 3A-4 MDOT BDM 7.01.08.A (Exempt Structures.pdf on BDM site)	14'-9" (Des) 14'-6" (Min) (Special Route)	14'-9" (Des) 14'-6" (Min) (Special Route)	14'-9" (Des) 14'-6" (Min) (Special Route)	14'-9" (Des) 14'-6" (Min) (Special Route)	14'-9" (Des) 14'-6" (Min)	14'-9" (Des) 14'-6" (Min)	
50	Vertical Clearance (Temporary During Construction)	Proposed Design	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	

Sources:

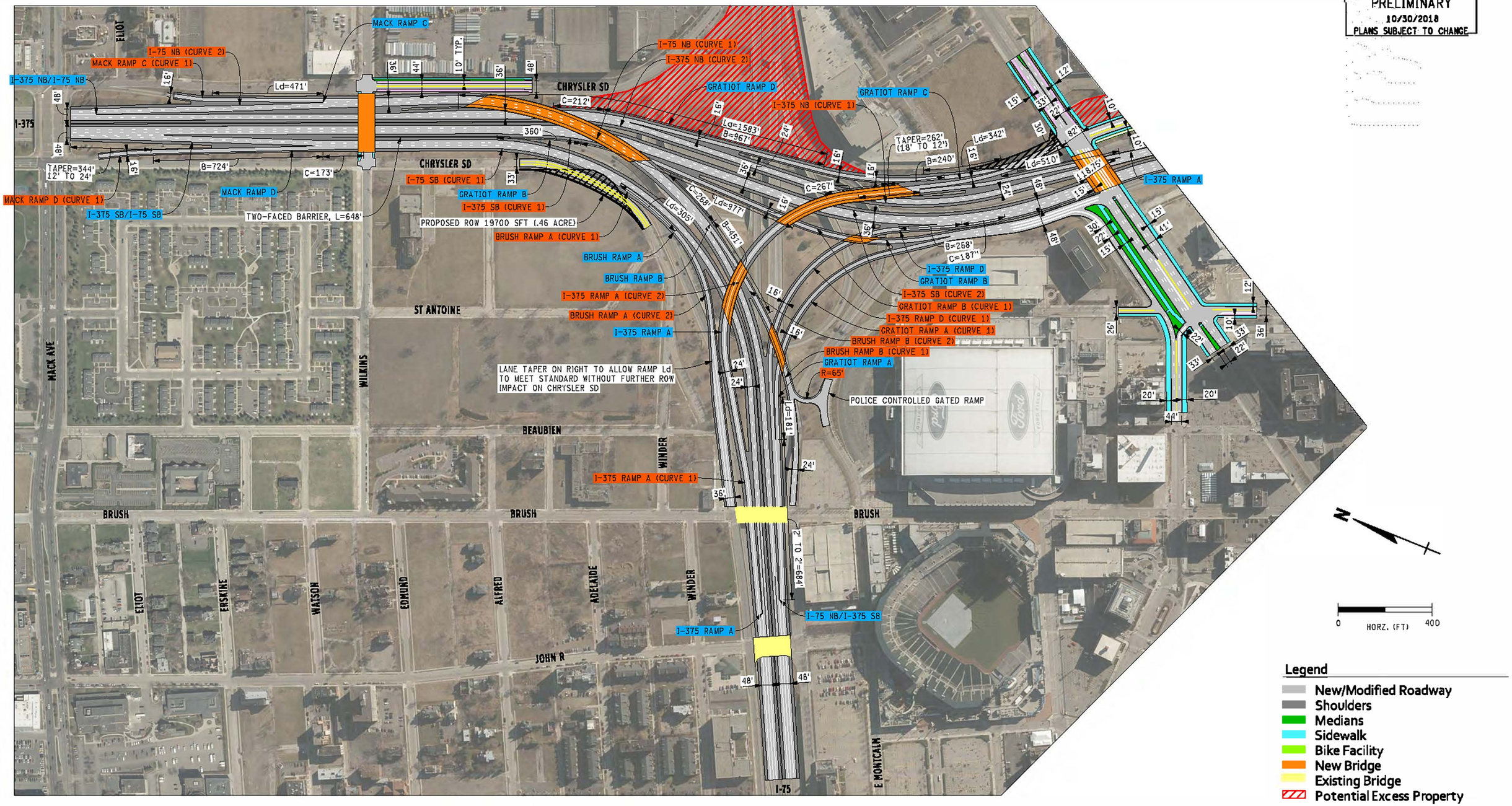
1. AASHTO = American Association of State Highway & Transportation Officials - A Policy on Geometric Design of Highways & Streets 2011
2. MDOT RDM = Michigan Department of Transportation Road Design Manual
3. MDOT SP = Michigan Department of Transportation Standard Plans
4. MDOT GDG = Michigan Department of Transportation Geometric Design Guide
5. MDOT BDM = Michigan Department of Transportation Bridge Design Manual


Pg. 5
Pg. 2
Pg. 4
PRELIMINARY
10/30/2018
PLANS SUBJECT TO CHANGE
ST AUBIN
ORLEANS
RIOPELLE
MARKET
ANTIETAM
RUSSELL
RIVARD
CHRYSLER SD
ST ANTOINE
BEAUBIEN
BRUSH
JOHN R
E MONTCALM
ELIZABETH
RANDOLPH
MACK AVE
ERSKINE
WATSON
WILKINS
ALFRED
DIVISION
ADELAIDE
WINDER
ELIOT
INS
BEACON
NICOLET
JOLIET
E LAFAYETTE
NAVARRE
LARNED
E JEFFERSON
CLINTON
MACOMB
MONROE
CONGRESS
GRATIOT (M-3)
N
0
HORZ. (FT)
600
Legend
New/Modified Roadway
Shoulders
Medians
Sidewalk
Bike Facility
New Bridge
Existing Bridge
Potential Excess Property
Proposed ROW

No comment - CEM 12/17/2020

I-375 Improvement Project: Preliminary Geometrics (I-375 & I-75 Interchange)

PRELIMINARY
10/30/2018
PLANS SUBJECT TO CHANGE



Legend

- New/Modified Roadway
- Shoulders
- Medians
- Sidewalk
- Bike Facility
- New Bridge
- Existing Bridge
- Potential Excess Property
- Proposed ROW

DS=XX Design Speed

No comment - CEM 12/17/2020

I-375 Improvement Project: Preliminary Geometrics (I-375 I-75 Interchange)

Ramp Geometrics and Curve Data Tables

Ramp Geometrics Table

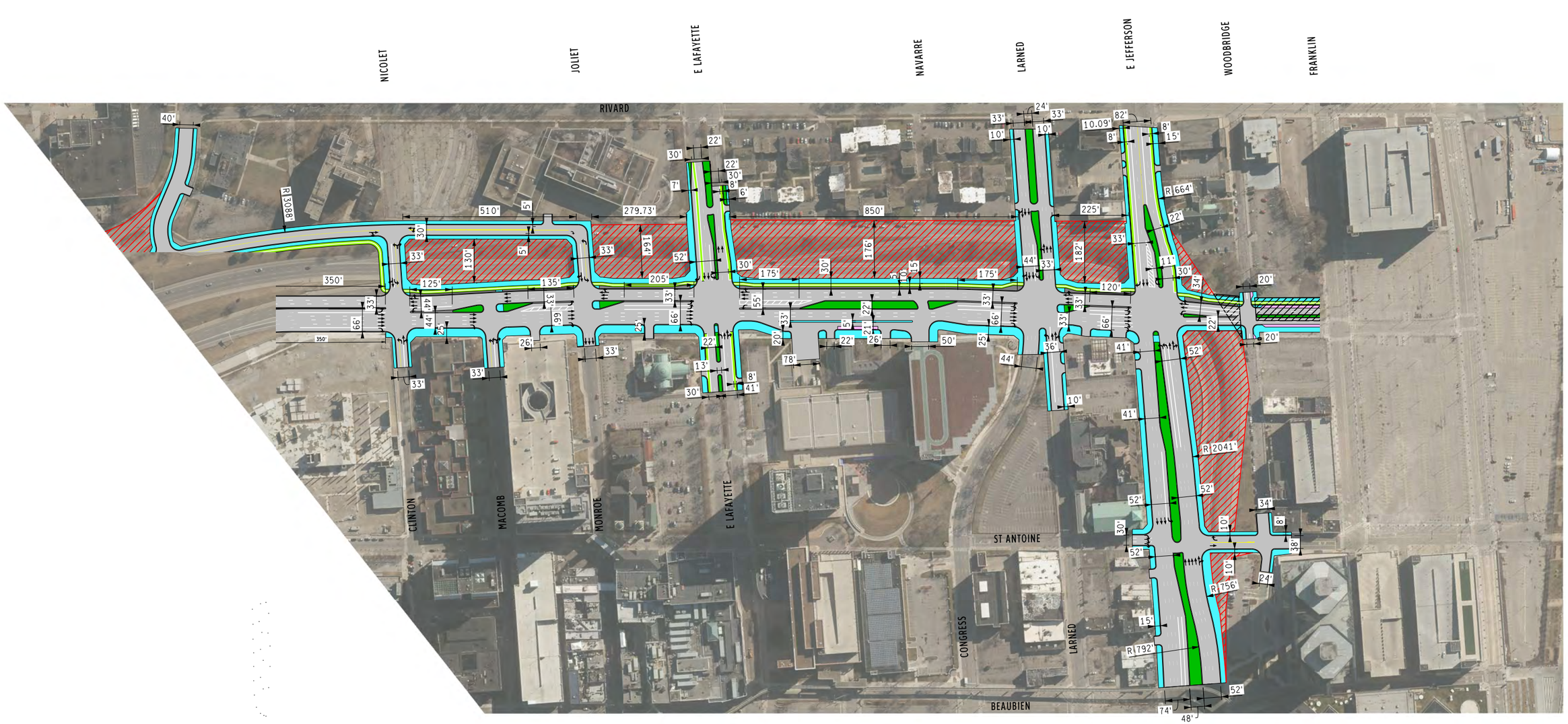
Ramp Name	Segment Type	From	To	Design Standard	Case	Ramp Design Speed	Thru Roadway Design Speed	La	Ld	B	C	Taper	Comments
I-375 NB/I-75 NB	Two-Lane Entrance Ramp	I-375 NB	I-75 NB	GEO-110-C	Case IV	55	55	N/A				1° 2' 30"	
I-375 SB/I-75 SB	Two-Lane Exit Ramp	I-75 SB	I-75 SB	GEO-140-B	Case II	55	55	N/A				2° 0' 0"	2° taper angle used for concept phase per MDOT guidance (this will be updated to the standard deflection during final design phase)
I-75 NB/I-375 SB	Two-Lane Exit Ramp	I-75 NB	I-375 SB & Gratiot Ave.	GEO-140-B	Case II	55	55	N/A				2° 0' 0"	2° taper angle used for concept phase per MDOT guidance (this will be updated to the standard deflection during final design phase)
I-375 RAMP A	One-Lane Parallel Exit Ramp	Gratiot Ave.	I-75 NB	GEO-130-D	Case II	40	45		510'			2° 17' 26"	
I-375 RAMP A	Two-Lane Entrance Ramp	I-375 NB & Gratiot Ave.	I-75 SB	GEO-110-C	Case IV	55	55	N/A				1° 8' 45"	12ft inside shoulder on bridge
I-375 RAMP D	One-Lane Parallel Entrance Ramp	I-75 NB	I-375 SB	GEO-101-F	Case II	40	55			268'	187'	1° 16' 23"	
GRATIOT RAMP A	One-Lane Parallel Exit Ramp	I-75 NB	Gratiot Ave.	GEO-130-D	Case II	40	55		181'			1° 48' 25"	
GRATIOT RAMP B	One-Lane Parallel Exit Ramp	I-375 SB	Gratiot Ave.	GEO-130-D	Case I	40	55		977'			2° 17' 10"	
GRATIOT RAMP C	One-Lane Parallel Entrance Ramp	Gratiot Ave.	I-75 SB	GEO-101-F	Case II	40	40			240'	267'	0° 52' 27"	
GRATIOT RAMP D	One-Lane Parallel Exit Ramp	I-375 NB	I-75 SB	GEO-130-D	Case II	40	40		342'			2° 17' 26"	
GRATIOT RAMP D	One-Lane Parallel Entrance Ramp	Gratiot Ave.	I-75 NB	GEO-101-F	Case I	40	55	1583'		967'	212'	1° 0' 48"	
MACK RAMP C	One-Lane Parallel Exit Ramp	I-75 NB	Mack Ave.	GEO-130-D	Case II	40	55		471'			2° 17' 26"	
MACK RAMP D	One-Lane Parallel Entrance Ramp	Mack Ave.	I-75 SB	GEO-101-F	Case II	40	55			724'	173'	1° 8' 45"	
BRUSH RAMP A	One-Lane Parallel Exit Ramp	I-75 SB	Brush St.	GEO-130-D	Case II	40	55		305'			2° 17' 26"	Approx. 780' event storage on ramp. 1-lane to 3-lane taper added to right of ramp to allow for full Ld without further ROW impact on Chrysler SD
BRUSH RAMP B	One-Lane Parallel Entrance Ramp	Brush St.	I-75 NB	GEO-101-F	Case II	40	55			451'	268'	2° 0' 0"	2° taper angle used for concept phase per MDOT guidance (this will be updated to the standard deflection during final design phase)

Ramp Curve Table

Curve Name	Design Speed	R (Ft)	E (%)
I-75 NB (Curve 1)	55	1300	4.9
I-75 NB (Curve 2)	60	12000	2
I-75 SB (Curve 1)	55	1106	5.7
I-375 NB (Curve 1)	60	1449	4.8
I-375 NB (Curve 2)	60	1461	4.8
I-375 SB (Curve 1)	55	1275	5
I-375 SB (Curve 2)	45	1700	2.3
I-375 Ramp A (Curve 1)	45	820	4.7
I-375 Ramp A (Curve 2)	40	600	4.8
I-375 Ramp D (Curve 1)	40	600	4.8
Gratiot Ramp A (Curve 1)	40	600	4.8
Gratiot Ramp B (Curve 1)	40	1000	2.9
Mack Ramp C (Curve 1)	40	662	4.5
Mack Ramp D (Curve 1)	40	2000	2.5
Brush Ramp A (Curve 1)	55	1105	5.7
Brush Ramp A (Curve 2)	40	580	5
Brush Ramp B (Curve 1)	40	1305	2.3
Brush Ramp B (Curve 2)	55	2341	4.9

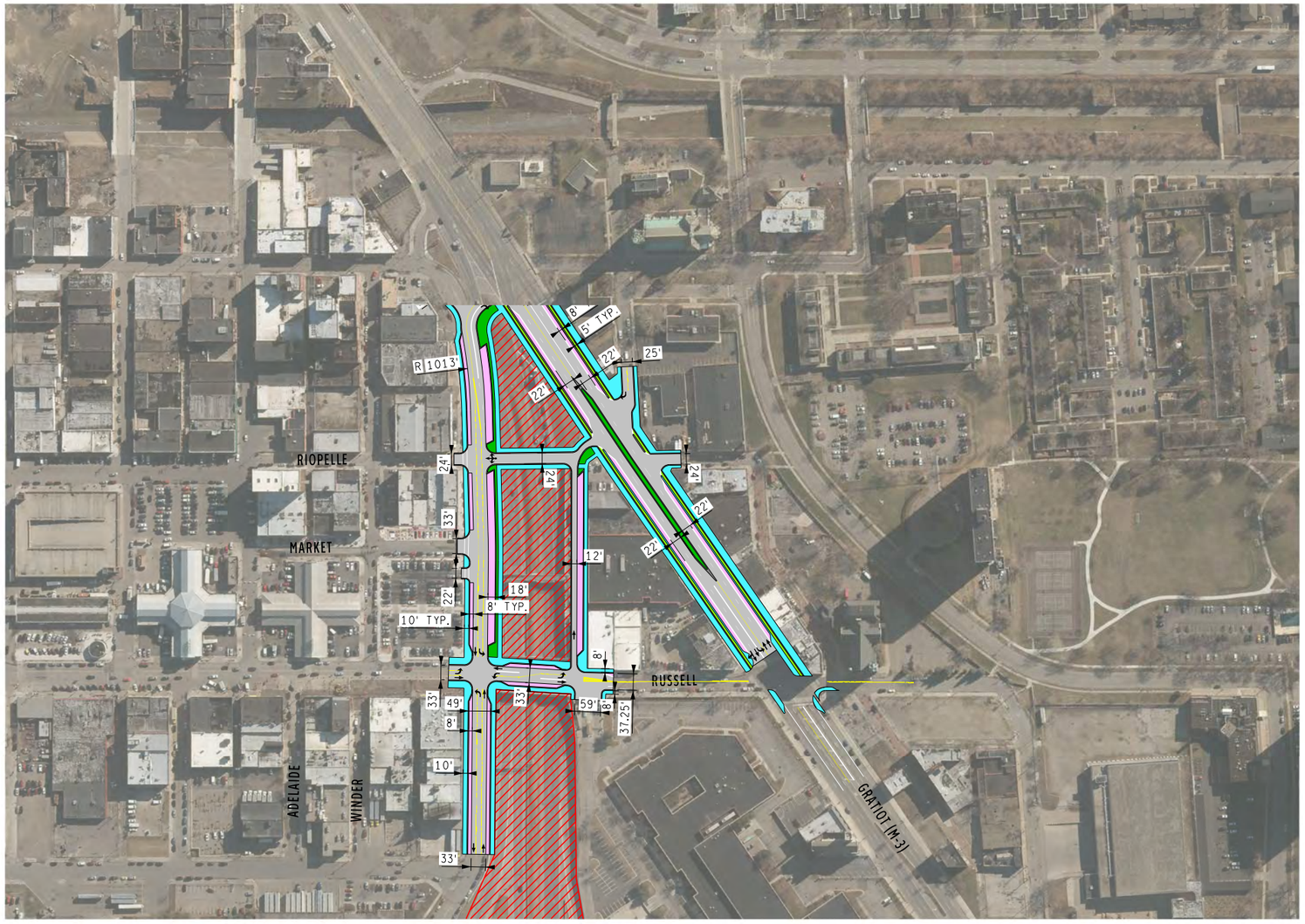
No comment - CEM 12/17/2020

I-375 Improvement Project: Preliminary Geometrics (375 Boulevard)



No comment - CEM 12/17/2020

I-375 Improvement Project: Preliminary Geometrics (Gratiot Ave)



PRELIMINARY
10/30/2018
PLANS SUBJECT TO CHANGE

Legend

- New/Modified Roadway
- Shoulders
- Medians
- Sidewalk
- Bike Facility
- New Bridge
- Existing Bridge
- Potential Excess Property
- Proposed ROW

N

0 HORZ. (FT) 300

No comment - CEM 12/17/2020

Appendix A-4 – Practical Alternative 5B Geometric Review

No comment - CEM 12/17/2020

I-375 Improvement Project

Comment Resolution Form

			Date	Initial
Project/Program Name	I-375 Improvement Project			
HNTB Job No.	60798			
Deliverable Name	Alternative 5B Direct - Interchange Geometrics Review	**Submitted for Review**	11/9/19	JHM
Phase	Varies	**Changes Made**	1/30/20	JHM
Deliverable Manager	Tony Migaldi	**All Changes Verified**		
Functional Group/Firm	HNTB I-375 Project Team			
Reviewer Name	Najim Salman			
Functional Group	MDOT Geometrics			
Review Type	Geometric Review			

ID	Sheet Name/Section/Para	Page/Sheet/Slide No.	Comment Made by Initials	Comment (Limit to One Item Per Row)	Agree	Response	Verified/ Initials
1	General		NS	Provide a list of all anticipated design exceptions	Yes	See attached Anticipated Design Exception/ Variance summary	
2	General		NS	Design exceptions are not required for using 55 mph design speed for the curves on I-75.	Yes	Per discussion with MDOT Geometrics a design exception is not required.	
3	Brush Ramp B		NS	Brush Ramp B, recommend to extend the 2' point under the bridge to be placed before the bridge. Also, recommend for the lane drop on the bridge to take place after the bridge, and not to transition on the bridge.	Yes	Modifications have been made to move the 2' point to a location before the bridge.	
4	Blvd Ramp A & Brush Ramp B		NS	Explain how these numbers were calculated: B=552 ft, C=287 ft	Yes	Agree. The B and C shown on the original plan have been updated. The original distances on the plan were incorrectly reported.	
5	Mack Ramp B		NS	L=775ft, explain how this number was calculated.	Yes	The L distance was located in the wrong location. The updated L distance measured from the 2' point to the P.C. is now shown on the plan. The original distances on the plan were incorrectly calculated.	
6	Under Roadway #27		NS	Compound Circular Curve Ratio, 1.5:I, should not exceed 1.5:1.	Yes	Design criteria updated to change system ramp to 1.5:1	
7	Under Roadway #28, #29		NS	AASHTO use uniform 50:1 to 70:1 tapers are recommended where length of acceleration lanes exceed 1,300ft (10-110page).	Yes	Design criteria updated.	
8	Blvd Ramp B		NS	Show Taper Length, use 370-E detail 4	Yes	This taper has been updated per 370-E detail 4	
9	I-75 SB & Blvd Ramp D 'I-75 NB & Brush Ramp B		NS	Show dimension distance length of the divergence of I-75 SB & Blvd Ramp D, and I-75 NB & Brush Ramp B.	Yes	Plan view has been updated to show divergence length.	
10	Blvd Ramp B		NS	Blvd Ramp B is a one-lane exit ramp, yet the design standard listed is GEO-140, which is for two-lane exit ramps. Should GEO-131 be listed here?	Yes	Ramp Geometric Table has been updated to reflect GEO-131 one-lane parallel exit.	
11	Gratiot Connector Ramp D		NS	Gratiot Connector Ramp D is a two-lane exit ramp, yet the design standard listed is GEO-130, which is for one-lane tapered exit ramps. Should GEO-140 be listed here?	Yes	Ramp Geometric Table has been updated to reflect GEO-140 Case III two-lane exit.	
12	AASHTO Reference		NS	AASHTO Ex. 10-78D is referenced several times. In the 2011 AASHTO book (which is the listed source on Page 3), there is no 10-78D.	Yes	To be addressed: The reference to AASHTO Ex. 10-78D has been updated to Figure 10-75 (Case D) in the 2011 AASHTO book.	
13	Ramps General		NS	Specify the ramp taper rate used for each ramp in the Ramps Geometrics Table.	Yes	All ramp tapers rates have been added.	
14	Blvd/Ramp Intersection		NS	Because the Blvd/Ramp intersection is similar to a DDI crossover, recommend lowering the Superelevation to 2% rather than 4%.	Yes	Agree. The first part of the curve may have a 4% super, however we anticipate warping the super into the intersection to ensure a smooth ride through the intersection.	
15	Blvd/Ramp Intersection		NS	Position the stop bars of the Blvd/Ramp intersection to provide clearer vehicle path alignment and prevent potential wrong-way movements.	Yes	Stop bars will be positioned similar to the positioning at DDI type interchanges.	
16	Curves General		NS	For curves with a radius of less than 500', verify with auto turn that trucks can make these movements without off-tracking on to adjacent lanes. Widen lanes in these locations if necessary.	Yes	This analysis will be performed during 30% design to ensure that adequate lane widths exist at all curves. A note has been added to the plan.	
17	Blvd Ramp B		NS	For Blvd Ramp B, is there enough tangent distance after Curve 2 to transition the 3.6% Superelevation to 2% at the intersection?	Yes	This ramp has been revised to lengthen the tangent distance to allow for appropriate transition	
18	Curves/Tangents General		NS	Please investigate all curves to make sure there is enough tangent length for proper transition.	Yes	Further verification of tangent lengths and super elevation design will be performed during the 30% design phase. Design adjustments will be made to ensure proper transitions.	

No comment - CEM 12/17/2020

I-375 Improvement Project

Comment Resolution Form

			Date	Initial
Project/Program Name	I-375 Improvement Project			
HNTB Job No.	60798			
Deliverable Name	Alternative 5B Direct - Interchange Geometrics Review	**Submitted for Review**	1/30/20	JHM
Phase	Varies	**Changes Made**		
Deliverable Manager	Tony Migaldi	**All Changes Verified**		
Functional Group/Firm	HNTB I-375 Project Team			
Reviewer Name	FHWA - Brandy Solak			
Functional Group	FHWA Geometrics			
Review Type	Geometric Review			

ID	Sheet Name/Section/Para	Page/Sheet/Slide No.	Comment Made by Initials	Comment (Limit to One Item Per Row)	Agree	Response	Verified/ Initials
1	Geometric Review Package/IACR	N/A	FHWA	•A signing schematic will have to be developed to demonstrate that the geometry can be signed in accordance with the MUTCD – this conceptual plan is needed for the IACR and would be helpful to provide comments now. The sequential NB exits to Gratiot Connector Ramp B followed by Blvd Ramp B is of particular concern.	Yes	A conceptual signing plan is currently being developed with the IACR. If the signing schematic is complete in advance of the IACR, it will be submitted to FHWA for review in advance of the IACR submittal.	
2	Geometric Review Package	6 of 10	FHWA	•Basic number of lanes on I-75 (2011 Green Book, p. 10-72). It looks like there are generally 4 main lanes on each side of the existing interchange. The proposal has just 2 lanes carried through the interchange for SB and 3 lanes NB. As discussed in the Green Book, the basic number of lanes should generally be carried through the interchange. Can you show traffic numbers for the major SB split where the 3-lane exit from SB I-75 with just two through lanes continuing on I-75? The numbers may confirm this all makes sense but you'll have to address it in the IACR.	Yes	The volume maps will be included in the IACR and the results on the freeway segments within the IACR will confirm that the number of lanes on I-75 is sufficient.	
3	Geometric Review Package	N/A	FHWA	VISSIM reports for this alternative need to be reviewed to ensure signal timing will not create any concerns with queuing traffic and the interstate.	Yes	VISSIM reports documenting the signal timing and traffic operations are being developed and will be submitted for review in the updated I-375 Traffic Tech Memo.	
4	Geometric Review Package	5 of 10	FHWA	NB traffic on the boulevard will have the option to make a sweeping right turn to enter NB I-75. If they continue straight (curving left), they'll encounter the signalized intersection with the ramp to SB boulevard. The angle of the SB ramp coming from the right is nearly concentric to the NB right turn lane. When drivers are tired, unfamiliar, under the influence, elderly, or whatever, might they miss the NB right turn and attempt a right turn on the SB ramp instead? It's always good to think through possible wrong-way entry scenarios and do our best to prevent the possibility.	Yes	In general, the boulevard/SB ramp intersection geometry was designed similar to a single ramp intersection at a DDI. The entry angle of the NB Boulevard measures at approximately 40 degrees which is within the threshold for entry angle for a DDI design. For instance, MoDOT recommends crossover angles range from 40 to 50 degrees and UDOT recommends crossover angles of 30 degrees or greater. The entry angle of the SB off-ramp is approximately 65 degrees. This higher entry angle will make a wrong way NB right turn onto the SB Off ramp difficult and uncomfortable for a driver. Additional treatments to be considered include overhead signing on the boulevard for lane assignments and no right turn signing at key locations within the intersection. These additional treatments will be evaluated and incorporated as the project progresses.	
5	Geometric Review Package	6 of 10	FHWA	The connection of St Antoine to Montcalm near the stadium hooks to the west where it ties to Montcalm. It looks like a right turn movement is permitted there but it is made very difficult by this geometry and NB drivers only have one lane to turn into. Perhaps St Antoine could be aligned to intersect Montcalm at closer to a right angle.	Yes	Further evaluation of the intersection angle can be performed in subsequent phases of the design. The intersection angle was designed to avoid right of way impacts to the east of the intersection.	
6	Geometric Review Package	2 of 10 (Line 23)	FHWA	Line 23 – if 1:3 is the steepest back slope allowed, it's a 'maximum', not a 'minimum'	Yes	The note will be changed to "Maximum"	
7	Geometric Review Package	3 of 10 (Line 25 and 37)	FHWA	Lines 25 and 37 – I'm not sure these values for minimum curve radii in Line 25 are correct. If you use the emax=6% Table 3-9 using a super rate of 5%, you get R=2330' for 60mph and R=1890' for 55mph. Perhaps I've overlooked something but this will need some further explanation.	Yes	Line 25 and 37 were updated to reflect a "Desirable" value and a "Minimum" value. The minimum value requires a 6% super. The Desirable value would reflect a 5% super.	
8	Geometric Review Package	4 of 10 (Line 49)	FHWA	Line 49 – I'm guessing the 'special route' note means there are other routes with 16' vertical clearance but it needs to be clear what the alternate route with adequate clearance is in lieu of travel on I-75 in this section. Coordination with SDDCTEA is necessary (see https://www.fhwa.dot.gov/design/090415.cfm) for any vertical clearance Design Exceptions.	Yes	Design Criteria has been updated to reflect a minimum 16' clearance on I-75. So the special route listed for I-75 no longer applies. I-375 is listed as a "special route", so the ramps to and from the boulevard could potentially use the "special route" clearances.	

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
11/15/2019

#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 /I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
	TRAFFIC								
1	Roadway Classification	AASHTO Chapter 1	Freeway (urban)	System Ramp (urban)	Arterial	Arterial	Minor Arterial	Local Roads	
2	Terrain	AASHTO Table 8-1 (p. 8-4) MDOT RDM Appendix 3A-4	Level	Level	Level	Level	Level	Level	
3	Existing ADT's (20XX)	XXXX	XX	XX	XX	XX	XX	XX	
4	Proposed AADT's (Projected to Year 2037-Peak Hour)	XXXX	XX	XX	XX	XX	XX	XX	
5	Design Level of Service	2011 AASHTO Table 2-5 (p. 2-67)	C	C	D	D	D	D	
6	Posted Speed	Field Review	55 mph (35 mph at terminal curve)	Not Posted	25 mph	375 Blvd: 35 mph Jefferson/Gratiot: 30 mph	30 mph	25 mph	
7	Design Speed	Mainline: AASHTO p. 8-1,8-2; MDOT RDM 3.06, Appendix 3A-1 Ramps: AASHTO Table 10-1 (p. 10-89); MDOT SP R-107-H; MDOT RDM 3.04.03	60 mph Desirable 55 mph Minimum (at terminal curve 40 mph; 35 mph min)	Upper Range: 50 mph Middle Range: 45 mph Lower Range: 30 mph	30 mph Desirable 25 mph Minimum	35 mph Desirable 30 mph Minimum	35 mph	30 mph	
8	Design Vehicle	MDOT RDM 3.07.01.B & AASHTO	WB-67	WB-67	WB-67	WB-67 (see note)	WB-50	CITY-BUS	For locations with limitted Right of Way (ROW), the designer should utilize compound curves and fit largest radius that avoids ROW impacts. These locations should be coordinated with MDOT Geometrics for approval.
	CROSS SECTION								
9	Median/Inside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	6'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
10	Outside Shoulder Width	MDOT RDM Appendix 3A-2 MDOT RDM Appendix 6-A	12' paved if truck traffic > 250 veh DDHV 10' paved min	8'	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required 8' desirable	No shoulder required	
11	Median Width	MDOT RDM Appendix 3A-2 MDOT GEO-670-E	26.67' paved if truck traffic > 250 veh DDHV 22.67' min	N/A	N/A	375 Blvd: 26' Jefferson: Match Existing Gratiot: Match Existing (22')	Match Existing (24')	N/A	
12	Curb Type	MDOT RDM Appendix 6-A MDOT RDM 7.01.34	Inside: 4' Valley Gutter adjacent to concrete barrier Outside: N/A (Fill), Type G1 (cut section)	Inside: Type D Outside: N/A (Fill), Type G1 (cut section)	Type E	Type F	Type E	Type E	MDOT preference for Type F curb, Type E provided where requested by City
13	Lane Width	Mainline - MDOT RDM Appendix 3A-1; AASHTO p. 4-7 Ramps - MDOT RDM 3.07.02.E; Appendix 6-A	12'	16'	12' desirable 11' min	12' Desirable 11' Min	Match Existing (11' min)	Match Existing (10' min) 11' for New Roadway	
14	Roadway Cross Slopes (normal section)	MDOT RDM 3.04; MDOT RDM Appendix 3A-4 MDOT SP R-107-H; AASHTO Table 4-6 (p. 4-6)	2%	2%	2%	2%	2%	2%	
15	Crown Point	MDOT RDM 6.09.01, MDOT SP R-107-H Scoping Report	TBD	N/A	TBD	Match Existing	Match Existing	Match Existing	
16	Crown Rollover	MDOT RDM 3.04	4%	4%	4%	4%	4%	4%	
17	Point of Rotation	MDOT RDM 3.04.01, MDOT SP R-107-H	TBD	Alignment edge/ Outside edge of traveled way	TBD	TBD	TBD	TBD	
18	Shoulder Cross Slopes	MDOT RDM 6.05.05.A MDOT RDM Appendix 3A-4	4%	4%	4%	4%	4%	4%	
19	Shoulder Rollover	MDOT SP R-107-H AASHTO Figure 4-2 (p. 4-3)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	6% Max. (MDOT) 8% Max. (AASHTO)	
20	Gore Cross Slopes	MDOT RDM 3.07.02.B.6 MDOT GDG	8% Max.	8% Max.	8% Max.	N/A	N/A	N/A	
21	Algebraic Difference (Between Adjacent Lane & Gore)	MDOT RDM 3.07.02.B.6 MDOT GDG	6% Max. (5% Des.)	6% Max. (5% Des.)	6% Max. (5% Des.)	N/A	N/A	N/A	
22	Fill Slope	MDOT RDM 2.03.01	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	1:6 (fill height < 10') 1:4 (fill height 10' to 25') 1:2 (fill height > 25')	
23	Back/Cut Slope	MDOT RDM 2.03.01	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	1:4 Desireable 1:3 Minimum	

I-375 Improvement Project
Roadway Design Criteria
11/15/2019

#	ITEM	REFERENCE	ROADWAY: Freeway I-75 /I-375	ROADWAY: System Ramp	ROADWAY: Service Drives	ROADWAY: 375 Boulevard Jefferson Gratiot	ROADWAY: Larned Lafayette	ROADWAY: Local Roads	QUESTIONS / NOTES / MDOT DIRECTION
	HORIZONTAL ALIGNMENT								
24	Minimum Curve Length	MDOT RDM 3.03.01.B (15 times Design Speed Min./30 times Design Speed Des.)	825' Min., 1650' Des. (55 mph) 900' Min., 1800' Des. (60 mph)	450' Min, 900' Des (30 mph) 675' Min, 1350' Des (45 mph) 750' Min, 1500' Des (50 mph)	375' Min, 750' Des (25 mph) 450' Min, 900' Des (30 mph)	450' Min, 900' Des (30 mph) 525' Min, 1050' Des (35 mph)	525' Min, 1050' Des	450' Min, 900' Des	
25	Minimum Curve Radii	MDOT RDM 3.04.03 / 3.07.02.D AASHTO Eqn 3-8 (p. 3-31) Ramp - MDOT SP R-107-H; RDM 03.07.02D	1008' R107, 1061' Straight (55 mph) 1263' R107 and 1333' Straight (60 mph)	222' R107, 232' Straight (30 mph) 614' R107, 643' Straight (45 mph) 794' R107, Straight (50 mph)	222' R107, 232' Straight (30 mph)	327' R107, 340' Straight (35 mph)	222' R107, 232' Straight (30 mph)	222' R107, 232' Straight (30 mph)	
26	Maximum Radius of Curve for Spiral	MDOT SP R-107-H (p. 3) AASHTO Table 3-2 (p. 3-71)	1531' (55 mph) 1822' (60 mph)	456' (30 mph) 1025' (45 mph) 1265'(50 mph)	456' (30 mph)	620' (35 mph) 456' (30 mph)	456' (30 mph)	456' (30 mph)	
27	Compound Circular Curve Ratio (Flatter to Sharper Ra	AASHTO p. 3-58 MDOT RDM 3.03.01.C	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	
28	Entrance Ramp Taper Rate (parallel)	MDOT GDG GEO-101-F AASHTO Table 10-3 (p. 10-110)	N/A	Design: 50:1 to 70:1 (AASHTO) - Uniform 50:1 to 70:1 taper where accel lane > 1,300 ft. 55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT)	N/A	N/A	N/A	N/A	
29	Entrance Ramp Taper Rate (tapered)	MDOT GDG GEO-100-F AASHTO Table 10-3 (p. 10-110)	N/A	Design: 50:1 to 70:1 (AASHTO) - Uniform 50:1 to 70:1 taper where decel lane > 1,300 ft. 55:1 (Δ=1°02'30") (60 mph, MDOT) 50:1 (Δ=1°08'45") (55 mph, MDOT)	N/A	N/A	N/A	N/A	
30	Exit Ramp Taper Rate (Tapered)	MDOT GDG GEO-130-D AASHTO p. 10-112 & Figure 10-70 (10-114)	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
31	Exit Ramp Taper Rate (Parallel)	MDOT GDG GEO-131-D AASHTO Table p. 10-116	N/A	25:1 (Δ=2°17'26") Δ=2° Min. 5° Max. (AASHTO)	N/A	N/A	N/A	N/A	
32	Acceleration Lane Length (one lane)	MDOT GDG GEO-101-F	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (La)	N/A	N/A	N/A	N/A	
33	Deceleration Lane Length (one lane; in weaving sections with a lane drop)	MDOT GDG GEO-130-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
34	Deceleration Lane Length (one lane)	MDOT GDG GEO-131-D AASHTO Table 10-4 & 10-5 (10-112, 10-115)	N/A	Dependent on thru rdwy longit. grade & ramp curve design speed (Ld)	N/A	N/A	N/A	N/A	
35	Ramp Terminals	MDOT GDG GEO-370-E	N/A	Detail dependent on traffic analysis	N/A	N/A	N/A	N/A	
36	Stopping Sight Distance	AASHTO Table 3-1 (p.3-4) MDOT RDM 3.03.01.D MDOT Sight Distance Guidelines - Exhibit 1 (p. 6)	570' (60 mph) 495' (55 mph)	425' (50 mph) 360' (45 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	250' (35 mph) 200' (30 mph)	250' (35 mph) 200' (30 mph)	200' (30 mph) 155' (25 mph)	
37	Superelevation	MDOT RDM 3.04.03	5% Desirable/6% Maximum SB I-75 to SB I-75 6% based on straight line	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	5% Desirable/6% Maximum	
38	Superelevation Transition Length Split Inside Curve	MDOT SP R-107-H MDOT RDM 3.04.02	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	33% 33% (30% Min, 40% Max.)	
39	Shoulder Cross Slope Transition Distance (to match bridge shoulder cross slope)	MDOT SP R-107-H (p. 1)	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	Road shldr width x (rate of Bridge shldr super minus Road shldr super) x 100 / Δ%	
40	Delta Max (Δ%)	MDOT SP R-107-H MDOT RDM 3.04.03 AASHTO Table 3-15 (p. 3-61)	.47% (55 mph) .45% (60 mph)	.50% (50 mph) .54% (45 mph) .66% (30 mph)	0.66%	.62% (35 mph) .66% (30 mph)	0.66%	0.66%	
41	Clear Zone Distances	MDOT RDM 7.01.11.C	18' (1:3 cut) 22' (1:4 - 1:5 cut), 40' (1:4 - 1:5 fill) 26' (1:6 or flatter cut), 30' (1:6 or flatter fill)	16' (1:3 cut) 18' (1:4 - 1:5 cut), 30' (1:4 - 1:5 fill) 22' (1:6 or flatter cut), 22' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	14' (1:3 cut) 16' (1:4 - 1:5 cut), 16' (1:4 - 1:5 fill) 16' (1:6 or flatter cut), 14' (1:6 or flatter fill)	Maximum clear zone values from MDOT RDM 7.01.11.C are desirable and should be used where possible. Clear zone minimums can be used if maximums not achievable.
42	Curve Correction Factors	MDOT RDM 7.01.11.D	Varies based on radius of curve 1.2 to 1.5	Varies based on radius of curve 1.1 to 1.5	N/A	N/A	N/A	N/A	

No comment - CEM 12/17/2020

I-375 Improvement Project
Roadway Design Criteria
11/15/2019

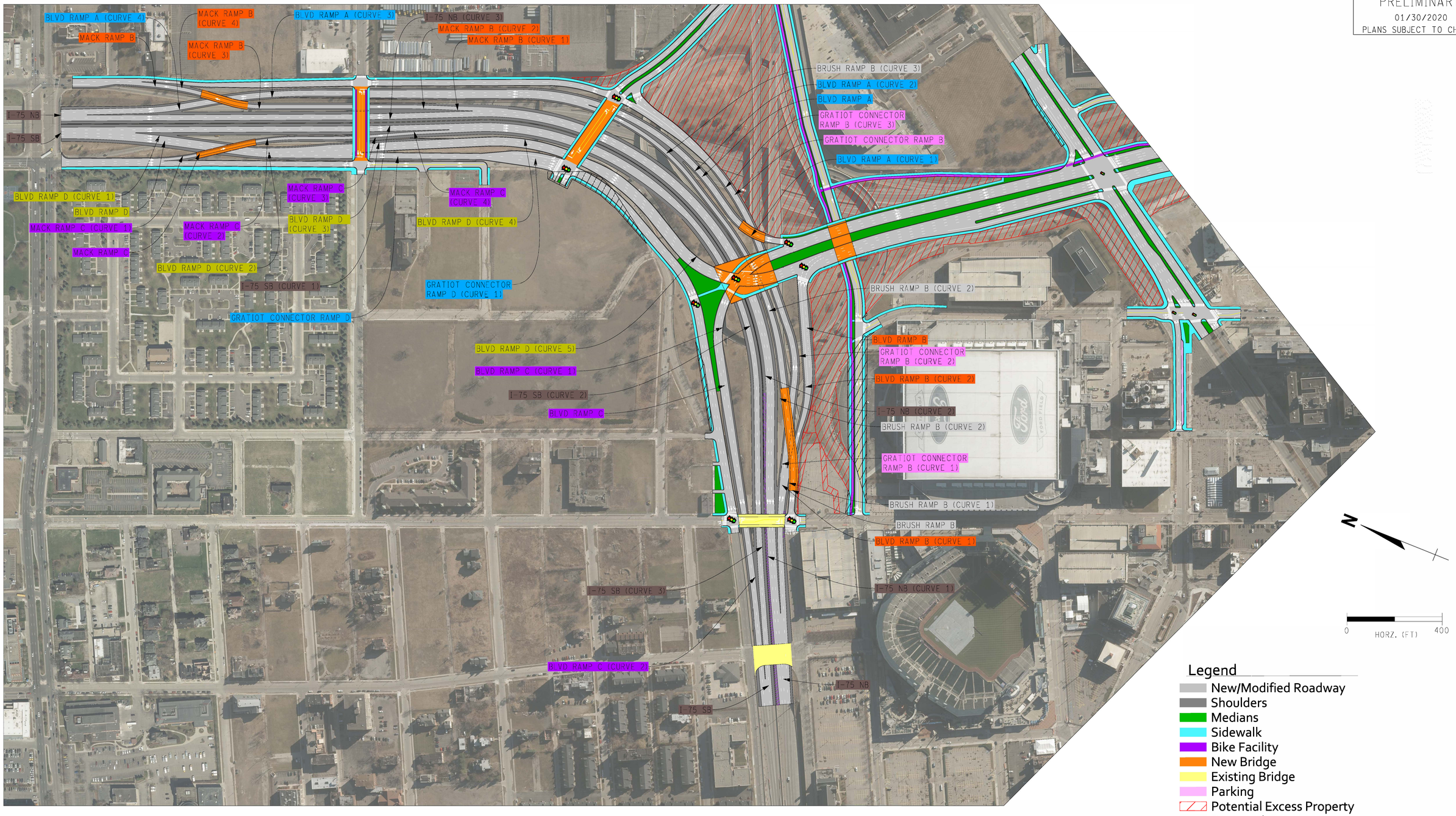
#	ITEM	REFERENCE	ROADWAY						QUESTIONS / NOTES / MDOT DIRECTION
			Freeway I-75 /I-375	System Ramp	Service Drives	375 Boulevard Jefferson Gratiot	Larned Lafayette	Local Roads	
	VERTICAL ALIGNMENT								
43	Maximum grade	AASHTOTable 8-1 (p. 8-4) AASHTO 10.9.6 (p. 10-93) MDOT RDM Appendix 3A-4	4% (60 mph) 5% (55 mph)	5% Maximum	8%	7%	7%	8%	
44	Minimum grade	AASHTO p. 3-119	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	Curbed Roadway - 0.5% Des., 0.3% Min Uncurbed Roadway - 0%	
45	K-Value (Crest)	AASHTO Table 3-34 (p. 3-155) MDOT Sight Distance Guidelines - Exhibit 5 (p. 13)	114 (55 mph) 151 (60 mph)	84 (50 mph) 61 (45 mph) 19 (30 mph)	19 (30 mph) 12 (25 mph)	29 (35 mph) 19 (30 mph)	29	12	
46	K-Value (Sag)	AASHTO Table 3-36 (p. 3-161) MDOT Sight Distance Guidelines - Exhibit 6 (p. 16)	115 (55 mph) 136 (60 mph)	96 (50 mph) 79 (45 mph) 37 (30 mph)	37 (30 mph) 26 (25 mph)	49 (35 mph) 37 (30 mph)	49	26	
47	Stopping Sight Distance	AASHTO Table 3-2 (p. 3-5) MDOT RDM 3.03.02.C MDOT Sight Distance Guidelines - Exhibit 5 & 6 (p. 13 & 16)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	Dependent on design speed and grade, see AASHTO Table 3-2 (p. 3-5)	
48	Minimum Vertical Curve Length	MDOT RDM 3.03.02.B (3 times Design Speed) AASHTO p. 3-153	165 (55 mph) 180 (60 mph)	150 (50 mph) 135 (45 mph) 90 (30 mph)	90 (30 mph) 75 (25 mph)	105 (35 mph) 90 (30 mph)	105	90	
49	Vertical Clearance (Final Condition)	MDOT RDM 3.12.G & Appendix 3A-4 MDOT BDM 7.01.08.A (Exempt Structures.pdf on BDM site)	16'-3" (Des) I-75 Only 16'-0" (Min) I-75 Only	14'-9" (Des) 14'-6" (Min) (Boulevard will be designated special Route)	N/A	N/A	N/A	14'-9" (Des) 14'-6" (Min)	
50	Vertical Clearance (Temporary During Construction)	Proposed Design	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	Match Existing - Min.	

Sources:

1. AASHTO = American Association of State Highway & Transportation Officials - A Policy on Geometric Design of Highways & Streets 2011
2. MDOT RDM = Michigan Department of Transportation Road Design Manual
3. MDOT SP = Michigan Department of Transportation Standard Plans
4. MDOT GDG = Michigan Department of Transportation Geometric Design Guide
5. MDOT BDM = Michigan Department of Transportation Bridge Design Manual

I-375 Improvement Project: Preliminary Geometrics (Alternative 5B Interchange) - CURVE DATA

PRELIMINARY
01/30/2020
PLANS SUBJECT TO CHANGE

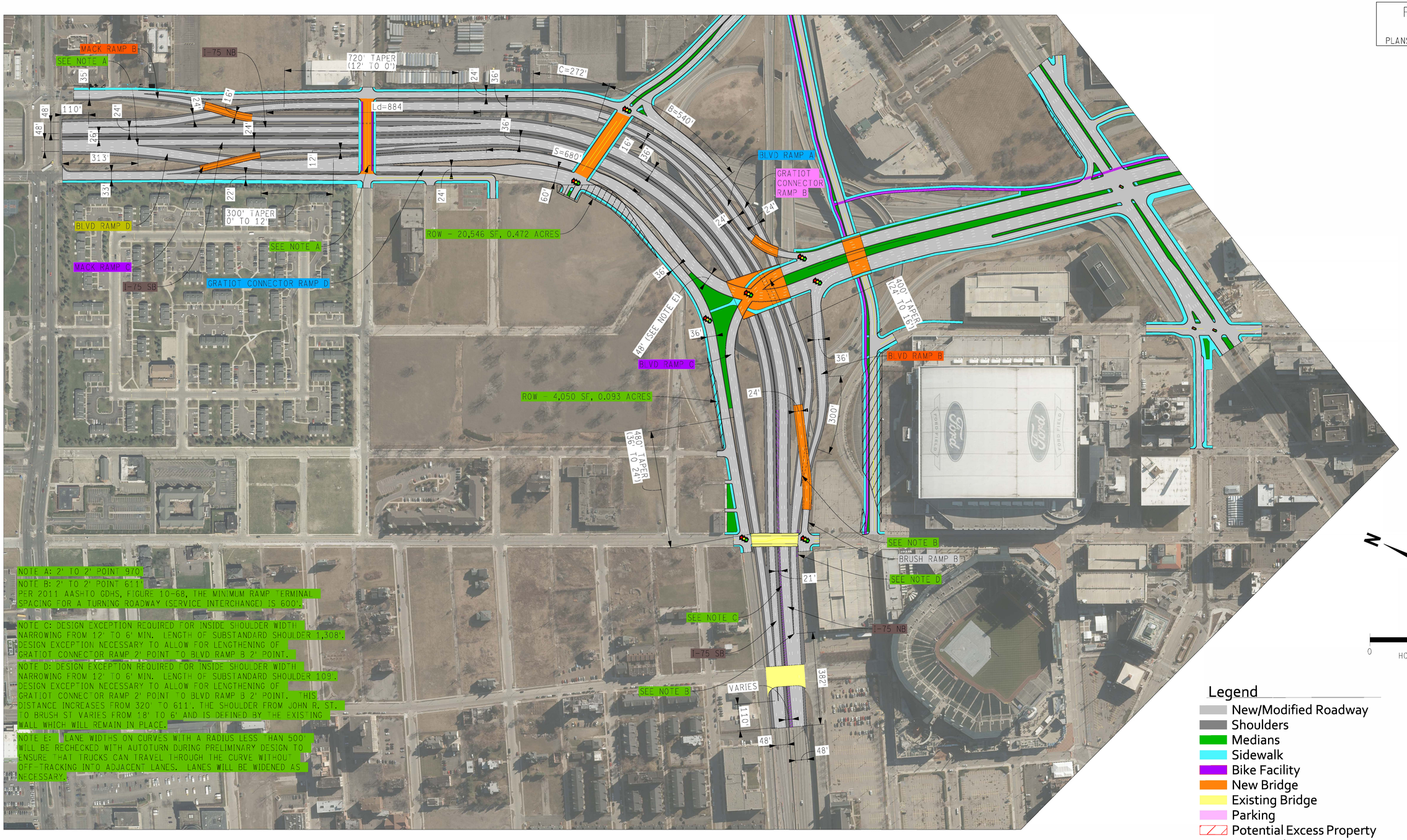


Legend

- New/Modified Roadway
- Shoulders
- Medians
- Sidewalk
- Bike Facility
- New Bridge
- Existing Bridge
- Parking
- Potential Excess Property
- Proposed ROW
- Design Exception - Shoulder Width

I-375 Improvement Project: Preliminary Geometrics (Alternative 5B Interchange) - PLAN VIEW DIMENSIONS

PRELIMINARY
01/30/2020
PLANS SUBJECT TO CHANGE



NOTE A: 2' TO 2' POINT 970'
NOTE B: 2' TO 2' POINT 611'
PER 2011 AASHTO GDHS, FIGURE 10-68, THE MINIMUM RAMP TERMINAL SPACING FOR A TURNING ROADWAY (SERVICE INTERCHANGE) IS 600'.

NOTE C: DESIGN EXCEPTION REQUIRED FOR INSIDE SHOULDER WIDTH NARROWING FROM 12' TO 6' MIN. LENGTH OF SUBSTANDARD SHOULDER 1,308'. DESIGN EXCEPTION NECESSARY TO ALLOW FOR LENGTHENING OF GRATIOT CONNECTOR RAMP 2' POINT TO BLVD RAMP B 2' POINT.

NOTE D: DESIGN EXCEPTION REQUIRED FOR INSIDE SHOULDER WIDTH NARROWING FROM 12' TO 6' MIN. LENGTH OF SUBSTANDARD SHOULDER 109'. DESIGN EXCEPTION NECESSARY TO ALLOW FOR LENGTHENING OF GRATIOT CONNECTOR RAMP 2' POINT TO BLVD RAMP B 2' POINT. THIS DISTANCE INCREASES FROM 320' TO 611'. THE SHOULDER FROM JOHN R. ST. TO BRUSH ST VARIES FROM 18' TO 6' AND IS DEFINED BY THE EXISTING WALL WHICH WILL REMAIN IN PLACE.

NOTE E: LANE WIDTHS ON CURVES WITH A RADIUS LESS THAN 500' WILL BE RECHECKED WITH AUTOTURN DURING PRELIMINARY DESIGN TO ENSURE THAT TRUCKS CAN TRAVEL THROUGH THE CURVE WITHOUT OFF-TRACKING INTO ADJACENT LANES. LANES WILL BE WIDENED AS NECESSARY.

Legend

- New/Modified Roadway
- Shoulders
- Medians
- Sidewalk
- Bike Facility
- New Bridge
- Existing Bridge
- Parking
- Potential Excess Property
- Proposed ROW
- Design Exception - Shoulder Width

I-375 Improvement Project: Preliminary Geometrics (Alternative 5B Interchange) - Traffic Volume AM/PM Peak

PRELIMINARY
01/30/2020
PLANS SUBJECT TO CHANGE

Legend
- New/Modified Roadway
- Shoulders
- Medians
- Sidewalk
- Bike Facility
- New Bridge
- Existing Bridge
- Parking
- Potential Excess Property
- Proposed ROW
- Design Exception - Shoulder Width

No comment - CEM 12/17/2020

I-375 Improvement Project: Preliminary Geometrics (I-375 5B Direct Alternative)

Ramp Geometrics and Curve Data Tables

DATE: 1/30/2019

Ramp Geometrics Table

Ramp Name	Segment Type	From	To	Design Standard	Case	Ramp Design Speed	Thru Roadway Design Speed	La	Ld	B	C	Taper	Comments
BLVD RAMP A	Two-Lane Entrance Ramp	Boulevard	I-75 NB	GEO-110-C	Case IV	50	55	N/A				55:1	Drop lane shown in GEO-110-C not applicable. No merge with I-75NB through traffic. Brush Ramp B adds a lane to this ramp and is described below.
BLVD RAMP B	One-Lane Exit Ramp (Continuous with Gratiot Connector Ramp B) developed as option lane from Gratiot Connector Ramp B.	Gratiot Connector Ramp B	Boulevard	GEO-131	Case II	40	35	N/A				52:1	1 lane exit on curve with 2,654' Radius tangent to option lane taper of 1° 39' 12". AASHTO Figure 10-75 Case D and Figure 10-74 show desirable minimum 1,000' Radius. While this is a one lane ramp it is continuous and developed via and "option lane" from Gratiot Connector Ramp B. Shoulders variations are not laid out in accordance with GEO-140-B Case III and will be updated during preliminary design. Ramp design speed at the diverge is assumed to be 40 mph. Diverge from the Gratiot Connector Ramp B is curved and approximately 5°
BLVD RAMP C	Two-Lane Entrance Ramp	Boulevard	I-75 SB	GEO-110-C	Case IV	50	55	N/A				55:1	Drop lane shown in GEO-110-C not applicable. No merge with I-75 SB through traffic. The lanes are added to mainline. Length 'S' does not apply.
BLVD RAMP D	Three-Lane Exit Ramp	I-75 SB	Boulevard	GEO-140-B	Case III	50	55	N/A				26:1	3 lane exit on curve with 3,476' Radius tangent to I-75 SB. Varies from GEO 140-B with an option lane and and no upstream lane add. Curved diverge begins at the Mack St. Bridge which is not reconstructed with this project. Curved development of the ramp is similar to AASHTO Figure 10-75D and Figure 10-74 show desirable minimum 1,000' Radius. GEO-140-B Case III is referenced for the curved diverge approach. Elements of Case II including long diverge to develop the option lane could not be met.
BRUSH RAMP B	One-Lane Parallel Entrance Ramp (Left Side Add Lane)	Brush St.	Boulevard Ramp A	GEO-101-F	Case I	50	50	N/A		540'	272'	68:1	Entrance taper "C" is developed using a curve, R=903'. "B" value is not relevant since there is no sharper curve upstream of the entrance taper curve.
GRATIOT CONNECTOR RAMP B	Two-Lane Exit Ramp	I-75 NB	Gratiot Connector	GEO-140-B	Case III	50	60	N/A				32:1	2 lane exit on curve with 2,654' Radius tangent to option lane taper of 1° 51' 59". AASHTO Figure 10-75 D and Figure 10-74 show desirable minimum 1,000' Radius. Existing geometry and bridges to remain in place to not allow for full development length shown in Case II.
GRATIOT CONNECTOR RAMP D	Two-Lane Exit Ramp	Blvd Ramp D	Gratiot Connector	GEO-140-B	Case III	45	45	N/A				28:1	Gratiot Connector Ramp D is part of continuous on tangent lanes from Blvd Ramp A. BLVD Ramp D curvature creates the diverge from Gratiot Connector Ramp D. Blvd Ramp A tapers on curve radius of 1,393 There is no taper associated with this ramp. Conforms with AASHTO Figure 10-75D.
MACK RAMP B	One-Lane Parallel Exit Ramp (Drop Lane)	I-75 NB	Mack Ave.	GEO-130-D	Case II	40	55	Ld = 884'				37.5:1	GEO-130D Case II
MACK RAMP C	One-Lane Parallel Entrance Ramp	Mack Ave.	I-75 SB	GEO-202-B GEO-400-B	Case II	50	55	N/A				60:1	Urban slip ramp cross section. S=680'

Curve Table				
Curve Name	**Design Speed**	**R (Ft)**	**E (%)**	**Comments**
Blvd Ramp A (Curve 1)	30	300	4.6	
Blvd Ramp A (Curve 2)	40	976	3.4	
Blvd Ramp A (Curve 3)	50	2476	2.4	
Blvd Ramp A (Curve 4)	50	1255	4.3	
Blvd Ramp B (Curve 1)	40	1100	2.5	
Blvd Ramp B (Curve 2)	30	500	2.8	
Blvd Ramp C (Curve 1)	30	350	2	2.0% MIN WILL BE APPLIED ON THE CURVES THROUGH THE INTERSECTION. SUPERELEVATION RATES AROUND THESE CURVES MAY BE INCREASED DURING FINAL DESIGN.
Blvd Ramp C (Curve 2)	50	7654	2	
Blvd Ramp D (Curve 1)	50	3512	2	
Blvd Ramp D (Curve 2)	45	1393	2.9	
Blvd Ramp D (Curve 3)	40	5036	2	
Blvd Ramp D (Curve 4)	40	866	3.4	
Blvd Ramp D (Curve 5)	30	350	2	2.0% MIN WILL BE APPLIED ON THE CURVES THROUGH THE INTERSECTION. SUPERELEVATION RATES AROUND THESE CURVES MAY BE INCREASED NORTH OF THE INTERSECTION DURING FINAL DESIGN.
Brush Ramp B (Curve 1)	30	850	2.4	
Brush Ramp B (Curve 2)	40	1182	2.2	
Brush Ramp B (Curve 3)	45	903	4.5	
Gratiot Connector Ramp B (Curve 1)	50	2508	2	
Gratiot Connector Ramp B (Curve 2)	40	500	5.8	
Gratiot Connector Ramp B (Curve 3)	30	1162	2	
Gratiot Connector Ramp D (Curve 1)	30	679	2.1	
I-75 NB (Curve 1)	60	7987	2	
I-75 NB (Curve 2)	55	1151	5.5	
I-75 NB (Curve 3)	60	11938	2	
I-75 SB (Curve 1)	60	11964	2	
I-75 SB (Curve 2)	55	1165	5.5	
I-75 SB (Curve 3)	60	8014	2	
Mack Ramp B (Curve 1)	50	3500	2	
Mack Ramp B (Curve 2)	50	3488	2	
Mack Ramp B (Curve 3)	30	500	2.8	
Mack Ramp B (Curve 4)	30	1145	2	
Mack Ramp C (Curve 1)	30	880	2	
Mack Ramp C (Curve 2)	30	1000	2	
Mack Ramp C (Curve 3)	50	1500	3.5	
Mack Ramp C (Curve 4)	50	1512	3.5	

No comment - CEM 12/17/2020

I-375 Anticipated Design Exception/Variance Summary for I-375 Practical Alternative 5B

No.	Location	Design Exception/Design Variance	Design Feature in Question	Standard for Feature	Proposed Treatment	Notes
1	I-75 NB inside Shoulder between the west project limit and 830 feet east of the Brush St. Bridge	Design Exception	Shoulder Width	MDOT RDM Appendix 3A-2	Reduction of inside shoulder width from 12' to 6' min. Length of substandard shoulder is 1,308'.	This design exception was considered necessary to lengthen the 2' point to 2' point distance from the Gratiot Connector Ramp B to the Blvd ramp B. Increasing this distance allows the design to meet criteria in AASHTO Figure 10-68 for a service interchange to exit with a turning roadway. In this design iteration the decision distance between the 2' points was prioritized over the shoulder width to enhance safety of this exit.
2	Gratiot Connector Ramp B Outside Shoulder	Potential Design Exception (under 50 mph) see RDM 3.08.01	Shoulder Width	MDOT RDM Appendix 3A-2	MDOT RDM, Section 6.05.04.F. states "In the event of limited side conditions, the usable shoulder width may be reduced to a minimum of 6 ft." Need MDOT Geometrics' opinion on whether a DE is required for this location.	Reducing the shoulder width at this location was considered necessary to lengthen the 2' point to 2' point distance from the Gratiot Connector Ramp B to the Blvd ramp B. Increasing this distance allows the design to meet criteria in AASHTO Figure 10-68 for a service interchange to exit with a turning roadway. In this design iteration the decision distance between the 2' points was prioritized over the shoulder width to enhance safety of this exit.
3	BLVD Ramp D	Design Variance	Ramp Diverge	MDOT GEO 140-B (Case II and III)	3 lane exit on curve with 3,476' Radius from I-75 SB. Varies from GEO 140-B (Case II) with an option lane. Curved diverge begins at the Mack St. Bridge which is not to be reconstructed with this project. Curved development of the ramp is similar to AASHTO Figure 10-75 (Case D) and Exhibit Ex. 10-74 which show desirable minimum 1,000' Radius. GEO-140-B Case III is referenced for the curved diverge approach.	GEO-140-B Case III calls for development of the 12' interior lane over a 360' tangent. The proposed curve results in development of the 12' interior lane along Ramp D over 313'. This increased separation rate allows for the braid with the Mack Ramp D. This distance may be increased in future phases of design as the details for the braid structure geometry are determined.
4	Gratiot Connector Ramp B	Potential Design Variance	Ramp Diverge	MDOT GEO 140-B (Case II)	Proposed distance from beginning of taper on NB I-75 to first curve on Gratiot Connector Ramp B (R=1267') is 658' to allow for braiding of Brush Ramp B. GEO 140-B Case II calls for a distance of 1260' to first curve (R=1145')."	MDOT to confirm if Design Variance is needed.
5	Gratiot Avenue and Boulevard north of Gratiot	Potential Design Exception	Lane Width	MDOT RDM Appendix 3A-1	Reduction of lane widths of Gratiot and the Boulevard to 11' for traffic calming through the corridor.	Gratiot (M-3) appears to be part of NHS, but not the National Network. MDOT Geometrics to advise whether a design exception is required for lane widths along Gratiot and along the proposed boulevard.