

**HASTINGS CITY COUNCIL
WORKSESSION AGENDA**

**Hastings Municipal Airport
3300 W. 12th Street
November 20, 2023
5:30 PM**

ROLL CALL:

PLEDGE OF ALLEGIANCE:

MOTION TO ADOPT CURRENT AGENDA for November 20, 2023 Worksession.

PUBLIC NOTICE - Official Notice of the Worksession was published in the Hastings Tribune on Friday, November 17, 2023. Pursuant to Nebraska Revised Statute Section 84-1412, the public is advised that a copy of today's agenda and all reproducible written material which will be discussed at today's meeting is available. Also, a current copy of the Nebraska Open Meetings Act is posted and accessible to members of the public.

DISCUSSION ITEMS

1. Hastings Utility Advisory Board importance.
2. Discussion of 12th Street corridor study.
3. Discussion of City Council standards and norms.
4. City Hall timeline.
5. Discussion of Payment in Lieu of Tax (PILOT).

ADJOURN:

The Mayor and City Council reserve the right to enter into an executive session at any time during the meeting, in accordance with the Nebraska Open Meetings Act, even though the closed session may not be indicated on the agenda.

It is the intention of the Mayor and City Council to take up the items on the agenda in sequential order. However, the Mayor and City Council reserve the right to take up matters in a different order to accommodate the schedules of the city council members, person having items on the agenda, and the public.

Worksession meetings are intended to allow for communication and discussion amongst the elected officials. At the prerogative of the presiding officer of the worksession, city staff, consultants or citizens may be requested or allowed to address specific items on the worksession agenda.



ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

12th Street Corridor Study Hastings, NE Draft

JEO Project No. 220893.00

***Prepared for:
The City of Hastings***

*Prepared by:
JEO Consulting Group*

*Date:
November 14, 2023*

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Appendix B: Concept illustrations (per project)

Appendix C: Corridor-wide drainage memorandum

Appendix D: Corridor-wide status of utilities

Appendix E: Design criteria

Appendix F: Engineer’s opinion of probable cost (per project)

1.0 Introduction

This report documents the results of the 12th Street Corridor Study conducted for the City of Hastings.

1.1 Project Background

The City of Hastings (City) desires to improve W 12th Street between Nalan Drive and N Hastings Avenue. With the newer subdivisions along the corridor, specifically at the western city limits, and the redevelopment of the Theater District southwest of the intersection of W 12th Street & N Marian Road, safety and capacity of the corridor needs to be reevaluated. Additionally, the existing pavement needs an overlay or a more invasive rehabilitation and there is little to no sidewalk along the corridor west of N Baltimore Avenue.

The W 12th Street Corridor Study included traffic analysis and conceptual design of the corridor, including intersection, street, and sidewalk/trail improvements. The primary goal of the study was to establish projects along the corridor, ranked by priority, that could be constructed individually by the City. The W 12th Street study corridor, with identified study intersections, is depicted in Figure 1.

1.2 Methodology

This report applies the methodology and guidance of the Highway Capacity Manual, 6th Edition, the Manual on Uniform Traffic Control Devices (MUTCD), the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition, the National Cooperative Highway Research Program (NCHRP) Report 457, and Nebraska Department of Transportation (NDOT) guidelines.

1.3 Report Organization

The remainder of this report is organized as follows:

- 2.0 Existing Conditions
- 3.0 Future Conditions
- 4.0 Projects
- 5.0 Detour Options
- 6.0 Funding Sources
- 7.0 Conclusion



Figure 1: Vicinity Map

2.0 Existing Conditions

The following sections summarize existing conditions along the corridor including descriptions of study-area streets, intersection geometrics and traffic control, current traffic demands, existing traffic operations, and safety analysis. Additional information is provided in the Traffic Analysis report included as Appendix A.

2.1 Existing Street Network and Geometry

The existing street network and intersection lane configurations are shown in Figure 2.

2.2 Existing Traffic Volumes

Existing turning movement volumes were collected at all study area intersections on Tuesday, April 25th, 2023. For the corridor as a whole, the observed weekday AM peak hour was between 7:15 am and 8:15 am; the observed school weekday PM peak hour was between 3:15 pm and 4:15 pm; and the observed commuter weekday PM peak hour was between 4:45 pm and 5:45 pm. AM, school PM, and commuter PM peak hour turning movement volumes are shown in Figure 3.

2.3 Existing Conditions Capacity Analysis

The existing AM, school PM, and commuter PM peak hour conditions were analyzed using the existing traffic volumes, intersection lane configurations, and current signal timing information. As shown in Figure 4, all intersections operate at level of service (LOS) D or better with most operating at LOS C or better. The lone exception is the westbound approach to the intersection of W 12th Street & N Marian Road, which operates at LOS E during the AM peak hour.

2.4 Safety Analysis¹

Crash data was obtained for intersections along W 12th Street for the most recent three-year period (2/1/2017 – 1/30/2020). Calculated crash rates at all W 12th Streets intersections were below one (1) crash per million entering vehicles and therefore no W 12th Street intersections would typically be considered high-crash locations.

It should be noted that one fatal crash was reported within the three years of crash data provided. The fatal crash happened approximately 650 feet west of the W 12th Street & N Baltimore Avenue intersection at the intersection of W 12th Street & Westwood Terrace. At 3:40 am, a westbound car struck a pedestrian attempting to cross the street. Alcohol was reported as a contributing factor in the crash.

¹ **CONFIDENTIAL INFORMATION:** Federal Law, 23 U.S.C 409, prohibits the production of this document or its contents in discovery or its use in evidence in a State or Federal Court. The State of Nebraska has not waived any privilege it may assert as provided by law through the dissemination of this document and has not authorized further distribution of this document or its contents to anyone other than the original recipient.

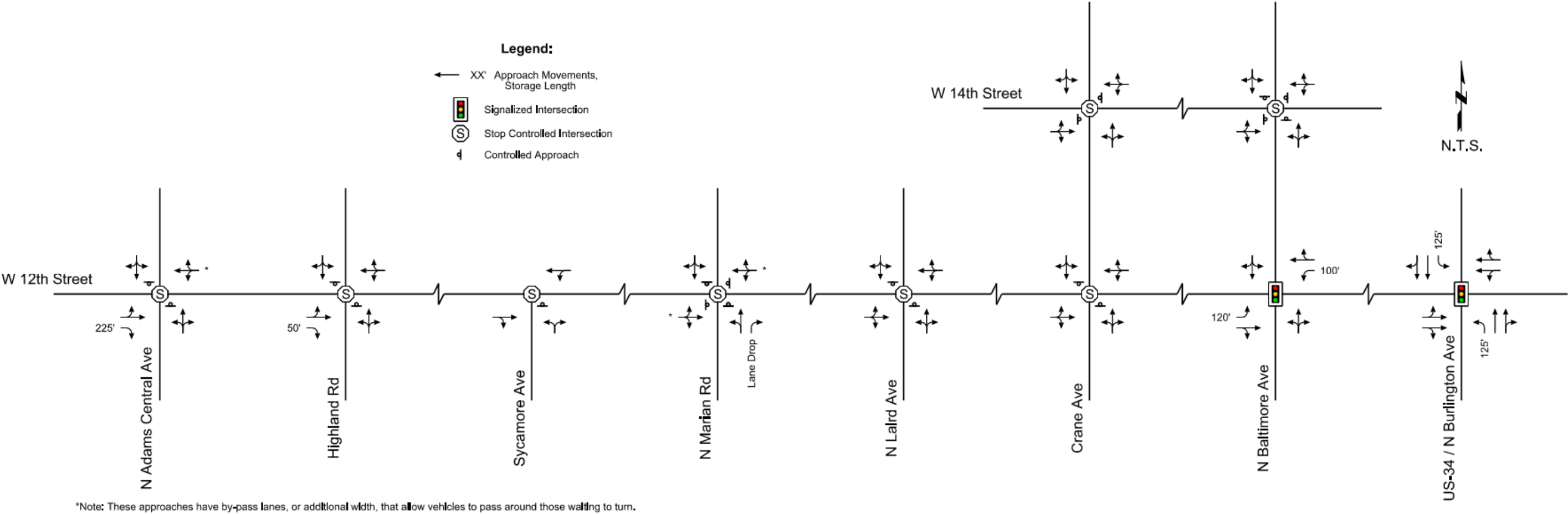


Figure 2: Existing Intersection Geometrics and Traffic Control

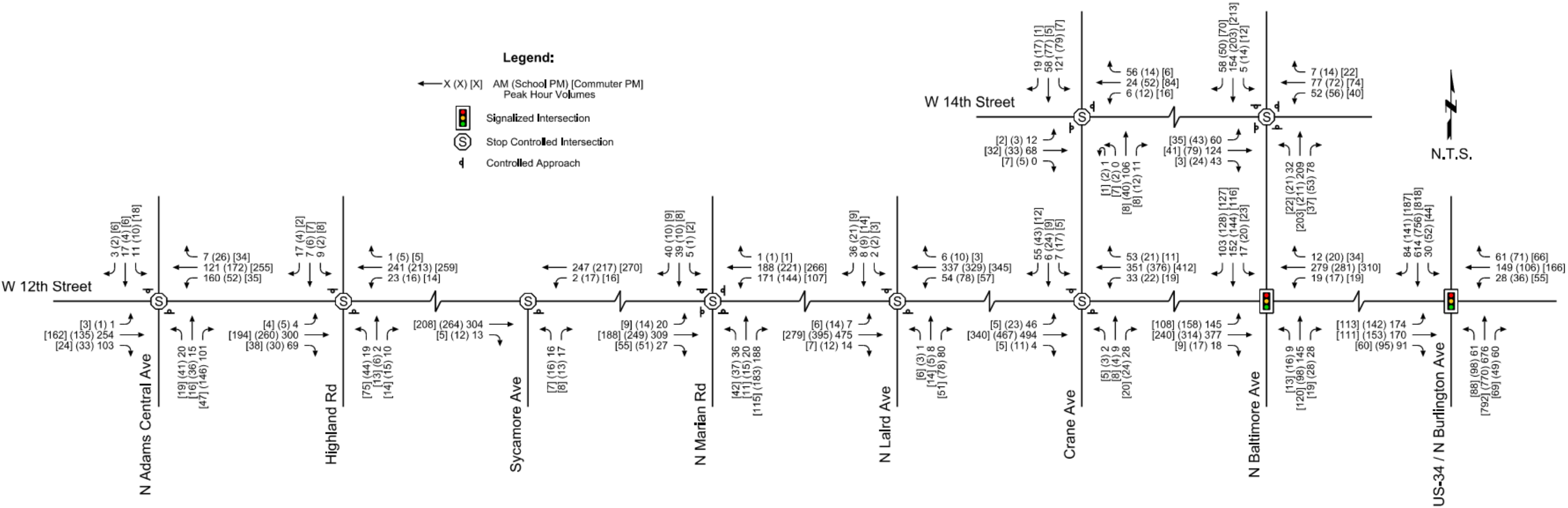


Figure 3: Existing Peak Hour Volumes

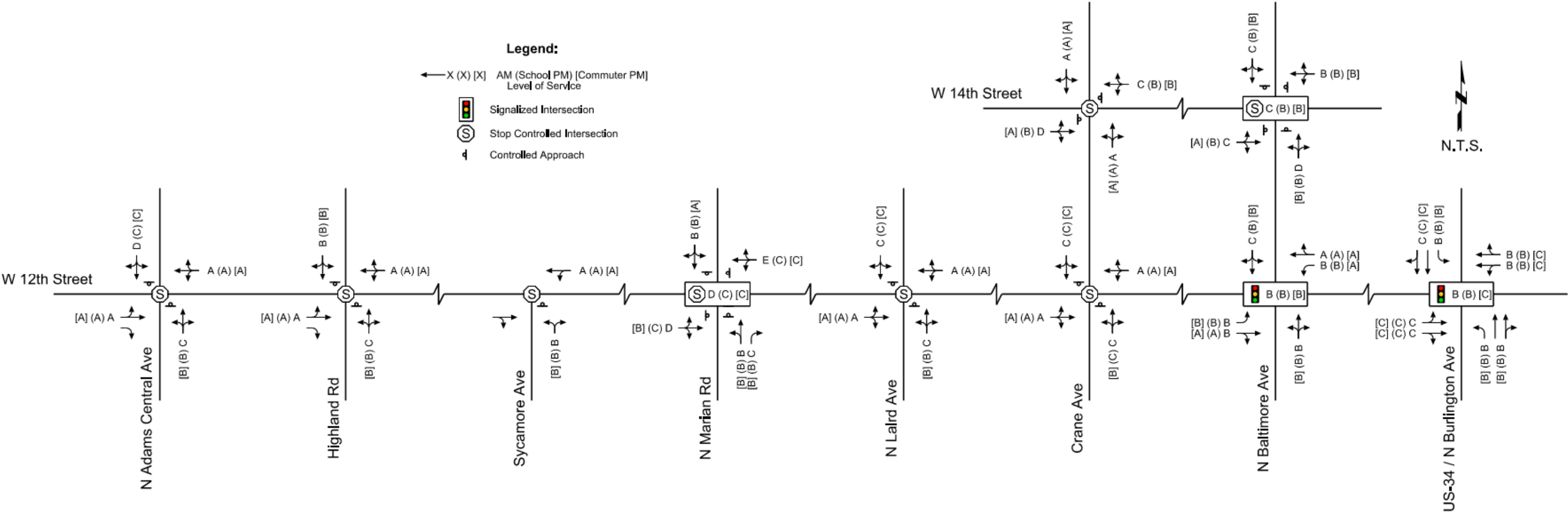


Figure 4: Existing Peak Hour Level of Service

3.0 Future Conditions

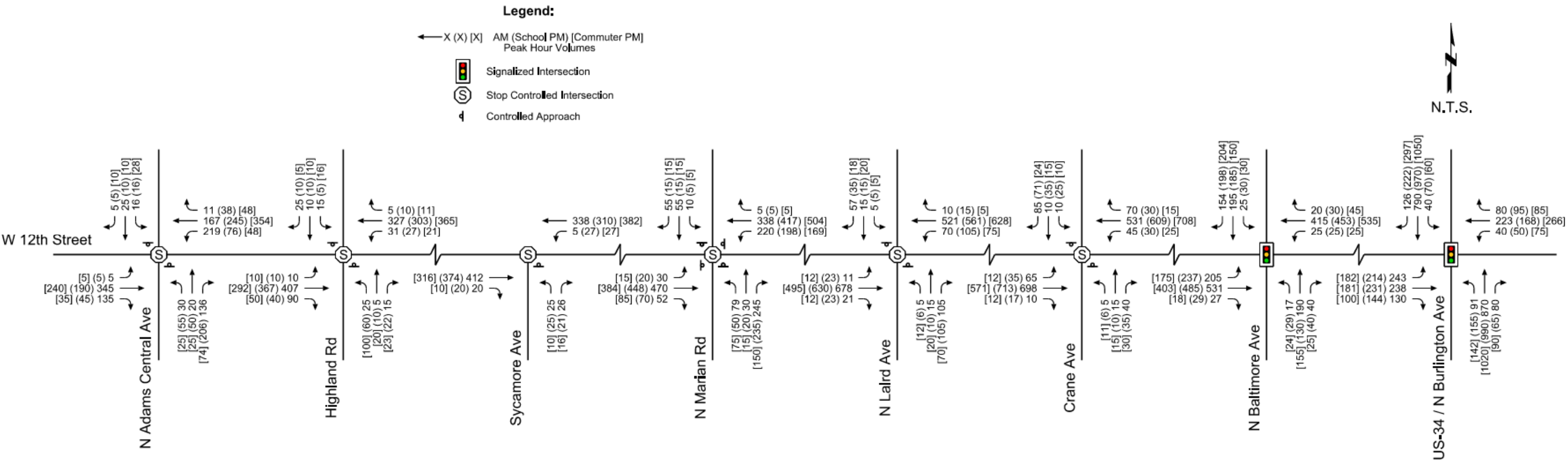
The following sections document the assumed future, no-build conditions of study area intersections for horizon year 2048. The only transportation infrastructure project that was considered in developing future intersection and street lane configurations was the NDOT signal upgrades at the intersection of W 12th Street & US-281/N Burlington Avenue. This project is not intended to change existing geometry or lane configurations. As such, intersection and street geometric configurations for the 2048 no-build conditions are identical to existing conditions. Additional information is provided in the Traffic Analysis report included as Appendix A.

3.1 Year 2048 Projected Traffic Demands

A review of historical traffic volumes provided by NDOT revealed both relatively low and, in a couple of cases, negative growth trends on area streets. To account for the possibility of future growth, to provide a likely conservative approach, and in consultation with the City of Hastings, the existing 2023 traffic volumes were grown at an average annual growth rate of 1.0% for 25 years to estimate 2048 background traffic volumes. Site trips associated with the Theatre District development on the southwest corner of the intersection of W 12th Street & N Marian Road were added to the 2048 background traffic volumes to establish year 2048 peak hour volumes. The resulting year 2048 peak hour volumes are illustrated in Figure 5. (Note: Future traffic volume forecasts were not developed for W 14th Street.)

3.2 Year 2048 No-Build Conditions Capacity Analysis

Year 2048 no-build conditions capacity analysis was conducted for all W 12th Street study intersections with the resulting year 2048 peak hour LOS summarized in Figure 6. As shown, several approaches to multiple intersections are expected to operate at LOS F during multiple peak time periods. However, it should be noted that these conditions are not uncommon for stop-controlled minor street approaches to major through streets, such as the N Laird Avenue approaches to W 12th Street.



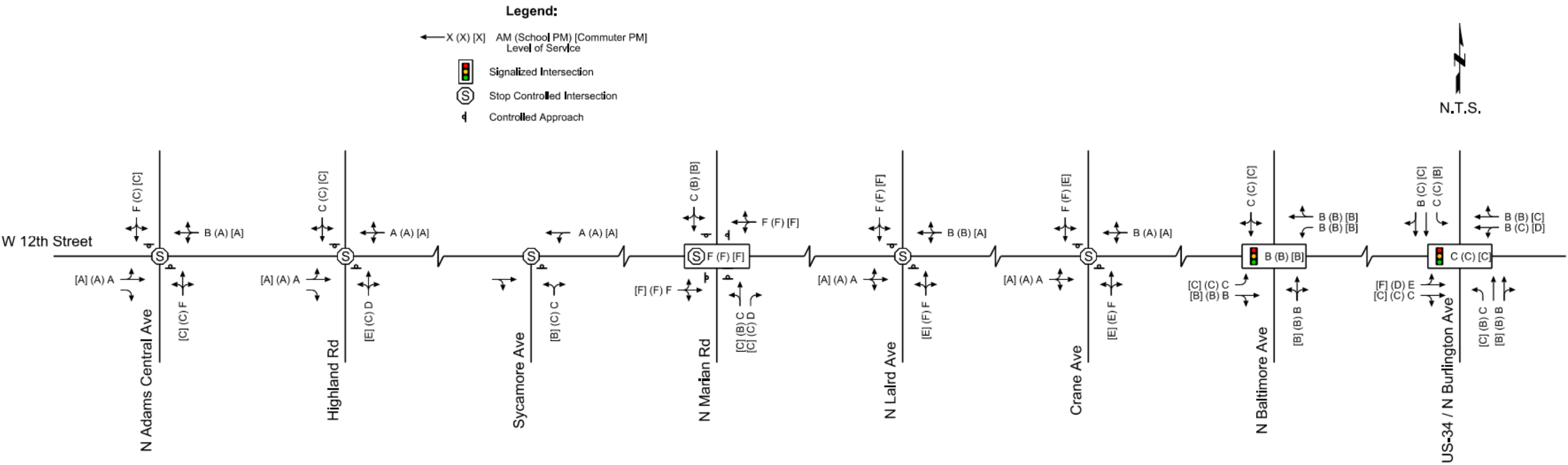


Figure 6: Year 2048 Peak Hour Level of Service

4.0 Projects

Below is a list of recommended projects throughout the W 12th Street corridor. This list starts at the west end of the corridor and works its way east. For each project, additional information is provided in the appendices, as follows:

- Appendix B – concept illustration (per project)
- Appendix C – corridor-wide drainage memorandum
- Appendix D – corridor-wide status of utilities
- Appendix E – design criteria
- Appendix F – engineer’s opinion of probable cost (per project)

Additionally, for each project:

- Temporary easements will likely be necessary during construction. Final ROW acquisition need will be determined during final design.
- Coordination of all utility impacts and necessary relocations is to be performed during final design.
- Storm sewer is identified at likely locations and will need to conform to the current version of the Hastings Drainage Criteria Manual during final design.

4.1 Project 1: W 12th Street, City Limits to N Adams Central Avenue

Below is a summary of the analysis and recommendations for W 12th Street from the west city limits (near Nalan Drive) to the intersection with N Adams Central Avenue.

4.1.1 Recommendation

The posted speed limit of 50 mph along this stretch of W 12th Street is above that recommended for a two-way left-turn lane (TWLTL). Because of this, it is recommended that this segment of W 12th Street be maintained as a two-lane road.

4.1.2 Concept

It is proposed that this segment of W 12th Street be constructed with a 28-ft wide surface comprised of two (2) 11-ft lanes and 3-ft paved shoulders. The typical cross-section would also consist of 5-ft earth shoulders. A trail, identified as Project 17, is also proposed along the north side of W 12th Street. An example section of Project 1 is illustrated in Figure 7.

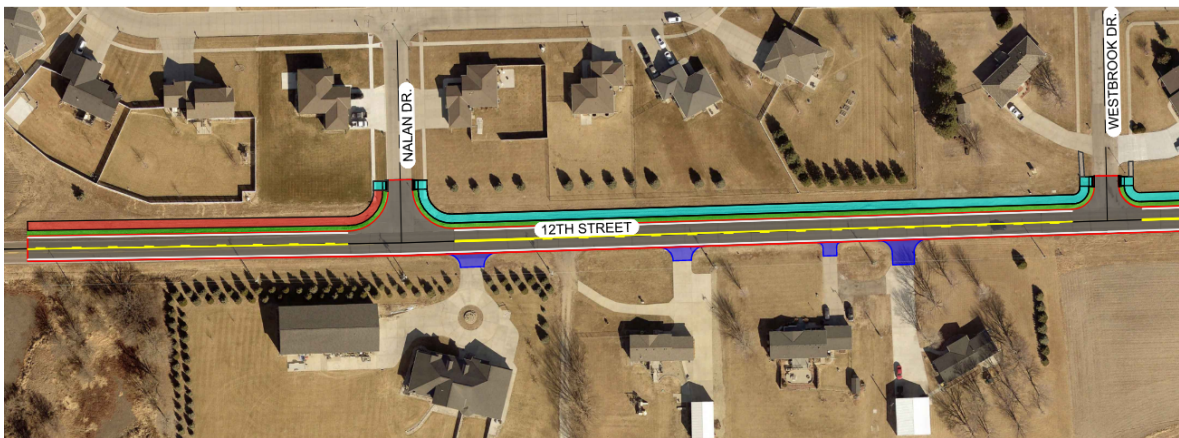


Figure 7: Project 1

4.1.3 Drainage

The existing roadway is paralleled by open ditches along both the north and south sides. Additionally, two culverts cross W 12th Street, east of Westbrook Drive (east of Sta. 33+00); one is a 36" steel pipe and the other is a 30" CMP culvert pipe. During the design of this project, the condition of these culverts should be evaluated as both will likely need to be extended if used in place. Furthermore, the existing culverts under side streets and driveways will likely be impacted by anticipated grading activity and will likely need to be replaced.

4.1.4 Status of Utilities

Construction of this project, specifically grading of the proposed trail, will likely have impacts on multiple telecommunications facilities along the project. Additionally, construction of the proposed trail at Nalan Drive will likely require relocation of a street luminaire and pole.

4.1.5 Right of Way

If the existing drainage culverts near Sta. 33+00 need to be extended (see section 4.1.3), additional drainage easement is anticipated. Additionally, temporary easements will likely be necessary during construction of this project.

4.1.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$1,190,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.2 Project 2: Intersection of W 12th Street & N Adams Central Avenue

Below is a summary of the analysis and recommendations for the W 12th Street intersection with N Adams Central Avenue.

4.2.1 Recommendation

As illustrated in Figure 6, operational deficiencies on the stop-controlled approaches of this intersection are expected by year 2048. To mitigate these conditions, both all-way stop-control (AWSC) and roundabout alternatives were evaluated.

4.2.1.1 All-way Stop Control

While AWSC did improve the operational performance of the N Adams Central Avenue approaches, it also significantly degraded operations on both W 12th Street approaches. For this reason, AWSC was not considered a viable option alternative.

4.2.1.2 Roundabout

A single-lane roundabout was shown to operate efficiently and provide a high level of service to all approaches during all three peak time periods. Combined with the strong safety benefits of single-lane roundabouts, the installation of a roundabout is recommended at this intersection.

4.2.2 Concept

Based on the conceptual design effort associated with this corridor study, a single-lane roundabout with a 140-ft inscribed circle is proposed for this intersection with the intent of accommodating a WB-67 design vehicle (tractor trailer with a 53-ft trailer). The configurations of the northbound and westbound approaches are proposed to decrease travel speeds of motorists approaching the roundabout in those directions, which are characterized by posted speed limits of 55 mph and 50 mph, respectively. To address the approach speeds of vehicles on the southbound and eastbound approaches, it is recommended that the posted speed limits be reduced to 40 mph.

A trail, identified as Project 17, is proposed across the north leg (southbound approach) of the intersection. The trail approaches, accessible ramps, and curb cuts within the north splitter island should be designed to accommodate the proposed trail.

To promote safe operations of the entire intersection and the proposed trail crossing, it is recommended that roadway lighting be installed at the roundabout intersection.

- 11' wide painted lane for N Adams Central Road north of 12th Street to City Limit to encourage slower speed (not shown).

A conceptual design of the proposed roundabout at this intersection is illustrated in Figure 8.

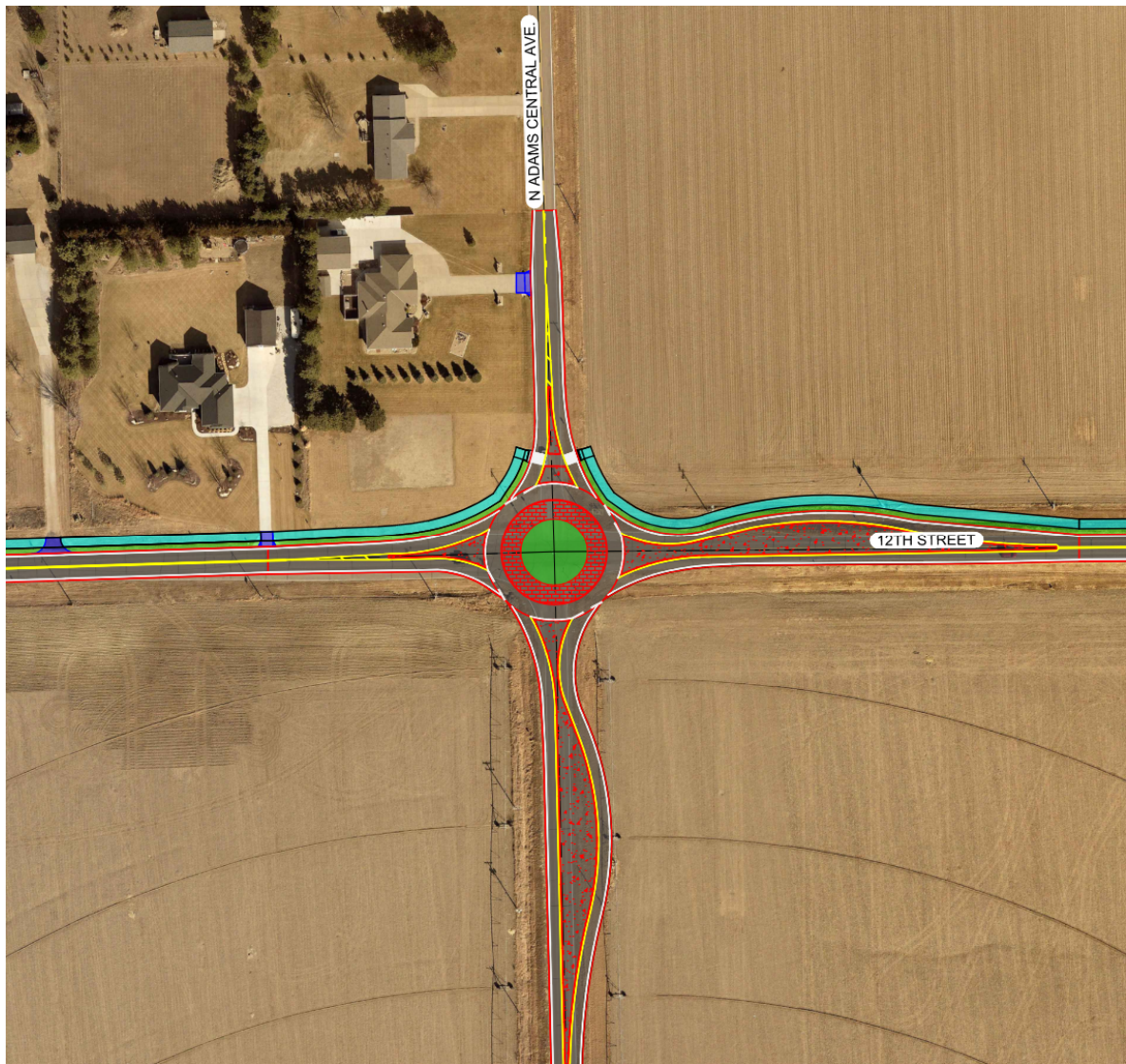


Figure 8: Project 2

4.2.3 Drainage

The 12th Street corridor is presently paralleled by open ditches along both the north and south sides of the roadway. It is recommended that drainage be maintained as open ditches with grading outside of the limits of the proposed intersection pavement and trail. During the design of this project, the condition of existing driveway culverts and their compatibility with the proposed grading shall be evaluated.

4.2.4 Status of Utilities

Construction of this project will have impacts on existing utility infrastructure. Those impacts and potential relocations known at the time of the writing of this document are as follows:

- Fire hydrant in the southwest quadrant of the intersection.

- Irrigation well and associated electric service pole, located approximately 320-feet south of 12th Street on the east side of N Adams Central Avenue.
- Power poles in the southwest, northwest, and northeast quadrants of the intersection will need to be relocated or the overhead lines buried.
- Power poles along the north side of 12th Street east of N Adams Central Avenue will need to be relocated.
- An above-ground gas valve station owned by Black Hills Energy will need to be relocated.
- One known telecommunications manhole is anticipated to need adjustment.
- As noted in Section 4.2.2, new roadway lighting is recommended beginning at each of the four approaches to the intersection.

4.2.5 Right of Way

Construction of the roundabout, trail, and utilities will likely require the following Right of Way (ROW) acquisition:

- Permanent ROW in the northwest quadrant to accommodate the geometry of the roundabout and proposed trail.
- Permanent ROW in the northeast quadrant to accommodate the geometry of the roundabout and proposed trail.
- Permanent ROW in the southeast quadrant to accommodate the geometry of the roundabout.
- Permanent ROW in the southwest quadrant to accommodate the geometry of the roundabout.
- Permanent ROW along the south leg of the roundabout to accommodate the proposed geometry of the splitter island along N Adams Central Avenue. The location of this ROW need is approximately 60 ft east of the section line.
- Permanent ROW along the east leg of the roundabout to accommodate the proposed geometry of the splitter island along W 12th Street. The location of this ROW need is approximately 60 ft north of the section line.

4.2.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$1,700,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.3 Project 3: W 12 Street, N Adams Central Avenue to Highland Road

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with N Adams Central Avenue and Highland Road.

4.3.1 Recommendation

This segment of W 12th Street is a two-lane road with a posted speed limit of 50 mph. Additionally, there are no public street connections and very few private driveway connections within this

segment. As the posted speed limit exceeds 45 mph, and due to the few number of access points, the preservation of the existing two-lane cross-section is recommended.

4.3.2 Concept

It is proposed that this segment of W 12th Street be constructed with a 28-ft wide surface comprised of two (2) 12-ft lanes and 2-ft paved shoulders. The typical cross-section would also consist of 6-ft earth shoulders. A trail, identified as Project 17, is also proposed along the north side of W 12th Street. An example section of Project 3 is illustrated in Figure 9.



Figure 9: Project 3

4.3.3 Drainage

Drainage of the existing cross-section is provided via open ditches. Drainage of the proposed cross-section will be accommodated with open ditches on both sides of W 12th Street, except for the following segments along the north side of W 12th Street:

- From approximately Sta. 72+00 to approximately Sta. 76+50
- From approximately Sta. 90+00 to the Highland Road intersection

For these two segments, it is recommended to drain the roadway and adjacent residential properties using underground storm sewer pipe with area inlets located between driveways.

During the design of this project, the condition of the existing culvert crossing between approximately Sta. 78+25 to Sta. 79+75 should be evaluated as it will likely need to be extended to the north, if used in place.

4.3.4 Status of Utilities

Construction of this project, specifically grading of the proposed trail and roadway ditches, will likely have impacts on multiple telecommunication facilities. The locations of these impacts are at approximately Sta. 63+00 and 65+00. Other utilities are not anticipated to be a conflict at this location.

4.3.5 Right of Way

Temporary construction easements are anticipated for driveway reconstruction, grading, and storm drainage improvements. Permanent drainage easements may be necessary to accommodate the proposed storm sewer construction.

4.3.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,220,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.4 Project 4: Intersection of W 12th Street & Highland Road

Below is a summary of the analysis and recommendations for the W 12th Street intersection with Highland Road.

4.4.1 Recommendation

As shown previously under year 2048 no-build conditions, the eastbound, westbound, and southbound approaches of this intersection, operated as a two-way stop-controlled (TWSC) intersection, are all expected to operate at LOS C, or better, during all three peak time periods. Conversely, the northbound approach is anticipated to operate at LOS D during the AM peak hour and LOS E during the commuter PM peak hour. However, these movements are both under capacity and it is not uncommon for stop-controlled, minor street approaches to major streets to experience poor Levels of Service during peak volume time periods. As such, it is recommended that this intersection be maintained as a TWSC intersection.

While not required to improve LOS, both an eastbound right-turn lane and a westbound left-turn lane are warranted and therefore recommended. As volumes increase, these auxiliary turn lanes will provide increased safety along W 12th Street by removing vehicles that are decelerating to turn from the through lanes. (It should be noted that the eastbound right-turn volume is only five vehicles short of satisfying the warrant threshold under existing (2023) conditions. The westbound left-turn lane, however, is not expected to satisfy warrant criteria until the mid-2040s.)

4.4.2 Concept

The proposed TWSC intersection is recommended to include a westbound right-turn lane and an eastbound left-turn lane. The width of all lanes, including the auxiliary turn lanes, is 12 ft. An example section of Project 4 is illustrated in Figure 10.

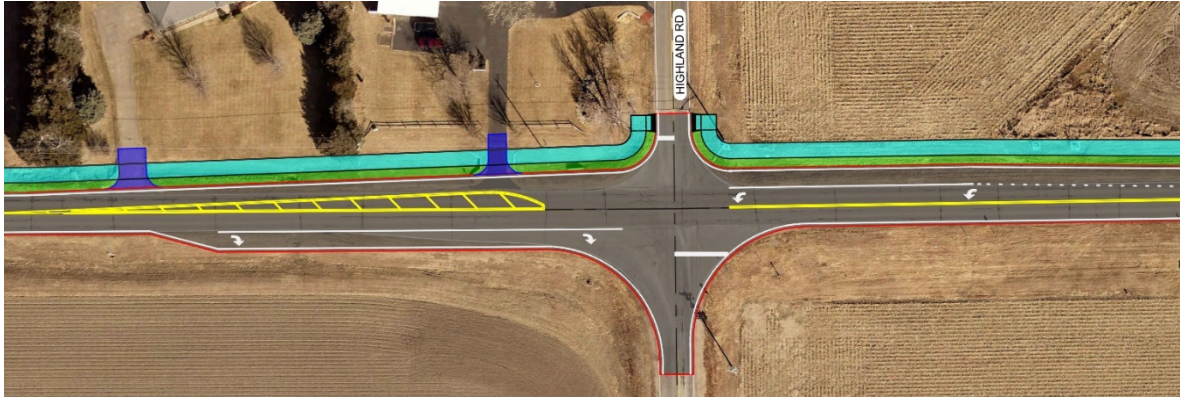


Figure 10: Project 4

4.4.3 Drainage

The existing 12th Street corridor is paralleled by open ditches on both the north and south sides of the street. It is recommended that drainage be maintained through existing or regraded ditches in the northeast, southeast and southwest quadrants of the intersection. Furthermore, in the northwest quadrant, along the north side of W 12th Street, it is recommended to drain the roadway and adjacent residential properties using underground storm sewer pipe with area inlets located between driveways.

During the design of this project, the condition of the existing culverts crossing on the west side of Highland Road should be evaluated as they are proposed to be extended to connect to the aforementioned storm sewer pipe and accommodate the widening of the roadway for the turning lanes. The three pipes are a 24" arch CMP and 2-36" arch CMPs.

4.4.4 Status of Utilities

An existing, above-ground gas valve station, owned by Black Hills Energy, is located on the north side of W 12th Street at approximately Sta. 101+00. This may be impacted by grading and storm sewer pipe installation.

4.4.5 Right of Way

Temporary construction easements are anticipated for driveway reconstruction and grading improvements. A permanent drainage easement may be necessary on the north side of W 12th Street, west of Highland Road, to construct the proposed storm sewer system. Additionally, permanent ROW or easement is anticipated on the north side of W 12th Street, east of Highland Road, to accommodate intersection and trail construction.

4.4.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$950,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility

relocations. This probable cost does not include the trail construction which is included as Project 17.

4.5 Project 5: W 12th Street, Highland Road to Sycamore Avenue

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with Highland Road and Sycamore Avenue.

4.5.1 Recommendation

This segment of W 12th Street is a two-lane street with a posted speed limit of 45 mph. Additionally, there are no public street or driveway connections within this segment. As such, the preservation of the existing two-lane cross-section is recommended.

4.5.2 Concept

It is proposed that this segment of W 12th Street be constructed with a 28-ft wide surface comprised of two (2) 12-ft lanes and 2-ft paved shoulders. The typical cross-section would also consist of 6-ft earth shoulders. A trail, identified as Project 17, is also proposed along the north side of W 12th Street. An example section of Project 5 is illustrated in Figure 11.



Figure 11: Project 5

4.5.3 Drainage

The existing 12th Street corridor is paralleled by open ditches on both the north and south sides of the street. It is recommended that drainage be maintained through existing or regraded ditches.

During the design of this project, the condition of existing twin 48" arch CMP culverts at approximately Sta. 110+25 should be evaluated as they will likely need to be extended. Also, the existing flood zone/floodway will require evaluation during design for impacts and permitting.

4.5.4 Status of Utilities

Construction of this project, specifically grading of the proposed trail and roadway ditches, will likely have impacts to the following utilities:

- Above-ground gas valve station, owned by Tallgrass Energy, located along the north side of W 12th Street at approximately Sta. 100+75.
- Above-ground gas valve station, owned by Black Hills Energy, located along the north side of W 12th Street at approximately Sta. 101+25.

4.5.5 Right of Way

No property impacts or ROW acquisition are anticipated.

4.5.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$510,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.6 Project 6: Intersection of W 12th Street & Sycamore Avenue

Below is a summary of the analysis and recommendations for the W 12th Street intersection with Sycamore Avenue.

4.6.1 Recommendation

As a TWSC intersection, W 12th Street & Sycamore Avenue is expected to operate at LOS C, or better, through the year 2048. As such, no changes are recommended to the type of traffic control of lane configurations. However, if the W 12th Street cross-section directly to the east of this intersection were to be modified to include a TWLTL, the addition of a dedicated westbound left-turn lane at this intersection would be recommended, serving as the start of the three lane TWLTL from this intersection east.

4.6.2 Concept

The Sycamore Avenue intersection is where the typical section transitions from a two-lane, 28-ft wide street with open ditch drainage (west of Sycamore Avenue) to a three-lane, 39-ft wide street with curb and gutters, underground storm sewer, and a 5-ft sidewalk on the south side of W 12th Street (east of Sycamore Avenue).

A trail, identified as Project 17, is proposed along the north side of W 12th Street.

The City of Hastings will coordinate with the adjacent property owner to extend the sidewalk south along Sycamore Avenue, connecting to the existing sidewalk further south within the subdivision.

An example section of Project 6 is illustrated in Figure 12.

4.6.3 Drainage

Storm sewer drainage at this intersection is proposed via curb and gutter and an underground storm sewer system. Details of this storm sewer system include the following:

- A storm sewer outlet is proposed into the south ditch of W 12th Street west of Sycamore Avenue.
- The sizing of curb inlets and storm sewer pipe shall be determined in final design and shall consider the storm sewer system constructed with Project 7.
- Due to existing water mains and other known utilities, it is anticipated that the storm sewer trunk line will be constructed south of the south curb line.



Figure 12: Project 6

4.6.4 Status of Utilities

The elevation of multiple manholes will likely need to be adjusted, some possibly requiring partial reconstruction, due to the anticipated lowering of the roadway profile.

4.6.5 Right of Way

Temporary construction easements are anticipated to accommodate grading activity.

4.6.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$410,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.7 Project 7: W 12th Street, Sycamore Avenue to N Marian Road

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with Sycamore Avenue and N Marian Road.

4.7.1 Recommendation

Because characteristics of this segment of W 12th Street satisfy the relevant criteria, a TWLTL section is recommended for implementation. Because the majority of the driveway and local street connections are located on the south side of W 12th Street, the occasional conflicts between overlapping left-turn movements that can result with TWLTL sections are not realized in this segment. While the implementation of a TWLTL section is expected to improve safety by removing left-turning vehicles from the through lane of travel, it also has the potential for increasing the operating speed of vehicles traversing the corridor, especially that of westbound vehicles leaving the city.

4.7.2 Concept

It is proposed that this segment of W 12th Street be constructed as a 39-ft curb and gutter section with two through lanes (one in each direction) and a center, TWLTL. A 5-ft sidewalk is proposed on the south side of W 12th Street, west of Theatre Drive, and a trail, identified as Project 17, is proposed along the north side of W 12th Street, also west of Theatre Drive. An example section of Project 7 is illustrated in Figure 13.

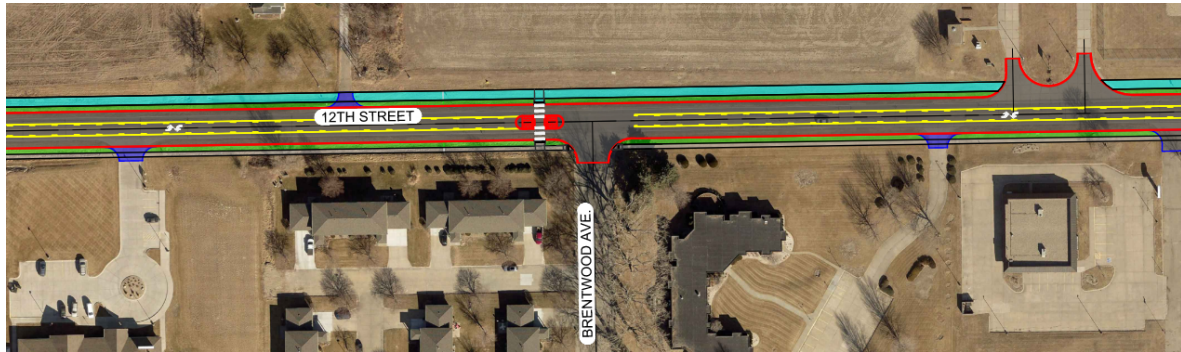


Figure 13: Project 7

To accommodate pedestrian safety and mobility, marked pedestrian crossings are proposed on the west legs of the intersections at Brentwood Avenue and Theatre Drive. During final design, the consideration of a raised median refuge island and a rectangular rapid flashing beacon (RRFB) should be considered.

4.7.3 Drainage

Though the existing street is drained via open ditches, a new underground storm sewer system is proposed to be constructed with the new street. Details of this storm sewer system include the following:

- The sizing and location of curb inlets and storm sewer pipe shall be determined during final design.
- For that portion of the segment west of approximately Sta. 136+00, storm water from the street will drain to the west. For this section, the storm sewer trunk line is anticipated to be along the south curb line due to existing utilities along the north side.
- For the portion of the segment east of approximately Sta. 136+00, storm water from the street will drain to the east toward the Marian Road intersection. The storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

4.7.4 Status of Utilities

With the proposed project, no major impacts to existing utility infrastructure are anticipated.

4.7.5 Right of Way

Temporary construction easements are anticipated to accommodate grading activity and driveway construction.

4.7.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,740,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations. This probable cost does not include the trail construction which is included as Project 17.

4.8 Project 8: Intersection of W 12th Street & N Marian Road

Below is a summary of the analysis and recommendations for the W 12th Street intersection with N Marian Road.

4.8.1 Recommendation

As illustrated in Figure 6, as an AWSC intersection, W 12th Street & N Marian Road is expected to operate at LOS F on both the eastbound and westbound approaches during all three peak time periods in the year 2048. To mitigate these anticipated conditions, two alternatives were considered: traffic signal control and a roundabout.

4.8.1.1 Traffic Signal

The existing traffic volumes at the intersection of W 12th Street & N Marian Road do not currently satisfy MUTCD traffic signal warrant criteria. It is also expected that neither Warrant 1 nor Warrant 2 will be satisfied in the year 2048. According to the MUTCD, traffic signals that are installed where they are not justified can result in excessive delay, excessive disobedience of the signal indications, increased use of less adequate routes as vehicles attempt to avoid traffic signals, and significant increases in the frequency of collisions (especially rear-end collisions).

Adding complexity to a potential traffic signal installation, this intersection is situated roughly 850 feet from one of the runways at Hastings Municipal Airport. The installation of traffic signal poles at this location could be in conflict with the flight paths associated with this runway. As such, if the implementation of this alternative were to be considered, coordination with the Hastings Municipal Airport and the Federal Aviation Administration (FAA) would be required. Consequently, a traffic signal was not evaluated further at this intersection.

4.8.1.2 Roundabout

As a single-lane roundabout, the intersection of W 12th Street & N Marian Road would be expected to operate at LOS C, or better, during all three peak time periods. Because of the safety benefits of single-lane roundabouts and the anticipated traffic operations which are better than if operated under AWSC, a single-lane roundabout is recommended at this intersection.

4.8.2 Concept

Based on the conceptual design effort associated with this corridor study, a single-lane roundabout with a 140-ft inscribed circle is proposed for this intersection with the intent of accommodating a WB-67 design vehicle. In order for N Marian Road to be compatible with the proposed roundabout lane configurations, it is recommended that N Marian Road, between Theatre Drive and N 12th

Street, be converted from a four-lane street to a 39-ft, divided two-lane street. Additional details of this conversion are as follows:

- Both of the outside lanes of the existing four-lane cross-section should be removed because of the poor existing pavement conditions. Where the pavement condition permits, salvage the two middle lanes, removing and replacing concrete panels, as necessary.
- Construct curb and gutter along the west side of existing southbound inside travel lane.
- Reconstruct east lane for northbound traffic with curb and gutter.
- The new 39-ft section shall include a striped median, separating northbound and southbound traffic, as no access points exist, and none are anticipated in the foreseeable future.
- North of W 12th Street, N Marian Road is proposed to be a two-lane, 28-ft wide roadway with open ditches to accommodate storm drainage.
- East and west of N Marian Road, W 12th Street is proposed to consist of a 39-ft wide, three-lane section.

The majority of Project 8 is illustrated in Figure 14.

4.8.3 Drainage

To drain storm water from the proposed intersection, it is recommended that the existing open ditches be maintained where possible and regraded where necessary. Where curb inlets are constructed, they should outlet to these open ditches. The existing curb inlets along N Marian Road, between Theatre Drive and W 12th Street, should be reconstructed or adjusted as necessary to accommodate the proposed paving improvements. The general locations of the curb inlets and proposed storm sewer pipe are to be similar as existing. The existing 3' x 8' reinforced concrete box culverts on the east and west sides of N Marian Road, at W 12th Street, will need to be either reconstructed or extended to accommodate the proposed roundabout pavement.

4.8.4 Status of Utilities

Construction of this project will have impacts on existing utility infrastructure. Those impacts and potential relocations known at the time of the writing of this document are as follows:

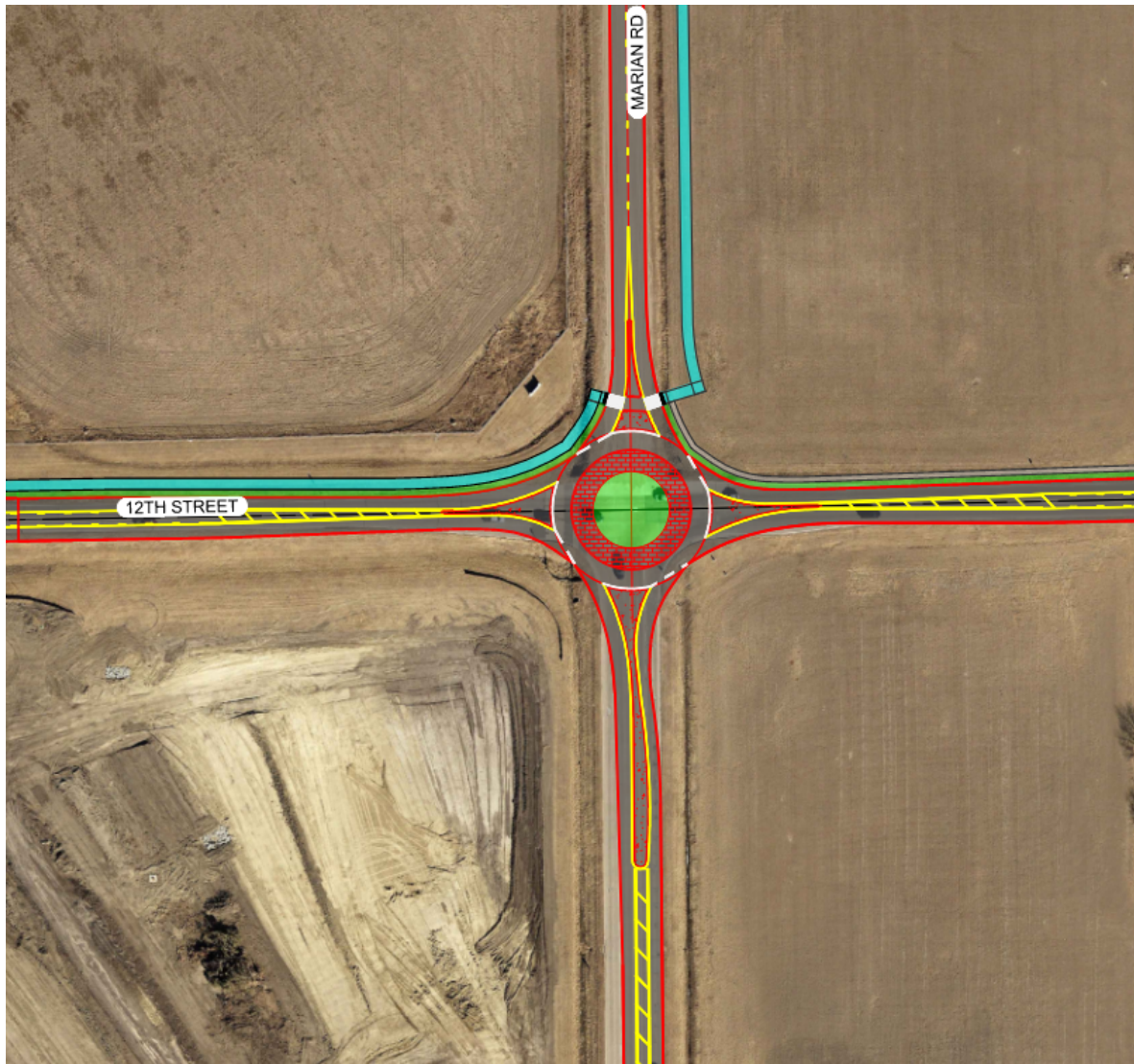


Figure 14: Project 8

- Two fire hydrants in the southwest quadrant will need to be relocated to accommodate proposed roundabout paving.
- New intersection and street lighting will be needed. To avoid conflicts with clearances of the adjacent airport runway, the height of the proposed street light poles will need to be coordinated with the Hastings Municipal Airport and FAA. For similar reasons, power serving the streetlights will need to be located underground. This coordination should occur during the design of the project.

4.8.5 Right of Way

Construction of the roundabout may require the acquisition of additional ROW in the northeast, southeast and/or southwest quadrants of the intersection.

4.8.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$1,870,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.9 Project 9: W 12th Street, N Marian Road to N Laird Avenue

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with N Marian Road and N Laird Avenue.

4.9.1 Recommendation

This segment of W 12th Street is presently a two-lane street with a posted speed limit of 30 mph. To accommodate the recommended single-lane roundabout at the N Marian Road intersection, W 12th Street will need to be widened to accommodate the center median (i.e., splitter island) associated with the roundabout. Widening of W 12th Street is also necessary to accommodate the warranted eastbound left-turn lane at the intersection with N Laird Avenue. Furthermore, since the relevant criteria are satisfied, it is recommended that the remainder of this segment be widened to accommodate a three-lane, with TWLTL, section. It should be noted that due to the close spacing of the Tilden Avenue and Westridge Drive intersections, occasional conflicts between overlapping left-turning vehicles could be experienced. However, the volume of vehicles using these two streets is relatively low, surmising that the frequency of this conflict is also low.

4.9.2 Concept

It is proposed that this segment of W 12th Street be constructed as a 39-ft curb and gutter section with two through lanes (one in each direction) and a center, TWLTL. A 5-ft sidewalk is proposed on the south side of W 12th Street, east of Tilden Avenue and on the north side of W 12th Street, east of West Ridge Drive. A 10-ft trail, connecting Tilden Avenue to Westridge Drive is proposed along the north side of W 12th Street with a marked crossing (i.e., crosswalk) of W 12th Street, inclusive of a raised pedestrian refuge, on the east leg of the Tilden Avenue intersection. This trail connection is consistent with the Hastings Walkability Study which proposes future trail extensions along the east side of Tilden Avenue, south of W 12th Street, and along the west side of Westridge Drive, north of W 12th Street. An example section of Project 9 is illustrated in Figure 15.

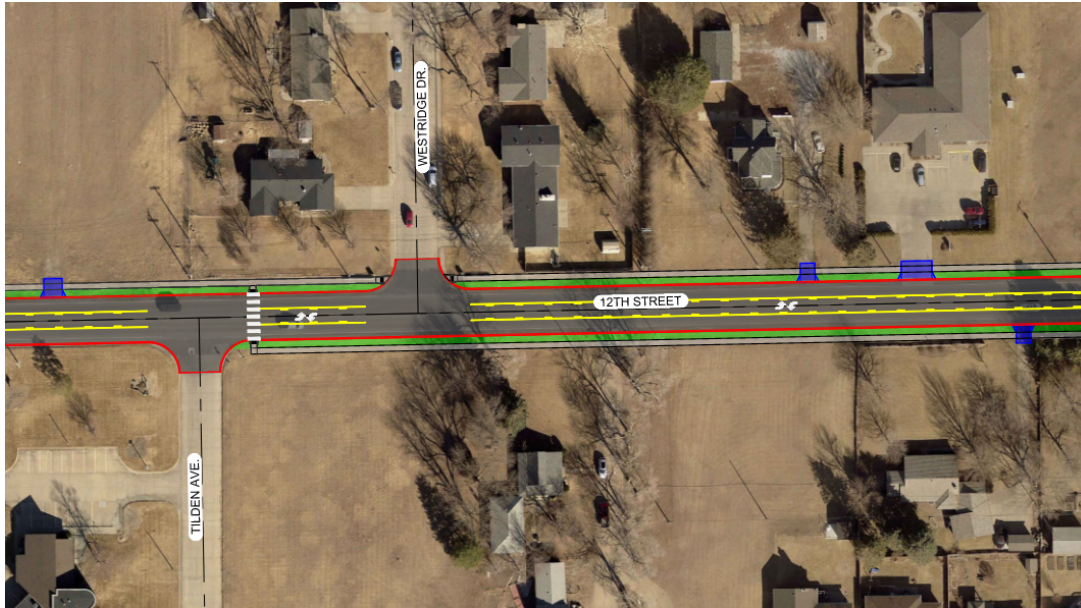


Figure 15: Project 9

4.9.3 Drainage

Though the existing street is drained using open ditches, a new underground storm sewer system is proposed to be constructed with the widened street. It is anticipated that this storm sewer system will drain towards and outlet to the open ditches near the Marian Road intersection. Furthermore, the storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

4.9.4 Status of Utilities

Construction of this project will require consideration of impacts to, and potential relocation of, the following utilities:

- A fire hydrant on the south side of W 12th Street at approximately Sta. 164+00.
- Power poles on the north side of W 12th Street at approximately Sta. 159+50, Sta. 160+50 and Sta. 162+00.
- The elevation of multiple manholes will likely need to be adjusted, some possibly require partial reconstruction, due to the anticipated lowering of the roadway profile.

4.9.5 Right of Way

Temporary construction easements are anticipated to accommodate grading activity and driveway construction. Permanent easement or ROW may be needed to accommodate the proposed trail and sidewalks.

4.9.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$1,130,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items

not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.10 Project 10: W 12th Street, N Laird Avenue to Crane Avenue

Below is a summary of the analysis and recommendations for W 12th Street between, and including, the intersections with N Laird Avenue and Crane Avenue.

4.10.1 Recommendation

Analysis was performed for the W 12th Street intersections with N Laird Avenue and Crane Avenue and for the segment of W 12th Street between those two intersections.

4.10.1.1 Intersection of W 12th Street & N Laird Avenue

As a TWSC intersection, both eastbound and westbound left-turn lanes are warranted by the year 2048 and are recommended at the intersection of W 12th Street & N Laird Avenue. It is recognized that during all three peak time periods, the northbound and southbound approaches may experience poor traffic operations (i.e., LOS E and F). However, these minor street movements are under capacity, and it is not an uncommon situation for stop-controlled, minor street approaches to major streets to experience poor Levels of Service during peak volume time periods. Because of resulting safety concerns, an additional lane to separate left- and right-turning vehicles on these minor street approaches is not recommended. The presence of vehicles stopped side-by-side can lead to reduced sight distance as drivers of both vehicles attempt to see around the adjacent vehicle.

4.10.1.2 Intersection of W 12th Street & Crane Avenue

As a TWSC intersection, both eastbound and westbound left-turn lanes are warranted by the year 2048 and are recommended at the intersection of W 12th Street & Crane Avenue. Similar to the N Laird Avenue intersection, poor LOS may be experienced on the minor street approaches during the three peak time periods. Analyses do conclude that a southbound right-turn lane may be warranted by the year 2048 but likely not until the year 2045. However, given the safety concerns outlined in the previous section, the installation of a southbound right-turn lane at the intersection of W 12th Street & Crane Avenue is not recommended as part of the initial construction of this project.

This report does not reflect volume fluctuations and traffic pattern changes that could occur should W 14th Street be extended to the west to connect with N Marian Road. If this extension is constructed, the intersection of W 12th Street & Crane Avenue should be reevaluated as it is estimated that the southbound right-turn lane would no longer be warranted after existing traffic volumes are diverted to the W 14th Street & N Marian Road intersection.

4.10.1.3 W 12th Street, N Laird Avenue to Crane Avenue

This segment of W 12th Street is presently a two-lane street with a posted speed limit of 30 mph. Left-turn lanes are warranted at both the N Laird Avenue and Crane Avenue intersections with W 12th Street. Furthermore, since the relevant criteria are satisfied, it is recommended that this segment of W 12th Street be constructed as a three-lane section with two through lanes in each direction and a center TWLTL. The resulting section, including the TWLTL, will serve well the

Apache Avenue intersection and the driveways (both residential and commercial) located along this segment.

4.10.2 Concept

It is recommended that this segment of W 12th Street be constructed as a 39-ft curb and gutter section with two through lanes (one in each direction) and a center, TWLTL. A 5-ft sidewalk, paralleling W 12th Street, is proposed on both the north and south sides of the street. The existing marked crosswalk across the east leg of the Crane Avenue intersection shall be maintained. To enhance this crosswalk, it is recommended that the existing RRFB be replaced to maintain the increased conspicuity of pedestrians, when present. An example section of Project 10 is illustrated in Figure 16.

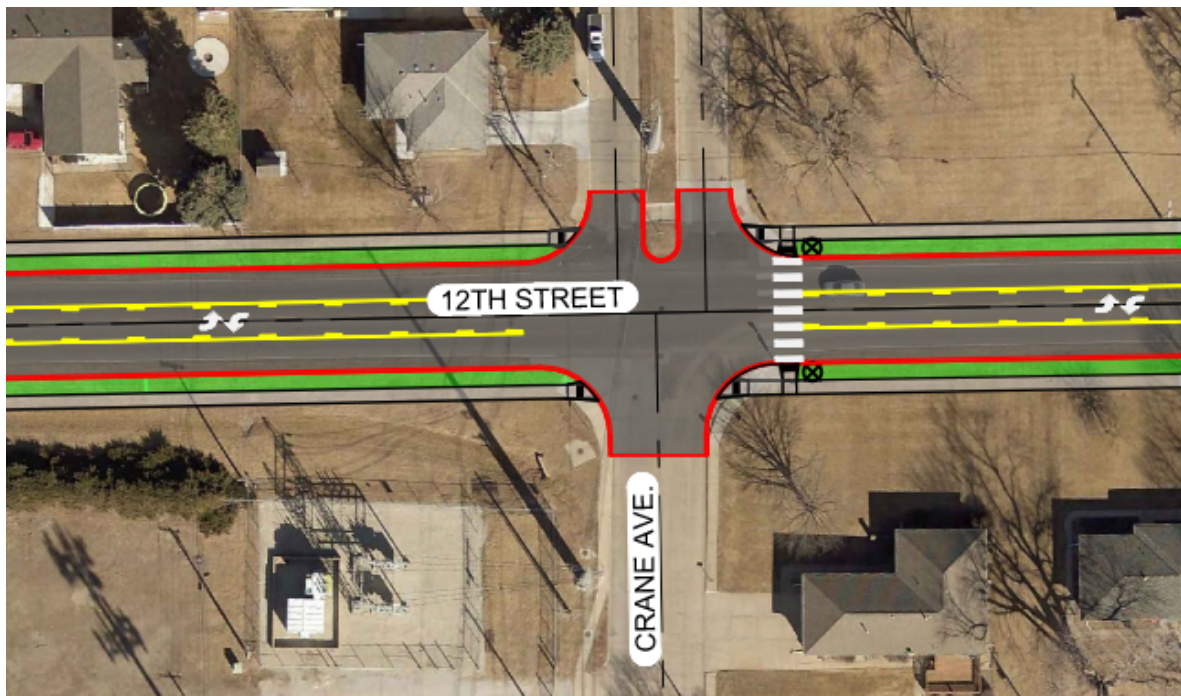


Figure 16: Project 10

4.10.3 Drainage

The existing street is drained using open ditches with a portion of the ditch along the south side of W 12th Street possessing a concrete liner. A new underground storm sewer system is proposed to be constructed with the widened street. It is anticipated that this storm sewer system will drain towards and connect to the existing storm sewer system extending to the north at Crane Avenue. Furthermore, the storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities. With the area south of W 12th Street being significantly lower than the existing roadway and properties north of the street, area inlets or other storm drainage collection features may be needed on the south side.

4.10.4 Status of Utilities

Construction of this project will require consideration of impacts to, and potential relocation of, the following utilities:

- Power poles on the north side of W 12th Street.
- The elevation of multiple manholes will likely need to be adjusted, some possibly require partial reconstruction, due to the anticipated lowering of the roadway profile.
- Two telecommunications pedestals at Sta. 167+75 and an underground telecommunications box at Sta. 178+50 will need to be adjusted or relocated.

4.10.5 Right of Way

Temporary construction easements are anticipated to accommodate grading activity and driveway construction. A permanent drainage easement may be necessary on the south side of W 12th Street.

4.10.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$1,700,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.11 Project 11: W 12th Street, Crane Avenue to N Baltimore Avenue

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with Crane Avenue and N Baltimore Avenue.

4.11.1 Recommendation

This segment of W 12th Street is presently a two-lane street with an eastbound left-turn lane at the N Baltimore Avenue intersection. Since the relevant criteria for two-way left-turn lanes (see Traffic Analysis Report) are satisfied, it is recommended that this segment be widened to accommodate a three-lane section, inclusive of a TWLTL. While volumes were not counted at intersections between Crane Avenue and N Baltimore Avenue, as few as ten W 12th Street vehicles turning left at any one of these intersections during a given peak hour would be required to satisfy the warrant criteria for a left-turn lane. It should be noted that due to the close spacing of intersections (e.g., Heritage Drive and Westlawn Avenue), occasional conflicts between overlapping left-turning vehicles could be experienced. However, the volume of vehicles using these streets is relatively low, surmising that the frequency of this conflict is also low.

4.11.2 Concept

It is recommended that this segment of W 12th Street be constructed as a 39-ft curb and gutter section with two through lanes (one in each direction) and a center, TWLTL. A 5-ft sidewalk, paralleling W 12th Street, is proposed on both the north and south sides of the street. An example section of Project 11 is illustrated in Figure 17.



Figure 17: Project 11

4.11.3 Drainage

The existing street is drained using open ditches with drainage swales located west of approximately Oswego Avenue. East of this location, the curb and gutter is connected to an existing underground storm sewer system. L

For the entirety of this proposed project, it is recommended that all street drainage be provided via an underground storm sewer system. West of approximately Heritage Drive, storm water will drain west to the existing storm sewer system at Crane Avenue. East of Oswego Avenue, storm water will drain east to the existing storm sewer system at the N Baltimore Avenue intersection. The storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

As with all projects, the location and sizes of storm sewer inlets and pipes are to be determined during the design of the project.

4.11.4 Status of Utilities

Construction of this project will require consideration of impacts to, and potential relocation of, the following utilities:

- Fire hydrants on the south side of W 12th Street at Sta. 185+00 and Sta. 191+25.
- The elevation of multiple manholes will likely need to be adjusted, some possibly require partial reconstruction, due to the anticipated lowering of a portion of the roadway profile.
- Three, at-grade electrical boxes on the north side of W 12th Street at Sta. 183+25.

4.11.5 Right of Way

Temporary construction easements are anticipated to accommodate grading activity and driveway construction.

4.11.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,260,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency)

include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.12 Project 12: Intersection of W 12th Street & N Baltimore Avenue

Below is a summary of the analysis and recommendations for the W 12th Street intersection with N Baltimore Avenue.

4.12.1 Recommendation

A traffic signal, roundabout, AWSC, and TWSC were evaluated as traffic control alternatives for this intersection.

4.12.1.1 Traffic Signal

As illustrated in Figure 9, under traffic signal control, this intersection is expected to operate acceptably at LOS C or better in the year 2048. However, as summarized in the Traffic Analysis document in Appendix A, the existing traffic volumes do not satisfy MUTCD warrant criteria. It is anticipated that traffic signal warrant criteria may be satisfied a few years before or after the year 2040.

4.12.1.2 Roundabout

A roundabout was also evaluated for the intersection of W 12th Street & N Baltimore Avenue. Based on this evaluation, the eastbound approach would require a two-lane approach, with the left lane serving only left-turning vehicles, to achieve acceptable levels of service under year 2048 anticipated volume conditions. If, however, traffic volumes increase at a rate of 0.5% per year rather than the assumed 1.0% future growth rate, the operational issues diminish, and a single-lane roundabout would achieve acceptable levels of service. For these reasons, a single-lane roundabout is recommended at this intersection. However, due to the variability of these future growth rates, in addition to the expected impact of local development, the geometric configuration of the roundabout should be reevaluated during the design of this project.

4.12.1.3 Stop Control

Stop control was evaluated at this intersection, both in the form of AWSC and TWSC. These were not evaluated further as the stop-controlled approaches are over capacity not only for future (2048) volume conditions, but also for existing conditions. These two alternatives should be considered not feasible.

4.12.2 Concept

Based on the conceptual design effort associated with this corridor study, a single-lane roundabout with a 120-ft inscribed circle is proposed for this intersection. The design intent of this configuration is for a school bus to navigate the roundabout using the circulating lane and for a WB-67 design vehicle to navigate the roundabout while encroaching upon the truck apron. Additionally, a 5-ft sidewalk is proposed around the entire perimeter of the roundabout with crosswalks through the splitter island of each leg of the roundabout.

In order to minimize impacts to existing residential structures in the southeast and southwest quadrants of the intersection and to commercial business property in the northeast quadrant, the

center of the roundabout is proposed to be shifted to the northwest approximately 25 feet from the center of the existing intersection. Project 12 is illustrated in Figure 18.

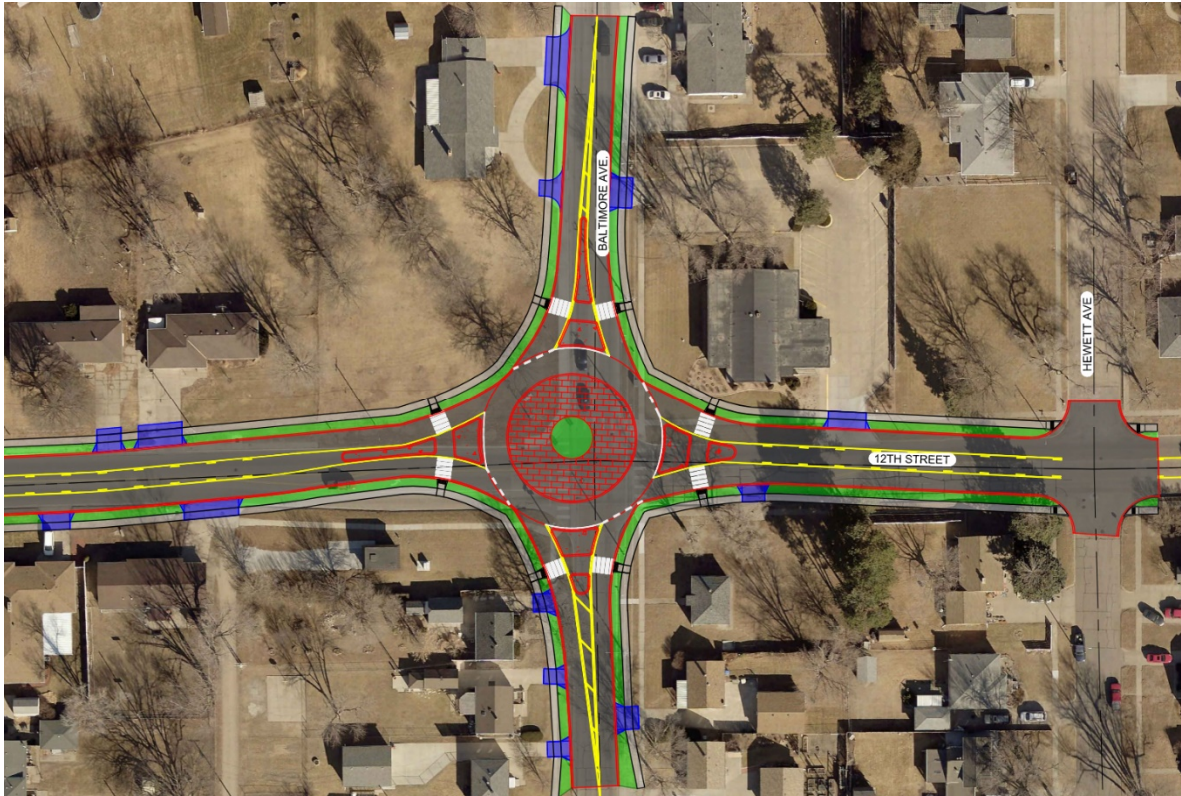


Figure 18: Project 12

4.12.3 Drainage

Existing storm water in the area drains north along N Baltimore Avenue through two large conduits: a 5-ft x 8-ft reinforced box culvert and a 48-in storm sewer pipe. This infrastructure will be reconstructed, as necessary, to accommodate the new intersection geometry. Additionally, it is anticipated that the existing storm sewer infrastructure in the W 12th Street & Hewett Avenue intersection will need to be adjusted to match the proposed grade of W 12th Street.

All existing storm sewer infrastructure should be further evaluated during the design of the project to determine if the condition of these components is sufficient without major maintenance or reconstruction.

4.12.4 Status of Utilities

Construction of this project will have impacts on existing utility infrastructure. Those impacts and potential relocations known at the time of the writing of this document are as follows:

- The existing traffic signal and all appurtenances will need to be removed.
- Power and light poles, one in each quadrant of the intersection will need to be removed or relocated. Two additional poles, supporting overhead power lines, west of the intersection

and along the north side of W 12th Street will need to be relocated to accommodate the west leg of the proposed roundabout.

- The elevation of multiple manholes will likely need to be adjusted, some possibly require partial reconstruction, due to the anticipated adjustment in the intersection grades.

4.12.5 Right of Way

ROW is needed in the northeast, northwest and southwest quadrants of the intersection to accommodate the proposed roundabout geometry. Temporary construction easements are anticipated to accommodate grading activity and driveway construction.

4.12.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,560,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.13 Project 13: W 12th Street, N Baltimore Avenue to N Bellevue Avenue

Below is a summary of the analysis and recommendation for W 12th Street between the intersections with N Baltimore Avenue and N Bellevue Avenue.

4.13.1 Recommendation

This segment of W 12th Street is presently a two-lane street for approximately 150 ft. immediately east of the N Baltimore Avenue intersection. From that location east, through the N Bellevue Avenue intersection, W 12th Street is presently a three-lane street consisting of two lanes in the eastbound direction and one lane in the westbound direction. Since the relevant criteria are satisfied, it is recommended that this segment be reconfigured as a three-lane section, with one through lane in each direction and a TWLTL.

4.13.2 Concept

It is recommended that the three-lane roadway be reconfigured, via new pavement markings, to include one travel lane in each direction and a center, TWLTL. During the design of this project, consideration of pedestrian-related elements (i.e., accessible ramps) should be given to ensure they satisfy ADA requirements. A review of existing signage should also be performed during the design of the project to ensure consistency with the proposed pavement markings. An example section of Project 13 is illustrated in Figure 19.



Figure 19: Project 13

4.13.3 Drainage

With the proposed concept summarized in Section 4.13.2, no storm sewer construction activity is proposed with this project.

4.13.4 Status of Utilities

With the proposed project, no major impacts to existing utility infrastructure are anticipated.

4.13.5 Right of Way

With the proposed project, neither the acquisition of ROW nor easements are anticipated.

4.13.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$80,000. This cost is inclusive of ADA ramp improvements and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.14 Project 14: W 12th Street, N Bellevue Avenue to N Hastings Avenue

Below is a summary of the analysis and recommendations for W 12th Street between the intersections with N Bellevue Avenue and N Hastings Avenue, including the W 12th Street intersection with US-281 / N Burlington Avenue.

4.14.1 Recommendation

This segment is presently comprised of three lanes between N Bellevue Avenue and N Lexington Avenue (similar to that described in Section 4.13.1); four lanes between N. Lexington Avenue and N Lincoln Avenue, with two travel lanes in each direction; and three travel lanes between N Lincoln Avenue and N Hastings Avenue, with one lane provided for eastbound traffic and two lanes for westbound traffic. The intersection with US-281/US34 and N Burlington Avenue is presently operated under traffic signal control. Analyses were performed for both the N Burlington Avenue intersection and the entire project segment independently, however, the number of lanes associated with the segment analysis was largely dependent on the analysis of the N Burlington Avenue intersection.

4.14.1.1 US-281 / N Burlington Avenue Intersection

According to plans provided by NDOT, a project is presently programmed to upgrade the traffic signal infrastructure at this intersection. This project includes the implementation of flashing yellow arrow left-turn indications for northbound and southbound vehicles and adds detection to all four legs of the intersection. Neither of these changes impact the current geometry of the northbound and southbound approaches, so these legs were assumed to remain as presently configured. After an analysis of lane configuration alternatives for the eastbound and westbound approaches, it is recommended that the west leg be restriped to consist of a dedicated left-turn lane and a shared through/right-turn lane approaching the intersection and a single lane departing from the intersection. It is further recommended that the east leg also be restriped to include a separate lane for each of the three movements approaching the intersection and a single lane departing from the intersection. It should be noted that the implementation of these lane configurations for the westbound approach may necessitate the reconstruction of the westbound traffic signal pole as the current mast arm does not appear to be long enough for the left-turn movement signal head to be centered on the westbound left-turn lane.

4.14.1.2 N Bellevue Avenue to N Hastings Avenue Segment

For the portion of this segment between N Lexington Avenue and N Lincoln Avenue, the W 12th Street configuration is dependent on the recommendations summarized in Section 4.14.11. For the portion of W 12th Street between N Bellevue Avenue and N Lexington Avenue, since the relevant criteria are satisfied, it is recommended that it be designated as a three-lane section with one travel lane in each direction and a TWLTL. The segment of W 12th Street between N Lincoln Avenue and N Hastings Avenue will remain similar as existing, serving as a transition area between the blocks east and west of this portion of Project 14.

4.14.2 Concept

Details of the recommended alternative to be implemented within this segment and at the intersection of US-281 / N Burlington Avenue & W 12th Street are as follows:

- The segment between N Bellevue Avenue and approximately 150' west of Burlington Avenue is to be restriped as a three-lane section with a center TWLTL.
- At the intersection of N Burlington Avenue, the pavement markings are to be modified to accommodate the following lane configurations:
 - Eastbound
 - One dedicated left-turn lane
 - One shared through/right-turn lane
 - Westbound
 - One dedicated left-turn lane
 - One through lane
 - One dedicated right-turn lane
- The outside (north) transition and westbound lane between N Bellevue Avenue and N Burlington Avenue is proposed to be removed and replaced with a widened turfed area between the reconstructed curb and the reconstructed sidewalk.

- In the northwest quadrant of the N Burlington Avenue intersection, the pavement is proposed to be reconstructed with a tapered curb and gutter section to accommodate southbound right-turning truck movements.
- The traffic signal pole in the northwest quadrant of the N Burlington Avenue intersection is proposed to be removed and replaced with a mast arm that spans further south than the current pole. This longer mast arm is necessary to position the traffic signal head corresponding to the westbound left-turn movement near the center of the westbound left-turn lane as required by MUTCD.
- ADA improvements will need to be reviewed at the time of final design as NDOT has a planned project that would bring the sidewalks and crossings into current standards.

An example section of Project 14 is illustrated in Figure 20.

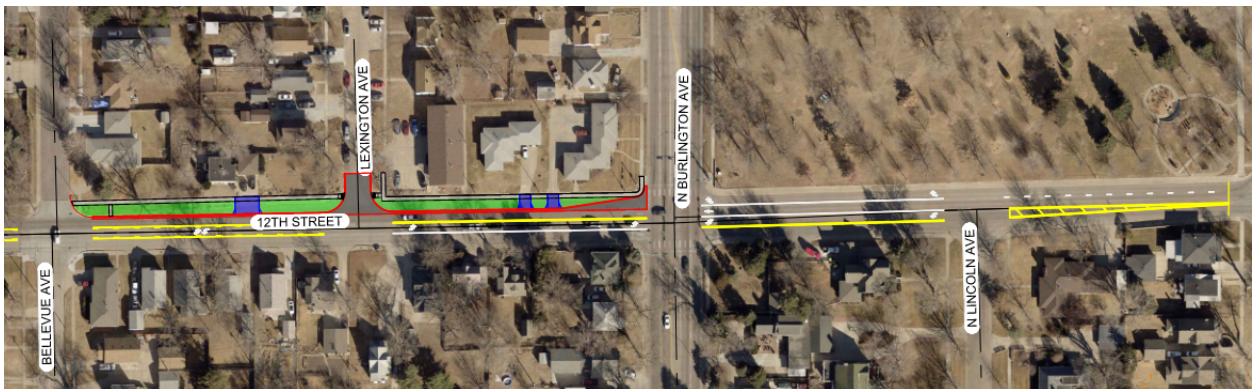


Figure 20: Project 14

4.14.3 Drainage

No impacts to drainage are anticipated.

4.14.4 Status of Utilities

With the proposed project, the traffic signal pole in the northwest quadrant of the N Burlington Avenue intersection will need to be reconstructed to accommodate the reconfigured westbound left-turn lane. The relocation of the existing street light poles along the north side of W 12th Street will also be considered during final design.

4.14.5 Right of Way

Temporary construction easements are anticipated on the north side of W 12th Street, between N Bellevue Avenue and N Burlington Avenue, to accommodate grading activity and driveway reconstruction.

4.14.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$400,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency)

include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.15 Project 15: N Marian Road, W 12th Street to W 14th Street

While not directly a part of the W 12th Street corridor study, the future paving of N Marian Road, north of W 12th Street to a future junction with W 14th Street, could result in benefits to area motorists, though those benefits would potentially be dependent on the implementation of Project 16 extending 14th Street west to Marian Road.(see Section 4.16). Below is a summary of the analysis and recommendations provided for this segment of N Marian Road.

4.15.1 Recommendation

This segment of N Marian Road should be paved as a two-lane street. A three-lane cross section, with one lane of travel in each direction. A center TWLTL, is not recommended because there are no driveway or public street connections along this stretch. The implementation of a wider street than is needed will lead to an increase in vehicle operating speeds as drivers feel more comfortable driving faster within a wider paved street. A future trail is proposed along the east side of Marian Road.

4.15.2 Concept

It is recommended that this segment of N Marian Road be constructed with a 28-ft wide surface comprised of two (2) 11-ft lanes and 3-ft paved shoulders. The typical cross-section would also consist of 5-ft earth shoulders. An example section of Project 15 is illustrated in Figure 21.



Figure 21: Project 15

4.15.3 Drainage

The existing N Marian Road corridor is paralleled by open ditches on both the east and west sides of the street. It is recommended that drainage be maintained through existing or regraded ditches.

4.15.4 Status of Utilities

No impacts to utilities are anticipated with this project.

4.15.5 Right of Way

Though no property impacts or ROW acquisition are anticipated, further evaluation will be necessary during design to confirm the ROW needs resulting from the required ditch grading.

4.15.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$290,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.16 Project 16: W 14th Street, N Marian Road to Westridge Drive

While not directly a part of the W 12th Street corridor study, the extension of W 14th Street from Westridge Drive west to N Marian Road would provide benefits to area motorists. With this connection, combined with the paving of N Marian Road (see Project 15), an additional route would be available to the existing residential area in proximity to W 14th Street including enhanced access to area schools. Below is a summary of the recommendations for this project.

4.16.1 Recommendation

Traffic analysis was not performed for this segment of W 14th Street as it was not an official component of the W 12th Street study area. However, it is recommended that this segment of W 14th Street be extended west to N Marian Road to provide benefit and additional route options to area motorists.

4.16.2 Concept

It is recommended that this segment of W 14th Street be constructed to match the existing cross-section of W 14th Street. This includes a 36-ft wide street with curb and gutter and parallel, on-street parking permitted on both sides of the street. It is recommended that a 5-ft sidewalk be included on both sides of the street either at the time the street is constructed or when the adjoining properties are developed. An example section of Project 16 is illustrated in Figure 22.



Figure 22: Project 16

During design, further consideration will need to be given to other aspects of the project including, but not limited to:

- Water and/or sanitary sewer extensions
- Intersections of the new roadway with existing streets (i.e., Westridge Drive, Pepperridge Drive)

4.16.3 Drainage

Construction of this street will also require a new underground storm sewer system, which will drain west to the ditch along the east side of N Marian Road. Additionally, a culvert (size to be determined during design) will likely be necessary under N 14th Street, along N Marian Road, extending north

past the existing electrical transformer station in the northeast quadrant of the N Marian Road & W 14th Street intersection.

4.16.4 Status of Utilities (When needed)

No impacts to utilities are anticipated with this project. However, consideration should be given to the extensions of water and sanitary sewer infrastructure to accommodate potential future development of adjoining currently undeveloped residential properties.

4.16.5 Right of Way

The proposed street and utility infrastructure improvements fit within existing platted ROW.

4.16.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$800,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

4.17 Project 17: Bike Trail

The Hastings Walkability Study identifies a trail extending along 12th Street to the Westbrook Subdivision. The study also identifies an on-street trail along 14th Street from Westridge Drive east to the existing street trail in Libb's Park. With the paving recommendations, consideration was given to the location and alignment of these future trail segments. At the time of the Walkability Study, the 14th Street connection to Marian Road and the Theater District were not yet planned for. The Theater District has since progressed in developing and has completed a trail width segment along Theater Drive from N Marian Road to W 12th Street.

4.17.1 Recommendation

It is recommended that a trail be constructed, as identified in the Walkability Study, from Nalan Drive in the Westbrook Subdivision to the proposed on-street trail system at W 14th Street and Westridge Drive. With the development of Theater Drive and the corresponding trail, it is recommended to consider adjusting the alignment from the walkability study that proposed a trail from N Marian Road and W 9th Street along W 9th Street, then north along Tilden Avenue and Westridge Drive. The recommended alignment is now from W 9th Street and N Marian Road north to the recently completed trail along Theater Drive to W 12th Street. From there, east across the proposed N Marian Road roundabout to the east side of N Marian Road, then north to the future W 14th Street. On 14th Street, it is proposed to convert the trail from a separate shared use path to an on-street trail that continues to the proposed on-street trail as recommended by the Walkability Study.

Outside of this study and recommendation, the trail will have an approximately 300-foot-long segment between W 9th Street and Theater Drive that will need to be completed.

4.17.2 Concept

The trail is proposed to be a 10-foot-wide, 6-inch-thick concrete trail with a minimum of 2-foot-wide earth shoulders. The trail is proposed to run along the north side of the W 12th Street corridor to N Marian Road.

Along W 14th Street, the trail is proposed to be converted to an on-street trail, with W 14th Street having pavement markings and signage to facilitate the safe implementation of a 5-foot-wide bike lane on each side of the street for bikers to ride in the same direction as traffic. A typical 5-foot-wide sidewalk is proposed to accommodate pedestrians when the trail converts to on-street.

Consideration will need to be made for the trail crossing of W 12th Street at Theater Drive with a possible Rectangular Rapid Flashing Beacon being installed at the crosswalk or other potential safety measures. The exact measure(s) shall be determined at the time of final design.

The trail at Nalan Drive should connect to the existing sidewalk within the Westbrook Subdivision and be laid out for the potential to extend further west in the future.

4.17.3 Drainage

Drainage improvements are discussed with the respective adjoining roadway paving projects. If the trail occurs prior to the proposed roadway paving projects, then some of the proposed storm sewer improvements may need to be addressed with this project. Roadside and ditch grading also will need to be coordinated between the roadway and trail projects. Each roadway segment should consider the ultimate grading that may be needed for the bike trail, and if the trail is constructed prior to any of the roadway segments, its final grading and alignment should be based on the ultimate paving planned based on this study. Drainage improvements are not included in the cost opinion of the trail.

4.17.4 Status of Utilities

Utility impacts are discussed with the respective, adjoining roadway paving projects. If the trail is constructed prior to the proposed roadway paving projects, then utility relocations will need to be addressed with trail construction. Utility relocations are not included in the cost opinion of the trail.

4.17.5 Right of Way

Temporary construction easements are anticipated throughout the entire project. Drainage easements and either trail easement or permanent right-of-way may be needed, specifically at the intersections of Highland Road and 12th Street and Adams Central Road and 12th Street. Permanent trail easement is anticipated along the west side of Marian Road. If Trail is constructed prior to proposed roadway projects, consideration should be given to the final roadway improvements to reduce future reconstruction of the trail when the roadway is completed. This includes drainage improvements, utility relocations, and ultimate geometric changes for the intersections.

4.17.6 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,290,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency)

include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

5.0 Project Alternatives

Should project funding not be available or other circumstances arise, two project alternatives are summarized below.

5.1 Project Alternative 1 – Paving W 12th Street, City Limits to Sycamore Avenue

5.1.1 Concept

Project Alternative 1 is an alternative to the combination of projects 1 through 6 summarized previously in this document. This alternative would consist of milling 2-inch of existing asphalt, replacing with a 4-inch asphalt overlay, and widening the roadway pavement to 28 feet to accommodate two (2) 12-ft lanes and 2-ft paved shoulders. Shoulder grading is anticipated to impact the existing ditches along the entire project.

The intersection improvements proposed at Highland Road, as summarized in Project 4, would be compatible with this alternative approach.

5.1.2 Drainage

During final design, the condition of the existing culverts will be evaluated with the potential need of extending them due to the required shoulder grading.

5.1.3 Status of Utilities

Marginal impacts to existing utilities are anticipated with this alternative project. If adjustments to turning lanes at the Highland Road intersection are implemented, rerouting of underground storm sewer pipe may be necessary as the proposed turn lanes may impact existing ditches.

5.1.4 Right of Way

To construct these alternative improvements, drainage easements may be needed to accommodate the required culvert extensions. Temporary easements and permanent right-of-way may be needed if turn lanes are implemented at the Highland Road intersection.

5.1.5 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$2,110,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

5.2 Project Alternative 2 – W 12th Street Intersections with N Laird Avenue and Crane Avenue

5.2.1 Concept

Project Alternative 2 is an alternative to Project 10 and includes only improvements at the intersections with N Laird Avenue and Crane Avenue with transitions to the two-lane street. Thus, the three-lane section proposed with Project 10 for the remainder of that segment is not included with this alternative. These intersection improvements would include concrete reconstruction for the full width of the street, including curb and gutter, for approximately 150 feet each side of both intersections. Transitional pavement would then be constructed for approximately 150 feet each

side of the full reconstruction area to transition between the newly constructed intersections and the existing, two-lane asphalt street. This project alternative would include the sidewalk, curb ramp, pedestrian crossing and RRFB as proposed with Project 10.

5.2.2 Drainage

Where curb and gutter are constructed and based on the resulting pavement geometry and elevations, the location for storm sewer inlets will need to be evaluated. The existing ditch between the N Laird Avenue and Crane Avenue intersections, south of W 12th Street, will be maintained or regraded, as needed, to accommodate the storm sewer improvements at the N Laird Avenue intersection. The existing storm sewer culvert at Crane Avenue will need to be extended past the proposed Crane Avenue- intersection grading improvements to continue to collect storm water from the ditch along the south side of W 12th Street.

5.2.3 Status of Utilities

Construction of this project will require consideration of impacts to, and potential relocation of, the following utilities:

- Power poles on the north side of W 12th Street.
- The elevation of multiple manholes will likely need to be adjusted, some possibly require partial reconstruction, due to the anticipated lowering of the roadway profile.
- Two telecommunications pedestals at Sta. 167+75 and an underground telecommunications box at Sta. 178+50.

5.2.4 Right of Way

The need for temporary construction easements is anticipated near both intersections.

5.2.5 Cost

The engineer's opinion of probable cost, in 2023 dollars, is \$970,000. This cost is inclusive of storm drainage infrastructure and a 35% contingency which is intended to include engineering fees. Items not specifically included in this opinion of cost (but could be included within the contingency) include, but are not limited to, water and sanitary sewer infrastructure, right of way, and utility relocations.

6.0 Detour Options

As part of this corridor study, construction phasing strategies have been considered. This has been accomplished in the way the overall reconstruction of W 12th Street has been broken into smaller projects and the consideration of potential alternate/detour routes for motorists using the study corridor. Based on the existing street network north and south of W 12th Street, it is anticipated that both W 9th Street and W 14th Street will be used. While both streets provide the benefit of having signalized intersections where they connect to N Burlington Avenue, making it easier for motorists to turn onto and from that major north/south arterial and state highway, only 9th Street provides a continuous connection west to N Marian Road. However, W 9th Street is a less desirable option in that it is a narrower road with a higher residential driveway density as compared to W 14th Street. By extending W 14th Street west to connect to N Marian Road, as proposed by Project 16, two viable options would be available to carry the burden of detoured or diverted traffic during construction. During final design, access to local traffic, both to businesses and residents, will need to be considered.

7.0 Funding Sources

There are several funding options to cost-share recommended improvements to the W 12th Street Corridor. They include the following grants and statutorily authorized programs:

- Local Option Sales Tax
- General Obligation Bonds
- Highway Allocation Bonds
- Special Assessments
- Transportation Alternatives Program
- Surface Transportation Program
- Congressional Directed Funding
- Safe Streets For All (SS4A) Program
- Neighborhood Access and Equity (NEA) Grant Program

Considering the capital construction cost of corridor improvements, the city may wish to pursue a combination of these funding sources – where possible – to reduce the economic burden on taxpayers. The city should be cognizant of duplication of benefit policies and procedures when selecting which funding sources to access for the project.

7.1 General Obligation Bonds

General obligation bonds may be issued for the West 12th Street Corridor Improvement Project. General obligation bonds are a type of municipal government bond, which is government debt issued to raise money to finance public improvements. A general obligation bond is a municipal bond backed by the full faith and credit (taxing power) of the issuing jurisdiction, rather than the revenue from a given project. No assets are used as collateral for the bond and the bond is not dependent on revenue of any project for repayment. It is also common to retire general obligation bonds with utility revenues. General obligation bonds are currently sold at market rates up to 20-year terms, depending on market conditions and credit worthiness of the issuer. If the city is interested in pursuing general obligation bonds, then it is recommended that the city contact its fiscal agent.

For more information, go to:

<http://law.justia.com/codes/nebraska/2022/chapter-16/statute-16-6-108/>

7.2 Highway Allocation Bonds

The Highway Trust Fund (HTF) was established in 1956 to provide a more dependable source of funding from the federal government for the construction of the interstate highway system. Each year proceeds from the HTF are distributed to states and local governments – based on a formula – and must be spent on highways, streets, roads, and related items/activities. The portions allocated to the counties and municipalities are called Highway Allocation Funds (HAF).

Any or all of these HAFs can be used to finance the debt service on a municipal bond which are called Highway Allocation Bonds.

For more information, go to:

<https://law.justia.com/codes/nebraska/2022/chapter-66/statute-66-4-101/>

7.3 Special Assessment

Certain improvements, such as new streets or new sidewalk improvements can be financed by special assessments. This method of financing is a special levy upon benefiting property owners for a portion of the costs incurred by the city for a particular improvement.

Due to the large amount of undeveloped/agricultural land on the western half of the project area and considering that a paving district will need to be created before Special Assessment can be levied, this statutorily authorized program is not recommended for West 12th Street Corridor Improvements.

For more information, go to:

<http://law.justia.com/codes/nebraska/2022/chapter-16/statute-16-708.01/>

7.4 Nebraska Department of Transportation – Transportation Alternatives Program

The federally funded Transportation Alternatives Program (TAP) encompasses a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, Complete Streets and road diets, recreational trails, safe routes to school projects, and community improvements such as historic preservation. TAP projects must relate to the surface transportation systems to be eligible for funding.

Eligible projects must meet one or more of these eligibilities and must relate to surface transportation.

1. Construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation, including sidewalks, bicycle infrastructure, pedestrian and bicycle signals, traffic calming techniques, lighting and other safety-related infrastructure, and transportation projects to achieve compliance with the Americans with Disabilities Act of 1990.
2. Construction, planning, and design of infrastructure-related projects and systems that will provide safe routes for non-drivers, including children, older adults, and individuals with disabilities to access daily needs.
3. Conversion and use of abandoned railroad corridors for trails for pedestrians, bicyclists, or other nonmotorized transportation users.
4. Construction of turnouts, overlooks, and viewing areas.
5. Historic preservation and rehabilitation of historic transportation facilities.
6. Construction of Complete Street/Safe Streets for All improvements

Maximum grant: None specified.
Match required: 20% non-federal match.
Application due date: Late-April.

For more information, go to:

<https://dot.nebraska.gov/business-center/lpa/projects/tap/>

7.5 Federal Fund Purchase Program (FFPP)

NDOT has the authority to purchase – *at a discount rate (80%)* – federal-aid transportation funds (Surface Transportation Program (STP) and the Highway Bridge Program (HBP) (formerly known as the Highway Bridge Replacement and Rehabilitation Program (BRRP)), from political or governmental subdivisions (otherwise known as Local Public Agency or LPAs) throughout the state of Nebraska. LPAs must then use proceeds from such sale for the purpose of construction, reconstruction, maintenance and repair of public highways, streets, roads, bridges, appurtenances, and roadway structures deemed necessary in connection therewith.

The phrase facilities, “appurtenances, and roadway structures deemed necessary in connection therewith,” includes medians, accessory lanes, steps, handrails, sidewalks, or adjoining pedestrian trails, paths or structures; drainage facilities such as storm sewers, curb or grate inlets, culverts, ditches, and other drainage structures; guardrails; lighting facilities; driveways; retaining walls, and other similar facilities that are necessary or desirable and directly related to the proper design of streets, roads and highways.

For more information, go to:

<https://dot.nebraska.gov/business-center/lpa/projects/programs/ffpp/>

7.6 Community Project Funding (Congressional Directed Funding)

The fiscal year 2023 Consolidated Appropriations Act (P.L. 117-328), signed into law on December 29, 2022, included funding for Community Project Funding (CPF), which is also known as Congressionally Directed Spending. CPF is appropriated and allocated on an annual basis and at the sole discretion of Congress. The total funding amounts are specified in the Consolidated Appropriations Act corresponding with each fiscal year, if applicable.

CPF recipients and their allocations are determined by Congress. CPF grants cannot represent more than 80% of all eligible project costs.

For more information, go to:

<https://www.appropriations.senate.gov/fy-2023-congressionally-directed-spending>

7.7 Safe Streets for All (SS4A) Program

Safe Streets and Roads for All (SS4A) is a \$5 billion, five-year discretionary grant program through the USDOT. The SS4A program funds regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries.

The purpose of SS4A grants is to improve roadway safety by significantly reducing or eliminating roadway fatalities and serious injuries through safety action plan development and implementation focused on all users, including pedestrians, bicyclists, public transportation users, motorists, personal conveyance and micro mobility users, and commercial vehicle operators. The program provides funding to develop the tools to help strengthen a community's approach to roadway safety and save lives and is designed to meet the needs of diverse local, Tribal, and regional communities that differ dramatically in size, location, and experience administering Federal funding.

There are two types of SS4A grants available: Planning and Implementation. The USDOT will allocate \$200 million per year through FY26 for planning grants and \$800 million for Implementation.

Eligible SS4A activities include:

- Action Planning. Based on safety impact, equity, and other safety considerations.
- Supplemental planning activities that support or enhance an existing Action Plan.
- Infrastructure, behavioral, and operational safety activities

Range of SS4A grant awards:

- Planning: Minimum: \$100,000. Maximum: \$10 million.
- Implementation: Minimum: \$2.5 million. Maximum: \$25 million.

Required match: 20% non-federal match.

Applications deadline: Varies. Refer to Notice of Funding Opportunity.

For more information, go to:

<https://www.transportation.gov/grants/SS4A>

7.8 Neighborhood Access and Equity (NAE) Grant Program

The Neighborhood Access and Equity Grant Program (NAE) is a \$3.155 billion, five-year discretionary grant program through the U.S. Department of Transportation. The purpose of the project is to connect communities by supporting neighborhood equity, safety, and affordable transportation access as well as mitigating negative environmental impacts. The NAE program will emphasize assisting economically disadvantaged or underserved communities with planning and capacity building.

There are two types of NAE grants available: Planning and Implementation. Eligible activities include:

- Planning: Public engagement, studies, predevelopment activities, and other planning activities in advance of the project.
- Implementation: Preliminary and detailed design, environmental studies, infrastructure that promotes walkability, safety, and affordable transportation, and projects that mitigate or remediate the negative impacts on the human and natural environment resulting from a burdening or divided facility.

Range of NAE grant awards:

- Planning: No minimum or maximum.
- Implementation: No minimum. Maximum award is \$5 million.

Required match: 20% non-federal match.

Application deadline: Varies. Refer to Notice of Funding Opportunity.

For more information, go to:

<https://www.transportation.gov/grants/rcnprogram/about-neighborhood-access-and-equity-grant-program>

8.0 Conclusion and Recommendations

Based on the information presented herein, the following conclusions and recommendations are provided.

8.1 Preferred Typical Section

Specific details regarding typical sections along the W 12th Street corridor can be found in Appendix E. In general, the typical section consists of a two-lane road west of Sycamore Avenue and a three-lane street (with one lane in each direction and a center TWLTL) between Sycamore Avenue and N Hastings Avenue.

8.2 Priority Ranking

As summarized herein, improvements along the W 12th Street corridor have been divided into several projects. Based on the need for the project and the information summarized within this document, each project was assigned a priority ranking. The resulting project priority and associated reasoning are provided below.

8.2.1 Priority 1 – Project 8: Intersection of W 12th Street & N Marian Road

The intersection of W 12th Street & N Marian Road has been identified as a high priority. Existing queues at this intersection during the AM peak hour are estimated at over 200 feet and as traffic volumes increase, this condition can be expected to worsen. Furthermore, the new Theatre District located in the southwest quadrant of this intersection is expected to generate more traffic in the area. As such, it would be preferred if this project were completed in time for the grand opening of this development.

8.2.2 Priority 2 – Projects 13 and 14: W 12th Street from East of the N Baltimore Avenue Intersection to N Hastings Avenue

This area was also identified as a high priority. The restriping W 12th Street between N Baltimore Avenue and N Hastings Avenue requires no pavement expansion and could therefore be accomplished with less effort than other projects. However, this project does require the reconstruction of the traffic signal pole in the northwest quadrant of the intersection of US-281 / N Burlington Avenue & W 12th Street.

8.2.3 Priority 3 - Project 10: W 12th Street, N Laird Avenue to Crane Avenue

This segment, inclusive of the two intersections that define the segment, was identified as a high priority because of the volume of turning traffic at the two intersections. The westbound left-turn volume at the N Laird Avenue intersection and both the eastbound and westbound left-turn volumes at the Craine Avenue intersection satisfy the warrant threshold for auxiliary turn lanes under existing conditions.

8.2.4 Priority 4 - Project 17: Bike Trail

This trail has been planned as a part of the City's ongoing trail system with modifications based on the proposed roadway paving improvements. The City has expressed desire to continue expanding and connecting the trail system and this proposed trail connects residential areas with commercial areas, and aids in completing a missing link in the city's total trail system. Outside funding for trails is also available to potentially provide a financial means to complete this project.

8.2.5 Priority 5 - Project 15: N Marian Road, W 12th Street to W 14th Street

In preparation for Project 16, N Marian Road should be paved from W 12th Street to W 14th Street. N Marian Road in this area currently has minimal traffic and a full closure of this stretch would not be expected to cause much of an impact, especially if the improvements at the intersection of W 12th Street & N Marian Road are complete.

8.2.6 Priority 6 - Project 16: W 14th Street, N Marian Road to Westridge Drive

Once Project 15 is complete, it should be followed closely by Project 16. This project has the potential to positively impact driver behavior and routing patterns along the W 12th Street corridor.

8.2.7 Priority 7 – All Other Projects

The rest of the projects should be implemented as funding allows, in light of continued pavement deterioration, and as potential future development occurs. They are listed below in order from west to east along the W 12th Street Corridor.

- Project 1: W 12th Street, City Limits to N Adams Central Avenue
- Project 2: Intersection of W 12th Street & N Adams Central Avenue

- Project 3: W 12 Street, N Adams Central Avenue to Highland Road
- Project 4: Intersection of W 12th Street & Highland Road
- Project 5: W 12th Street, Highland Road to Sycamore Avenue
- Project 6: Intersection of W 12th Street & Sycamore Avenue
- Project 7: W 12th Street, Sycamore Avenue to N Marian Road
- Project 9: W 12th Street, N Marian Road to N Laird Avenue
- Project 11: W 12th Street, Crane Avenue to N Baltimore Avenue
- Project 12: Intersection of W 12th Street & N Baltimore Avenue

APPENDIX A

12TH Street Corridor Study – Traffic Analysis Report



12th Street Corridor Study – Traffic Analysis Hastings, NE

JEO Project No. 220893.00

***Prepared for:
The City of Hastings***

*Prepared by:
JEO Consulting Group*

*Date:
August 30, 2023*



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1.0 Introduction

This report documents the results of the traffic analysis task for the 12th Street Corridor Study conducted for the City of Hastings.

1.1 Project Background

The City of Hastings desires to improve W 12th Street between Nalan Drive and N Hastings Avenue. Within this stretch, W 12th Street's width varies as the lane configuration changes between a two-lane, three-lane, and four-lane cross-section. W 12th Street also changes between a 50-mph rural road with unpaved shoulders at the west end of the study corridor to a 25-mph urban street with curb and gutter at the east end of the study corridor.

The traffic analysis task for the W 12th Street Corridor Study included traffic analysis of intersection and street improvements focused on W 12th Street, between N Adams Central Avenue and US-34/N Burlington Avenue. Specifically, this analysis included the evaluation of alternative forms of traffic control at several study intersections as well as modifications to the current cross-section of W 12th Street. A safety analysis was also completed to identify mitigation strategies that should be considered during the design process, if needed. A vicinity map highlighting the study corridor is depicted in Figure 1, while a more detailed vicinity map showing the location of each study intersection is provided as Figure 2.

1.2 Methodology

This report applies the methodology and guidance of the Highway Capacity Manual, 6th Edition, the Manual on Uniform Traffic Control Devices (MUTCD), the Institute of Transportation Engineer's (ITE) Trip Generation Manual, 11th Edition, the National Cooperative Highway Research Program (NCHRP) Report 457, and Nebraska Department of Transportation (NDOT) guidelines.

1.3 Report Organization

The remainder of this report is organized as follows:

- 2.0 Existing Conditions
- 3.0 Year 2048 No-Build Conditions
- 4.0 W 12th Street Intersection Alternatives Analysis
- 5.0 Two-Way Left Turn Lanes
- 6.0 W 12th Street Corridor Segments
- 7.0 Conclusion



Figure 1: Vicinity Map

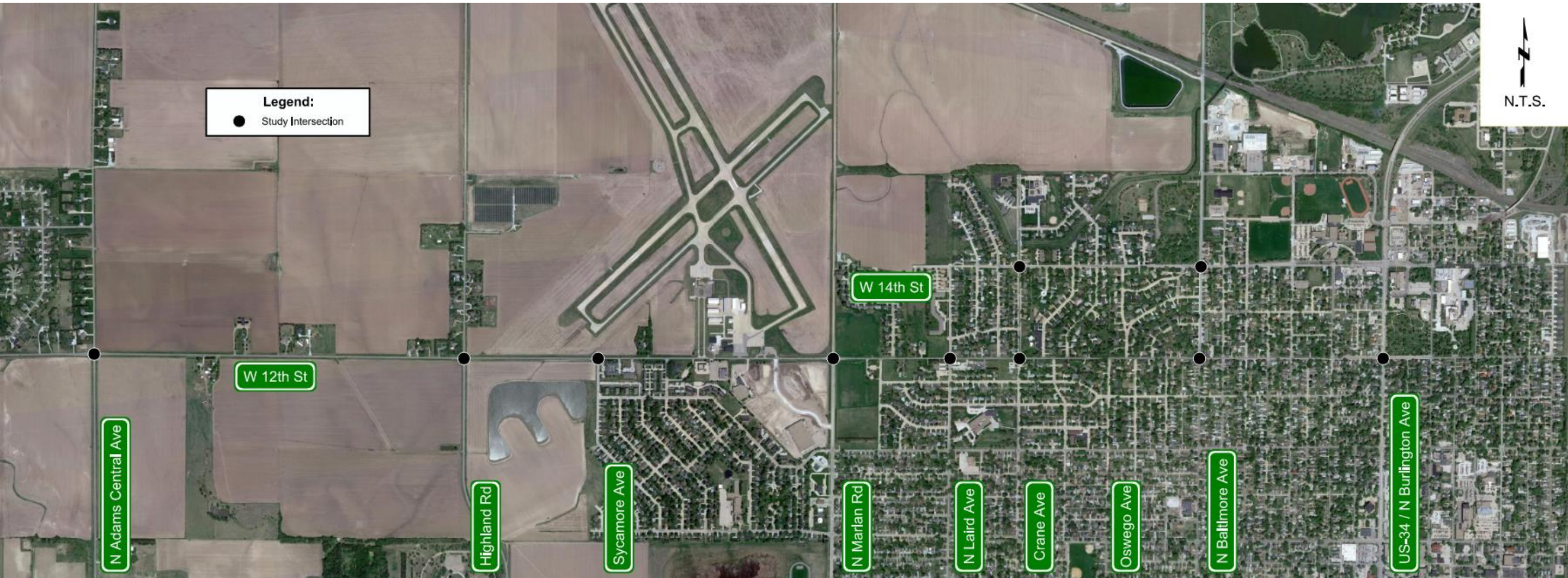


Figure 2: Study Intersection Map

2.0 Existing Conditions

This section of the report summarizes the existing study area conditions.

2.1 Existing Street Geometrics and Traffic Control

While a full description of the existing street network can be found in Appendix A, the existing street geometrics and traffic control throughout the study area are shown in Figure 3.

2.2 Existing Traffic Volumes

Existing turning movement volumes were collected at all study area intersections using Miovision Scout Cameras on Tuesday, April 25th, 2023. For the corridor as a whole, the observed weekday AM peak hour was between 7:15 am and 8:15 am, the observed school weekday PM peak hour was between 3:15 pm and 4:15 pm, and the observed commuter weekday PM peak hour was between 4:45 pm and 5:45 pm. AM, school PM, and commuter PM peak hour turning movement volumes are shown in Figure 4.

2.3 Study Methodology

The peak hour volumes for the study area intersections were then analyzed using the signalized and unsignalized intersection capacity analysis procedures outlined in the Highway Capacity Manual, 6th Edition (HCM). Per the HCM, Levels of Service (LOS) are presented as a letter grade (A through F) based on the calculated average control delay for an intersection or movement during a specific time period (such as the AM and PM peak hours). LOS A represents free flow movement with very little to no delay, while LOS F represents congested flow at or exceeding the capacity of the street. Further detail regarding the LOS methodology can be found in Table 1.

2.4 Existing Conditions Capacity Analysis

The existing weekday AM, school PM, and commuter PM peak hour traffic conditions were analyzed using the existing traffic volumes and intersection geometrics described previously via Synchro 11, a program that uses HCM 6th Edition methodology. As shown in Figure 5, all intersections and approaches operate acceptably at LOS D or better, with most operating at LOS C or better. The lone exception is the westbound approach to the intersection of W 12th Street & N Marian Road which operates at LOS E during the AM peak hour. Table 2 provides details on the eastbound and westbound approaches of W 12th Street to N Marian Road during the AM peak hour. As shown, while both approaches have a volume-to-capacity (V/C) ratio less than one, the 95th-percentile queue for both approaches exceeds 200 feet. The V/C ratio is a value that compares the volume of a movement to the theoretical maximum capacity of that movement. The 95th-percentile queue is a statistical number of which 95% of queues that occur will be shorter than this value. Synchro output reports are included in Appendix B.

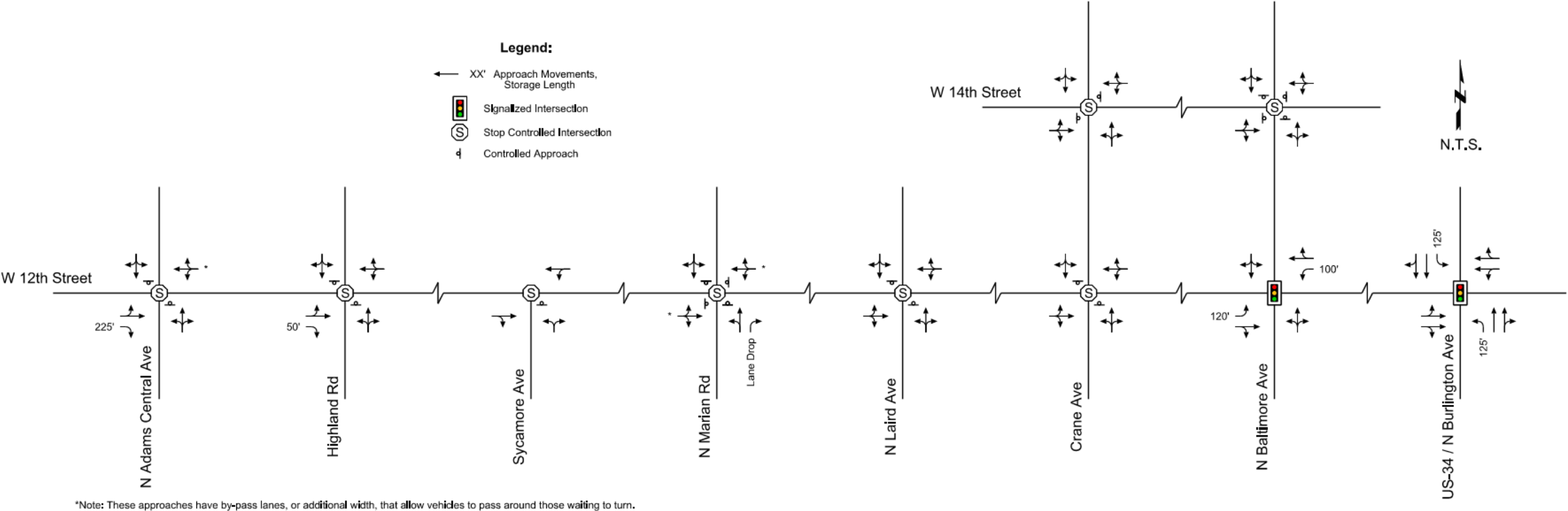


Figure 3: Existing Intersection Geometrics and Traffic Control

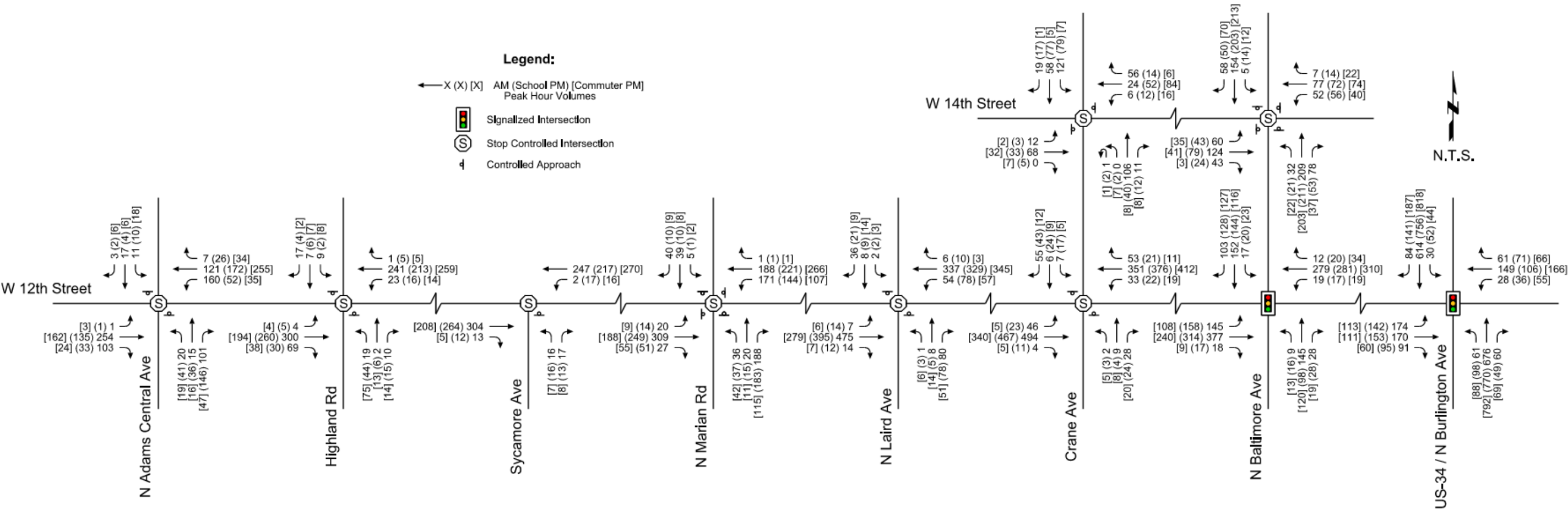


Figure 4: Existing Peak Hour Volumes

Table 1: Level of Service (LOS) Interpretation

Level of Service	Description	Signalized Intersection Delay (seconds per vehicle)	Stop-Controlled Intersection & Roundabout Delay (seconds per vehicle)
A	Free-flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	< 10	< 10
B	Reasonably free flow. The ability to maneuver within the traffic stream is only slightly restricted.	>10 and < 20	>10 and < 15
C	At or near free flow. Freedom to maneuver within the traffic stream is noticeably restricted.	>20 and < 35	>15 and < 25
D	Speeds begin to decline slightly. Freedom to maneuver within the traffic stream is noticeably limited.	>35 and < 55	>25 and < 35
E	At capacity. Maneuverability within the traffic stream is extremely limited.	>55 and < 80	>35 and < 50
F	Breakdown. Vehicles are jammed. Generally, queues form behind the breakdown condition.	> 80	> 50

Source: Highway Capacity Manual, 6th Edition, A Guide for Multimodal Mobility Analysis, Transportation Research Board, Washington, D.C.

**Table 2: W 12th Street at N Marian Road
Capacity Results (Existing) – AM Peak Hour**

	WESTBOUND APPROACH	EASTBOUND APPROACH
VOLUME (VPH)	360	356
LOS	E	D
V/C	0.842	0.819
95TH% QUEUE	220'	205'

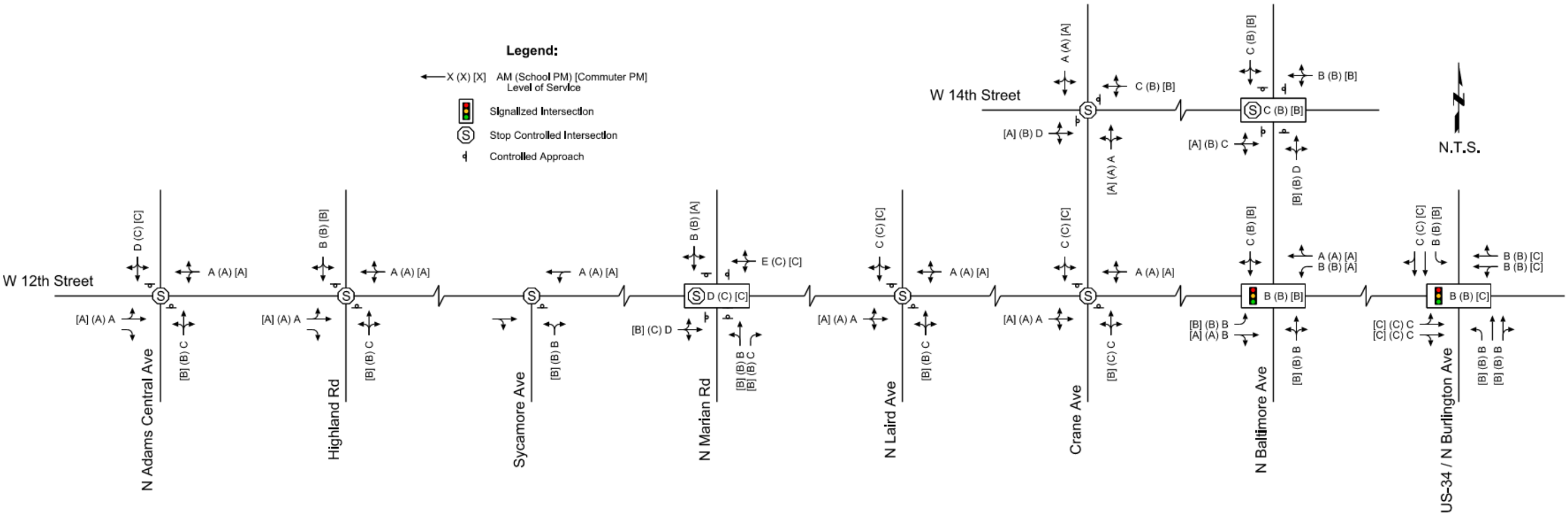


Figure 5: Existing Peak Hour Level of Service

2.5 Safety Analysis*

Crash data along the W 12th Street corridor was obtained from NDOT for the most recent available three-year period (2/1/2017 – 1/30/2020). Crash rates at all W 12th Street study intersections were calculated and are provided in Table 3. As shown, the crash rate for all study intersections are less than 1 crash per MEV and would not typically be considered high crash locations.

Table 3: W 12th Street Crash History

W 12 th Street Intersections	Number of Crashes	Intersection Crash Rate (Per MEV)
<i>N Adams Central Avenue</i>	5	0.76
<i>Highland Road</i>	1	0.16
<i>Sycamore Ave</i>	1	0.19
<i>N Marian Road</i>	4	0.45
<i>N Laird Avenue</i>	2	0.22
<i>Crane Avenue</i>	3	0.31
<i>N Baltimore Avenue</i>	8	0.63
<i>N Saunders Avenue</i>	6	**
<i>US-34/N Burlington Avenue</i>	26	0.83
<i>N Hastings Avenue</i>	4	**

****Note:** As neither the N Saunders Avenue nor the N Hastings Avenue intersection with W 12th Street were study intersections, volume data was not collected at these intersections, which is necessary for the calculation of the intersection crash rate.

It should be noted that one fatal crash was reported within the three years of crash data provided. The fatal crash happened approximately 650 feet west of the W 12th Street & N Baltimore Avenue intersection at the intersection of W 12th Street & Westwood Terrace. At 3:40 am, a westbound car struck a pedestrian trying to cross the street. Alcohol was reported as a contributing factor in the crash.

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3.0 Year 2048 No-Build Conditions

This section of the report summarizes the development of year 2048 peak hour traffic volumes and the analysis of the corridor under year 2048 no-build conditions.

3.1 Year 2048 Traffic Volumes

A review of historical traffic volumes provided by NDOT revealed both relatively low and, in a couple of cases, negative growth trends on area streets. To account for the possibility of future growth, and to provide a likely conservative approach, the existing 2023 traffic volumes were grown at an average annual growth rate of 1.0% for 25 years to estimate 2048 background traffic volumes. These year 2048 background traffic volumes are shown in Figure 6.

A previous study, included as Appendix C, generated trips associated with the Theatre District development on the southwest corner of W 12th Street & N Marian Road. These site trips were propagated through the W 12th Street study corridor based on existing traffic patterns. However, it should be noted that school PM peak hour trips were not included in this previous study. Using both information provided in this previous study and ratios provided by the ITE's Trip Generation Manual, 11th edition, site trips generated by the proposed development were produced. Further details on this process are provided in Appendix D. Anticipated site trips related to the Theatre District are shown in Figure 7.

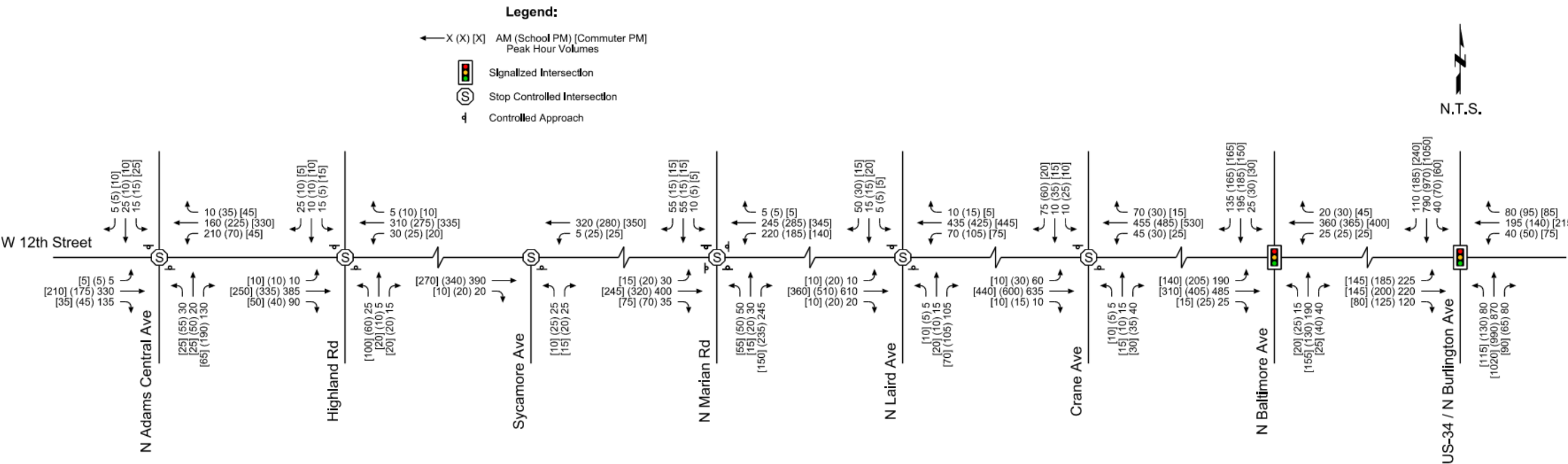
These site trips were then combined with the year 2048 background traffic volumes to establish year 2048 peak hour volumes. These year 2048 peak hour volumes are shown in Figure 8.

3.2 NDOT Signal Updates at the Intersection of W 12th Street and US-34/N Burlington Avenue

According to plans provided by NDOT, there is currently a programmed project to upgrade the traffic signal infrastructure at the intersection of W 12th Street and US-34/N Burlington Avenue that will be completed by Year 2048. This project includes the implementation of vehicle detection on all four approaches to the intersection and the addition of flashing yellow arrow left-turn indications for both the northbound and southbound approaches.

3.3 Year 2048 No-Build Conditions Capacity Analysis

Year 2048 no-build conditions capacity analysis was conducted for all W 12th Street study intersections using the existing intersection geometrics and traffic control, the traffic signal improvements at W 12th Street & US-34/N Burlington Road, and the year 2048 peak hour volumes illustrated in Figure 8. As shown in Figure 9, while many intersections do still operate at LOS D or better, several approaches to multiple intersections are expected to operate at LOS F during multiple peak hours. Further details on all lanes that operate at LOS E or F are provided in Table 4. Synchro output reports are included in Appendix E.



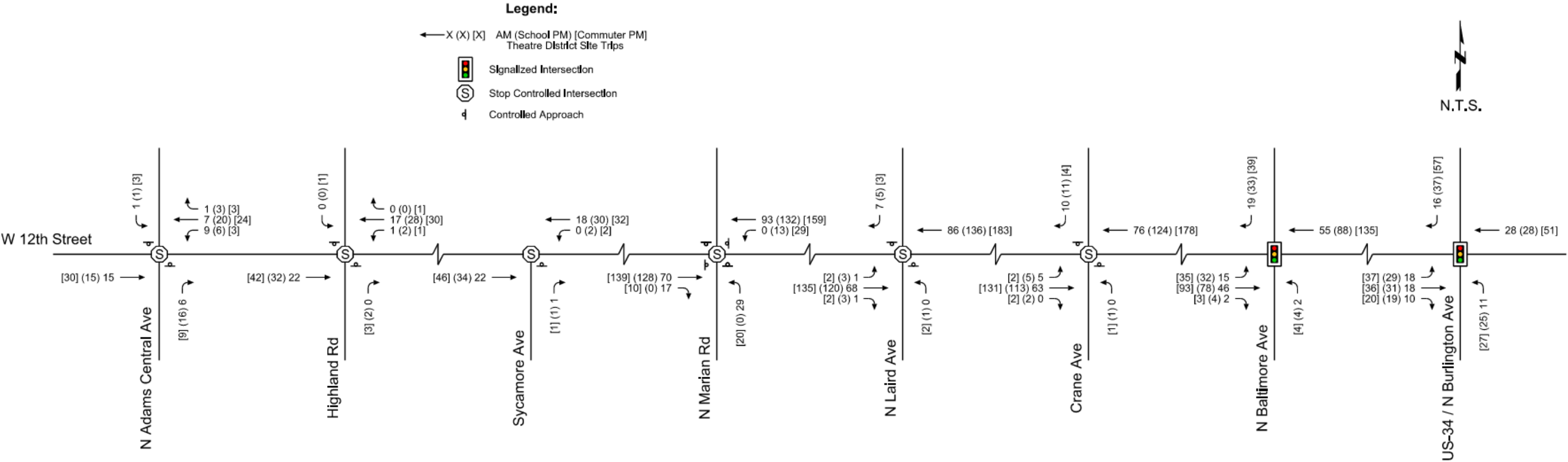


Figure 7: Year 2048 Theatre District Site Trips

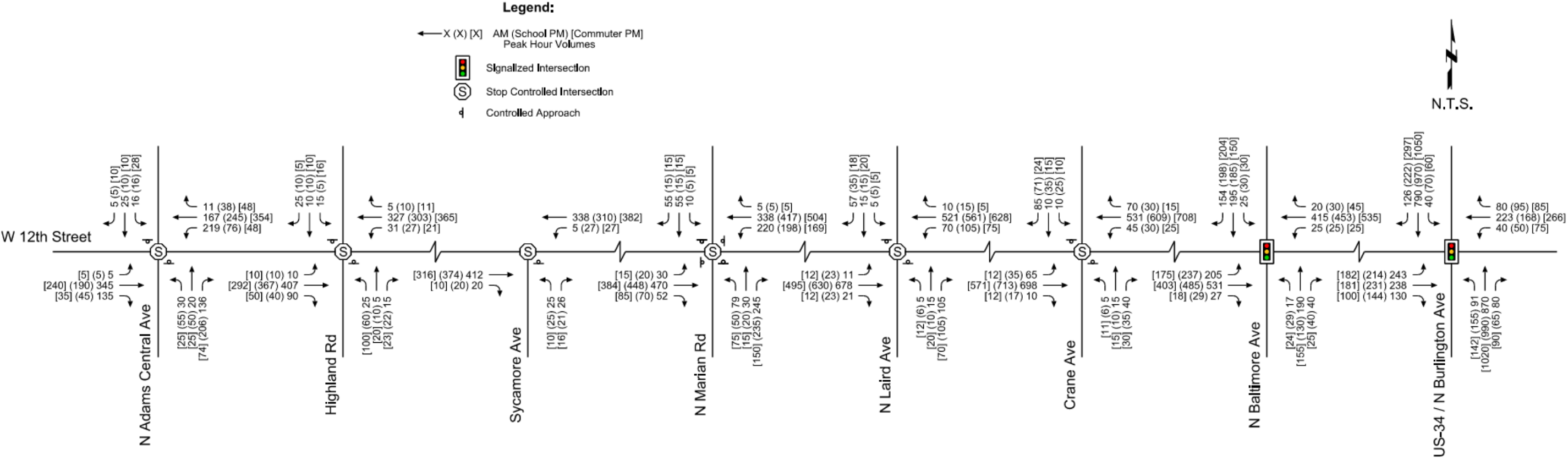


Figure 8: Year 2048 Peak Hour Volumes (Background plus Theatre District Site Trips)

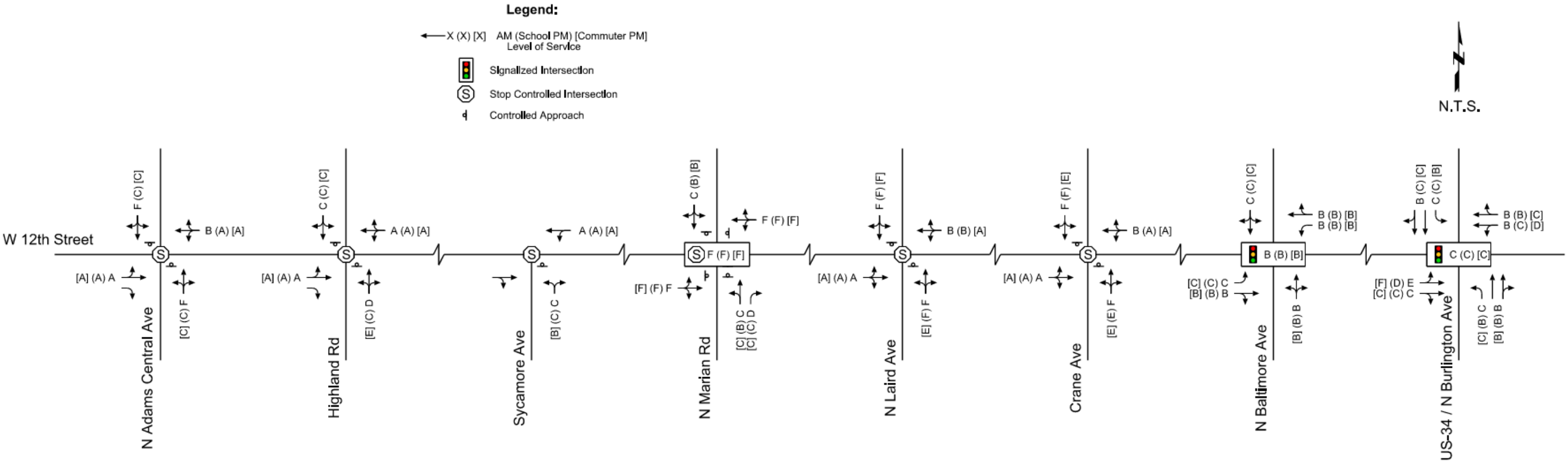


Figure 9: Year 2048 Peak Hour Level of Service

Table 4: Year 2048 Capacity Results

	N Adams Central Avenue		Highland Road	N Marian Road						N Laird Avenue						Crane Avenue						US-34/N Burlington Avenue	
	NB	SB	NB	EB			SB			NB			SB			NB			SB			EBTL	
Peak Hour	AM	AM	Commuter PM	AM	School PM	Commuter PM	AM	School PM	Commuter PM	AM	School PM	Commuter PM	AM	School PM	Commuter PM	AM	School PM	Commuter PM	AM	School PM	Commuter PM	AM	Commuter PM
Volume	186	46	143	465	410	335	470	475	490	125	120	100	70	50	40	60	50	55	95	120	45	138	183
LOS	F	F	E	F	F	F	F	F	F	F	F	E	F	F	F	F	E	E	F	F	E	E	F
V/C Ratio	1.10	0.88	0.60	1.64	1.25	1.16	1.70	1.41	1.51	0.88	0.77	0.61	0.74	0.68	0.39	0.95	0.39	0.39	1.21	1.05	0.37	0.92	1.01
95 th % Queue	278'	108'	90'	815'	533'	408'	875'	813'	1075'	163'	130'	88'	108'	85'	43'	130'	40'	43'	220'	193'	40'	358'	330'

4.0 W 12th Street Intersection Alternatives Analysis

Study intersections along the W 12th Street corridor were each evaluated to determine the impact of alternative traffic control.

4.1 Study Intersection Warrant Analyses

To determine the geometry and traffic control that should be analyzed at the study intersections, both traffic signal and auxiliary turn lane warrants were evaluated.

4.1.1 Year 2048 Traffic Signal Warrant Analysis

A warrant analysis was conducted for three W 12th Street intersections to determine if existing and/or projected 2048 traffic demands would satisfy 2009 MUTCD signal warrant criteria. The following warrants were considered in the analysis:

- Warrant 1 (Eight Hour Warrant)
- Warrant 2 (Four Hour Warrant)
- Warrant 7 (Crash Experience)

MUTCD warrant analysis results are summarized in Table 5. As shown, only the traffic signal at the intersection of W 12th Street & US-34 / N Burlington Avenue is currently warranted. It is possible that traffic signal at the intersection W 12th Street & N Baltimore Avenue could be warranted in the future, but this is not expected to occur until at least year 2038. Signal warrant sheets are provided in Appendix F.

Table 5: MUTCD Traffic Signal Warrants

W 12 th Street Intersection with	Traffic Demand Year	2009 MUTCD Warrants		
		Warrant 1 (8 Hour)	Warrant 2 (4 Hour)	Warrant 7 (Crash)
N Marian Road	Existing	No	No	No
	2048	No	No	N/A
N Baltimore Avenue	Existing	No	No	No
	2048	No*	Unknown**	N/A
US-34 / N Burlington Avenue	Existing	YES	YES	N/A
	2048	YES	YES	N/A

*While the three peak hours do meet the eight hour warrant criteria, when given the assumptions in this document, it is unlikely that five other hours of the day will also satisfy the warrant criteria.

**It is possible that, with a combination of background traffic growth and additional growth related to the Theatre District, that this signal may satisfy the warrant criteria starting around year 2038 to 2043. For more information, see Section 4.8.1 .

4.1.2 Year 2048 Auxiliary Turn Lane Warrant Analysis

A warrant analysis was conducted at several study intersections to determine if left-turn or right-turn lanes would be recommended. In accordance with guidance provided in NCHRP 457, year 2048 volumes along W 12th Street were analyzed to determine if they satisfied the warrant's volume threshold. Tables 6 and 7 provide the results of the right-turn lane warrant analysis and the left-turn lane warrant analysis, respectively. It should be noted that the NCHRP 457 guidance is only applicable for auxiliary turn lanes at two-way stop-controlled (TWSC) intersections. The intersection

of W 12th Street & N Baltimore Avenue was included on this analysis because the signal is unwarranted. NCHRP 457 turn lane warrant analysis sheets are provided in Appendix G.

Table 6: Right-Turn Lane Warrant Analysis

Peak Hour	W 12 th Street Intersection with										
	N Adams Central Ave		Highland Rd		Sycamore Ave	N Laird Ave		Crane Ave		N Baltimore Ave	
	EBR	WBR	EBR	WBR	EBR	EBR	WBR	EBR	WBR	EBR	WBR
AM	YES	No	YES	No	No	No	No	No	No	No	No
School PM	No	YES	No	No	No	No	No	No	No	No	No
Commuter PM	No	YES	No	No	No	No	No	No	No	No	No

Table 7: Left-Turn Lane Warrant Analysis

Peak Hour	W 12 th Street Intersection with										
	N Adams Central Ave		Highland Rd		Sycamore Ave	N Laird Ave		Crane Ave		N Baltimore Ave	
	EBL	WBL	EBL	WBL	WBL	EBL	WBL	EBL	WBL	EBL	WBL
AM	No	YES	No	YES	No	No	YES	YES	YES	YES	No
School PM	No	YES	No	No	No	YES	YES	YES	YES	YES	YES
Commuter PM	No	YES	No	No	No	No	YES	No	YES	YES	No

As shown above, auxiliary turn lanes are warranted at several study intersections and will therefore be included in the intersection operations analyses.

4.1.3 Year 2048 Second Lane on Minor Road Approach Analysis

A warrant analysis was conducted at two intersections to determine if a second side street approach lane should be added. In accordance with guidance provided in NCHRP 457, year 2048 volumes at the W 12th Street intersections with N Laird Avenue and Crane Avenue were analyzed to determine if they satisfied the warrant's volume threshold. As shown in Table 8, only the southbound Crane Avenue approach to W 12th Street satisfied the warrant during the school PM peak hour. It should be noted that southbound Crane Avenue volumes are not anticipated to satisfy the warrant's volume threshold until at least year 2045. NCHRP 457 second lane on minor road approach warrant analysis sheets are also included in Appendix G.

Table 8: Second Lane on Minor Road Approach Analysis

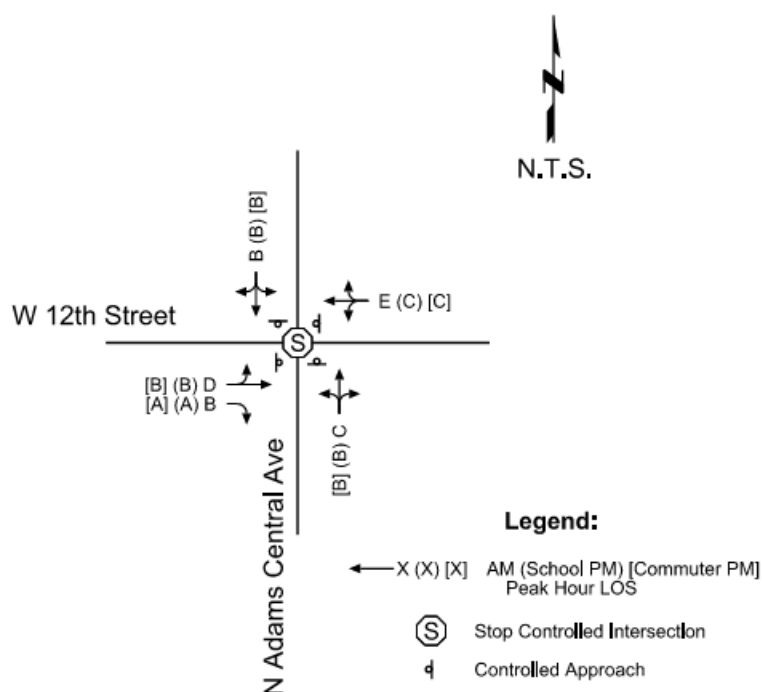
Peak Hour	W 12 th Street Intersection with			
	N Laird Ave		Crane Ave	
	NB	SB	NB	SB
AM	No	No	No	No
School PM	No	No	No	YES
Commuter PM	No	No	No	No

4.2 W 12th Street & N Adams Central Ave

As shown previously under no-build conditions, the intersection of W 12th Street & N Adams Central Avenue is expected to operate at LOS F during the AM peak hour for both the northbound and southbound approaches. Additionally, northbound approach is also overcapacity with a V/C ratio of 1.04. To alleviate this, two alternatives were evaluated: all-way stop control (AWSC) and a roundabout.

4.2.1 All-Way Stop Control

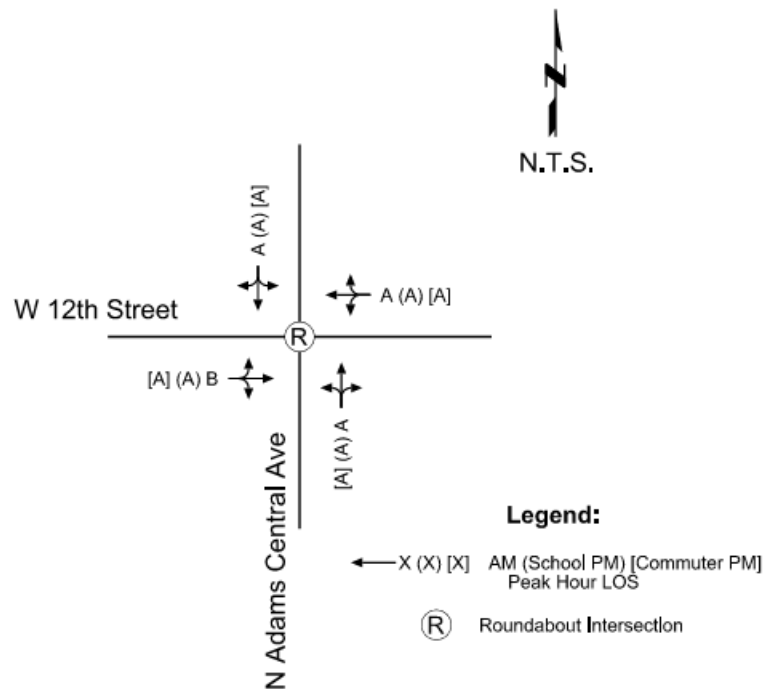
The intersection of W 12th Street & N Adams Central Avenue was evaluated as an AWSC intersection. As shown in Figure 10, the implementation of AWSC does improve the northbound and southbound LOS during the AM peak hour. However, this is to the detriment of both the eastbound and westbound approaches which, during the AM peak hour, would operate at LOS D and E, respectively. It should be noted that the westbound approach during this AM peak hour is nearing capacity with a V/C ratio of 0.90. Synchro Output sheets are provided in Appendix H.



**Figure 10: W 12th Street & N Adams Central Avenue
LOS – All Way Stop Control**

4.2.2 Roundabout

The intersection of W 12th Street & N Adams Central Avenue was also evaluated as a single-lane roundabout. As shown in Figure 11, the intersection operates at LOS B, or better, on all approaches during all three peak hours. SIDRA output sheets are also provided in Appendix H.



**Figure 11: W 12th Street & N Adams Central Avenue
LOS – Roundabout**

Based on the above analysis, a single-lane roundabout is expected to operate better than both the existing TWSC and the AWSC alternative. For this reason, a single-lane roundabout is recommended at the intersection of W 12th Street & N Adams Central Avenue.

4.3 W 12th Street & Highland Road

As shown previously under no-build conditions, the eastbound, westbound, and southbound approaches to the intersection of W 12th Street & Highland Road are all anticipated to operate at LOS C, or better, during all three peak hours. However, the northbound approach does operate at LOS D during the AM peak hour and LOS E during the commuter PM peak hour. These movements are both under capacity with a V/C ratio of 0.26 and 0.60, respectively. This is not uncommon for minor street, stop-controlled approaches to major through streets during peak hours.

While not required to improve the LOS at the intersection, both an eastbound right-turn lane and a westbound left-turn lane are warranted and therefore recommended. As volumes increase, these auxiliary turn lanes will provide increased safety along W 12th Street by removing vehicles that are decelerating to turn from the through lanes. It should be noted that the existing eastbound right-turn volume is only five vehicles shy from satisfying the warrant criteria. The westbound left-turn, on the other hand, is not expected to warrant until the mid-2040s.

4.4 W 12th Street & Sycamore Avenue

The intersection of W 12th Street & Sycamore Avenue is expected to operate at LOS C or better through Year 2048. Due to this acceptable operation, no changes are recommended at the intersection of W 12th Street & Sycamore Avenue. However, if the W 12th Street cross-section directly to the east of this intersection were to be expanded to include a two-way left-turn lane (TWLTL), the addition of a dedicated westbound left-turn lane at this intersection would be recommended.

4.5 W 12th Street & N Marian Road

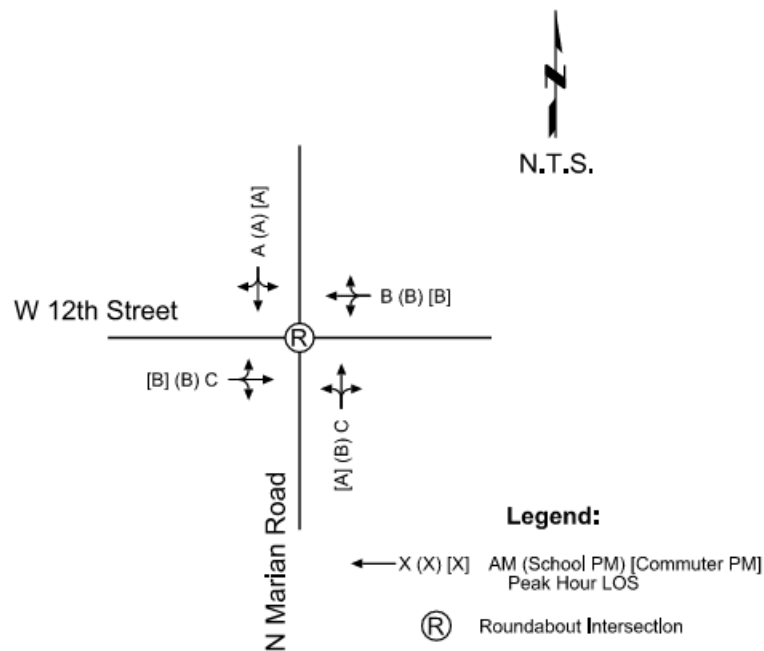
As shown previously in Figure 9 and in Table 4, the intersection of W 12th Street & N Marian Road is expected to operate at LOS F on both the eastbound and westbound approaches during all three peak hours in the year 2048 as an AWSC intersection. To mitigate this, two alternatives were considered: traffic signal control and a roundabout.

4.5.1 Traffic Signal

As shown previously in Table 5, the existing volumes at the intersection of W 12th Street & N Marian Road do not currently satisfy MUTCD traffic signal warrant criteria. It is also expected that neither Warrant 1 nor Warrant 2 will be satisfied in year 2048. According to the MUTCD, traffic signals that are installed where they are not justified can result in excessive delay, excessive disobedience of the signal indications, increased use of less adequate routes as vehicles attempt to avoid traffic signals, and significant increases in the frequency of collisions (especially rear-end collisions). Consequently, a traffic signal was not evaluated further at this intersection.

4.5.2 Roundabout

A single-lane roundabout was evaluated at the intersection of W 12th Street & N Marian Road. As shown in Figure 12, a roundabout would be expected to operate at LOS C, or better, during all three peak hours. As shown, a single-lane roundabout at the intersection of W 12th Street & N Marian Road is expected to operate better than the existing AWSC. For this reason, a single-lane roundabout is recommended at the intersection of W 12th Street & N Marian Road. SIDRA output sheets are provided in Appendix J.



**Figure 12: W 12th Street & N Marian Road
LOS – Roundabout**

4.6 W 12th Street & N Laird Avenue

As shown previously in Tables 6 and 7, both an eastbound left-turn lane and a westbound left-turn lane are warranted in year 2048 and should be included at the intersection of W 12th Street & N Laird Avenue. It is recognized that while northbound and southbound approaches do not operate efficiently with LOS E and F present on both approaches during all three peak hours, this is not uncommon for stop-controlled side street approaches to major through streets. Both approaches are also under capacity with V/C ratios of less than 0.9 during all three peak hours. In agreement with Table 8, the addition of a second lane on these minor street approaches is not recommended. The presence of two vehicles stopped side-by-side can lead to reduced sight distance as drivers of both vehicles attempt to see around the adjacent vehicle.

4.7 W 12th Street & Crane Avenue

As shown previously, both an eastbound left-turn lane and a westbound left-turn lane are warranted in year 2048 and should be included at the intersection of W 12th Street & Crane Avenue. It is recognized that while the northbound and southbound approaches do not operate efficiently with LOS E and F present during all three peak hours, this is not uncommon for stop-controlled side street approaches to major through streets. It is also recognized the southbound approach is overcapacity in the year 2048 analysis. As shown in Table 8, when given the assumptions in this report, a southbound right-turn lane would be warranted in year 2048, however this warranted status is not expected until year 2045 at the earliest. Given this, the installation of a southbound right-turn lane at the intersection of W 12th Street & Crane Avenue is not currently recommended. This report does not reflect volume

fluctuations and traffic pattern changes that could occur should W 14th Street be extended to the west and connect with N Marian Road. This intersection should be reevaluated once either that extension is completed or in year 2045, whichever happens first. The presence of two vehicles stopped side-by-side, as would happen with the installation of this southbound right-turn lane, can lead to reduced sight distance as drivers of both vehicles attempt to see around the adjacent vehicle.

4.8 W 12th Street & N Baltimore Avenue

While acceptable operations are present at the intersection of W 12th Street & N Baltimore Avenue, traffic signal control is not currently warranted and may not be for several years. Because of this, two alternatives were evaluated: continuation of traffic signal control and a roundabout.

4.8.1 Traffic Signal

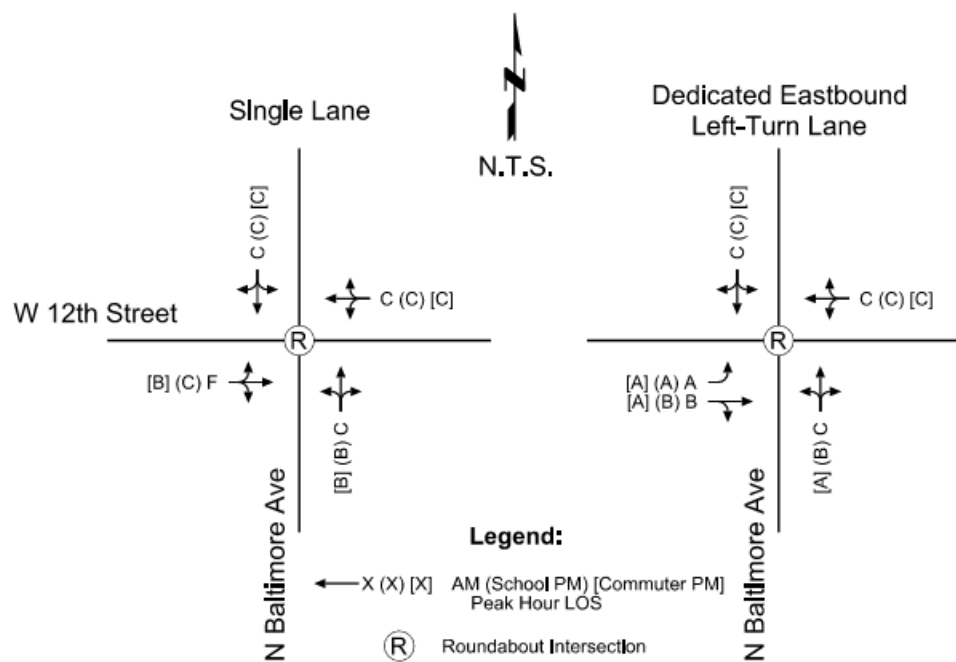
As shown previously in Figure 9, a traffic signal at this intersection is expected to operate acceptable at LOS C or better in year 2048. However, as also shown previously in Table 5, the existing volumes at the intersection of W 12th Street & N Marian Road do not currently satisfy MUTCD warrant criteria. It is also not expected that Warrant 1 will be satisfied by year 2048. However, it is possible that, with both the background traffic volume growth and the trips associated the Theatre District, the intersection may satisfy Warrant 2 criteria starting around the years of 2038 to 2043.

It should be noted that if a 0.5% growth rate were used to grow the background traffic volumes instead of the 1.0% growth rates, when given the assumptions contained in this study, volumes would not be expected to satisfy the warrant criteria until after year 2050. As mentioned previously, the operation unwarranted traffic signals can result in excessive delay, excessive disobedience of the signal indications, increased use of less adequate routes as vehicles attempt to avoid traffic signals, and significant increases in the frequency of collisions (especially rear-end collisions).

4.8.2 Roundabout

The intersection of W 12th Street & N Baltimore Avenue was also evaluated as a roundabout. As shown in Figure 13, a single-lane roundabout does have operational issues on the eastbound approach during the AM peak hour. This approach is also over capacity with a V/C ratio of 1.002. However, if a second lane were added to this eastbound approach, separating the eastbound left-turning vehicles from the eastbound through and right-turning vehicles, LOS improves to B and A in the respective lanes with V/C ratios that are both under 0.7. SIDRA output reports are provided in Appendix K.

It should be noted that in addition to the two formal options above, installation of stop-control on two or more approach was also evaluated. However, the stop-controlled approaches were frequently overcapacity, so none of these options were carried further as formal alternatives. Due to the variability of traffic volumes associated with both year 2048 and with the Theatre District, it is recommended that this intersection be reexamined after the full opening of the Theatre District, year 2040, or when the traffic signal needs to be reconstructed, whichever occurs first.



**Figure 13: W 12th Street & N Baltimore Avenue
LOS – Roundabout**

4.9 W 12th Street & US-34 / N Burlington Avenue

As shown previously in this report, volumes at the intersection of W 12th Street & US-34 / N Burlington Avenue do satisfy the warrant thresholds for traffic signal control. However, to alleviate poor operations on W 12th Street approaches, three variations of these W 12th Street approaches were analyzed. The first alternative consists of a dedicated left-turn lane and a shared through and right-turn lane for both the eastbound and westbound approaches. The second alternative consists of a dedicated left-turn lane, dedicated through lane, and a dedicated right-turn lane for the eastbound approach and a dedicated right-turn lane and a shared through and right-turn lane for the westbound approach. The third alternative consists of a dedicated left-turn lane and a shared through and right-turn lane for the eastbound approach and a dedicated left-turn lane, dedicated through lane, and a dedicated right-turn lane for the westbound approach. As shown in Figure 14, the third alternative operates the best with LOS D, or better, for all lanes and the intersection as a whole. Synchro output reports are included in Appendix L.

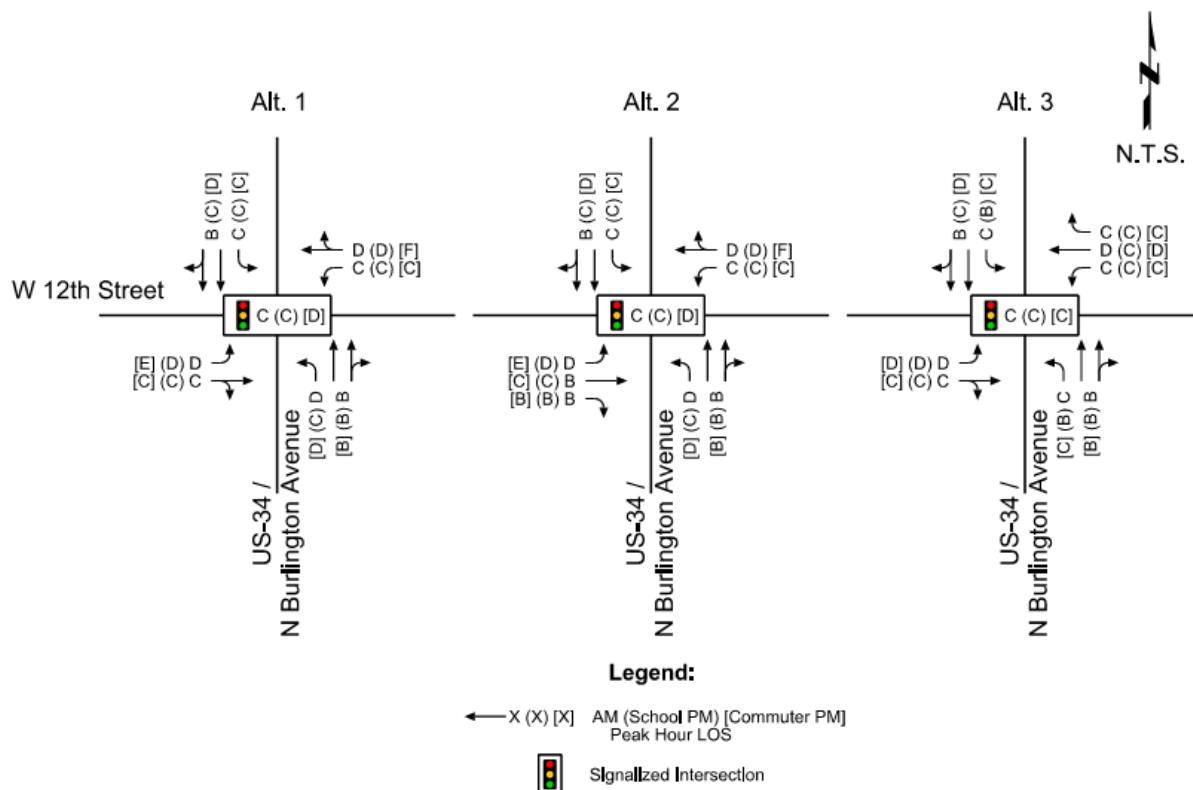


Figure 14: W 12th Street Approach Configuration Alternatives at US-34 / N Burlington Avenue

5.0 Two-Way Left-Turn Lanes (TWLTLs)

A TWLTL is a dedicated center lane that allows vehicles to make left turns into side street or driveway connections along a corridor, providing safer and more efficient flow of traffic while minimizing disruptions to the general flow of the corridor.

5.1 TWLTL Background

In general, current regional policy and practice recommend the installation of a TWLTL on two-lane, undivided streets with Average Daily Traffic (ADT) greater than 3,000 vehicles. Furthermore, TWLTLs can work well on streets with a high density of residential driveways where left-turn movements are less frequent throughout the day than commercial or industrial uses. The presence of this left-turn lane allows for vehicles waiting to complete their left-turn movement to do so outside of the adjacent through lane. This allows through vehicles to pass the vehicle waiting to turn left, instead of being stuck behind them, as is the case on two-lane streets without TWLTLs. TWLTLs should also not be considered when ADTs reach levels of 17,500 or greater and on commercial corridors with greater left-turn demands as crash occurrences tend to increase and operational efficiency decreases.

While crash occurrences tend to reduce when a TWLTL is added to a two-lane undivided cross-section, there are some negatives associated with the induction of a TWLTL. These include the following:

1. Operating speeds have the tendency to increase,
2. Motorists can be tempted to use the TWLTL as a passing lane,
3. Opposing left-turn conflicts can be introduced, especially on corridors with frequent driveways,
4. Crash frequencies have been observed to be greater on facilities with TWLTLs versus facilities that have continuously raised medians and enhanced access control, and
5. At mid-block locations, TWLTLs have more exposure to crossing pedestrians than raised medians, which provide a protected refuge area for pedestrians.

5.2 TWLTL and Access Management

On corridors where frequent driveways and access points occur, there is the risk of creating unsafe opposing left-turn conflicts with the introduction of TWLTL geometry. This can occur when opposing driveways are closely spaced and are offset in such a way that opposing left-turn paths cross, which can lead to confusion, conflicts, and crashes. An example of this scenario is depicted in Figure 15.

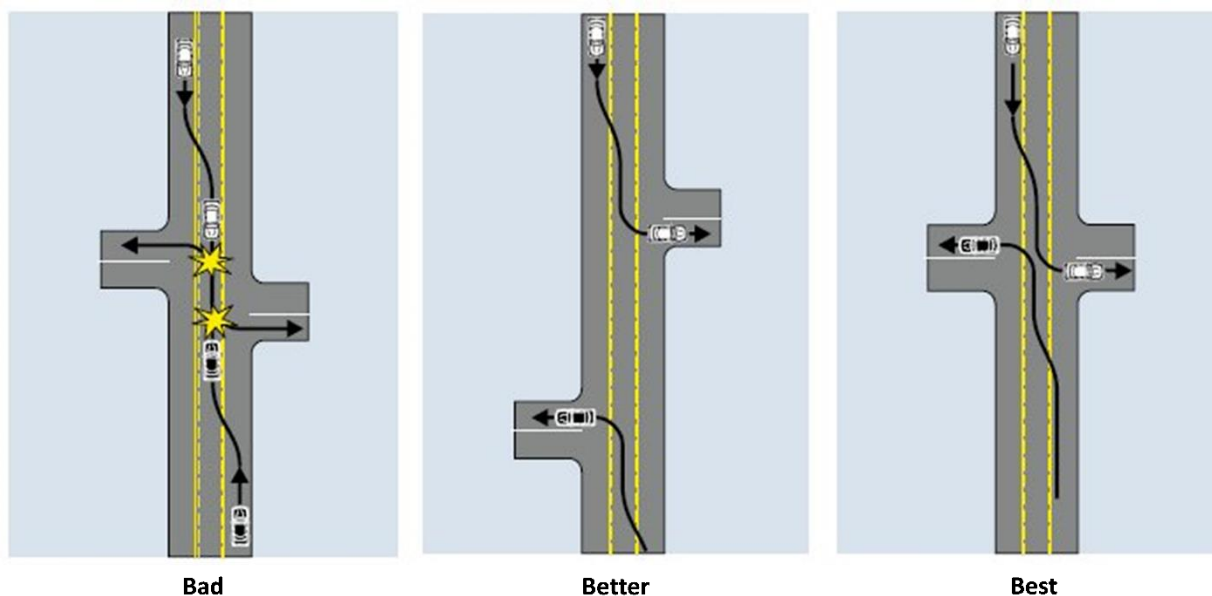


Figure 15: Left-Turn Conflicts to Opposing Driveways on TWLTLs

Source: FHWA Access Management in the Vicinity of Intersections

5.3 TWLTLs and the W 12th Street Corridor

Regional guidance suggests that a street segment may be suitable for a TWLTL when the following criteria are met:

1. Future ADT volume of greater than 3,000 vehicles per day for an existing two-lane urban street,
2. Side streets plus driveway density of 20 or more entrances per mile, and
3. Speed limits are 45 mph or less.

Table 9 below summarizes how the study segments compare to this criterion. As shown, all W 12th Street segments east of Sycamore Avenue meet all three qualifications.

Table 9: TWLTL Regional Guidance Applied to W 12th Street Corridor Segments

Criteria 1	N Adams Central Ave	X	Highland Rd	X	Sycamore Ave	X	N Marian Rd	X	N Laird Ave	X	Crane Ave	X	N Baltimore Ave	X	US-34 / N Burlington Ave	X	N Hastings Ave
Criteria 2					X	X	X	X	X	X	X	X	X	X	X	X	
Criteria 3			X	X	X	X	X	X	X	X	X	X	X	X	X	X	

6.0 W 12th Street Corridor Segments

Between the study intersections, corridor segments were evaluated to improve the safety and operations of W 12th Street. Segment alternatives include 1) no-build; 2) two-lane plus warranted turn lanes (if not already present today); and 3) two-lane with a center two-way, left-turn lane (TWLTL).

6.1 W 12th Street – N Adams Central Avenue to Highland Road

The segment of W 12th Street between N Adams Central Avenue and Highland Road is a two-lane road with a speed limit of mainly 50 mph. Additionally there are no public street connections and very few private driveway connections within this segment. As the speed limit exceeds 45 mph and due to the relative lack of access points along this segment, the preservation of the existing two-lane cross-section is recommended.

6.2 W 12th Street – Highland Road to Sycamore Avenue

The segment of W 12th Street between Highland Road and Sycamore road is a two-lane street with a speed limit of 45 mph. As there are no connections of any kind between these two intersections, the preservation of the existing two-lane cross-section is recommended.

6.3 W 12th Street – Sycamore Avenue to N Marian Road

As shown in Table 9, the W 12th Street segment from Sycamore Avenue to N Marian Road does satisfy all three criteria for the possible use of a TWLTL. Driveway and local street connections along this segment are also mostly located on the south side of W 12th Street. This does help to reduce the left-turn conflicts that can arise with the installation of a TWLTL. However, it should be noted that this installation could also increase the speed of westbound through vehicles as they accelerate out of town.

6.4 W 12th Street – N Marian Road to N Laird Avenue

The segment of W 12th Street between N Marian Road and N Laird Avenue currently contains two lanes with a speed limit of 30 mph. To accommodate the recommended single-lane roundabout at N Marian Road, W 12th Street would be expanded to accommodate the center median (i.e., splitter island) typical of roundabouts. Also, as shown in Table 7, an eastbound left-turn lane is warranted at the intersection of W 12th Street & N Laird Avenue, which W 12th Street could need to be widened to accommodate. A TWLTL would greatly reduce the horizontal shifting the drivers would experience at both ends of this segment. This segment also meets all three criteria for the installation of a TWLTL, as shown previously in Table 9. However, it should be noted that if a TWLTL is installed in this segment, it does create the negative offset described as ‘bad’ in Figure 15 between the connection to Tilden Avenue and Westridge Drive. While they may not be a reason to not install a TWLTL in this segment, the creation of this negative offset should be noted.

6.5 W 12th Street – N Laird Avenue to Crane Avenue

The segment of W 12th Street between N Laird Avenue and Crane Avenue currently contains two lanes and a speed limit of 30 mph. Left-turn lanes are warranted at both the N Laird Avenue and Crane Avenue intersections with W 12th Street. Due to the taper needed to develop these turn lanes, there will only be approximately 270’ between the ends of the left-turn lanes. To avoid transitioning between a two-lane section and a three-lane section repeatedly implementation of a TWLTL is recommended. This segment also meets all of the TWLTL criteria, as shown previously in Table 9. A

TWLTL along this segment would also provide further benefits by servicing the residential drives, Apache Avenue, and the commercial drives in this area.

6.6 W 12th Street – Crane Avenue to N Baltimore Avenue

The two lane segment of W 12th Street between Crane Avenue and N Baltimore Avenue satisfies the criteria for the installation of a TWLTL. Also, while volumes were not counted at intersections between Crane Avenue and N Baltimore Avenue, it would require as few as ten W 12th Street vehicles turning left at any one of these intersections during a peak hour to warrant a left-turn lane. However, it should be noted that while the installation of a TWLTL would positively impact the corridor, it does create some negative offsets, such as between Heritage Drive and Westlawn Avenue.

6.7 W 12th Street – N Baltimore Avenue to US-34 / N Burlington Avenue

The segment of W 12th Street between N Baltimore Avenue and US-34 / N Burlington Avenue contains two lanes for about 150 feet east of N Baltimore Avenue, three lanes (with two lanes eastbound and one lane westbound) for the next 2,000 feet, and finally four lanes (with two lanes in each direction) for the final 375' until US-34 / N Burlington Avenue. It should be noted that this stretch of W 12th Street has a lower volume than the two-lane segment of W 12th Street between Crane Avenue and N Baltimore Avenue. This stretch of W 12th Street also satisfies all three criteria for the inclusion of a TWLTL. It should also be noted that it would take as few as 19 left-turning vehicles for any of the intermediate intersections between N Baltimore Avenue and US-34 / N Burlington Avenue to satisfy the warrant threshold for dedicated left-turn lanes. This segment also contains many of the 'best' configurations for left turns, according to Figure 15, as the vast majority of public streets line up directly across W 12th Street. For these reasons, it is recommended that this segment be restriped to include one lane of traffic in both the eastbound and westbound directions and one center TWLTL.

6.8 W 12th Street – US-34 / N Burlington Avenue to N Hastings Avenue

The segment of W 12th Street between US-34 / N Burlington Avenue and N Hastings Avenue contains four lanes (with two lanes in each direction) at the intersection with US-34 / N Burlington Avenue but narrows down to a two-lane section east of the intersection with N Hastings Avenue. As shown previously in Figure 14, the intersection of W 12th Street & US-34 / N Burlington Avenue can operate acceptably with only one westbound and eastbound through lane. This stretch of W 12th Street also satisfies all three criteria for TWLTLs, as shown in Table 9. As such, it is recommended that the W 12th Street segment from US-34 / N Burlington Avenue to N Hastings Avenue be striped with one lane of traffic in both the eastbound and westbound directions, with a TWLTL to serve the side street and driveway connections to the south.

7.0 Conclusion and Recommendations

Based on the above analysis, the following conclusions are provided:

- The intersection of W 12th Street & N Adams Central Avenue is recommended to be reconstructed as a single-lane roundabout.
- The segment of W 12th Street from N Adams Central Avenue to Highland Road is recommended to stay as a two-lane road.
- The intersection of W 12th Street & Highland Road should be reconstructed to include both an eastbound right-turn lane and a westbound left-turn lane. (However, while the eastbound right-turn lane almost satisfies the warrant threshold today, the westbound left-turn is not expected to reach the volumes needed to satisfy the warrant until the mid 2040s.)
- The segment of W 12th Street from Highland Road to Sycamore Avenue is recommended to stay as a two-lane road.
- The intersection of W 12th Street & Sycamore Avenue is recommended to retain the existing cross-section. (However, this intersection could act as the west end of the TWLTL and the associated introduction of a westbound left-turn lane would not have a negative impact on the intersection.)
- The segment of W 12th Street from Sycamore Avenue to N Marian Road satisfies all the criteria for the inclusion of a TWLTL and therefore could be considered for the installation of a TWLTL.
- The intersection of W 12th Street & N Marian Road is recommended to be reconstructed as a single-lane roundabout.
- The segment of W 12th Street from N Marian Road to N Laird Avenue satisfies all the criteria for the inclusion of a TWLTL and therefore could be considered for the installation of a TWLTL.
- The intersection of W 12th Street & N Laird Avenue should be reconfigured to include dedicated left-turn lanes in both the westbound and eastbound directions, either by the installation of a TWLTL on both segments or via street expansion to create the dedicated left-turn lanes. The addition of side street stop-controlled right-turn lanes is not recommended both because they are not warranted and due to the sight distance limitations that they introduce.
- The segment of W 12th Street from N Laird Avenue to Crane Avenue should be improved to include a TWLTL. Due to the left-turn lane requirements at both N Laird Avenue and Crane Avenue, the additional of a TWLTL limits the constant horizontal shifting of drivers. This TWLTL could then also benefit local drivers by serving the residential driveways, the commercial driveways, and Apache Avenue.
- The intersection of W 12th Street & Crane Avenue should be reconfigured to include dedicated left-turn lanes in both the westbound and eastbound directions, either by the installation of a TWLTL on both segments or via street expansion to create the dedicated left-turn lanes. The addition of side street stop-controlled right-turn lanes is not currently recommended. This intersection should be reevaluated once W 14th Street is extended to N Marian Road or year 2045, whichever happens first.
- The segment of W 12th Street from Crane Avenue to N Baltimore Avenue should be improved to include a center TWLTL. (Within this area, it would take as little as ten W 12th Street vehicles turning left at any of the intermediate intersections during one peak hour to warrant the addition of dedicated left-turn lanes.)
- The intersection of W 12th Street & N Baltimore Avenue has been shown to operate well as both a (possibly unwarranted) traffic signal and a single-lane roundabout, with a two-lane approach on the west leg. Due to the variability of traffic volumes associated both with year 2048 and with the Theatre District, it is recommended that this intersection be reexamined after the full opening

of the Theatre District, year 2040, or when the traffic signal needs to be reconstructed, whichever occurs first.

- The segment of W 12th street from N Baltimore Avenue to US-34 / N Burlington Avenue should be restriped to include one lane of travel in each direction and a center TWLTL. This segment carries fewer vehicles than the segment directly to the west, concluding that the two eastbound lanes are not needed in this segment.
- The intersection of W 12th Street & US-34 / N Burlington Avenue is shown to operate best presently and in the future with a dedicated auxiliary left-turn lane and a shared through and right-turn lane on the eastbound approach and a dedicated auxiliary left-turn lane, a dedicated through lane, and a dedicated auxiliary right-turn lane.
- The segment of W 12th Street from US-34 / N Burlington Avenue to N Hastings Avenue should be converted to a single lane of travel in each direction and a center TWLTL. This configuration connects well to both the recommended geometry of the US-34 / N Burlington Avenue intersection and the existing lane configuration east of N Hastings Avenue.



Appendix A: Full Description of the Local Street Network

Below is a full description of the local street network within the study area.

A.1 W 12th Street

W 12th Street is an east/west two-way 'Other Arterial' as defined by the Nebraska Department of Transportation's (NDOT) State Functional Classification Map. From the west end of the corridor just past the intersection with N Baltimore Avenue, W 12th Street contains one lane of travel in each direction. Between this point east of the N Baltimore intersection to a location about 375' west of the US-34 / N Burlington Avenue intersection, W 12th Street consists of one westbound lane and two eastbound lanes. For about 350' either side of the US-34 / N Burlington Avenue intersection, W 12th Street contains two lanes in each direction. East of this point, W 12th Street narrows back down to one lane of travel in each direction east of the N Hastings Avenue intersection. Sidewalk is provided on both sides of W 12th Street east of N Baltimore Avenue. However, apart from a 200-foot stretch of sidewalk on the south side immediately adjacent to the N Baltimore Avenue intersection, there is no sidewalk provided on W 12th Street west of N Baltimore Avenue. W 12th Street is also lighted via luminaires mainly located on the north side of the street, although the number and density of this lighting does reduce west of N Marian Road. This reduces to no streetlighting between Sycamore Avenue and N Highland Avenue, however full lighting is then provided between N Highland Avenue and N Adams Central Road. Curb and gutter is provided on both sides of the street starting from about 1,100-feet west of the N Baltimore Avenue intersection east through the project area. Pictures of W 12th Street in various locations throughout the study corridor are provided in Figures A1 thru A4.



Figure A1: W 12th Street Looking East, East of N Adams Central Avenue



Figure A4: W 12th Street Looking East, East of N Laird Avenue



Figure A2: W 12th Street Looking West, East of US-34 / N Burlington Avenue



Figure A3: W 12th Street Looking East, East of N Baltimore Avenue

A.2 W 14th Street

W 14th Street is an east/west two-way street that is classified as “Local” west of N Baltimore Avenue and as “Other Arterial” east of N Baltimore Avenue, according to NDOT’s State Functional Classification Map. W 14th Street contains one lane of travel in each direction within the study area. Sidewalk and curb and gutter are provided on both sides of W 14th Street throughout the study area, apart from a 120’ section on the south side just west of Crane Avenue where sidewalk is not provided. Lighting along W 14th Street is provided by luminaires located mainly on the north side of the street west of Crane Avenue and luminaires located on the south side of the street east of Crane Avenue. A picture of Crane Avenue is provided in Figure A5.



Figure A5: W 14th Street Looking West, West of N Baltimore Avenue

A.3 N Adams Central Avenue

N Adams Central Avenue is a north/south two-way, two-lane, “Local” street north of W 12th Street and “Other Arterial” south of W 12th Street, according to NDOT’s State Functional Classification Map. N Adams Central Avenue has unpaved shoulders throughout the study area and no sidewalk is provided. Outside of the intersection with W 12th Street, no lighting is provided. A photo of N Adams Central Avenue looking south, south of the intersection with W 12th Street, is provided in Figure A6.



Figure A6: N Adams Central Avenue Looking South, South of W 12th Street

A.4 Highland Road

Highland Road is a north/south two-way, two-lane, “Local” street north of W 12th Street and “Other Arterial” south of W 12th Street, according to NDOT’s State Functional Classification Map. Highland Road has unpaved shoulders throughout the study area and no sidewalk is provided. Outside of the intersection with W 12th Street, no immediate lighting is provided. A photo of Highland Road looking south, south of the intersection with W 12th Street, is provided in Figure A6.



Figure A7: Highland Road Looking South, South of W 12th Street

A.5 Sycamore Road

Sycamore road is a north/south two-way, two-lane, “Local” street, according to NDOT’s State Functional Classification Map. Sidewalk is not provided within the study area, although lighting is provided via luminaires located on the east side of the street. Curb and gutter is provided on both sides of the street. A photo of Sycamore Road looking south, south of W 12th Street, is provided in Figure A8.



Figure A8: Sycamore Road Looking South, South of W 12th Street

A.6 N Marian Road

South of W 12th Street, N Marian Road is a north/south two-way, four-lane, paved “Other Arterial”, while north of W 12th Street, N Marian Road is a two-way, two-lane, gravel “Local” street, according to NDOT’s State Functional Classification Map. Curb and gutter is provided south of W 12th Street, while unpaved shoulder is provided north of W 12th Street. No sidewalk or lighting is provided along N Marian Road within the study area. Pictures of N Marian Road, both north and south of W 12th Street, are provided in Figures A9 and A10.



Figure A9: N Marian Road Looking South, South of W 12th Street



Figure A10: N Marian Road Looking North, North of W 12th Street

A.7 N Laird Avenue

N Laird Avenue is a north/south two-way, two-lane “Other Arterial” south of S 12th Street and “Local” street north of W 12th Street, according to NDOT’s State Functional Classification Map. Sidewalk and curb and gutter is provided on both sides of the street, apart from a 250-foot sidewalk gap on the west side of N Laird Avenue, just north of W 12th Street. Street lighting is provided via luminaires on the west side of the street south of W 12th Street and on both sides of the street north of W 12th Street. A picture of N Laird Avenue north of W 12th Street is provided in Figure A11.



Figure A11: N Laird Avenue Looking North, North of W 12th Street

A.8 Crane Avenue

Crane Avenue is a north/south two-way, two-lane “Local” street, according to NDOT’s State Functional Classification Map. North of W 12th Street, Crane Avenue also contains an unpaved median with a back-of-curb to back-of-curb (BOC to BOC) width of 12-feet. Curb and gutter is provided everywhere within the study area. South of W 12th Street, luminaires to provide streetlighting are located along the west side of the street and sidewalk is provided along both sides of the street. North of W 12th Street, luminaires for streetlighting are provided within the unpaved median, while sidewalk is only provided on the west side of the street. Pictures of Crane Avenue, both north and south of W 12th Street are provided in Figures A12 and A13.



Figure A13: Crane Avenue Looking North, North of W 12th Street



Figure A12: Crane Avenue Looking South, South of W 12th Street

A.9 N Baltimore Avenue

N Baltimore Avenue is a north/south two-way, two-lane “Other Arterial”, according to NDOT’s State Functional Classification Map. Sidewalk is provided on both sides the street throughout the project area, while streetlighting is provided by luminaires located only on the east side of the street. Curb and gutter is also provided throughout the project area. A photo of N Baltimore Avenue north of W 12th Street is provided in Figure A14.



Figure A14: N Baltimore Avenue Looking North, North of W 12th Street

A.10 US-34 / N Burlington Avenue

US-34 / N Burlington Avenue is a north/south two-way, four-lane “Expressway”, according to NDOT’s State Functional Classification Map. Sidewalk and curb and gutter are both provided everywhere within the study area. Streetlighting is provided via luminaires located on the east side of the street. A picture of US-34 / N Burlington Avenue at W 12th street is provided in Figure A15.



Figure A15: US-34 / N Burlington Avenue Looking South, at W 12th Street

A.11 Area Speed Limits

Speed limits vary widely throughout the study area. For simplicity, all speed limits are shown graphically in Figure A16.

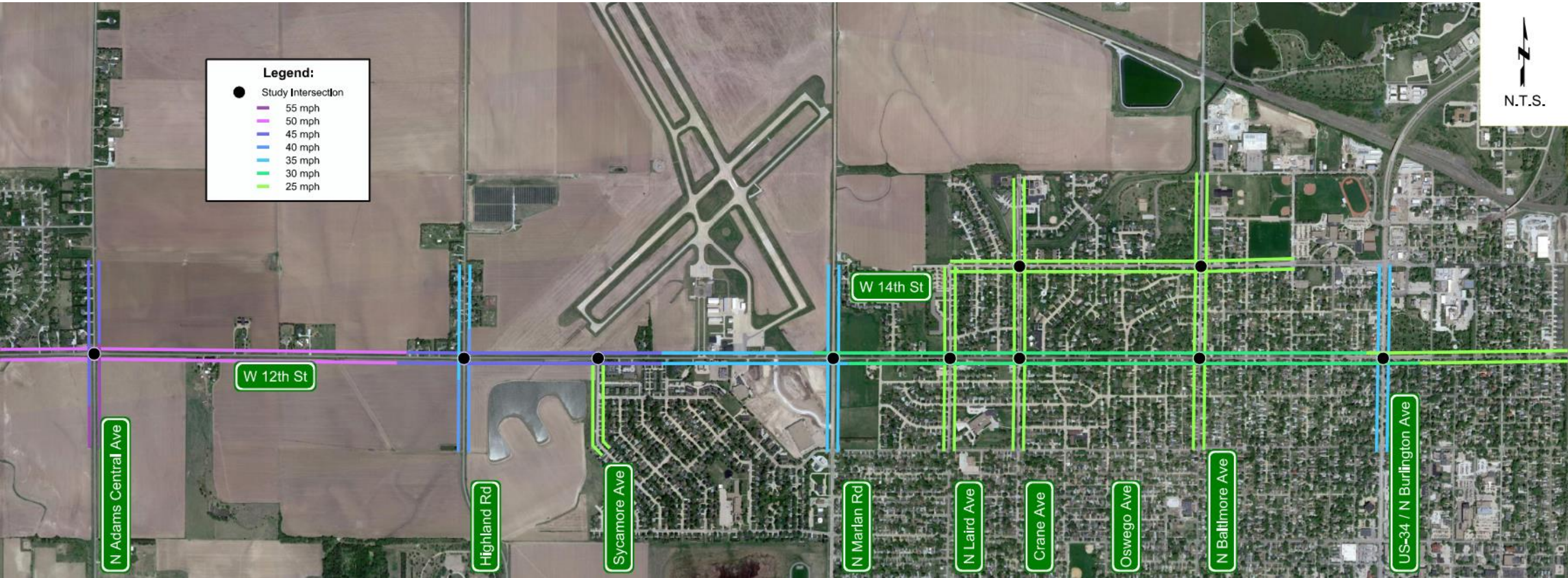


Figure A16: Existing Speed Limits Throughout the Study Area

A.12 W 12th Street & N Adams Central Avenue Intersection

The two-way stop-controlled intersection of W 12th Street & N Adams Central Avenue is a four-legged intersection with W 12th Street forming the eastbound and westbound approaches and N Adams Central Avenue forming the northbound and southbound approaches. Traffic control at the intersection is provided both by a span-wire traffic signal that blinks red for the northbound and southbound approaches and yellow for the eastbound and westbound approaches and by northbound and southbound stop signs. The uncontrolled eastbound W 12th Street approach consists of a shared left/through lane and a dedicated right-turn lane. The uncontrolled westbound W 12th Street approach consists of a shared left/through lane with a right-turn bypass lane. In addition to facilitating right-turns, this bypass lane also allows westbound through drivers to drive around vehicles waiting to turn left. Both northbound and southbound approaches consist of a single lane shared by all movements and are stop-controlled. The intersection is lighted via luminaires in the northeast, northwest, and the southwest corners. There are no pedestrian accommodations at the intersection. Pictures of this intersection are provided in Figure A17.



Figure A17: Intersection of W 12th Street & N Adams Central Avenue
(Overhead and Looking East)
(Courtesy: Google Earth)

A.13 W 12th Street & Highland Road

The two-way stop-controlled intersection of W 12th Street & Highland Road is a four-legged intersection with W 12th Street forming the eastbound and westbound approaches and Highland Road forming the northbound and southbound approaches. The uncontrolled eastbound W 12th Street approach consists of a shared left/through lane and a dedicated right-turn lane. The uncontrolled westbound W 12th Street approach consists of a single lane shared by all movements. Both the northbound and southbound Highland Road approaches are stop-controlled and consist of a single lane shared by all movements. The intersection is lighted via a single luminaire in the northeast corner of the intersection. There are no pedestrian accommodations at the intersection. Pictures of this intersection are provided in Figure A18.



**Figure A18: Intersection of W 12th Street & Highland Avenue
(Overhead and Looking North)**
(Courtesy: Google Earth)

A.14 W 12th Street & Sycamore Avenue

The two-way stop-controlled intersection of W 12th Street & Sycamore Road is a three-legged intersection with W 12th Street forming the eastbound and westbound approaches and Sycamore Road forming the northbound approach. The uncontrolled eastbound W 12th Street approach consists of a single lane shared by both the right-turn and through movements. The uncontrolled westbound W 12th Street approach consists of a single lane shared by both the left-turn and through movements. The northbound Sycamore Avenue approach is stop-controlled and consists of a single lane shared by all movements. There are no lighting nor pedestrian accommodations at the intersection. Pictures of this intersection are provided in Figure A19.



**Figure A19: Intersection of W 12th Street & Sycamore Avenue
(Overhead and Looking North)**
(Courtesy: Google Earth)

A.15 W 12th Street & N Marian Road

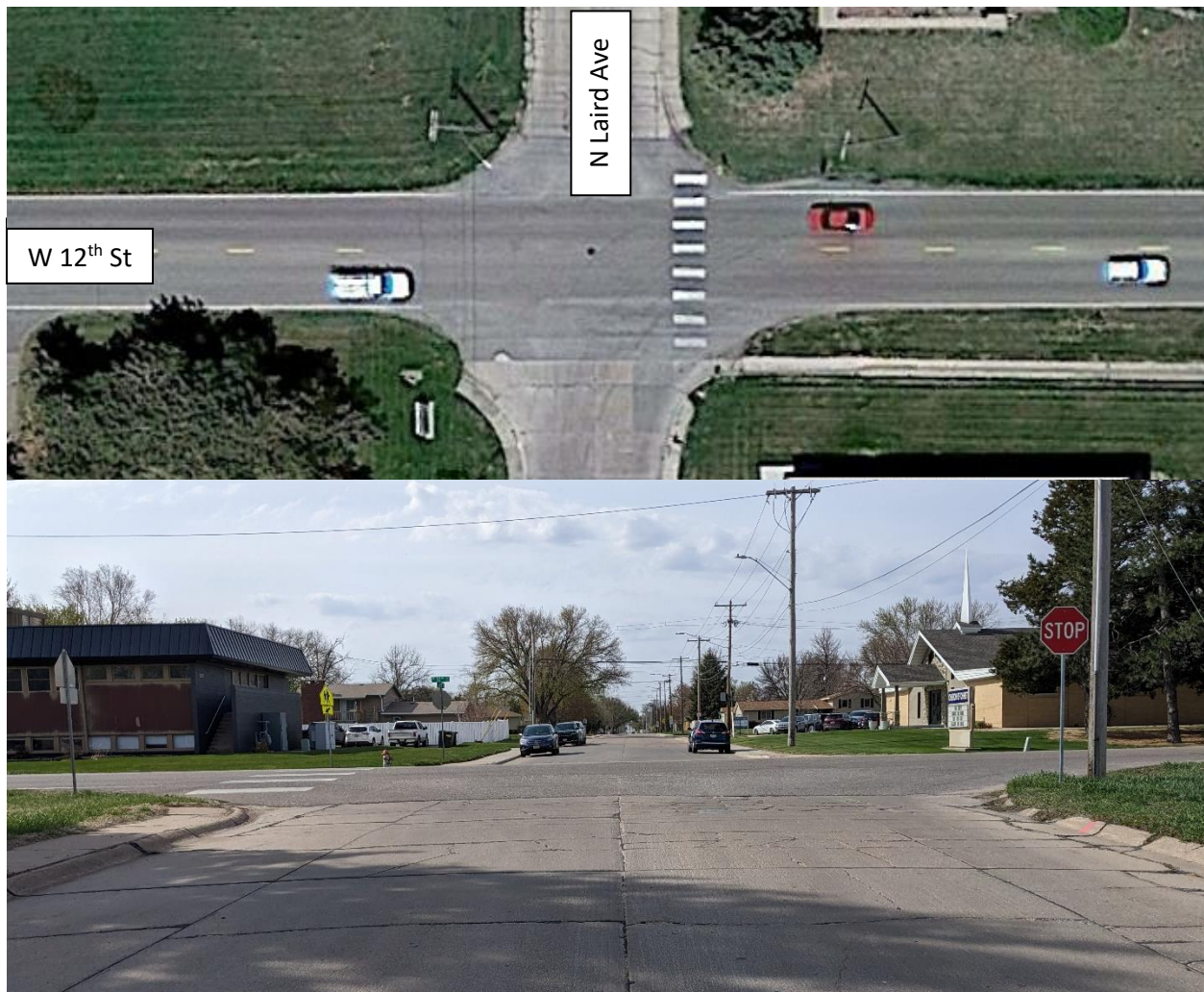
The all-way stop-controlled intersection of W 12th Street & N Marian Road is a four-legged intersection with W 12th Street forming the eastbound and westbound approaches and N Marian Road forming the northbound and southbound approaches. Both W 12th Street approaches consist of a single lane shared by all movements. However, it should be noted that both of these approaches feature extra width, beyond the single lane and some vehicles do use this width to complete right-turn movements. The northbound approach consists of a shared right/through lane and a right-turn lane drop. The southbound approach is the only unpaved approach and consists of a single lane shared by all movements. There are no lighting nor pedestrian accommodations at the intersection. Pictures of the intersection are provided in Figure A20.



**Figure A20: Intersection of W 12th Street & N Marian Road
(Overhead and Looking North)**
(Courtesy: Google Earth)

A.16 W 12th Street & N Laird Avenue

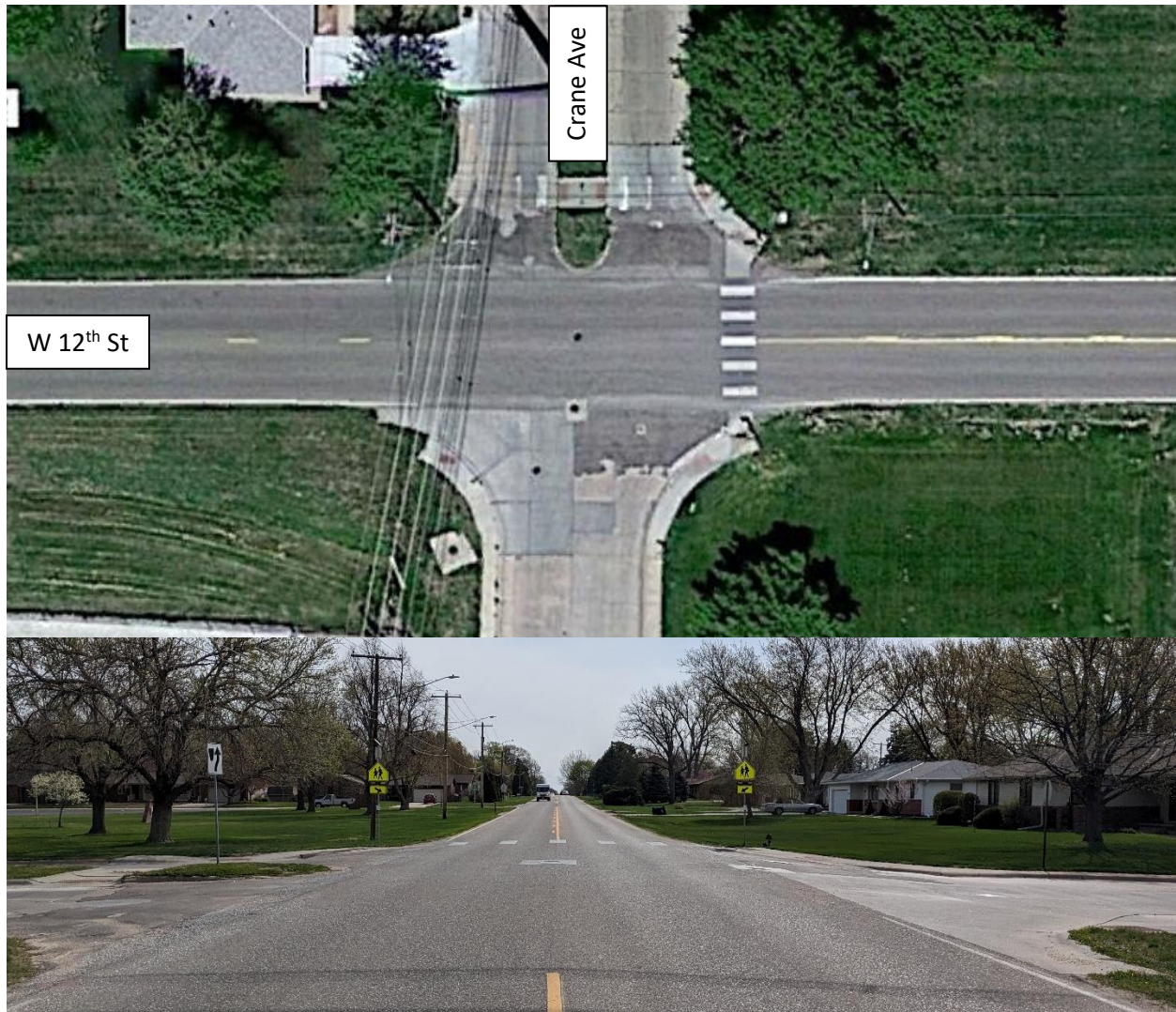
cThe two-way stop-controlled intersection of W 12th Street & N Laird Avenue is a four-legged intersection with W 12th Street forming the uncontrolled eastbound and westbound approaches while N Laird Avenue forms the stop-controlled northbound and southbound approaches. All four approaches consist of single lanes shared by all movements. The intersection is lighted via a luminaire in the northwest corner. The only pedestrian accommodation at the intersection is the signed and marked crosswalk across the east leg. Pictures of this intersection are provided in Figure A21.



**Figure A21: Intersection of W 12th Street & N Laird Avenue
(Overhead and Looking South)
(Courtesy: Google Earth)**

A.17 W 12th Street & Crane Avenue

The two-way stop-controlled intersection of W 12th Street & Crane Avenue is a four-legged intersection with W 12th Street forming the uncontrolled eastbound and westbound approaches while Crane Avenue forms the stop-controlled northbound and southbound approaches. All four approaches consist of single lanes shared by all movements. The intersection is lighted via a luminaire in the northwest corner. There is a rectangular rapid flashing beacon (RRFB) assembly with an associated painted crosswalk across the east leg of the intersection. There is also a painted crosswalk across the north left of this intersection. In addition to the curb ramps that accompany these two crosswalks, there is also a curb ramp in the southwest corner of the intersection. Pictures of this intersection are provided in Figure A21.



**Figure A22: Intersection of W 12th Street & Crane Avenue
(Overhead and Looking East)**
(Courtesy: Google Earth)

A.18 W 12th Street & N Baltimore Avenue

The span-wire signalized intersection of W 12th Street & N Baltimore Avenue is a four-legged intersection with W 12th Street forming the eastbound and westbound approaches while N Baltimore Avenue forms the northbound and southbound approaches. Both W 12th Street approaches consist of a dedicated left-turn lane and a shared through/right-turn lane, while both N Baltimore Avenue approaches consist of single lanes which are shared by all movements. The intersection is lighted via a luminaire in the northeast corner. There are painted crosswalks with associated curb ramps across the north, east, and west legs of the intersection. However, no pedestrian signals are associated with these crosswalks. Pictures of this intersection are provided in Figure A22.



**Figure A23: Intersection of W 12th Street & N Baltimore Avenue
(Overhead and Looking South)
(Courtesy: Google Earth)**

A.19 W 12th Street & US-34 / N Burlington Avenue

The signalized intersection of W 12th Street & US-34 / N Burlington Avenue is a four-legged intersection with W 12th Street forming the eastbound and westbound approaches while US-34 / N Burlington Avenue forming the northbound and southbound approaches. Both W 12th Street approaches consist of a shared left-turn/through lane and a shared through/right-turn lane, while both US-34 / N Burlington Avenue approaches consist of a single dedicated left-turn lane, a dedicated through lane, and a shared through/right-turn lane. Lighting is provided via luminaires located in the northeast and southwest corners of the intersection. Pedestrian accommodations are provided at the intersection in the form of curb ramps, painted crosswalks, and pedestrian signals across all four legs of the intersection, however no pedestrian push buttons are provided. Pictures of this intersection are provided in Figure A24.



**Figure A24: Intersection of W 12th Street & US-34 / N Burlington Avenue
(Overhead and Looking East)
(Courtesy: Google Earth)**

A.20 W 14th Street & Crane Avenue

The two-way stop-controlled intersection of W 14th Street & Crane Avenue is a four-legged intersection with W 14th Street forming the stop-controlled eastbound and westbound approaches while Crane Avenue forms the uncontrolled northbound and southbound approaches. All four approaches consist of single lanes shared by all movements. The intersection is lighted via a luminaire in the middle of the south approach. Painted crosswalks are provided across all four legs of the intersection, however curb ramps are only provided on the northwest, northeast, and southeast corners. Pictures of this intersection are provided in Figure A25.



**Figure A25: Intersection of W 14th Street & Crane Avenue
(Overhead and Looking West)**
(Courtesy: Google Earth)

A.21 W 14th Street & N Baltimore Avenue

The all-way stop-controlled intersection of W 14th Street & N Baltimore Avenue is a four-legged intersection with W 14th Street forming the eastbound and westbound approaches while N Baltimore Avenue forms the northbound and southbound approaches. All four approaches consist of single lanes shared by all movements. The intersection is lighted via a luminaire in the northwest corner of the intersection. Painted crosswalks and their corresponding curb ramps are provided across all four legs of the intersection. Pictures of this intersection are provided in Figure A26.



**Figure A26: Intersection of W 14th Street & N Baltimore Avenue
(Overhead and Looking South)
(Courtesy: Google Earth)**

Appendix B: Synchro Output Reports – Existing Conditions

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/12/2023

Intersection												
Int Delay, s/veh	6.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	254	103	160	121	7	20	15	101	11	17	3
Future Vol, veh/h	1	254	103	160	121	7	20	15	101	11	17	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	1	334	136	211	159	9	26	20	133	14	22	4
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	168	0	0	470	0	0	935	926	334	1067	1058	164
Stage 1	-	-	-	-	-	-	336	336	-	586	586	-
Stage 2	-	-	-	-	-	-	599	590	-	481	472	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1398	-	-	1081	-	-	244	267	703	198	223	875
Stage 1	-	-	-	-	-	-	674	638	-	493	494	-
Stage 2	-	-	-	-	-	-	485	492	-	562	556	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1398	-	-	1081	-	-	183	209	703	125	175	875
Mov Cap-2 Maneuver	-	-	-	-	-	-	183	209	-	125	175	-
Stage 1	-	-	-	-	-	-	673	637	-	493	387	-
Stage 2	-	-	-	-	-	-	357	386	-	441	555	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			5.1			19.8			34.1		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	419	1398	-	-	1081	-	-	164				
HCM Lane V/C Ratio	0.427	0.001	-	-	0.195	-	-	0.249				
HCM Control Delay (s)	19.8	7.6	0	-	9.1	0	-	34.1				
HCM Lane LOS	C	A	A	-	A	A	-	D				
HCM 95th %tile Q(veh)	2.1	0	-	-	0.7	-	-	0.9				

HCM 6th TWSC
6: Highland Rd & W 12th St

05/12/2023

Intersection												
Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	300	69	23	241	1	19	2	10	9	7	17
Future Vol, veh/h	4	300	69	23	241	1	19	2	10	9	7	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	5	385	88	29	309	1	24	3	13	12	9	22
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	310	0	0	473	0	0	778	763	385	815	851	310
Stage 1	-	-	-	-	-	-	395	395	-	368	368	-
Stage 2	-	-	-	-	-	-	383	368	-	447	483	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1245	-	-	1084	-	-	312	333	660	295	296	728
Stage 1	-	-	-	-	-	-	628	603	-	650	620	-
Stage 2	-	-	-	-	-	-	638	620	-	589	551	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1245	-	-	1084	-	-	287	320	660	279	285	728
Mov Cap-2 Maneuver	-	-	-	-	-	-	287	320	-	279	285	-
Stage 1	-	-	-	-	-	-	624	599	-	646	600	-
Stage 2	-	-	-	-	-	-	590	600	-	572	548	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.7			16.5			14.7		
HCM LOS							C			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	354	1245	-	-	1084	-	-	412				
HCM Lane V/C Ratio	0.112	0.004	-	-	0.027	-	-	0.103				
HCM Control Delay (s)	16.5	7.9	0	-	8.4	0	-	14.7				
HCM Lane LOS	C	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.3				

Intersection

Int Delay, s/veh 0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	304	13	2	247	16	17
Future Vol, veh/h	304	13	2	247	16	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	416	18	3	338	22	23

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	434
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1126
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1126
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	468	-	-	1126	-
HCM Lane V/C Ratio	0.097	-	-	0.002	-
HCM Control Delay (s)	13.5	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 6th TWSC
14: N Laird Ave & W 12th St

05/12/2023

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	475	14	54	337	6	1	8	80	2	8	36
Future Vol, veh/h	7	475	14	54	337	6	1	8	80	2	8	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	609	18	69	432	8	1	10	103	3	10	46
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	440	0	0	627	0	0	1238	1214	618	1267	1219	436
Stage 1	-	-	-	-	-	-	636	636	-	574	574	-
Stage 2	-	-	-	-	-	-	602	578	-	693	645	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1120	-	-	955	-	-	152	182	489	146	180	620
Stage 1	-	-	-	-	-	-	466	472	-	504	503	-
Stage 2	-	-	-	-	-	-	486	501	-	434	467	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1120	-	-	955	-	-	123	163	489	101	161	620
Mov Cap-2 Maneuver	-	-	-	-	-	-	123	163	-	101	161	-
Stage 1	-	-	-	-	-	-	460	466	-	498	455	-
Stage 2	-	-	-	-	-	-	397	453	-	331	461	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			1.2			17.4			16.9		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	403	1120	-	-	955	-	-	361				
HCM Lane V/C Ratio	0.283	0.008	-	-	0.072	-	-	0.163				
HCM Control Delay (s)	17.4	8.2	0	-	9.1	0	-	16.9				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.1	0	-	-	0.2	-	-	0.6				

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	46	494	4	33	351	53	2	9	28	7	6	55
Future Vol, veh/h	46	494	4	33	351	53	2	9	28	7	6	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	60	642	5	43	456	69	3	12	36	9	8	71
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	525	0	0	647	0	0	1381	1376	645	1366	1344	491
Stage 1	-	-	-	-	-	-	765	765	-	577	577	-
Stage 2	-	-	-	-	-	-	616	611	-	789	767	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1042	-	-	939	-	-	121	145	472	124	152	578
Stage 1	-	-	-	-	-	-	396	412	-	502	502	-
Stage 2	-	-	-	-	-	-	478	484	-	384	411	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1042	-	-	939	-	-	90	123	472	94	129	578
Mov Cap-2 Maneuver	-	-	-	-	-	-	90	123	-	94	129	-
Stage 1	-	-	-	-	-	-	360	375	-	457	469	-
Stage 2	-	-	-	-	-	-	385	453	-	312	374	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.7			0.7			22.8			20.8		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	252	1042	-	-	939	-	-	315				
HCM Lane V/C Ratio	0.201	0.057	-	-	0.046	-	-	0.28				
HCM Control Delay (s)	22.8	8.7	0	-	9	0	-	20.8				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.7	0.2	-	-	0.1	-	-	1.1				

HCM 6th TWSC
28: Crane Ave & W 14th St

05/12/2023

Intersection												
Int Delay, s/veh	9.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	68	0	6	24	56	1	106	11	121	58	19
Future Vol, veh/h	12	68	0	6	24	56	1	106	11	121	58	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	61	61	61	61	61	61	61	61	61	61	61	61
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	111	0	10	39	92	2	174	18	198	95	31
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	760	703	111	749	709	183	126	0	0	192	0	0
Stage 1	507	507	-	187	187	-	-	-	-	-	-	-
Stage 2	253	196	-	562	522	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	323	362	942	328	359	859	1460	-	-	1381	-	-
Stage 1	548	539	-	815	745	-	-	-	-	-	-	-
Stage 2	751	739	-	512	531	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	229	305	942	208	303	859	1460	-	-	1381	-	-
Mov Cap-2 Maneuver	229	305	-	208	303	-	-	-	-	-	-	-
Stage 1	547	455	-	813	744	-	-	-	-	-	-	-
Stage 2	634	738	-	327	449	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	27.1		15.1		0.1		4.9					
HCM LOS	D		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1460	-	-	291	496	1381	-	-				
HCM Lane V/C Ratio	0.001	-	-	0.451	0.284	0.144	-	-				
HCM Control Delay (s)	7.5	0	-	27.1	15.1	8	0	-				
HCM Lane LOS	A	A	-	D	C	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	2.2	1.2	0.5	-	-				

HCM 6th AWSC
11: N Marian Rd & W 12th St

05/12/2023

Intersection												
Intersection Delay, s/veh	27.7											
Intersection LOS	D											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	309	27	171	188	1	36	20	188	5	39	40
Future Vol, veh/h	20	309	27	171	188	1	36	20	188	5	39	40
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	401	35	222	244	1	47	26	244	6	51	52
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	32.3	35.1	15.1	13.2
HCM LOS	D	E	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	64%	0%	6%	47%	6%
Vol Thru, %	36%	0%	87%	52%	46%
Vol Right, %	0%	100%	8%	0%	48%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	56	188	356	360	84
LT Vol	36	0	20	171	5
Through Vol	20	0	309	188	39
RT Vol	0	188	27	1	40
Lane Flow Rate	73	244	462	468	109
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.162	0.472	0.819	0.841	0.236
Departure Headway (Hd)	8.014	6.962	6.377	6.479	7.791
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	445	515	564	556	464
Service Time	5.802	4.749	4.46	4.561	5.791
HCM Lane V/C Ratio	0.164	0.474	0.819	0.842	0.235
HCM Control Delay	12.4	15.9	32.3	35.1	13.2
HCM Lane LOS	B	C	D	E	B
HCM 95th-tile Q	0.6	2.5	8.2	8.8	0.9

HCM 6th AWSC
29: N Baltimore Ave & W 14th St

05/12/2023

Intersection	
Intersection Delay, s/veh	20.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	124	43	52	77	7	32	209	78	5	154	58
Future Vol, veh/h	60	124	43	52	77	7	32	209	78	5	154	58
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	82	170	59	71	105	10	44	286	107	7	211	79
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	18.7	14.6	26.2	17.2
HCM LOS	C	B	D	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	26%	38%	2%
Vol Thru, %	66%	55%	57%	71%
Vol Right, %	24%	19%	5%	27%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	319	227	136	217
LT Vol	32	60	52	5
Through Vol	209	124	77	154
RT Vol	78	43	7	58
Lane Flow Rate	437	311	186	297
Geometry Grp	1	1	1	1
Degree of Util (X)	0.755	0.578	0.376	0.545
Departure Headway (Hd)	6.319	6.811	7.264	6.595
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	577	532	497	550
Service Time	4.319	4.811	5.283	4.595
HCM Lane V/C Ratio	0.757	0.585	0.374	0.54
HCM Control Delay	26.2	18.7	14.6	17.2
HCM Lane LOS	D	C	B	C
HCM 95th-tile Q	6.7	3.6	1.7	3.3

HCM 6th Signalized Intersection Summary

20: N Baltimore Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	377	18	19	279	12	9	145	28	17	152	103
Future Volume (veh/h)	145	377	18	19	279	12	9	145	28	17	152	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	186	483	23	24	358	15	12	186	36	22	195	132
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	540	944	45	440	951	40	74	495	92	80	340	217
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1009	1771	84	893	1782	75	33	1486	276	50	1021	652
Grp Volume(v), veh/h	186	0	506	24	0	373	234	0	0	349	0	0
Grp Sat Flow(s),veh/h/ln	1009	0	1855	893	0	1857	1795	0	0	1723	0	0
Q Serve(g_s), s	7.9	0.0	10.5	1.1	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	15.0	0.0	10.5	11.6	0.0	7.0	5.9	0.0	0.0	10.0	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.04	0.05		0.15	0.06		0.38
Lane Grp Cap(c), veh/h	540	0	989	440	0	990	661	0	0	638	0	0
V/C Ratio(X)	0.34	0.00	0.51	0.05	0.00	0.38	0.35	0.00	0.00	0.55	0.00	0.00
Avail Cap(c_a), veh/h	540	0	989	440	0	990	661	0	0	638	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.5	0.0	9.0	12.7	0.0	8.2	15.3	0.0	0.0	16.7	0.0	0.0
Incr Delay (d2), s/veh	1.7	0.0	1.9	0.2	0.0	1.1	1.5	0.0	0.0	3.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.3	0.0	7.1	0.4	0.0	4.6	4.6	0.0	0.0	7.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.3	0.0	10.9	12.9	0.0	9.3	16.8	0.0	0.0	20.0	0.0	0.0
LnGrp LOS	B	A	B	B	A	A	B	A	A	C	A	A
Approach Vol, veh/h		692		397		234		349				
Approach Delay, s/veh		11.8		9.5		16.8		20.0				
Approach LOS		B		A		B		C				
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		20.0		32.0		20.0		32.0				
Max Q Clear Time (g_c+I1), s		7.9		17.0		12.0		13.6				
Green Ext Time (p_c), s		1.1		3.8		1.4		2.3				
Intersection Summary												
HCM 6th Ctrl Delay			13.7									
HCM 6th LOS			B									

HCM 6th Signalized Intersection Summary
24: US-34 / N Burlington Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	174	170	91	28	149	61	61	676	60	30	614	84
Future Volume (veh/h)	174	170	91	28	149	61	61	676	60	30	614	84
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	215	210	112	35	184	75	75	835	74	37	758	104
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	335	344	199	126	598	249	399	1825	162	346	1246	171
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.09	0.56	0.56	0.40	0.40	0.40
Sat Flow, veh/h	767	1096	632	197	1904	793	1767	3276	290	609	3114	427
Grp Volume(v), veh/h	258	0	279	148	0	146	75	449	460	37	429	433
Grp Sat Flow(s),veh/h/ln	920	0	1575	1348	0	1546	1767	1763	1803	609	1763	1779
Q Serve(g_s), s	14.7	0.0	10.3	0.4	0.0	5.0	1.5	10.6	10.6	2.7	13.5	13.5
Cycle Q Clear(g_c), s	19.7	0.0	10.3	10.8	0.0	5.0	1.5	10.6	10.6	2.7	13.5	13.5
Prop In Lane	0.83		0.40	0.24		0.51	1.00		0.16	1.00		0.24
Lane Grp Cap(c), veh/h	383	0	495	487	0	486	399	982	1005	346	705	711
V/C Ratio(X)	0.67	0.00	0.56	0.30	0.00	0.30	0.19	0.46	0.46	0.11	0.61	0.61
Avail Cap(c_a), veh/h	383	0	495	487	0	486	399	982	1005	346	705	711
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.6	0.0	20.0	18.0	0.0	18.2	10.3	9.2	9.2	13.4	16.7	16.7
Incr Delay (d2), s/veh	9.1	0.0	4.6	1.6	0.0	1.6	1.0	1.5	1.5	0.6	3.9	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	8.5	0.0	7.5	3.5	0.0	3.5	1.1	6.7	6.8	0.7	9.5	9.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.7	0.0	24.6	19.6	0.0	19.8	11.4	10.7	10.7	14.0	20.5	20.5
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	C	C
Approach Vol, veh/h		537			294			984			899	
Approach Delay, s/veh		29.5			19.7			10.8			20.3	
Approach LOS		C			B			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		43.5		26.5	11.0	32.5		26.5				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		39.0		22.0	6.5	28.0		22.0				
Max Q Clear Time (g_c+I1), s		12.6		21.7	3.5	15.5		12.8				
Green Ext Time (p_c), s		6.2		0.1	0.0	4.6		1.2				
Intersection Summary												
HCM 6th Ctrl Delay				18.6								
HCM 6th LOS				B								

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/12/2023

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	162	24	35	255	34	19	16	47	18	6	6
Future Vol, veh/h	3	162	24	35	255	34	19	16	47	18	6	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	4	191	28	41	300	40	22	19	55	21	7	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	340	0	0	219	0	0	608	621	191	652	629	320
Stage 1	-	-	-	-	-	-	199	199	-	402	402	-
Stage 2	-	-	-	-	-	-	409	422	-	250	227	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1208	-	-	1339	-	-	405	401	846	378	397	716
Stage 1	-	-	-	-	-	-	798	733	-	621	597	-
Stage 2	-	-	-	-	-	-	615	585	-	750	712	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1208	-	-	1339	-	-	383	384	846	329	380	716
Mov Cap-2 Maneuver	-	-	-	-	-	-	383	384	-	329	380	-
Stage 1	-	-	-	-	-	-	795	730	-	619	574	-
Stage 2	-	-	-	-	-	-	579	563	-	680	709	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.8			12.8			15.4		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	558	1208	-	-	1339	-	-	380
HCM Lane V/C Ratio	0.173	0.003	-	-	0.031	-	-	0.093
HCM Control Delay (s)	12.8	8	0	-	7.8	0	-	15.4
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.6	0	-	-	0.1	-	-	0.3

HCM 6th TWSC
6: Highland Rd & W 12th St

05/12/2023

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	194	38	14	259	5	19	2	10	8	7	2
Future Vol, veh/h	4	194	38	14	259	5	19	2	10	8	7	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	2
Mvmt Flow	5	231	45	17	308	6	23	2	12	10	8	2
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	314	0	0	276	0	0	591	589	231	616	631	311
Stage 1	-	-	-	-	-	-	241	241	-	345	345	-
Stage 2	-	-	-	-	-	-	350	348	-	271	286	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.318
Pot Cap-1 Maneuver	1241	-	-	1281	-	-	417	419	806	401	397	729
Stage 1	-	-	-	-	-	-	760	704	-	668	634	-
Stage 2	-	-	-	-	-	-	664	632	-	733	673	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1241	-	-	1281	-	-	402	410	806	387	389	729
Mov Cap-2 Maneuver	-	-	-	-	-	-	402	410	-	387	389	-
Stage 1	-	-	-	-	-	-	756	700	-	665	624	-
Stage 2	-	-	-	-	-	-	643	622	-	716	670	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.4			13.1			14.2		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	480	1241	-	-	1281	-	-	411				
HCM Lane V/C Ratio	0.077	0.004	-	-	0.013	-	-	0.049				
HCM Control Delay (s)	13.1	7.9	0	-	7.8	0	-	14.2				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2				

Intersection

Int Delay, s/veh 0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	208	5	16	270	7	8
Future Vol, veh/h	208	5	16	270	7	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	248	6	19	321	8	10

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	254
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1311
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1311
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	583	-	-	1311	-
HCM Lane V/C Ratio	0.031	-	-	0.015	-
HCM Control Delay (s)	11.4	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	279	7	57	345	3	6	14	51	3	14	9
Future Vol, veh/h	6	279	7	57	345	3	6	14	51	3	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	324	8	66	401	3	7	16	59	3	16	10
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	404	0	0	332	0	0	890	878	328	915	881	403
Stage 1	-	-	-	-	-	-	342	342	-	535	535	-
Stage 2	-	-	-	-	-	-	548	536	-	380	346	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1155	-	-	1227	-	-	264	287	713	253	285	647
Stage 1	-	-	-	-	-	-	673	638	-	529	524	-
Stage 2	-	-	-	-	-	-	521	523	-	642	635	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1155	-	-	1227	-	-	233	265	713	208	263	647
Mov Cap-2 Maneuver	-	-	-	-	-	-	233	265	-	208	263	-
Stage 1	-	-	-	-	-	-	668	634	-	525	488	-
Stage 2	-	-	-	-	-	-	461	487	-	569	631	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.1			14.2			17.5		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	473	1155	-	-	1227	-	-	319				
HCM Lane V/C Ratio	0.175	0.006	-	-	0.054	-	-	0.095				
HCM Control Delay (s)	14.2	8.1	0	-	8.1	0	-	17.5				
HCM Lane LOS	B	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.6	0	-	-	0.2	-	-	0.3				

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	340	5	19	412	11	5	8	20	5	9	12
Future Vol, veh/h	5	340	5	19	412	11	5	8	20	5	9	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	378	6	21	458	12	6	9	22	6	10	13
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	470	0	0	384	0	0	911	905	381	915	902	464
Stage 1	-	-	-	-	-	-	393	393	-	506	506	-
Stage 2	-	-	-	-	-	-	518	512	-	409	396	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1092	-	-	1174	-	-	255	276	666	253	277	598
Stage 1	-	-	-	-	-	-	632	606	-	549	540	-
Stage 2	-	-	-	-	-	-	541	536	-	619	604	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1092	-	-	1174	-	-	237	267	666	233	268	598
Mov Cap-2 Maneuver	-	-	-	-	-	-	237	267	-	233	268	-
Stage 1	-	-	-	-	-	-	628	602	-	545	527	-
Stage 2	-	-	-	-	-	-	506	523	-	585	600	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.3			14.7			16.4		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	407	1092	-	-	1174	-	-	346				
HCM Lane V/C Ratio	0.09	0.005	-	-	0.018	-	-	0.083				
HCM Control Delay (s)	14.7	8.3	0	-	8.1	0	-	16.4				
HCM Lane LOS	B	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.3				

HCM 6th TWSC
28: Crane Ave & W 14th St

05/12/2023

Intersection												
Int Delay, s/veh	9.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	32	7	16	84	6	8	8	8	7	5	1
Future Vol, veh/h	2	32	7	16	84	6	8	8	8	7	5	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	55	55	55	55	55	55	55	55	55	55	55	55
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	58	13	29	153	11	15	15	15	13	9	2
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	171	96	10	125	90	23	11	0	0	30	0	0
Stage 1	36	36	-	53	53	-	-	-	-	-	-	-
Stage 2	135	60	-	72	37	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	792	794	1071	849	800	1054	1608	-	-	1583	-	-
Stage 1	980	865	-	960	851	-	-	-	-	-	-	-
Stage 2	868	845	-	938	864	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	658	781	1071	781	786	1054	1608	-	-	1583	-	-
Mov Cap-2 Maneuver	658	781	-	781	786	-	-	-	-	-	-	-
Stage 1	971	858	-	951	843	-	-	-	-	-	-	-
Stage 2	697	837	-	857	857	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	9.9		11			2.4			3.9			
HCM LOS	A		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1608	-	-	811	797	1583	-	-				
HCM Lane V/C Ratio	0.009	-	-	0.092	0.242	0.008	-	-				
HCM Control Delay (s)	7.3	0	-	9.9	11	7.3	0	-				
HCM Lane LOS	A	A	-	A	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.3	0.9	0	-	-				

HCM 6th AWSC
11: N Marian Rd & W 12th St

05/12/2023

Intersection	
Intersection Delay, s/veh	15.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	188	55	107	266	1	42	11	115	2	8	9
Future Vol, veh/h	9	188	55	107	266	1	42	11	115	2	8	9
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	241	71	137	341	1	54	14	147	3	10	12
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	12.8	18.9	10.6	9.7
HCM LOS	B	C	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	79%	0%	4%	29%	11%
Vol Thru, %	21%	0%	75%	71%	42%
Vol Right, %	0%	100%	22%	0%	47%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	53	115	252	374	19
LT Vol	42	0	9	107	2
Through Vol	11	0	188	266	8
RT Vol	0	115	55	1	9
Lane Flow Rate	68	147	323	479	24
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.132	0.241	0.468	0.689	0.043
Departure Headway (Hd)	7.011	5.893	5.211	5.171	6.324
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	511	609	691	700	564
Service Time	4.757	3.639	3.247	3.203	4.388
HCM Lane V/C Ratio	0.133	0.241	0.467	0.684	0.043
HCM Control Delay	10.8	10.5	12.8	18.9	9.7
HCM Lane LOS	B	B	B	C	A
HCM 95th-tile Q	0.5	0.9	2.5	5.5	0.1

HCM 6th AWSC
29: N Baltimore Ave & W 14th St

05/12/2023

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	35	41	3	40	74	22	22	203	37	12	213	70
Future Vol, veh/h	35	41	3	40	74	22	22	203	37	12	213	70
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	40	47	3	46	85	25	25	233	43	14	245	80
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10	10.6	11.8	12.3
HCM LOS	A	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	8%	44%	29%	4%
Vol Thru, %	77%	52%	54%	72%
Vol Right, %	14%	4%	16%	24%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	262	79	136	295
LT Vol	22	35	40	12
Through Vol	203	41	74	213
RT Vol	37	3	22	70
Lane Flow Rate	301	91	156	339
Geometry Grp	1	1	1	1
Degree of Util (X)	0.424	0.149	0.246	0.467
Departure Headway (Hd)	5.069	5.915	5.676	4.958
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	711	606	632	726
Service Time	3.1	3.959	3.716	2.989
HCM Lane V/C Ratio	0.423	0.15	0.247	0.467
HCM Control Delay	11.8	10	10.6	12.3
HCM Lane LOS	B	A	B	B
HCM 95th-tile Q	2.1	0.5	1	2.5

HCM 6th Signalized Intersection Summary

20: N Baltimore Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	108	240	9	19	310	34	13	120	19	23	116	127
Future Volume (veh/h)	108	240	9	19	310	34	13	120	19	23	116	127
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	124	276	10	22	356	39	15	138	22	26	133	146
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	521	957	35	610	883	97	85	501	75	89	270	269
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	989	1794	65	1093	1656	181	60	1504	225	70	810	808
Grp Volume(v), veh/h	124	0	286	22	0	395	175	0	0	305	0	0
Grp Sat Flow(s),veh/h/ln	989	0	1859	1093	0	1838	1788	0	0	1688	0	0
Q Serve(g_s), s	5.1	0.0	5.1	0.7	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	12.8	0.0	5.1	5.8	0.0	7.7	4.2	0.0	0.0	8.6	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.10	0.09		0.13	0.09		0.48
Lane Grp Cap(c), veh/h	521	0	991	610	0	980	661	0	0	628	0	0
V/C Ratio(X)	0.24	0.00	0.29	0.04	0.00	0.40	0.26	0.00	0.00	0.49	0.00	0.00
Avail Cap(c_a), veh/h	521	0	991	610	0	980	661	0	0	628	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.1	0.0	7.7	9.3	0.0	8.3	14.7	0.0	0.0	16.2	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.7	0.1	0.0	1.2	1.0	0.0	0.0	2.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	2.1	0.0	3.3	0.3	0.0	5.0	3.3	0.0	0.0	6.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.2	0.0	8.5	9.4	0.0	9.6	15.7	0.0	0.0	18.9	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h	410			417			175			305		
Approach Delay, s/veh	9.9			9.5			15.7			18.9		
Approach LOS	A			A			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	24.0			36.0			24.0			36.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	20.0			32.0			20.0			32.0		
Max Q Clear Time (g_c+I1), s	6.2			14.8			10.6			9.7		
Green Ext Time (p_c), s	0.8			2.1			1.3			2.6		
Intersection Summary												
HCM 6th Ctrl Delay	12.7											
HCM 6th LOS	B											

HCM 6th Signalized Intersection Summary
24: US-34 / N Burlington Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	113	111	60	55	166	66	88	792	69	44	818	187
Future Volume (veh/h)	113	111	60	55	166	66	88	792	69	44	818	187
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	127	125	67	62	187	74	99	890	78	49	919	210
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	326	355	202	205	572	230	323	1827	160	329	1140	260
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.09	0.56	0.56	0.40	0.40	0.40
Sat Flow, veh/h	740	1130	642	427	1819	732	1767	3279	287	576	2850	651
Grp Volume(v), veh/h	155	0	164	166	0	157	99	478	490	49	568	561
Grp Sat Flow(s),veh/h/ln	940	0	1573	1421	0	1557	1767	1763	1804	576	1763	1738
Q Serve(g_s), s	7.2	0.0	5.6	2.0	0.0	5.4	2.0	11.5	11.5	4.0	20.0	20.0
Cycle Q Clear(g_c), s	12.6	0.0	5.6	7.6	0.0	5.4	2.0	11.5	11.5	4.5	20.0	20.0
Prop In Lane	0.82		0.41	0.37		0.47	1.00		0.16	1.00		0.37
Lane Grp Cap(c), veh/h	389	0	494	517	0	489	323	982	1005	329	705	695
V/C Ratio(X)	0.40	0.00	0.33	0.32	0.00	0.32	0.31	0.49	0.49	0.15	0.81	0.81
Avail Cap(c_a), veh/h	389	0	494	517	0	489	323	982	1005	329	705	695
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.4	0.0	18.4	18.7	0.0	18.3	12.8	9.4	9.4	14.1	18.6	18.6
Incr Delay (d2), s/veh	3.0	0.0	1.8	1.6	0.0	1.7	2.4	1.7	1.7	1.0	9.5	9.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.3	0.0	3.9	4.1	0.0	3.8	1.6	7.3	7.5	1.0	14.0	13.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.5	0.0	20.2	20.3	0.0	20.0	15.3	11.1	11.1	15.1	28.1	28.3
LnGrp LOS	C	A	C	C	A	C	B	B	B	B	C	C
Approach Vol, veh/h		319			323			1067			1178	
Approach Delay, s/veh		22.7			20.2			11.5			27.7	
Approach LOS		C			C			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		43.5		26.5	11.0	32.5		26.5				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		39.0		22.0	6.5	28.0		22.0				
Max Q Clear Time (g_c+I1), s		13.5		14.6	4.0	22.0		9.6				
Green Ext Time (p_c), s		6.7		1.1	0.0	3.6		1.6				
Intersection Summary												
HCM 6th Ctrl Delay				20.3								
HCM 6th LOS				C								

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/22/2023

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	135	33	52	172	26	41	36	146	10	4	2
Future Vol, veh/h	1	135	33	52	172	26	41	36	146	10	4	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	1	152	37	58	193	29	46	40	164	11	4	2
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	222	0	0	189	0	0	481	492	152	599	515	208
Stage 1	-	-	-	-	-	-	154	154	-	324	324	-
Stage 2	-	-	-	-	-	-	327	338	-	275	191	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1335	-	-	1373	-	-	492	475	889	411	461	827
Stage 1	-	-	-	-	-	-	844	766	-	684	646	-
Stage 2	-	-	-	-	-	-	681	637	-	727	739	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1335	-	-	1373	-	-	469	452	889	301	438	827
Mov Cap-2 Maneuver	-	-	-	-	-	-	469	452	-	301	438	-
Stage 1	-	-	-	-	-	-	843	765	-	683	615	-
Stage 2	-	-	-	-	-	-	642	606	-	561	738	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.6			13.5			15.6		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	673	1335	-	-	1373	-	-	357				
HCM Lane V/C Ratio	0.372	0.001	-	-	0.043	-	-	0.05				
HCM Control Delay (s)	13.5	7.7	0	-	7.7	0	-	15.6				
HCM Lane LOS	B	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.7	0	-	-	0.1	-	-	0.2				

HCM 6th TWSC
6: Highland Rd & W 12th St

05/22/2023

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	260	30	16	213	5	44	6	15	2	6	4
Future Vol, veh/h	5	260	30	16	213	5	44	6	15	2	6	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	2
Mvmt Flow	6	299	34	18	245	6	51	7	17	2	7	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	251	0	0	333	0	0	601	598	299	624	629	248
Stage 1	-	-	-	-	-	-	311	311	-	284	284	-
Stage 2	-	-	-	-	-	-	290	287	-	340	345	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.318
Pot Cap-1 Maneuver	1309	-	-	1221	-	-	411	414	738	396	398	791
Stage 1	-	-	-	-	-	-	697	656	-	721	675	-
Stage 2	-	-	-	-	-	-	716	673	-	673	634	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1309	-	-	1221	-	-	396	404	738	375	389	791
Mov Cap-2 Maneuver	-	-	-	-	-	-	396	404	-	375	389	-
Stage 1	-	-	-	-	-	-	693	652	-	717	664	-
Stage 2	-	-	-	-	-	-	692	662	-	646	630	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.5			14.7			13		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	444	1309	-	-	1221	-	-	465				
HCM Lane V/C Ratio	0.168	0.004	-	-	0.015	-	-	0.03				
HCM Control Delay (s)	14.7	7.8	0	-	8	0	-	13				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1				

Intersection

Int Delay, s/veh 0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	264	12	17	217	16	13
Future Vol, veh/h	264	12	17	217	16	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	311	14	20	255	19	15

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	325
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1235
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1235
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	539	-	-	1235	-
HCM Lane V/C Ratio	0.063	-	-	0.016	-
HCM Control Delay (s)	12.1	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

HCM 6th TWSC
14: N Laird Ave & W 12th St

05/22/2023

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	395	12	78	329	10	3	5	78	2	9	21
Future Vol, veh/h	14	395	12	78	329	10	3	5	78	2	9	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	482	15	95	401	12	4	6	95	2	11	26
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	413	0	0	497	0	0	1140	1127	490	1171	1128	407
Stage 1	-	-	-	-	-	-	524	524	-	597	597	-
Stage 2	-	-	-	-	-	-	616	603	-	574	531	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1146	-	-	1067	-	-	178	205	578	170	204	644
Stage 1	-	-	-	-	-	-	537	530	-	490	491	-
Stage 2	-	-	-	-	-	-	478	488	-	504	526	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1146	-	-	1067	-	-	146	177	578	124	176	644
Mov Cap-2 Maneuver	-	-	-	-	-	-	146	177	-	124	176	-
Stage 1	-	-	-	-	-	-	526	519	-	480	434	-
Stage 2	-	-	-	-	-	-	395	431	-	407	515	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			1.6			14.9			17.8		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	468	1146	-	-	1067	-	-	320				
HCM Lane V/C Ratio	0.224	0.015	-	-	0.089	-	-	0.122				
HCM Control Delay (s)	14.9	8.2	0	-	8.7	0	-	17.8				
HCM Lane LOS	B	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.9	0	-	-	0.3	-	-	0.4				

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	467	11	22	376	21	3	4	24	17	24	43
Future Vol, veh/h	23	467	11	22	376	21	3	4	24	17	24	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	508	12	24	409	23	3	4	26	18	26	47
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	432	0	0	520	0	0	1069	1044	514	1048	1039	421
Stage 1	-	-	-	-	-	-	564	564	-	469	469	-
Stage 2	-	-	-	-	-	-	505	480	-	579	570	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1128	-	-	1046	-	-	199	229	560	206	231	632
Stage 1	-	-	-	-	-	-	510	508	-	575	561	-
Stage 2	-	-	-	-	-	-	549	554	-	501	505	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1128	-	-	1046	-	-	160	215	560	185	217	632
Mov Cap-2 Maneuver	-	-	-	-	-	-	160	215	-	185	217	-
Stage 1	-	-	-	-	-	-	494	492	-	557	544	-
Stage 2	-	-	-	-	-	-	469	537	-	459	489	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.4			15.2			21.3		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	386	1128	-	-	1046	-	-	311				
HCM Lane V/C Ratio	0.087	0.022	-	-	0.023	-	-	0.294				
HCM Control Delay (s)	15.2	8.3	0	-	8.5	0	-	21.3				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0.1	-	-	1.2				

HCM 6th TWSC
28: Crane Ave & W 14th St

05/22/2023

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	33	5	12	52	14	4	40	12	79	77	17
Future Vol, veh/h	3	33	5	12	52	14	4	40	12	79	77	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	36	5	13	57	15	4	43	13	86	84	18
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	359	329	93	344	332	50	102	0	0	56	0	0
Stage 1	265	265	-	58	58	-	-	-	-	-	-	-
Stage 2	94	64	-	286	274	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	596	590	964	610	588	1018	1490	-	-	1549	-	-
Stage 1	740	689	-	954	847	-	-	-	-	-	-	-
Stage 2	913	842	-	721	683	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	516	553	964	550	552	1018	1490	-	-	1549	-	-
Mov Cap-2 Maneuver	516	553	-	550	552	-	-	-	-	-	-	-
Stage 1	738	648	-	951	844	-	-	-	-	-	-	-
Stage 2	837	839	-	637	643	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	11.7		12		0.5		3.4					
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1490	-	-	580	601	1549	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.077	0.141	0.055	-	-				
HCM Control Delay (s)	7.4	0	-	11.7	12	7.5	0	-				
HCM Lane LOS	A	A	-	B	B	A	A	-				
HCM 95th %tile Q(veh)	0	-	-	0.2	0.5	0.2	-	-				

HCM 6th AWSC
11: N Marian Rd & W 12th St

05/12/2023

Intersection												
Intersection Delay, s/veh	16.5											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	249	51	144	221	1	37	15	183	1	10	10
Future Vol, veh/h	14	249	51	144	221	1	37	15	183	1	10	10
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	304	62	176	270	1	45	18	223	1	12	12
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	16	20	12.1	10.1
HCM LOS	C	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	71%	0%	4%	39%	5%
Vol Thru, %	29%	0%	79%	60%	48%
Vol Right, %	0%	100%	16%	0%	48%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	52	183	314	366	21
LT Vol	37	0	14	144	1
Through Vol	15	0	249	221	10
RT Vol	0	183	51	1	10
Lane Flow Rate	63	223	383	446	26
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.126	0.375	0.584	0.687	0.048
Departure Headway (Hd)	7.132	6.054	5.486	5.545	6.787
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	501	591	655	647	531
Service Time	4.899	3.82	3.546	3.602	4.787
HCM Lane V/C Ratio	0.126	0.377	0.585	0.689	0.049
HCM Control Delay	10.9	12.4	16	20	10.1
HCM Lane LOS	B	B	C	C	B
HCM 95th-tile Q	0.4	1.7	3.8	5.4	0.2

HCM 6th AWSC
29: N Baltimore Ave & W 14th St

05/12/2023

Intersection												
Intersection Delay, s/veh	13.6											
Intersection LOS	B											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	79	24	56	72	14	21	211	53	14	203	50
Future Vol, veh/h	43	79	24	56	72	14	21	211	53	14	203	50
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	53	98	30	69	89	17	26	260	65	17	251	62
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.9	12	14.8	14.2
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	29%	39%	5%
Vol Thru, %	74%	54%	51%	76%
Vol Right, %	19%	16%	10%	19%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	285	146	142	267
LT Vol	21	43	56	14
Through Vol	211	79	72	203
RT Vol	53	24	14	50
Lane Flow Rate	352	180	175	330
Geometry Grp	1	1	1	1
Degree of Util (X)	0.536	0.307	0.302	0.505
Departure Headway (Hd)	5.489	6.125	6.193	5.519
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	651	582	575	649
Service Time	3.565	4.215	4.283	3.597
HCM Lane V/C Ratio	0.541	0.309	0.304	0.508
HCM Control Delay	14.8	11.9	12	14.2
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	3.2	1.3	1.3	2.9

HCM 6th Signalized Intersection Summary

20: N Baltimore Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	158	314	17	17	281	20	16	98	28	20	144	128
Future Volume (veh/h)	158	314	17	17	281	20	16	98	28	20	144	128
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	182	361	20	20	323	23	18	113	32	23	166	147
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	561	936	52	533	920	66	94	441	114	82	302	249
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	1035	1756	97	1002	1725	123	82	1322	343	55	906	747
Grp Volume(v), veh/h	182	0	381	20	0	346	163	0	0	336	0	0
Grp Sat Flow(s),veh/h/ln	1035	0	1853	1002	0	1848	1747	0	0	1708	0	0
Q Serve(g_s), s	7.4	0.0	7.2	0.7	0.0	6.4	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	13.8	0.0	7.2	8.0	0.0	6.4	4.0	0.0	0.0	9.6	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.07	0.11		0.20	0.07		0.44
Lane Grp Cap(c), veh/h	561	0	988	533	0	986	649	0	0	634	0	0
V/C Ratio(X)	0.32	0.00	0.39	0.04	0.00	0.35	0.25	0.00	0.00	0.53	0.00	0.00
Avail Cap(c_a), veh/h	561	0	988	533	0	986	649	0	0	634	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.0	0.0	8.2	10.6	0.0	8.0	14.7	0.0	0.0	16.5	0.0	0.0
Incr Delay (d2), s/veh	1.5	0.0	1.1	0.1	0.0	1.0	0.9	0.0	0.0	3.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.1	0.0	4.8	0.3	0.0	4.2	3.0	0.0	0.0	7.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.5	0.0	9.4	10.7	0.0	9.0	15.6	0.0	0.0	19.7	0.0	0.0
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		563			366			163			336	
Approach Delay, s/veh		10.7			9.1			15.6			19.7	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		36.0		24.0		36.0				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		20.0		32.0		20.0		32.0				
Max Q Clear Time (g_c+I1), s		6.0		15.8		11.6		10.0				
Green Ext Time (p_c), s		0.7		2.9		1.4		2.2				
Intersection Summary												
HCM 6th Ctrl Delay				13.0								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

05/17/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	142	153	95	36	106	71	98	770	49	52	756	141
Future Volume (veh/h)	142	153	95	36	106	71	98	770	49	52	756	141
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	154	166	103	39	115	77	107	837	53	57	822	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	335	362	238	173	466	318	364	1876	119	351	1187	221
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.09	0.56	0.56	0.40	0.40	0.40
Sat Flow, veh/h	782	1152	757	332	1484	1012	1767	3367	213	620	2967	552
Grp Volume(v), veh/h	212	0	211	116	0	115	107	438	452	57	488	487
Grp Sat Flow(s),veh/h/ln	1140	0	1552	1322	0	1506	1767	1763	1817	620	1763	1756
Q Serve(g_s), s	8.7	0.0	7.6	0.3	0.0	4.0	2.2	10.3	10.3	4.3	16.1	16.1
Cycle Q Clear(g_c), s	12.7	0.0	7.6	7.9	0.0	4.0	2.2	10.3	10.3	4.3	16.1	16.1
Prop In Lane	0.73		0.49	0.34		0.67	1.00		0.12	1.00		0.31
Lane Grp Cap(c), veh/h	447	0	488	484	0	473	364	982	1012	351	705	702
V/C Ratio(X)	0.47	0.00	0.43	0.24	0.00	0.24	0.29	0.45	0.45	0.16	0.69	0.69
Avail Cap(c_a), veh/h	447	0	488	484	0	473	364	982	1012	351	705	702
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.8	0.0	19.0	17.7	0.0	17.8	11.4	9.1	9.1	13.9	17.4	17.4
Incr Delay (d2), s/veh	3.6	0.0	2.8	1.2	0.0	1.2	2.0	1.5	1.4	1.0	5.5	5.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.9	0.0	5.3	2.7	0.0	2.7	1.6	6.5	6.7	1.1	11.2	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.4	0.0	21.8	18.8	0.0	19.0	13.5	10.6	10.6	14.9	23.0	23.0
LnGrp LOS	C	A	C	B	A	B	B	B	B	B	C	C
Approach Vol, veh/h		423			231			997			1032	
Approach Delay, s/veh		23.6			18.9			10.9			22.5	
Approach LOS		C			B			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		43.5		26.5	11.0	32.5		26.5				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		39.0		22.0	6.5	28.0		22.0				
Max Q Clear Time (g_c+I1), s		12.3		14.7	4.2	18.1		9.9				
Green Ext Time (p_c), s		6.0		1.5	0.0	4.6		1.1				
Intersection Summary												
HCM 6th Ctrl Delay				18.1								
HCM 6th LOS				B								

Appendix C: Imperial Mall Redevelopment Traffic Impact Study



ENGINEERING ■ ARCHITECTURE ■ SURVEYING ■ PLANNING

Imperial Mall Redevelopment Traffic Impact Study

Hastings, NE

JEO Project No. 201293.00

***Prepared for:
Perry Reid Properties***

*Prepared by:
JEO Consulting Group*

*Date:
June 10, 2021*



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Appendix A: Imperial Mall Concept Plan

Introduction

This report documents results of the traffic impact study conducted for the proposed redevelopment of the former Imperial Mall site located on the southwest corner of N Marian Road and W 12th Street in Hastings, Nebraska.

1.1 Objective

The primary objective of this traffic impact study was to evaluate the expected impacts associated with the development of the former Imperial Mall site in Hastings, Nebraska. Specifically, this study was conducted to answer the following questions:

- How will the development of the proposed site affect the study area intersections?
- What potential traffic control and geometric street modifications will be needed to support the proposed development?

1.2 Project Description

The former Imperial Mall site on the southwest corner of N Marian Road and W 12th Street is planned for redevelopment into a mixed use development. This new development is planned to include an apartment complex, some office and retail space, a grocery store, two restaurants, a drive-thru coffee business and an indoor sports complex. A site plan for this development is included as Appendix A. Further details regarding the Imperial Mall study area as well as the identification of study intersections are shown on the vicinity map in Figure 1.

1.3 Report Organization

The remainder of this report is organized as follows:

- 2.0 Existing Conditions
- 3.0 Existing Plus Site Conditions
- 4.0 Year 2045 Conditions
- 5.0 N Marian Road Cross Section
- 6.0 Auxiliary Lane Warrant Analysis
- 7.0 N Marian Road and W 12th Street Intersection Alternatives
- 8.0 Conclusions and Recommendations



Figure 1: Vicinity Map

2.0 Existing Conditions

This section of the report summarizes the existing study area conditions.

2.1 Existing Geometrics

The Imperial Mall study area includes the following streets and intersections:

2.1.1 N Marian Road

South of W 12th Street, N Marian Road is a four-lane, two-way, undivided street that is classified as an other arterial, according to the state functional classification map. N Marian Road has a width of 52', back-of-curb to back-of-curb (BOC to BOC) and curb and gutter as well as a drainage ditch provided on both sides. North of S 12th Street, N Marian Road is a two-lane, two-way, undivided unpaved street that is classified as local, according to the state functional classification map. N Marian Road has a width of 30', edge of gravel to edge of gravel, and unpaved shoulders and a drainage ditch on both sides of the road. There is no sidewalk or trail provided anywhere on N Marian Road in the study area except South of W 9th Street where the Pioneer Spirit Trail is present on the west side of the roadway. N Marian Road has a speed limit of 35 mph and a picture of N Marian Road is provided in Figure 2.



Figure 2: N Marian Road Just North of W 9th Street (Looking North)

2.1.2 W 9th Street

W 9th Street is a 36' wide (BOC to BOC) two-lane, two-way, undivided street that is classified as collector, according to the state functional classification map. W 9th Street has curb and gutter and allows parking on both sides of the street. Sidewalks are provided only on the south side of the street. The speed limit is 25 mph and a picture of W 9th Street is provided in Figure 3.



Figure 3: W 9th Street Just East of N Marian Road (Looking East)

2.1.3 Parklane Drive

Parklane Drive is a 36' wide (BOC to BOC) two-lane, two-way, undivided street that is classified as local, according to the state functional classification map. Parklane Drive has a curb and gutter and allows parking on both sides of the street. There is a sidewalk directly adjacent to the BOC provided on the south side of the street. No sidewalk is provided on the north side. Parklane Drive has a speed limit of 25 mph and a picture of Parklane Drive is provided in Figure 4.



Figure 4: Parklane Drive Just West of N Marian Road (Looking West)

2.1.4 W 12th Street

W 12th Street is a two-lane, two-way, undivided street that is classified as other arterial, according to the state functional classification map. W 12th Street has a width of 30' from edge of pavement to edge of pavement (EOP to EOP). There is unpaved shoulder and drainage ditches provided on both sides of the street, however, there are no sidewalks on either side. W 12th Street has a speed limit of 35 mph and a picture of W 12th Street is provided in Figure 5.



Figure 5: W 12th Street Just West of N Marian Road (Looking West)

2.1.5 The Intersection of N Marian Road and Parklane Drive/W 9th Street

The signalized intersection of N Marian Road and Parklane Drive/W 9th Street is a 4-leg intersection with N Marian Road forming the northbound and southbound legs, Parklane Drive forming the eastbound leg, and W 9th Street forming the westbound leg. Both N Marian Road approaches consist of one shared through and left-turn lane and one shared through and right-turn lane. Although there are no pavement markings on either approach, both the eastbound and westbound approaches appear to consist of a single shared left, through, and right-turn lane. This intersection is lit via a luminaire on each corner. Permitted left-turn phasing is provided for all approaches. There are pedestrian signals, push-buttons, and a crosswalk provided to cross the south leg only.



Figure 6: The Intersection of N Marian Road and Parklane Drive/W 9th Street (Looking Northwest)

2.1.6 The Intersection of N Marian Road and W 12th Street

The all-way stop intersection of N Marian Road and W 12th Street is a 4-leg intersection with N Marian Road forming the northbound and southbound approaches and W 12th Street forming the eastbound and westbound approaches. The northbound approach consists of a dedicated right-turn lane drop and a shared through and left-turn lane. Although the southbound approach is not paved and has no pavement markings, it appears to consist of one shared left, through, and right-turn lane. Both the eastbound and westbound approaches also consist of one shared left, through, and right-turn lane. However, the pavement for both the eastbound and westbound approaches does widen it approaches the intersection, and it was observed that some eastbound right-turning vehicles do use this extra pavement as a dedicated right-turn lane. A picture of this intersection is provided in Figure 7.

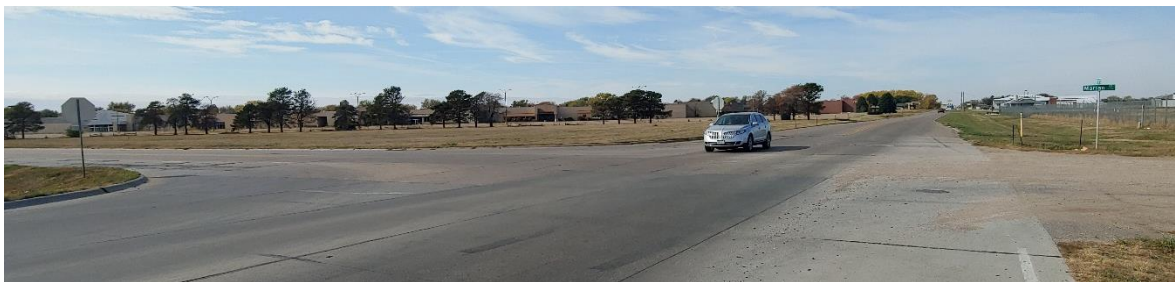


Figure 7: The Intersection of N Marian Road and W 12th Street (Looking Southwest)

Further details on lane geometrics and traffic control throughout the study area are shown in Figure 8.

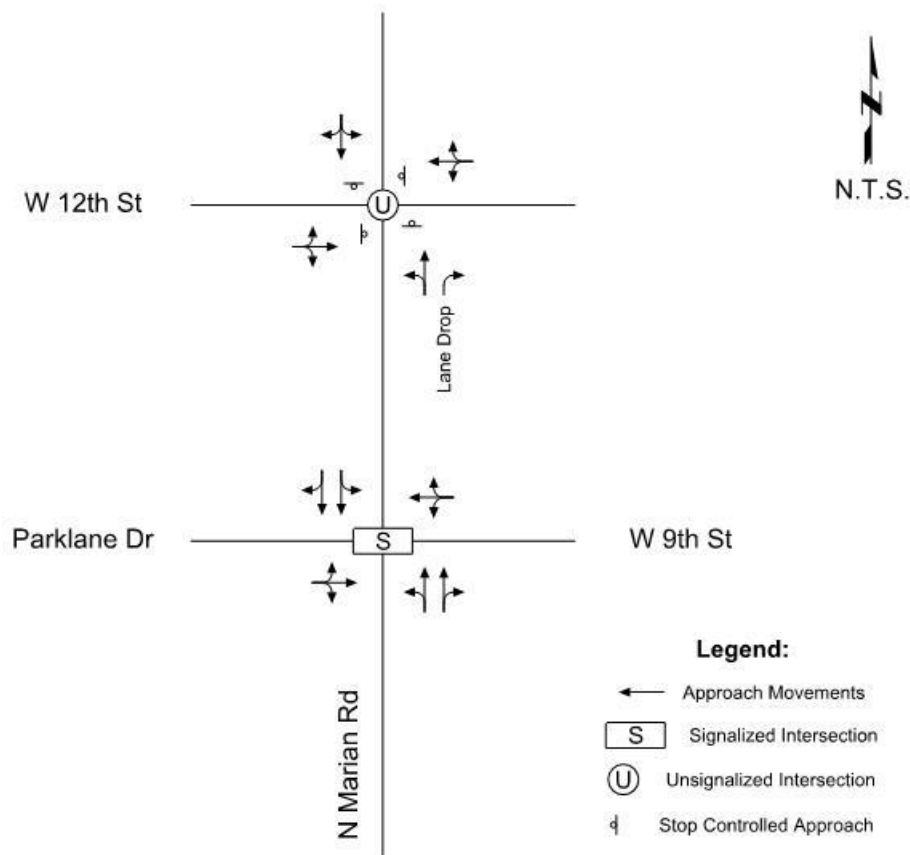


Figure 8: Existing Geometrics and Traffic Control

2.2 Existing Traffic Volumes

Existing turning movement volumes were collected on Tuesday, October 20th, 2020 using Miovision Scout Cameras. The observed AM peak hour was 7:15 – 8:15 AM and the observed commuter PM peak hour was 4:45 – 5:45 PM. These existing peak hour volumes are shown in Figure 9. It should be noted that existing volumes were not reported at the existing mall driveways due to the negligible amount of existing traffic entering/exiting the previous Imperial Mall site.

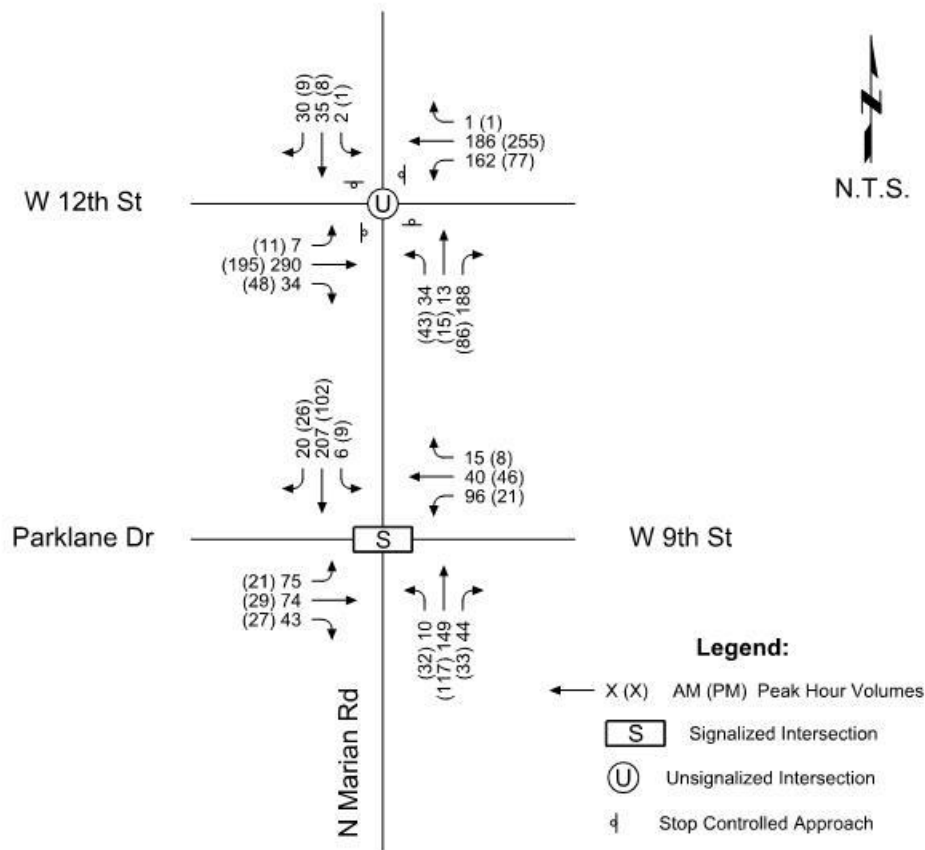


Figure 9: Existing Peak Hour Volumes

2.3 Study Methodology

The peak hour volumes for the study area intersections were analyzed using the signalized and unsignalized intersection capacity analysis procedures outlined in the Highway Capacity Manual, 6th Edition (HCM). Per the HCM, Level of Service (LOS) is presented as a letter grade (A through F) based on the calculated average delay for an intersection or movement during a specific time period (such as the AM and PM peak hours). LOS A represents free flow movement with very little to no delay, while LOS F represents congested flow at or exceeding the capacity of the roadway. Further explanations and detail about the LOS methodology can be found in Table 1. 95th percentile queue lengths and volume to capacity (V/C) ratios provide further information about an approach. The 95th percentile queue is a statistical metric that defines the length at which 95% of queues will be shorter. The V/C ratio is a measure of how close a movement is to its capacity. A ratio above one would indicate that the movement is over capacity.

Table 1: Level of Service Interpretation

Level of Service	Description	Signalized Intersection Delay (seconds per vehicle)	Stop-Controlled Intersection & Roundabout Delay (seconds per vehicle)
A	Free-flow operations. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream.	< 10	< 10
B	Reasonably free flow. The ability to maneuver within the traffic stream is only slightly restricted.	>10 and < 20	>10 and < 15
C	At or near free flow. Freedom to maneuver within the traffic stream is noticeably restricted.	>20 and < 35	>15 and < 25
D	Speeds begin to decline slightly. Freedom to maneuver within the traffic stream is noticeably limited.	>35 and < 55	>25 and < 35
E	At capacity. Maneuverability within the traffic stream is extremely limited.	>55 and < 80	>35 and < 50
F	Breakdown. Vehicles are jammed. Generally, queues form behind the breakdown condition.	> 80	> 50

Source: Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, D.C., 2000.

2.4 Existing Conditions Peak Hour Capacity Analysis

The existing weekday AM and commuter PM peak hour traffic conditions were analyzed using the existing traffic volumes and intersection geometrics described previously. As shown in Figure 10, all intersections and approaches operate acceptably at LOS D or better with most operating at LOS C or better. The eastbound and westbound approaches to the intersection of N Marian Road and W 12th Street operate at LOS D during the AM peak hour. During this AM peak hour, the westbound approach has a 95th percentile queue of 168' and a V/C ratio of 0.821. Also, during the AM peak hour, the eastbound approach has a 95th percentile queue of 142' and a V/C ratio of 0.769. These queues were confirmed during a site visit and a picture of an eastbound queue during the AM peak hour is provided in Figure 11.

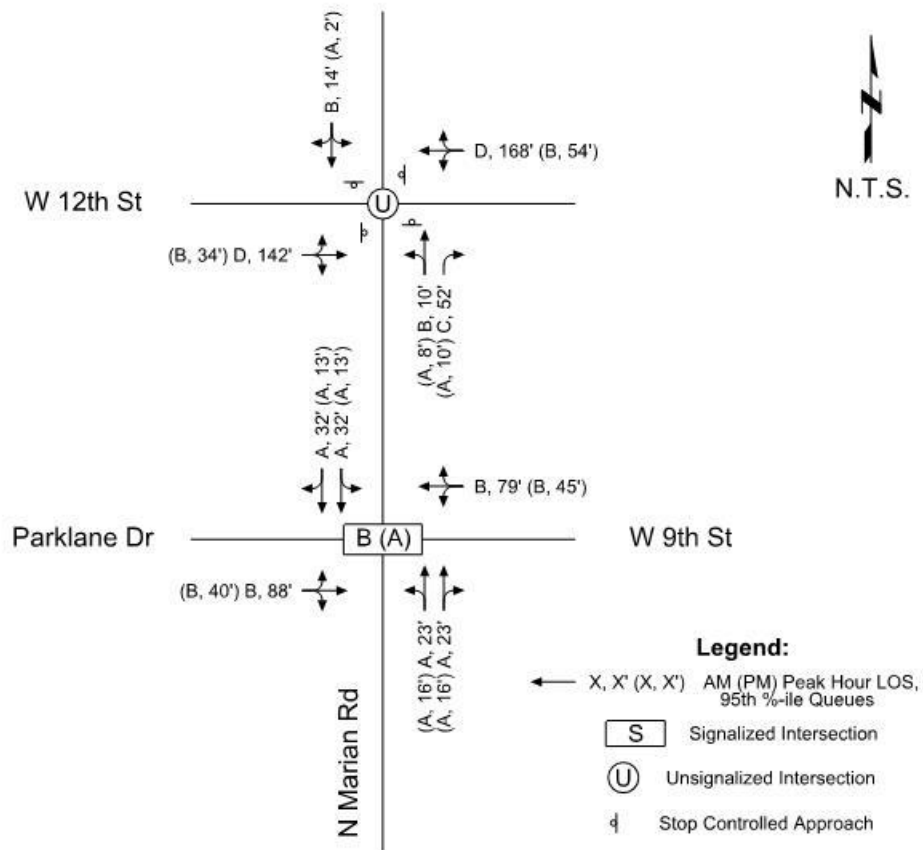


Figure 10: Existing Peak Hour Level of Service



Figure 11: 200'+ Westbound Queue During Morning Peak Hour

3.0 Existing Plus Site Conditions

This section of the report presents potential geometric and operational changes, trip generation estimates to and from the redevelopment site, site trip assignment, and development of buildout traffic volumes within the study area.

3.1 Geometric Configuration Changes

As vehicles will now be using the existing driveways into and out of the former Imperial Mall site, these three existing driveways were included as study intersections for the development buildout scenario. The geometric and traffic control characteristics of these new study intersections are shown in Figure 12.

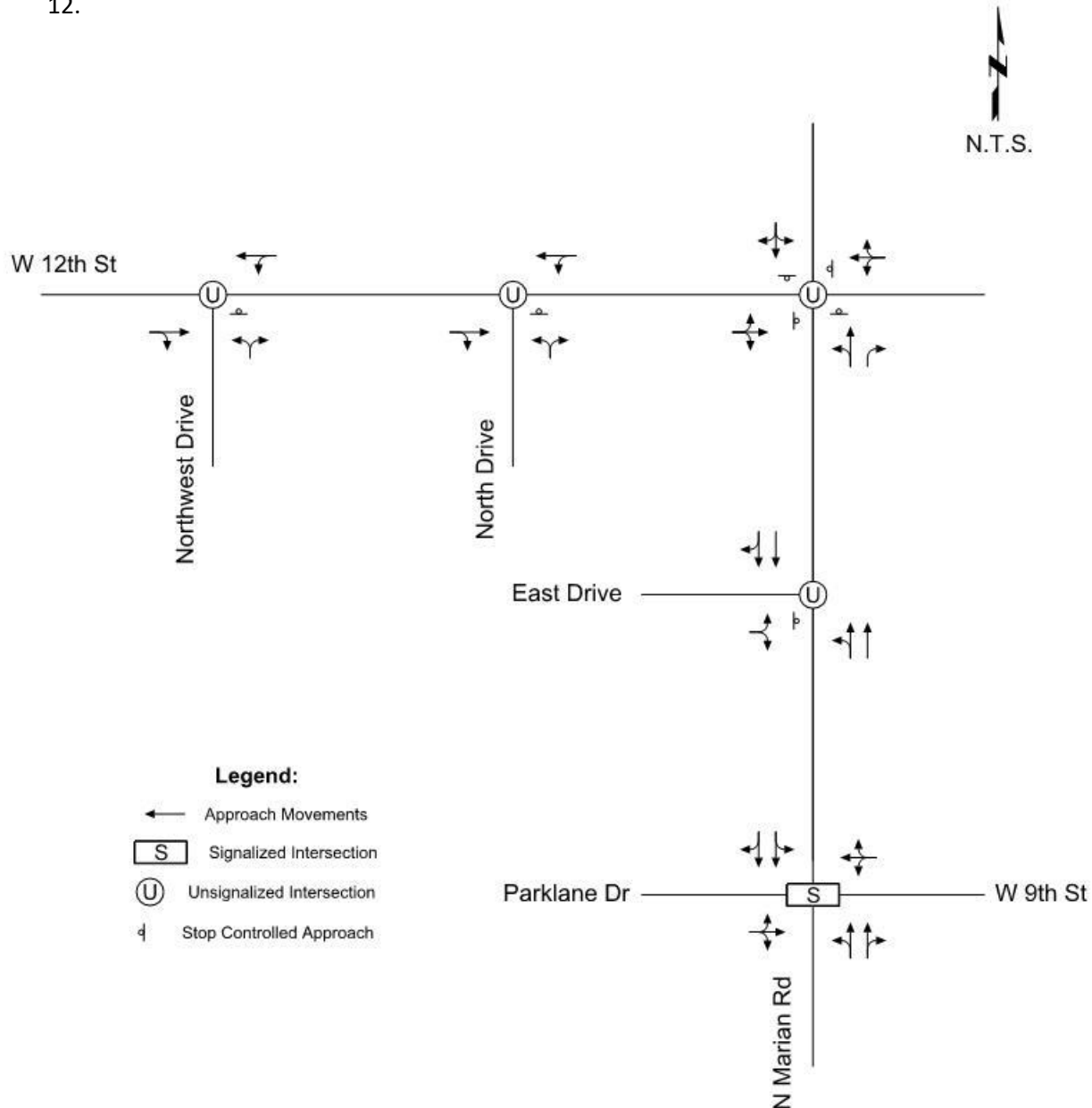


Figure 12: Existing Geometrics and Traffic Control – Including Site Driveways

3.2 Imperial Mall Site Buildout

The trip generation characteristics for most proposed land uses were provided by the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 10 Edition. However, trip generation characteristics for the sports complex was based on a trip generation study of the Iowa West Fieldhouse in Council Bluffs to provide more accurate local generation rates. Trip generation calculations for the Imperial Mall site are summarized in Tables 2 and 3. These tables also include a mixed-use reduction. This reduction is applied to account for an estimated number of trips that would be coming from within the development or linked and would not be counted as an external trip. AM trip estimates are likely on the conservative side as some land uses are not expected to be open until after traditional commuter peak hours, such as the 'discount supermarket'. This is expected to be an Aldi's, which typically do not open until 9 AM.

Table 2: Imperial Mall AM Peak Hour Trip Generation

ITE Land Use Code	Usage	Size	Trip Generation		Directional Distribution		Total	Mixed Use Reduction	Total Trips	External Trips	
			Unit	Rate	In	Out				In	Out
221	Multifamily Housing (Mid-Rise)	150	Dwelling Unit	0.36	26%	74%	54	-	54	14	40
630	Clinic	10.65	1000 SF GFA	3.69	78%	22%	39	-	39	31	9
710	General Office Building	19.58	1000 SF GFA	0.94(X)+26.49	86%	14%	45	-	45	39	6
820	Shopping Center	41.32	1000 SF GFA	0.94	62%	38%	39	-4	35	22	13
854	Discount Supermarket	17.80	1000 SF GFA	2.53	58%	42%	45	-5	41	24	17
932	High-Turnover Sit-down Restaurant	8.00	1000 SF GFA	9.94	55%	45%	80	-8	72	39	32
932	High-Turnover Sit-down Restaurant	8.00	1000 SF GFA	9.94	55%	45%	80	-8	72	39	32
937	Coffee/Donut Shop with Drive-Thru Window	0.65	1000 SF GFA	88.99	51%	49%	57	-6	52	26	25
N/A	Sport Complex	-	-	-	-	-	-	-	-	0	0
Total:										234	175

Note: Due to rounding, some sums may not add as expected.

Table 3: Imperial Mall Commuter PM Peak Hour Trip Generation

ITE Land Use Code	Usage	Size	Trip Generation		Directional Distribution		Total	Mixed Use Reduction	Total Trips	External Trips	
			Unit	Rate	In	Out				In	Out
221	Multifamily Housing (Mid-Rise)	150	Dwelling Unit	.44	61%	39%	66		66	40	26
630	Clinic	10.65	1000 SF GFA	3.28	78%	22%	35		35	27	8
710	General Office Building	19.58	1000 SF GFA	$\ln(T)=0.95\ln(X)+0.36$	16%	84%	24		24	4	20
820	Shopping Center	41.32	1000 SF GFA	$\ln(T)=0.74\ln(X)+2.89$	48%	52%	283	-28	254	122	132
854	Discount Supermarket	17.80	1000 SF GFA	$\ln(T)=0.89\ln(X)+2.59$	58%	42%	173	-17	156	90	65
932	High-Turnover Sit-down Restaurant	8.00	1000 SF GFA	9.77	55%	45%	78	-8	70	39	32
932	High-Turnover Sit-down Restaurant	8.00	1000 SF GFA	9.77	55%	45%	78	-8	70	39	32
937	Coffee/Donut Shop with Drive-Thru Window	0.65	1000 SF GFA	43.38	50%	50%	28	-3	25	13	13
N/A	Sport Complex	8	Courts	14.75	83%	17%	118		118	98	20
									Total:	472	347

Note: Due to rounding, some sums may not add as expected.

These new trips were then distributed to the existing road network based on observed directional flows and locations of residential origin/destinations. In general, these trips were distributed to/from the west on W 12th Street (10%), to/from the east on W 12th Street (40%), to/from the east on W 9th Street (20%), and to/from the south on N Marian Road (30%). These distributed site trips, as well as distribution percentages, are shown in Figure 13.

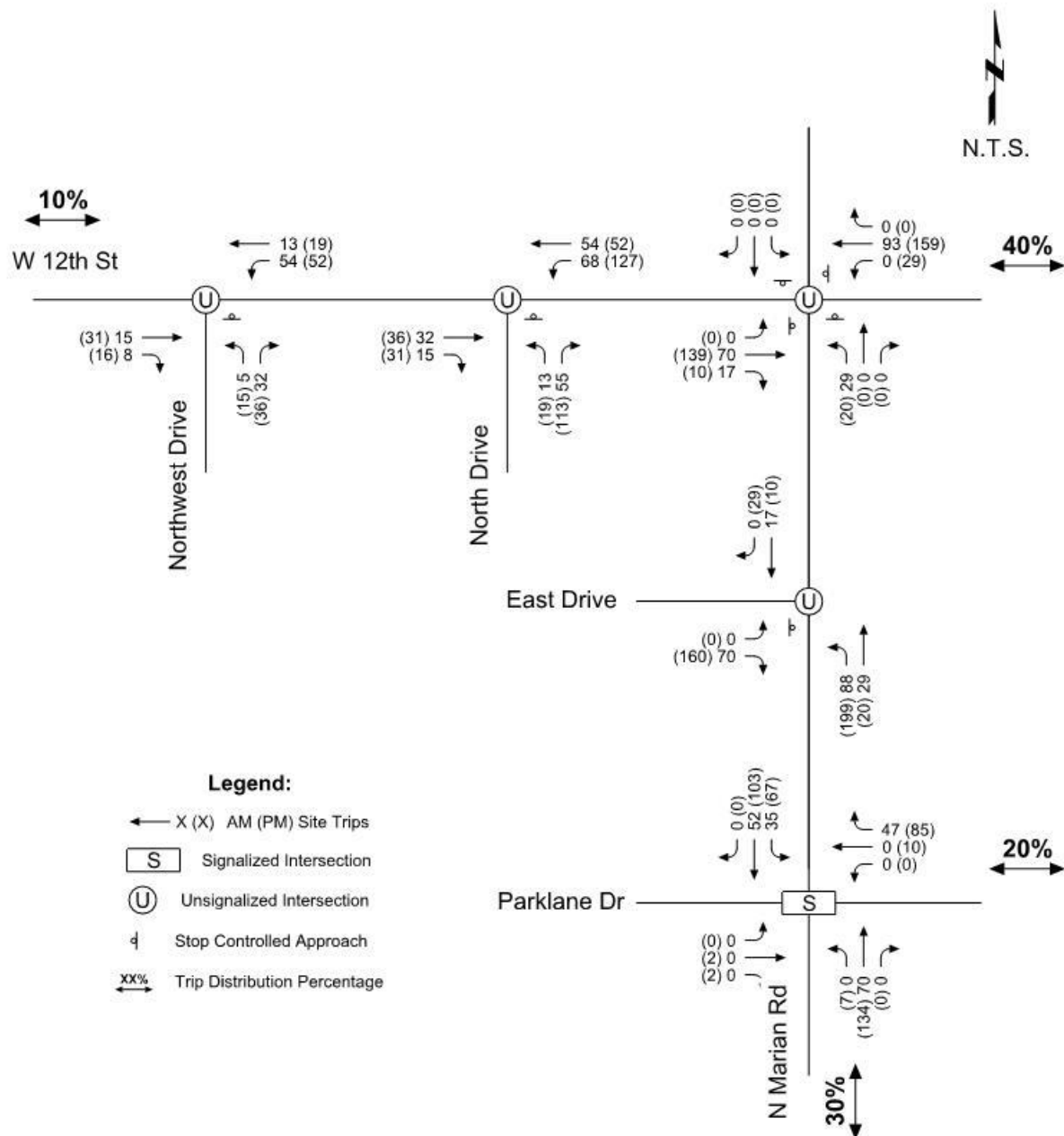


Figure 13: AM and PM Site Trips

3.3 Existing Plus Site Peak Hour Volumes

These distributed site trips were then added to the background peak hour volumes to develop existing plus site peak hour volumes. These peak hour volumes are depicted in Figure 14.

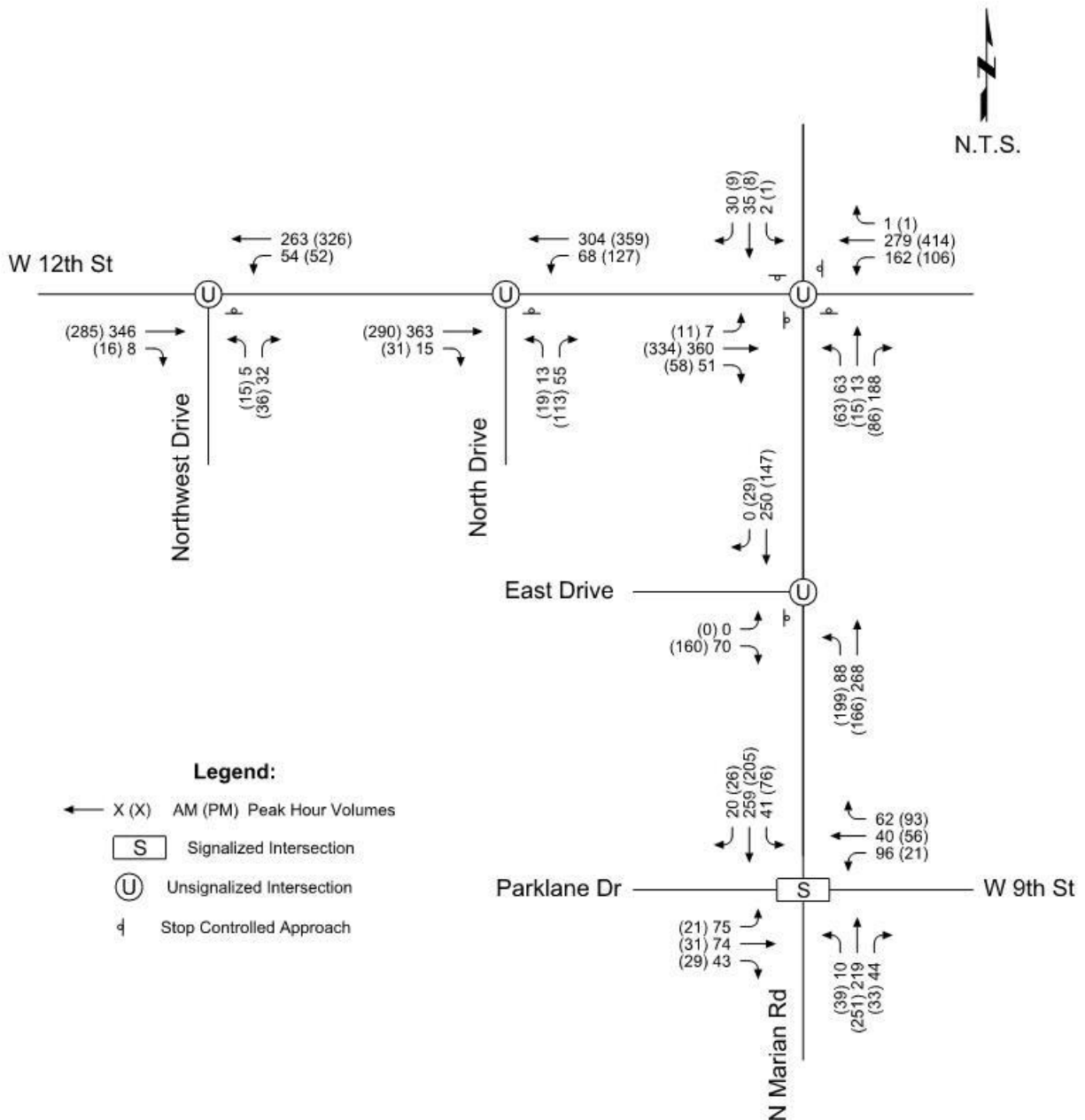


Figure 14: Existing Plus Site Peak Hour Volumes

3.4 Existing Plus Site Capacity Analysis

Like the existing conditions capacity analysis, the study intersections were analyzed again using the existing plus site peak hour volumes. As shown in Figure 15, all movements and intersections operate at LOS D or better during both peak hours apart from the eastbound and westbound approaches to the intersection of N Marian Road and W 12th Street, which operate at LOS F during the AM peak hour. The eastbound approach has a 95th percentile queue of 312' and a V/C ratio of 1.064, while the westbound approach has a 95th percentile queue of 380' and a V/C ratio of 1.135. This indicates that both approaches are over capacity.

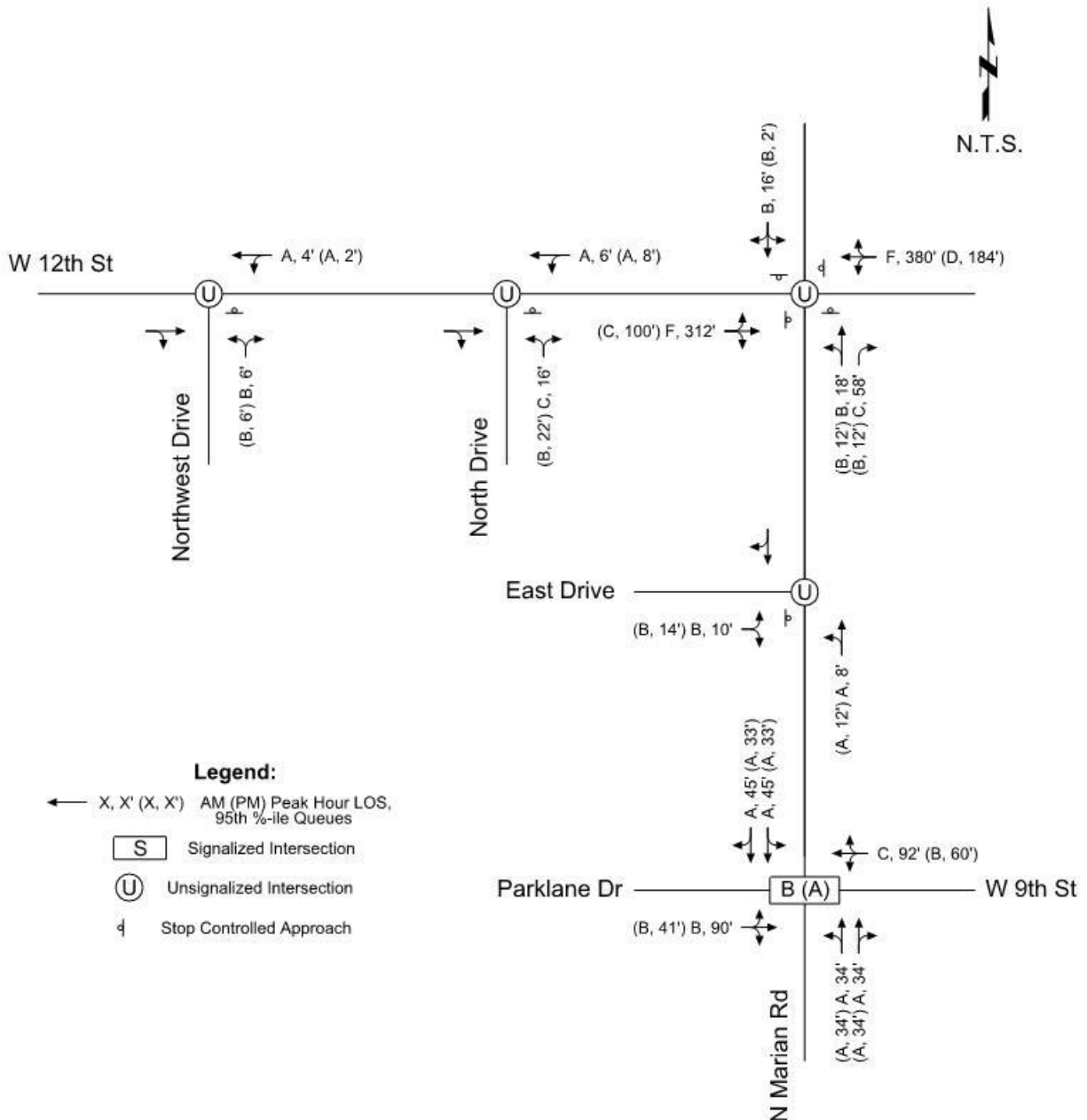


Figure 15: Existing Plus Site Peak Hour Level of Service

4.0 Year 2045 Conditions

This section of the report represents the results of the projected Year 2045 traffic conditions.

4.1 Year 2045 Background Peak Hour Volumes

A review of historical traffic counts provided by the Nebraska Department of Transportation (NDOT) revealed both relatively low and, in a couple of cases, negative growth trends on area roadways. To account for the possibility of future growth, and to provide a conservative analysis, the existing mainline background traffic volumes were grown at a modest average annual growth rate of 0.5% for 25 years to estimate 2045 background peak hour volumes. This 0.5% growth rate was chosen after These Year 2045 background peak hour volumes are shown in Figure 16.

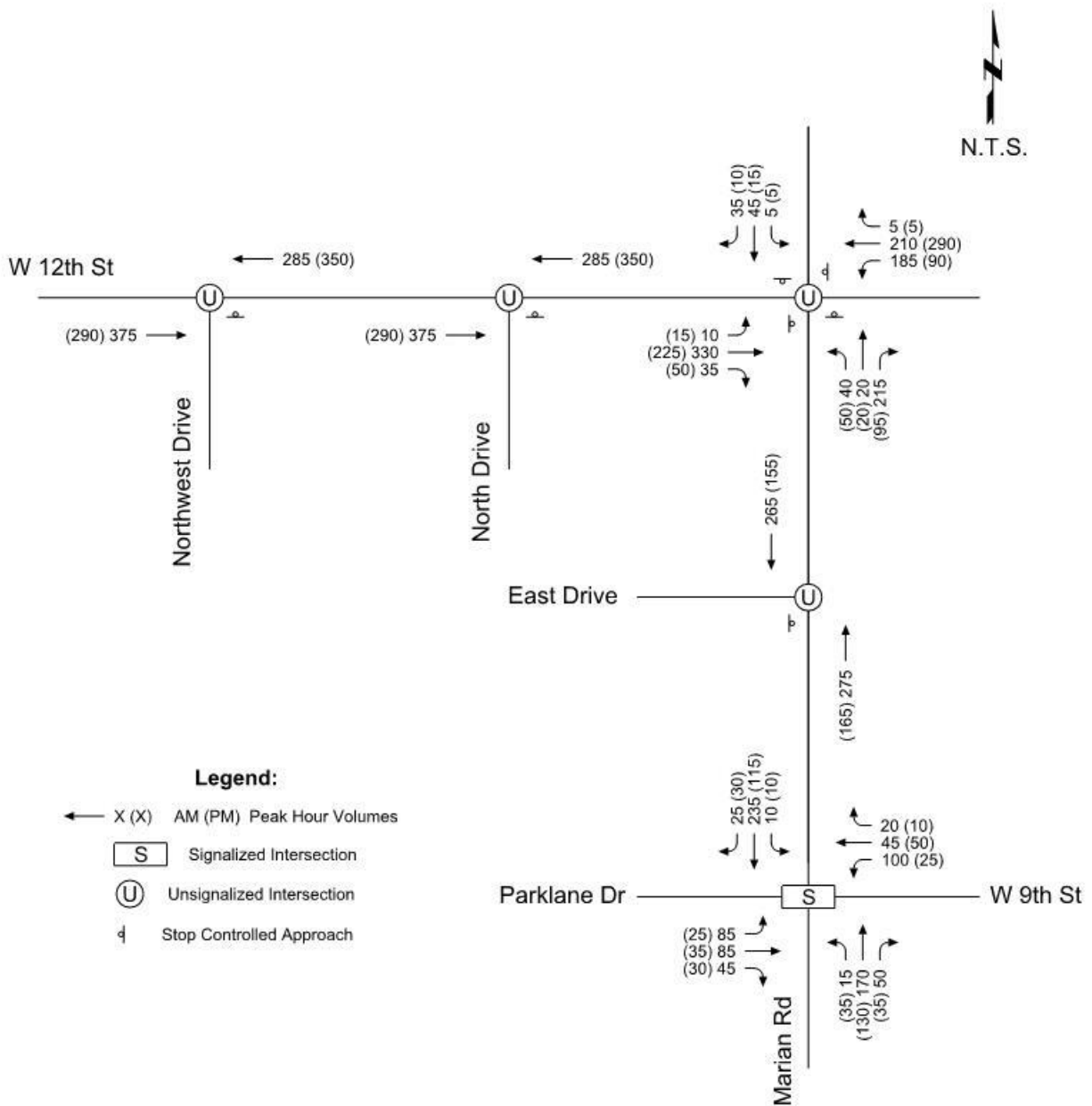


Figure 16: Year 2045 Background Peak Hour Volumes

4.2 Year 2045 Background Plus Site Peak Hour Volumes

The distributed site trips discussed previously were then added to the Year 2045 background peak hour volumes to develop Year 2045 background plus site peak hour volumes. These volumes are shown in Figure 17.

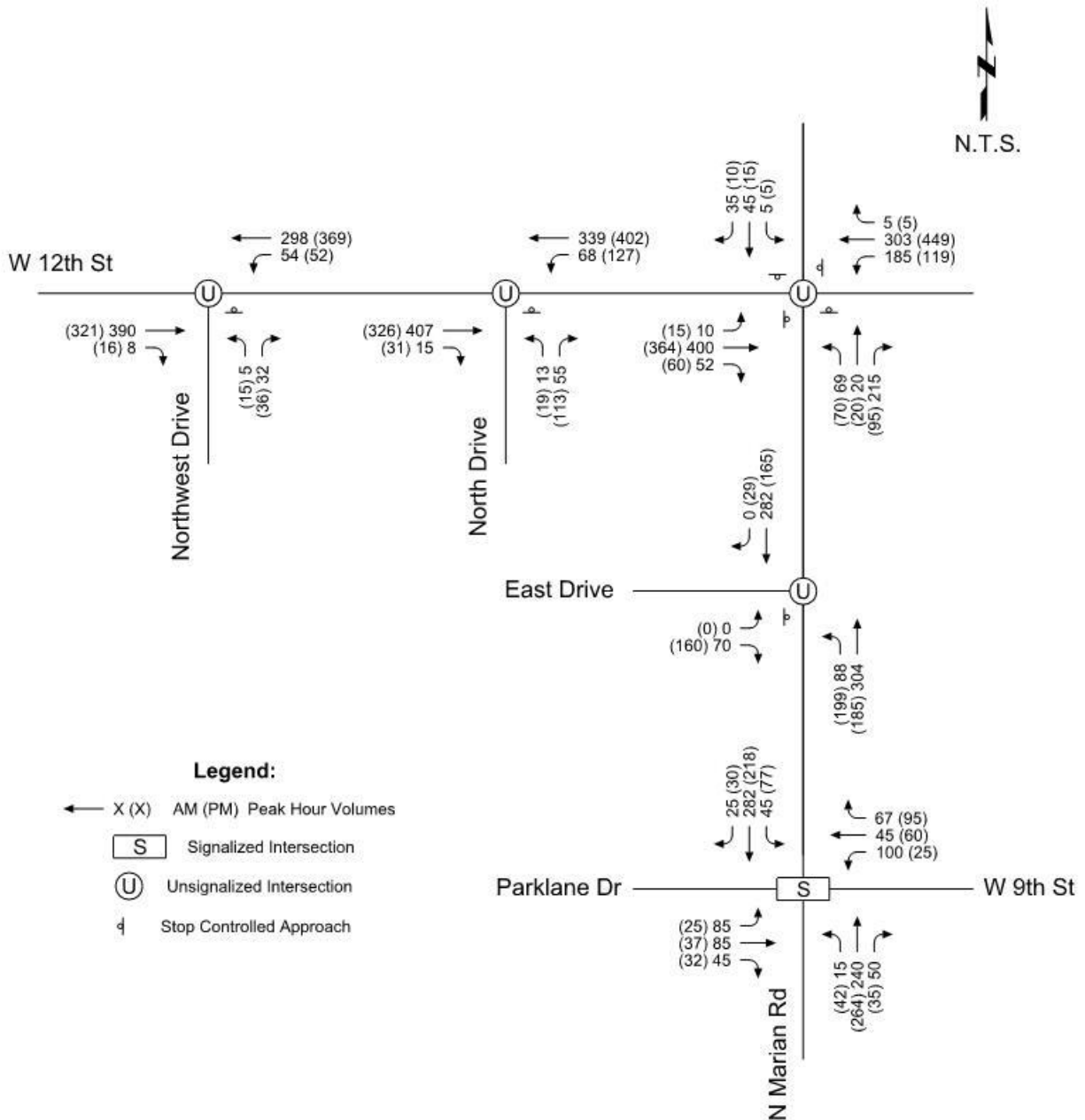


Figure 17: Year 2045 Background Plus Site Peak Hour Volumes

4.3 Year 2045 Background Plus Site Capacity Analysis

The Year 2045 background plus site peak hour volumes were then analyzed using the signalized and unsignalized intersection capacity analysis procedures described previously. As shown in Figure 18, all approaches and intersections continue to operate at LOS D or better during both peak hours, apart from the eastbound (AM peak hour) and westbound (AM and PM peak hour) approaches to the intersection of N Marian Road and W 12th Street. The eastbound approach during the AM peak hour operates at LOS F and is over capacity with a V/C ratio of 1.281 and a 95th percentile queue of over 430'. The westbound approach during the AM peak hour is also operating at LOS F and is over capacity with a V/C ratio of 1.37 and a 95th percentile queue of over 535' (LOS F, 0.962, and 278' in the PM peak hour, respectively).

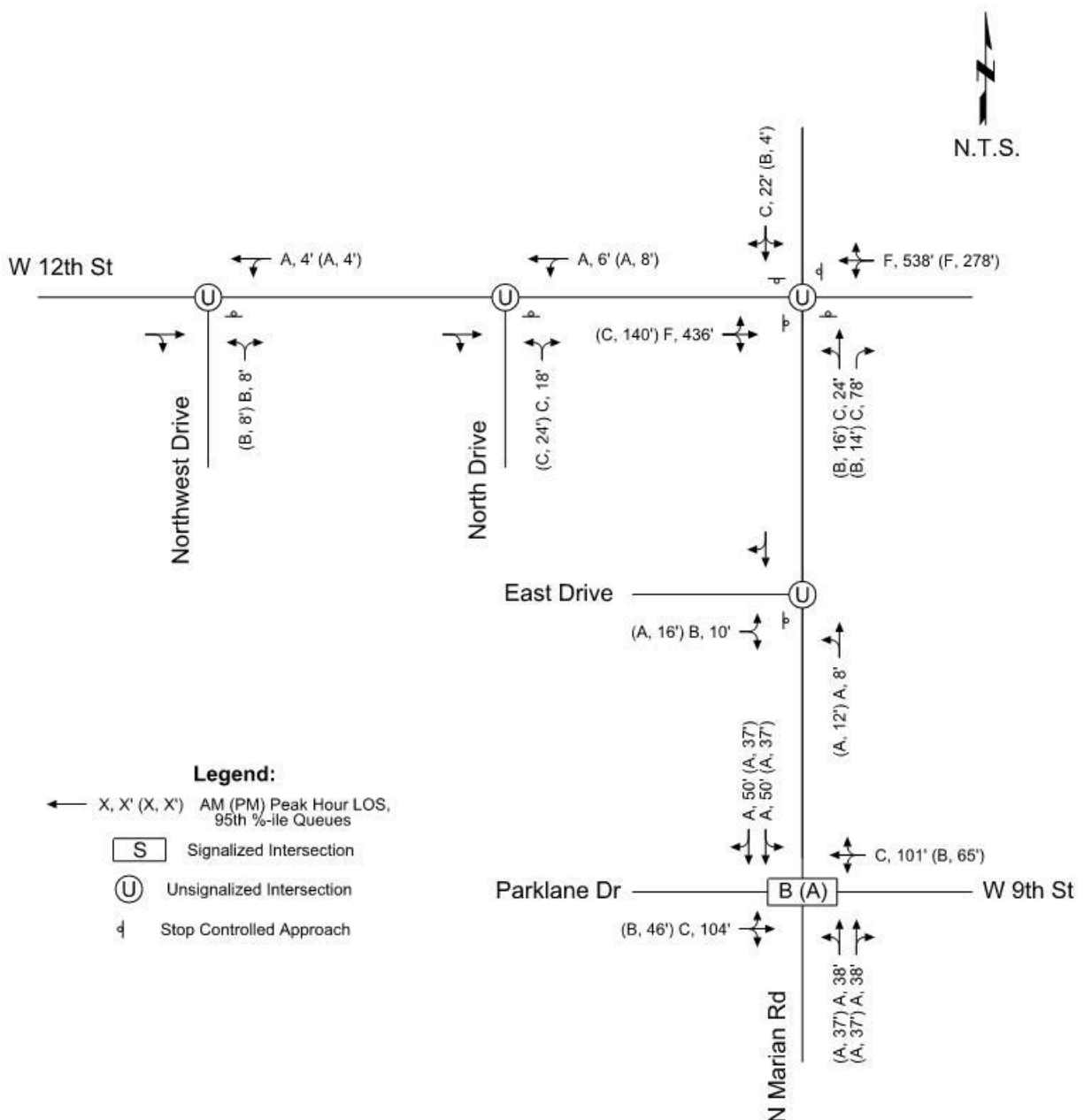


Figure 18: Year 2045 Background Plus Site Peak Hour Level of Service

5.0 N Marian Road Cross Section

This section discusses potential safety and operational benefits of reducing the number of through lanes and adding a two-way left-turn lane (TWLTL) on N Marian Road.

5.1 Safety Concerns

The addition of nearly 200 left turns off of N Marian Road at the intersection with the East Drive in the PM peak hour introduces a safety concern with vehicles stopping in a through lane as they wait for a gap in opposing traffic to complete their left-turn movement. Due to this stoppage, through vehicles tend towards the outside lane, forcing the four-lane road to operate as a two-lane road, as shown on the left in Figure 19. It should also be noted that in this scenario, the northbound left-turning green vehicle cannot see the southbound grey vehicle that is changing lanes. This can lead to a safety issue with the lack of sight distance of opposing vehicles. However, this is not the case on the right in Figure 19 as cars in the opposing lane are clearly visible.

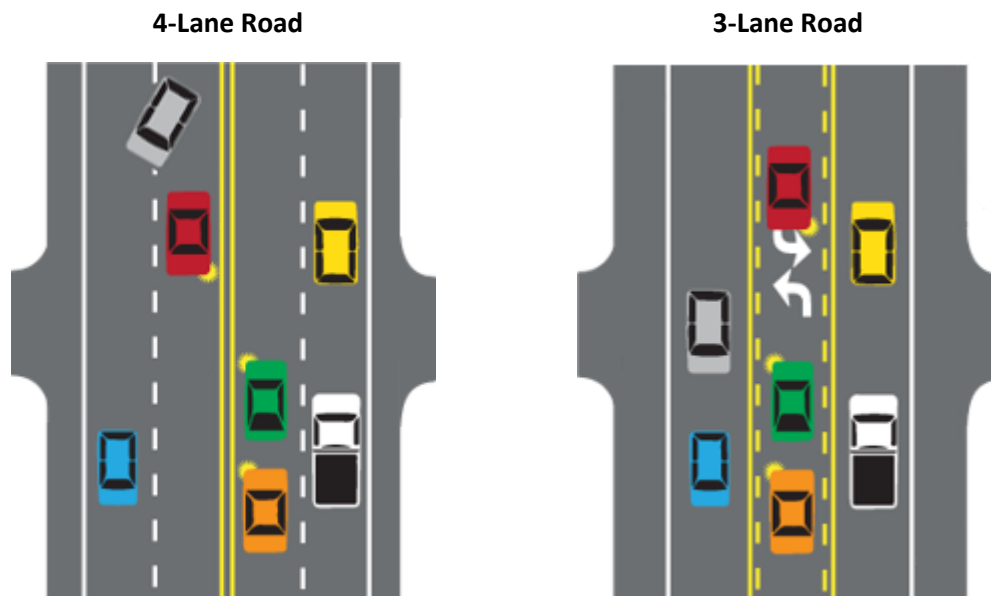


Figure 19: Four-Lane Section vs. Three-Lane Section

This three lane street contains one lane in each direction as well as a center TWLTL. A conversion from a four-lane undivided section to a three-lane section with a TWLTL is generally called a road diet.

Furthermore, figure 20 shows the conflict points and safety issues related to turning movements for a four-lane undivided roadway as compared to a three-lane road. As shown, a road diet can reduce the number of mid-block conflict points, crossing and through traffic conflict points, and improve major-street left-turn sight distance. The following is a summary of the safety benefits as applied to N Marian Road:

- The additional safety benefit of a road diet on N Marina Road with regards to mid-block conflict points is the potential reduction of left-turn crashes (both rear-end and angle crashes) that may occur due to the increase in stopped left-turning traffic, especially at the intersection with the East Driveway.

- For crossing and through traffic, the number of conflict points reduces from eight to four for four-legged intersections and reduces from six to four for three-legged intersections. This is a result of vehicles only having to cross one through lane in each direction.
- For major-street left-turn sight distance, the implementation of a road diet mitigates site distance restrictions illustrated in both Figures 19 and 20.

With the publication of the Highway Safety Manual in 2010, research is now available in the form of crash modification/reduction factors that can help assess the impact on the frequency of crashes. Table 4 summarizes the anticipated crash reduction of a road diet on N Marian Road based on the 2010 Highway Safety Manual and the Crash Modification Clearinghouse Website, which publishes the most current research.

Based on the findings in Table 4, a road diet would be expected to provide improved safety by reducing conflicts along the N Marian Road corridor.

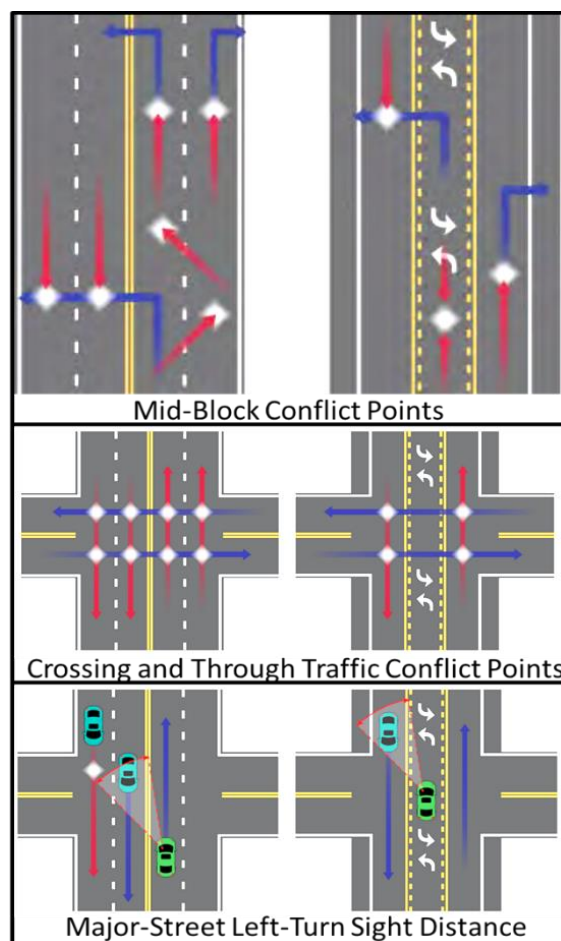


Figure 20: Safety Benefits of a Road Diet (FHWA)

Table 4: Road Diet Countermeasure and the Corresponding Predicted Crash Reduction

Countermeasure	Condition	Predicted Crash Reduction/Increase (%)		
		All Crashes	Angle Crashes	Rear End Crashes
Narrow Cross Section (4 to 3 lanes with two way left turn lane)	Urban	-37%	-24%	-31%

5.2 Average Daily Traffic on N Marian Road

According to information provided by NDOT, the average daily traffic (ADT) on N Marian Road varies from 2365 just south of W 2nd Street, rises to 5270 just south of W 7th Street, and falls back to 3145 just south of W 12th Street. Exhibit 16-16 in the Highway Capacity Manual (HCM) contains generalized daily service volumes for two and four-lane Urban Street Facilities. To further examine the possibility of a road diet on N Marian Road, existing traffic demands were compared to generalized daily service volumes. There have been several three-lane street sections implemented across the country in recent years comparable to N Marian Road. In most cases, a three-lane section can carry upwards of 18,000 to 20,000 vehicles per day depending on intersection spacing, traffic control, and the presence of right-turn lanes. As shown in Figure 21, the existing demands are significantly less than the capacity of a two-lane roadway. This suggests that a two-lane cross section with a TWLTL would be a feasible alternative on N Marian Road. A three-lane section was proposed to be implemented along this entire stretch back when the new school facility was built, and traffic signal control was deployed at the intersection with 5th Street.

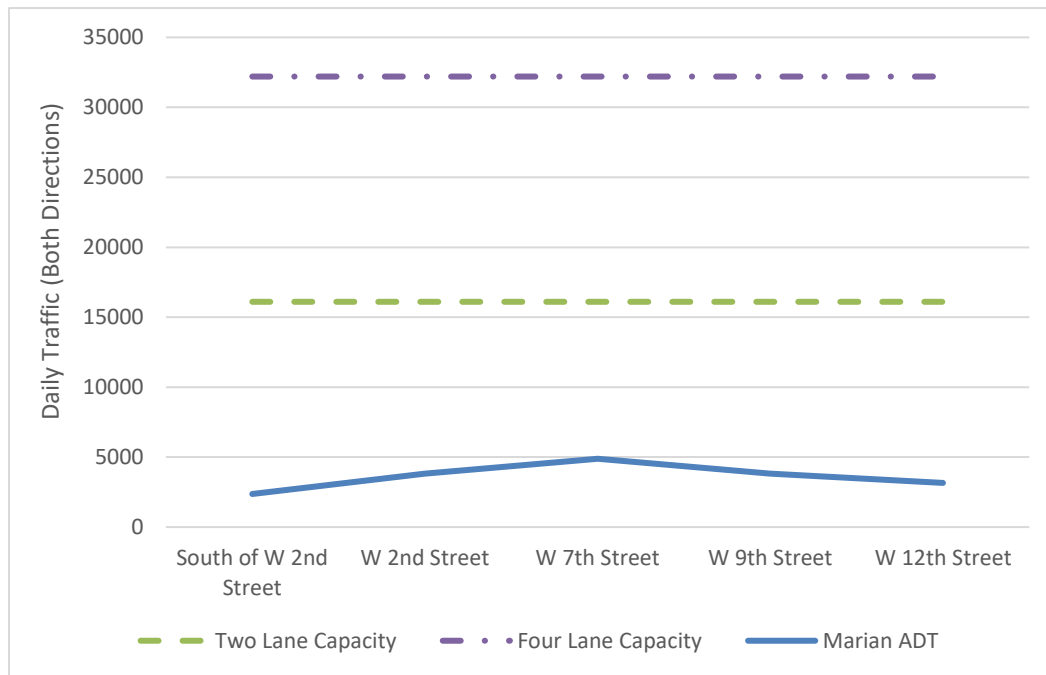


Figure 21: N Marian Road Existing Corridor Demands

6.0 Auxiliary Lane Warrant Analysis

The need for auxiliary lanes at two-way stop-controlled intersections was evaluated using the current NDOT accepted methodology from Report 457 of the National Highway Cooperative Highway Research Program (NCHRP).

6.1 Dedicated Major Road Left-Turn Lane Analysis

The need for dedicated left-turn lanes was evaluated at the study intersections of N Marian Road and East Drive, W 12th Street and North Drive, and W 12th Street and Northwest Drive. The results of this analysis are shown in Table 5 below. It should be noted that this left-turn analysis was based upon the assumption that both N Marian Road and W 12th Street are two lane roads.

Table 5: NCHRP 457 – Dedicated Left-Turn Lane Warrant Analysis Summary

Intersection	Existing Plus Site (2020)				Future Plus Site (2045)			
	NBL		WBL		NBL		WBL	
	AM	PM	AM	PM	AM	PM	AM	PM
N Marian Road and East Drive	Yes	Yes	-	-	Yes	Yes	-	-
W 12 th Street and North Drive	-	-	Yes	Yes	-	-	Yes	Yes
W 12 th Street and Northwest Drive	-	-	No	Yes	-	-	Yes	Yes

As shown in Table 5, mainline left-turns are warranted and should be constructed for all three site driveways. If a three-lane section is adopted for N Marian Road, the addition of a TWLTL would provide the needed northbound left-turn lane for the N Marian Road and East Drive intersection.

6.2 Dedicated Major Road Right-Turn Lane Analysis

The need for dedicated right-turn lanes was evaluated at the study intersections of N Marian Road and East Drive, W 12th Street and North Drive, and W 12th Street and Northwest Drive. No intersections satisfy the warrant for a major road right-turn lane. As such, right-turn lanes are not recommended at any site drives.

6.3 Minor Road Approach Geometry

The minor road need for dual approach lanes was evaluated at the study intersections of N Marian Road and East Drive, W 12th Street and North Drive, and W 12th Street and Northwest Drive. All side road (East Drive, North Drive, and Northwest Drive) approaches do not warrant dual lane approaches and should be constructed as single lane approaches.

7.0 N Marian Road and W 12th Street Intersection Alternatives

A warrant analysis was conducted for the intersection of N Marian Road and W 12th Street to determine if existing or projected 2045 traffic demands would satisfy 2009 Manual on Uniform Traffic Control Devices (MUTCD) signal warrants. Warrants 1 (eight hour) and 2 (four hour) were used. While the intersection of N Marian Road and W 12th Street does not satisfy either of these warrants under the existing conditions and likely would not under existing plus site, it is highly likely that both will be satisfied in 2045.

A roundabout was also examined for this intersection. According to Exhibit 3-12 in the NCHRP Report 672 – *Roundabouts An Informational Guide*, conditions at the N Marian Road and W 12th Street intersection would allow a roundabout to operate acceptably. Due to the moderate volumes, the higher left-turn movements on specific approaches, and the general variability in traffic at this intersection, a roundabout would be recommended to provide the best overall operational and safety characteristics. In addition, operation and maintenance costs and overall lifecycle return on investment are far superior with a roundabout intersection when compared to a traffic signal control for an intersection such as W 12th Street and N Marian Road.

A figure showing the recommended geometry for the study area is shown in Figure 22. Year 2045 background plus site peak hour volumes were then analyzed using this recommended geometry and the (un)signalized and roundabout intersection capacity analysis procedures outlined in the HCM. As shown in Figure 23, the roundabout operates at LOS A for all approaches during both peak hours, while the signal operates at LOS C or better during both peak hours. For this reason, the roundabout is the preferred option at the intersection of N Marian Road and W 12th Street.

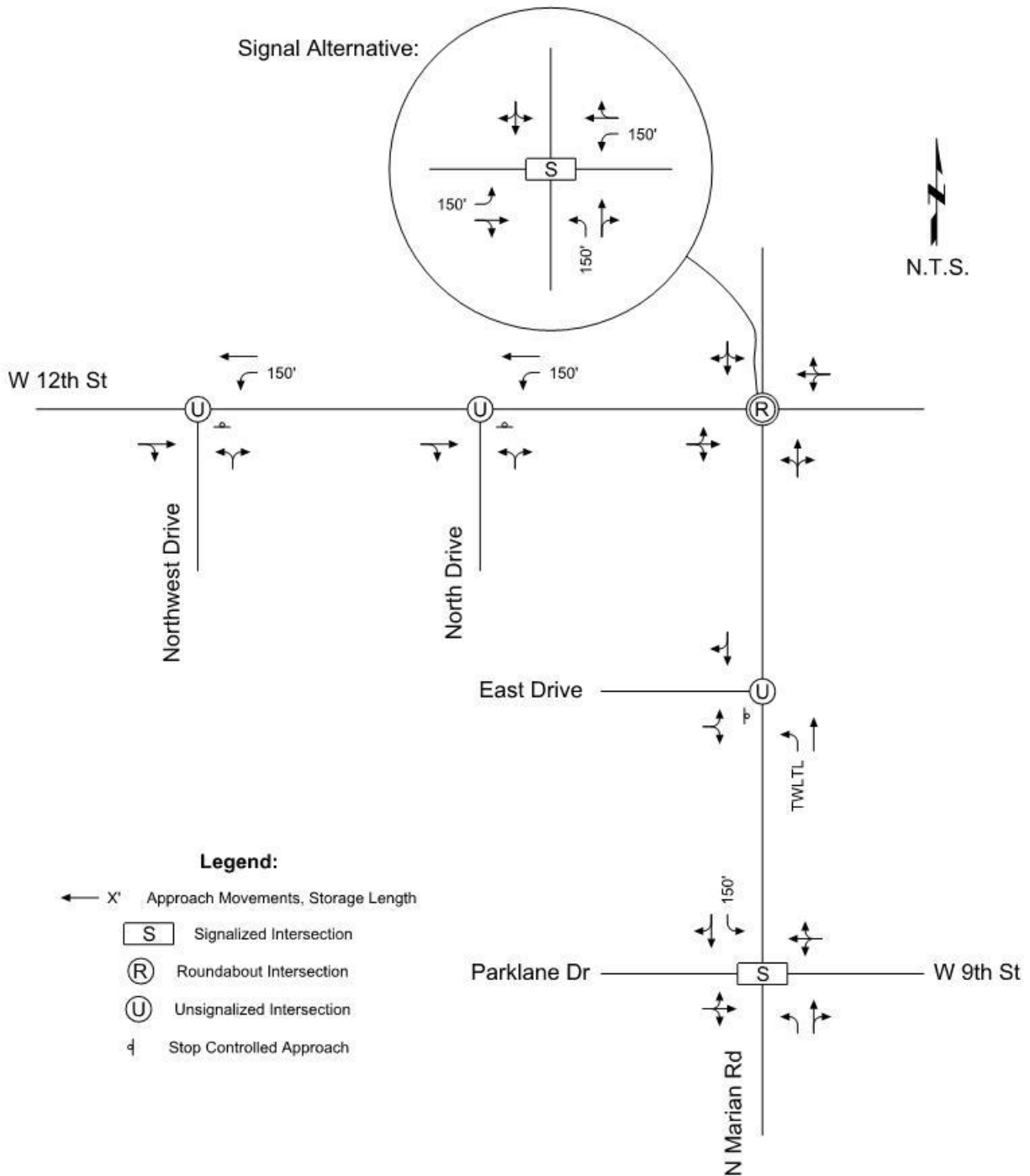


Figure 22: Recommended Intersection Geometry and Traffic Control

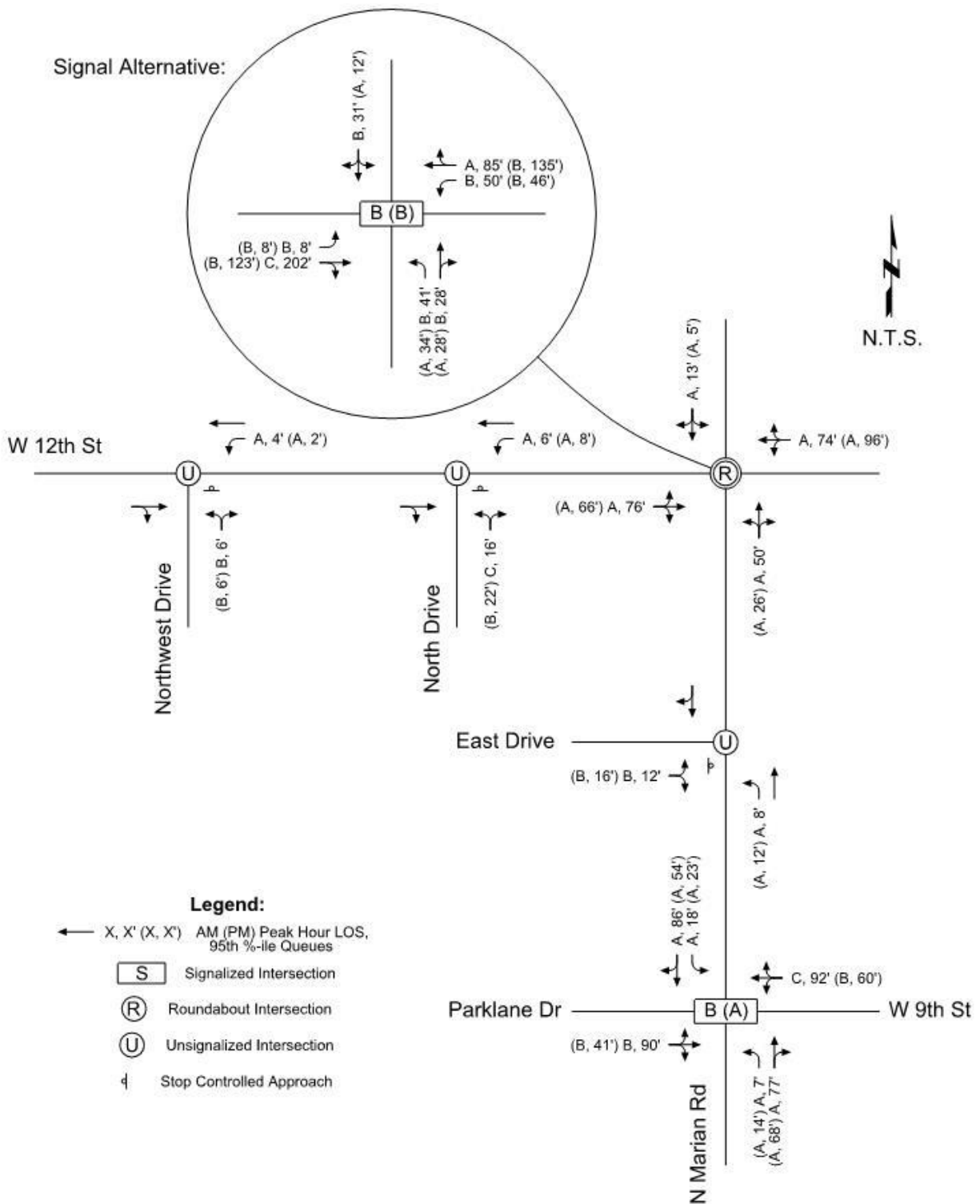


Figure 23: Year 2045 Background Plus Site LOS with Recommended Geometry

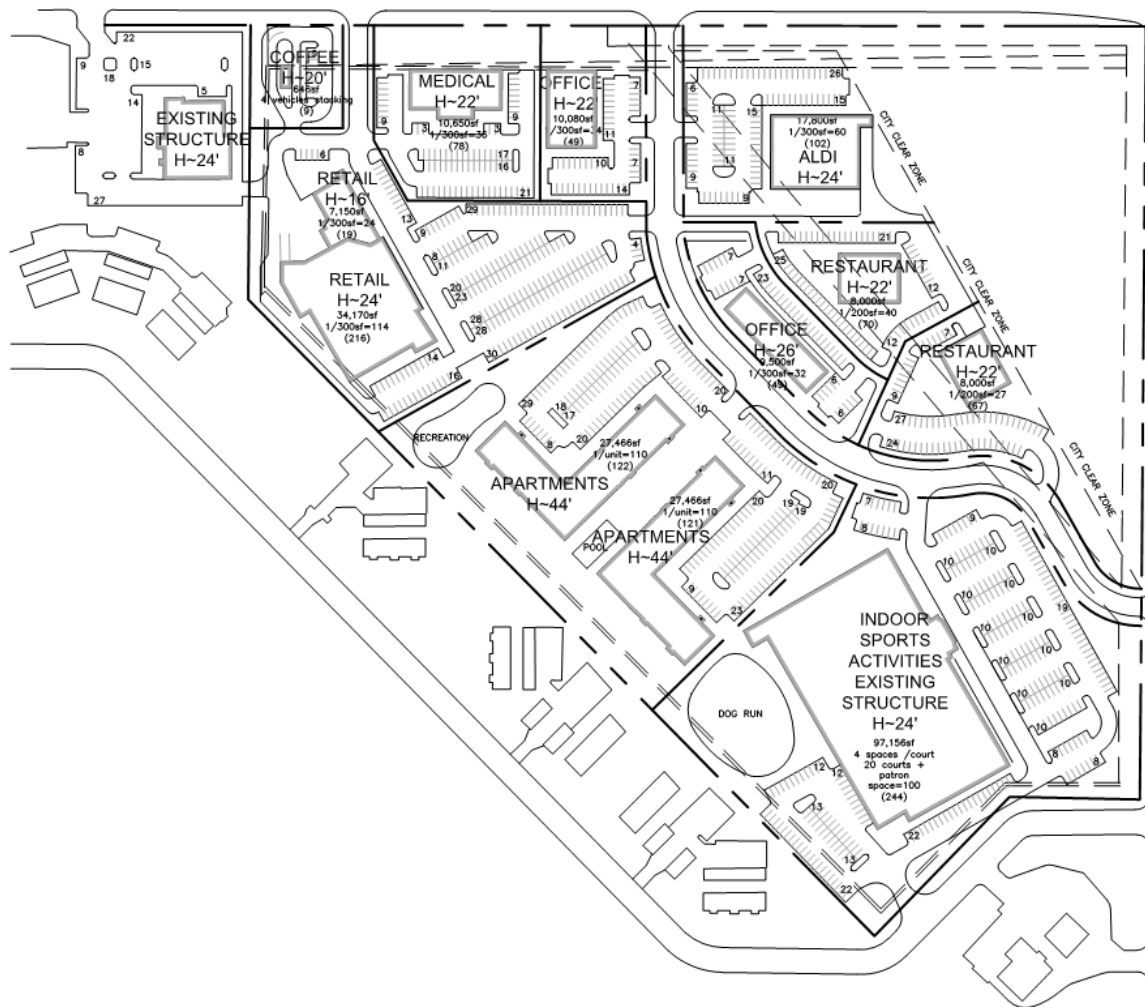
8.0 Conclusions and Recommendations

Based upon the analyses and evaluation of study area streets and traffic control, the following recommendations are provided:

- N Marian Road should be reconfigured from a four-lane, undivided street section to a three-lane section with center two-way left-turn lane for its entire distance. The capacity of a three-lane street section has been shown to carry up to approximately 20,000 vehicle per day depending on intersection spacing, traffic control, and presence of auxiliary turn lanes. For traffic volumes of 15,000 vehicles per day and under this three-lane facility is an obvious choice for improved safety and operations. Additional width along each side of the street can be reserved as shoulder space or marked as bicycle lanes as desired to provide improved mobility.
- The intersection of N Marian Road and W 12th Street should be reconfigured with a single-lane roundabout. The existing all-way stop is overcapacity on multiple approaches. The roundabout is also projected to operate at a higher LOS than a traffic signal, provide long-turn life cycle benefits, and improve the overall safety and operations of the intersection.
- Dedicated major road left-turn lanes should be provided at all three site drives for vehicles entering the proposed site (left-turn lanes along N Marian Road can be accommodated with the simple re-striping and implementation of a three-lane section). Based upon the analysis, no exclusive right-turn lanes are warranted.

Appendix A

Imperial Mall Concept Plan



Appendix D:

Development of Theatre District School PM Peak Hour Site Trips

The initial traffic impact study for the Imperial Mall’s redevelopment (theatre district site at the southwest corner of the W 12th Street & N Marian Road intersection) did not generate site trips for the school PM peak hour (for reference, this study has been included as Appendix C). However, peak hour volumes for the school weekday PM peak hour related to the traffic impact study site were required for the W 12th Street corridor study. The Institute of Transportation Engineer’s (ITE) Trip Generation Manual, 11th Edition, contains a breakdown of daily site trips as a percentage of daily traffic. Table 1 below shows the conversion between weekday commuter PM site trips and weekday school PM site trips.

Table D1: Volume Conversion From Commuter PM Peak Hour to School PM Peak Hour

Land Use	ITE Land Use Code	Volume during Commuter PM Peak*	Percent of Traffic during Commuter PM Peak Hour	Estimated Daily Trips	Percent of Traffic during School PM Peak Hour	Volume during School PM Peak
Multifamily Housing (Mid-Rise)	221	66	9.1%	725	5.3%	38
Clinic	630	35	7.7%	455	9.7%	44
General Office Building	710	24	11.0%	218	8.6%	19
Shopping Center	820	311	8.3%	3747	7.9%	296
Discount Supermarket	854	190	9.9%	1919	8.7%	167
High-Turnover Sit-Down Restaurant (1 of 2)	932	86	7.7%	1117	3.5%	78
High-Turnover Sit-Down Restaurant (2 of 2)	932	86	7.7%	1117	3.5%	39
Coffee/Donut Shop with Drive-Thru Window	937	31	3.5%	886	4.9%	43

*These volumes come from the “Imperial Mall Redevelopment Traffic Impact Study”, included as Appendix C.

It should be noted that the sports complex was not included in the table above. For the purposes of this report, it was assumed that the sports complex would not normally be open during the school PM peak hour. The volumes during the school PM peak were then routed in accordance with the procedures documented in the original study. These generated site trips are included as the school PM site trips in Figure 7 in the main body of this report.

Appendix E: Synchro Output Reports – Year 2048 Conditions

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	32.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕			↕	
Traffic Vol, veh/h	5	345	135	219	167	11	30	20	136	16	25	5
Future Vol, veh/h	5	345	135	219	167	11	30	20	136	16	25	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	7	454	178	288	220	14	39	26	179	21	33	7
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	234	0	0	632	0	0	1291	1278	454	1463	1449	227
Stage 1	-	-	-	-	-	-	468	468	-	803	803	-
Stage 2	-	-	-	-	-	-	823	810	-	660	646	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1322	-	-	941	-	-	139	165	602	105	130	807
Stage 1	-	-	-	-	-	-	572	558	-	374	393	-
Stage 2	-	-	-	-	-	-	365	390	-	449	464	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1322	-	-	941	-	-	71	106	602	44	84	807
Mov Cap-2 Maneuver	-	-	-	-	-	-	71	106	-	44	84	-
Stage 1	-	-	-	-	-	-	567	554	-	371	255	-
Stage 2	-	-	-	-	-	-	204	253	-	298	460	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			5.8			136.9			175.7		
HCM LOS							F			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	222	1322	-	-	941	-	-	69				
HCM Lane V/C Ratio	1.102	0.005	-	-	0.306	-	-	0.877				
HCM Control Delay (s)	136.9	7.7	0	-	10.5	0	-	175.7				
HCM Lane LOS	F	A	A	-	B	A	-	F				
HCM 95th %tile Q(veh)	11.1	0	-	-	1.3	-	-	4.3				

HCM 6th TWSC
6: Highland Rd & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕			↕	
Traffic Vol, veh/h	10	407	90	31	327	5	25	5	15	15	10	25
Future Vol, veh/h	10	407	90	31	327	5	25	5	15	15	10	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	13	522	115	40	419	6	32	6	19	19	13	32
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	425	0	0	637	0	0	1073	1053	522	1120	1165	422
Stage 1	-	-	-	-	-	-	548	548	-	502	502	-
Stage 2	-	-	-	-	-	-	525	505	-	618	663	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.327
Pot Cap-1 Maneuver	1129	-	-	942	-	-	197	225	553	183	193	630
Stage 1	-	-	-	-	-	-	519	515	-	550	540	-
Stage 2	-	-	-	-	-	-	534	539	-	475	457	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1129	-	-	942	-	-	167	209	553	163	179	630
Mov Cap-2 Maneuver	-	-	-	-	-	-	167	209	-	163	179	-
Stage 1	-	-	-	-	-	-	510	506	-	540	510	-
Stage 2	-	-	-	-	-	-	466	509	-	445	449	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.8			26.6			22.7		
HCM LOS							D			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	224	1129	-	-	942	-	-	267				
HCM Lane V/C Ratio	0.258	0.011	-	-	0.042	-	-	0.24				
HCM Control Delay (s)	26.6	8.2	0	-	9	0	-	22.7				
HCM Lane LOS	D	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1	0	-	-	0.1	-	-	0.9				

Intersection

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	412	20	5	338	25	26
Future Vol, veh/h	412	20	5	338	25	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	564	27	7	463	34	36

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	591
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	985
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	985
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	18.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	337	-	-	985	-
HCM Lane V/C Ratio	0.207	-	-	0.007	-
HCM Control Delay (s)	18.5	-	-	8.7	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0	-

Intersection												
Int Delay, s/veh	12.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	678	21	70	521	10	5	15	105	5	15	57
Future Vol, veh/h	11	678	21	70	521	10	5	15	105	5	15	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	869	27	90	668	13	6	19	135	6	19	73
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	681	0	0	896	0	0	1812	1772	883	1843	1779	675
Stage 1	-	-	-	-	-	-	911	911	-	855	855	-
Stage 2	-	-	-	-	-	-	901	861	-	988	924	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	912	-	-	757	-	-	61	83	345	58	82	454
Stage 1	-	-	-	-	-	-	328	353	-	353	375	-
Stage 2	-	-	-	-	-	-	333	372	-	297	348	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	912	-	-	757	-	-	33	65	345	23	64	454
Mov Cap-2 Maneuver	-	-	-	-	-	-	33	65	-	23	64	-
Stage 1	-	-	-	-	-	-	318	342	-	342	303	-
Stage 2	-	-	-	-	-	-	211	301	-	166	337	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			1.2			90.4			85.4		
HCM LOS							F			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	182	912	-	-	757	-	-	133				
HCM Lane V/C Ratio	0.881	0.015	-	-	0.119	-	-	0.742				
HCM Control Delay (s)	90.4	9	0	-	10.4	0	-	85.4				
HCM Lane LOS	F	A	A	-	B	A	-	F				
HCM 95th %tile Q(veh)	6.5	0	-	-	0.4	-	-	4.3				

Intersection												
Int Delay, s/veh	22.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	65	698	10	45	531	70	5	15	40	10	10	85
Future Vol, veh/h	65	698	10	45	531	70	5	15	40	10	10	85
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	84	906	13	58	690	91	6	19	52	13	13	110
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	781	0	0	919	0	0	1994	1978	913	1968	1939	736
Stage 1	-	-	-	-	-	-	1081	1081	-	852	852	-
Stage 2	-	-	-	-	-	-	913	897	-	1116	1087	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	837	-	-	743	-	-	45	62	331	47	65	419
Stage 1	-	-	-	-	-	-	264	294	-	354	376	-
Stage 2	-	-	-	-	-	-	328	358	-	252	292	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	837	-	-	743	-	-	20	42	331	20	44	419
Mov Cap-2 Maneuver	-	-	-	-	-	-	20	42	-	20	44	-
Stage 1	-	-	-	-	-	-	210	233	-	281	323	-
Stage 2	-	-	-	-	-	-	199	308	-	155	232	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.7			175.2			222.9		
HCM LOS							F			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	82	837	-	-	743	-	-	113				
HCM Lane V/C Ratio	0.95	0.101	-	-	0.079	-	-	1.207				
HCM Control Delay (s)	175.2	9.8	0	-	10.3	0	-	222.9				
HCM Lane LOS	F	A	A	-	B	A	-	F				
HCM 95th %tile Q(veh)	5.2	0.3	-	-	0.3	-	-	8.8				

HCM 6th AWSC
11: N Marian Rd & W 12th St

05/25/2023

Intersection

Intersection Delay, s/veh 191.8

Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔	↔		↔	
Traffic Vol, veh/h	30	470	52	220	338	5	79	30	245	10	55	55
Future Vol, veh/h	30	470	52	220	338	5	79	30	245	10	55	55
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	610	68	286	439	6	103	39	318	13	71	71
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	251.1	273.9	26.4	21.6
HCM LOS	F	F	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	72%	0%	5%	39%	8%
Vol Thru, %	28%	0%	85%	60%	46%
Vol Right, %	0%	100%	9%	1%	46%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	109	245	552	563	120
LT Vol	79	0	30	220	10
Through Vol	30	0	470	338	55
RT Vol	0	245	52	5	55
Lane Flow Rate	142	318	717	731	156
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.345	0.682	1.48	1.533	0.385
Departure Headway (Hd)	10.483	9.364	8.506	8.542	11.571
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	345	388	437	431	313
Service Time	8.183	7.064	6.506	6.542	9.571
HCM Lane V/C Ratio	0.412	0.82	1.641	1.696	0.498
HCM Control Delay	18.6	29.9	251.1	273.9	21.6
HCM Lane LOS	C	D	F	F	C
HCM 95th-tile Q	1.5	4.9	32.6	35	1.8

HCM 6th Signalized Intersection Summary

20: N Baltimore Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	205	531	27	25	415	20	17	190	40	25	195	154
Future Volume (veh/h)	205	531	27	25	415	20	17	190	40	25	195	154
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	263	681	35	32	532	26	22	244	51	32	250	197
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	403	940	48	296	943	46	83	483	96	84	314	233
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	851	1763	91	735	1768	86	57	1449	289	60	941	700
Grp Volume(v), veh/h	263	0	716	32	0	558	317	0	0	479	0	0
Grp Sat Flow(s),veh/h/ln	851	0	1854	735	0	1855	1795	0	0	1701	0	0
Q Serve(g_s), s	17.9	0.0	17.6	2.1	0.0	12.0	0.0	0.0	0.0	6.3	0.0	0.0
Cycle Q Clear(g_c), s	30.0	0.0	17.6	19.7	0.0	12.0	8.4	0.0	0.0	15.6	0.0	0.0
Prop In Lane	1.00		0.05	1.00		0.05	0.07		0.16	0.07		0.41
Lane Grp Cap(c), veh/h	403	0	989	296	0	989	662	0	0	631	0	0
V/C Ratio(X)	0.65	0.00	0.72	0.11	0.00	0.56	0.48	0.00	0.00	0.76	0.00	0.00
Avail Cap(c_a), veh/h	403	0	989	296	0	989	662	0	0	631	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.3	0.0	10.6	18.1	0.0	9.3	16.1	0.0	0.0	18.4	0.0	0.0
Incr Delay (d2), s/veh	8.0	0.0	4.6	0.7	0.0	2.3	2.5	0.0	0.0	8.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.2	0.0	11.3	0.7	0.0	8.0	6.7	0.0	0.0	11.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.3	0.0	15.3	18.9	0.0	11.7	18.6	0.0	0.0	26.8	0.0	0.0
LnGrp LOS	C	A	B	B	A	B	B	A	A	C	A	A
Approach Vol, veh/h	979			590			317			479		
Approach Delay, s/veh	18.5			12.1			18.6			26.8		
Approach LOS	B			B			B			C		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	24.0			36.0			24.0			36.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	20.0			32.0			20.0			32.0		
Max Q Clear Time (g_c+I1), s	10.4			32.0			17.6			21.7		
Green Ext Time (p_c), s	1.4			0.0			0.8			2.8		
Intersection Summary												
HCM 6th Ctrl Delay	18.6											
HCM 6th LOS	B											

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Future Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	300	294	160	49	275	99	112	1074	99	49	975	156
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	335	389	222	107	620	259	234	1693	156	224	1579	252
Arrive On Green	0.37	0.37	0.37	0.37	0.37	0.37	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	677	1056	603	138	1681	703	494	3264	301	475	3044	487
Grp Volume(v), veh/h	335	0	419	203	0	220	112	580	593	49	564	567
Grp Sat Flow(s),veh/h/ln	756	0	1580	960	0	1562	494	1763	1801	475	1763	1768
Q Serve(g_s), s	21.2	0.0	18.2	1.9	0.0	8.3	16.6	18.9	18.9	6.6	18.1	18.2
Cycle Q Clear(g_c), s	29.5	0.0	18.2	20.2	0.0	8.3	34.8	18.9	18.9	25.5	18.1	18.2
Prop In Lane	0.90		0.38	0.24		0.45	1.00		0.17	1.00		0.28
Lane Grp Cap(c), veh/h	364	0	583	410	0	576	234	914	934	224	914	917
V/C Ratio(X)	0.92	0.00	0.72	0.50	0.00	0.38	0.48	0.63	0.63	0.22	0.62	0.62
Avail Cap(c_a), veh/h	364	0	583	410	0	576	234	914	934	224	914	917
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.2	0.0	21.7	19.0	0.0	18.6	26.0	13.8	13.8	23.0	13.6	13.6
Incr Delay (d2), s/veh	27.9	0.0	4.3	0.9	0.0	0.4	6.9	3.3	3.3	2.2	3.1	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	14.3	0.0	11.4	4.9	0.0	5.4	4.1	11.8	12.1	1.5	11.4	11.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	59.1	0.0	26.0	19.9	0.0	19.0	32.8	17.1	17.1	25.2	16.7	16.8
LnGrp LOS	E	A	C	B	A	B	C	B	B	C	B	B
Approach Vol, veh/h		754			423			1285			1180	
Approach Delay, s/veh		40.7			19.4			18.5			17.1	
Approach LOS		D			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		46.0		34.0		46.0		34.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		41.5		29.5		41.5		29.5				
Max Q Clear Time (g_c+I1), s		36.8		31.5		27.5		22.2				
Green Ext Time (p_c), s		3.2		0.0		6.7		1.6				
Intersection Summary												
HCM 6th Ctrl Delay				22.7								
HCM 6th LOS				C								

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕			↕	
Traffic Vol, veh/h	5	240	35	48	354	48	25	25	74	28	10	10
Future Vol, veh/h	5	240	35	48	354	48	25	25	74	28	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	6	282	41	56	416	56	29	29	87	33	12	12
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	472	0	0	323	0	0	862	878	282	929	891	444
Stage 1	-	-	-	-	-	-	294	294	-	556	556	-
Stage 2	-	-	-	-	-	-	568	584	-	373	335	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1079	-	-	1226	-	-	273	284	752	246	280	610
Stage 1	-	-	-	-	-	-	710	666	-	512	509	-
Stage 2	-	-	-	-	-	-	504	495	-	644	639	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1079	-	-	1226	-	-	245	264	752	189	261	610
Mov Cap-2 Maneuver	-	-	-	-	-	-	245	264	-	189	261	-
Stage 1	-	-	-	-	-	-	705	661	-	508	477	-
Stage 2	-	-	-	-	-	-	452	464	-	540	635	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.9			18.1			24.9		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	420	1079	-	-	1226	-	-	237				
HCM Lane V/C Ratio	0.347	0.005	-	-	0.046	-	-	0.238				
HCM Control Delay (s)	18.1	8.4	0	-	8.1	0	-	24.9				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.5	0	-	-	0.1	-	-	0.9				

HCM 6th TWSC
6: Highland Rd & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	6.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	292	50	21	365	11	100	20	23	16	10	5
Future Vol, veh/h	10	292	50	21	365	11	100	20	23	16	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	2
Mvmt Flow	12	348	60	25	435	13	119	24	27	19	12	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	448	0	0	408	0	0	873	870	348	920	924	442
Stage 1	-	-	-	-	-	-	372	372	-	492	492	-
Stage 2	-	-	-	-	-	-	501	498	-	428	432	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.318
Pot Cap-1 Maneuver	1107	-	-	1145	-	-	269	289	693	250	268	615
Stage 1	-	-	-	-	-	-	646	617	-	557	546	-
Stage 2	-	-	-	-	-	-	550	543	-	603	581	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1107	-	-	1145	-	-	249	277	693	217	256	615
Mov Cap-2 Maneuver	-	-	-	-	-	-	249	277	-	217	256	-
Stage 1	-	-	-	-	-	-	637	608	-	549	530	-
Stage 2	-	-	-	-	-	-	517	527	-	549	573	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.4			35.5			21.4		
HCM LOS							E			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	282	1107	-	-	1145	-	-	256				
HCM Lane V/C Ratio	0.604	0.011	-	-	0.022	-	-	0.144				
HCM Control Delay (s)	35.5	8.3	0	-	8.2	0	-	21.4				
HCM Lane LOS	E	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	3.6	0	-	-	0.1	-	-	0.5				

Intersection

Int Delay, s/veh 0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	316	10	27	382	10	16
Future Vol, veh/h	316	10	27	382	10	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	376	12	32	455	12	19

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	388
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1170
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1170
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	451	-	-	1170	-
HCM Lane V/C Ratio	0.069	-	-	0.027	-
HCM Control Delay (s)	13.6	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

HCM 6th TWSC
14: N Laird Ave & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	5.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	495	12	75	628	5	12	20	70	5	20	18
Future Vol, veh/h	12	495	12	75	628	5	12	20	70	5	20	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	576	14	87	730	6	14	23	81	6	23	21
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	736	0	0	590	0	0	1540	1521	583	1570	1525	733
Stage 1	-	-	-	-	-	-	611	611	-	907	907	-
Stage 2	-	-	-	-	-	-	929	910	-	663	618	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	870	-	-	985	-	-	94	118	512	90	118	421
Stage 1	-	-	-	-	-	-	481	484	-	330	355	-
Stage 2	-	-	-	-	-	-	321	353	-	450	481	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	870	-	-	985	-	-	64	98	512	54	98	421
Mov Cap-2 Maneuver	-	-	-	-	-	-	64	98	-	54	98	-
Stage 1	-	-	-	-	-	-	469	472	-	322	302	-
Stage 2	-	-	-	-	-	-	239	300	-	351	469	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1			49.5			50.7		
HCM LOS							E			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	193	870	-	-	985	-	-	127				
HCM Lane V/C Ratio	0.615	0.016	-	-	0.089	-	-	0.394				
HCM Control Delay (s)	49.5	9.2	0	-	9	0	-	50.7				
HCM Lane LOS	E	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	3.5	0	-	-	0.3	-	-	1.7				

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	571	12	25	708	15	11	15	30	10	15	24
Future Vol, veh/h	12	571	12	25	708	15	11	15	30	10	15	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	634	13	28	787	17	12	17	33	11	17	27
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	804	0	0	647	0	0	1541	1527	641	1544	1525	796
Stage 1	-	-	-	-	-	-	667	667	-	852	852	-
Stage 2	-	-	-	-	-	-	874	860	-	692	673	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	820	-	-	939	-	-	94	117	475	94	118	387
Stage 1	-	-	-	-	-	-	448	457	-	354	376	-
Stage 2	-	-	-	-	-	-	344	373	-	434	454	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	820	-	-	939	-	-	73	108	475	73	109	387
Mov Cap-2 Maneuver	-	-	-	-	-	-	73	108	-	73	109	-
Stage 1	-	-	-	-	-	-	437	446	-	345	356	-
Stage 2	-	-	-	-	-	-	289	353	-	379	443	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.3			41.5			43.6		
HCM LOS							E			E		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	159	820	-	-	939	-	-	146				
HCM Lane V/C Ratio	0.391	0.016	-	-	0.03	-	-	0.373				
HCM Control Delay (s)	41.5	9.5	0	-	9	0	-	43.6				
HCM Lane LOS	E	A	A	-	A	A	-	E				
HCM 95th %tile Q(veh)	1.7	0.1	-	-	0.1	-	-	1.6				

HCM 6th AWSC
11: N Marian Rd & W 12th St

05/25/2023

Intersection	
Intersection Delay, s/veh	151
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔	↔		↔	
Traffic Vol, veh/h	15	384	85	169	504	5	75	15	150	5	15	15
Future Vol, veh/h	15	384	85	169	504	5	75	15	150	5	15	15
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	19	492	109	217	646	6	96	19	192	6	19	19
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	79.9	256.7	15.5	13.8
HCM LOS	F	F	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	83%	0%	3%	25%	14%
Vol Thru, %	17%	0%	79%	74%	43%
Vol Right, %	0%	100%	18%	1%	43%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	150	484	678	35
LT Vol	75	0	15	169	5
Through Vol	15	0	384	504	15
RT Vol	0	150	85	5	15
Lane Flow Rate	115	192	621	869	45
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.265	0.381	1.053	1.51	0.103
Departure Headway (Hd)	9.196	8.031	6.836	6.444	9.652
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	393	452	534	574	374
Service Time	6.896	5.731	4.836	4.444	7.652
HCM Lane V/C Ratio	0.293	0.425	1.163	1.514	0.12
HCM Control Delay	15.2	15.6	79.9	256.7	13.8
HCM Lane LOS	C	C	F	F	B
HCM 95th-tile Q	1.1	1.8	16.3	43	0.3

HCM 6th Signalized Intersection Summary

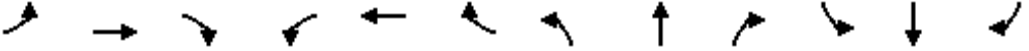
20: N Baltimore Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	403	18	25	535	45	24	155	25	30	150	204
Future Volume (veh/h)	175	403	18	25	535	45	24	155	25	30	150	204
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	201	463	21	29	615	52	28	178	29	34	172	234
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	327	947	43	456	907	77	102	484	73	88	237	296
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	769	1775	81	911	1701	144	106	1452	219	70	712	888
Grp Volume(v), veh/h	201	0	484	29	0	667	235	0	0	440	0	0
Grp Sat Flow(s),veh/h/ln	769	0	1856	911	0	1844	1777	0	0	1669	0	0
Q Serve(g_s), s	15.5	0.0	9.9	1.2	0.0	15.9	0.0	0.0	0.0	5.2	0.0	0.0
Cycle Q Clear(g_c), s	31.4	0.0	9.9	11.1	0.0	15.9	5.9	0.0	0.0	14.2	0.0	0.0
Prop In Lane	1.00		0.04	1.00		0.08	0.12		0.12	0.08		0.53
Lane Grp Cap(c), veh/h	327	0	990	456	0	984	659	0	0	621	0	0
V/C Ratio(X)	0.61	0.00	0.49	0.06	0.00	0.68	0.36	0.00	0.00	0.71	0.00	0.00
Avail Cap(c_a), veh/h	327	0	990	456	0	984	659	0	0	621	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.7	0.0	8.8	12.3	0.0	10.2	15.3	0.0	0.0	18.0	0.0	0.0
Incr Delay (d2), s/veh	8.4	0.0	1.7	0.3	0.0	3.8	1.5	0.0	0.0	6.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.9	0.0	6.6	0.5	0.0	10.2	4.6	0.0	0.0	10.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.1	0.0	10.6	12.6	0.0	14.0	16.8	0.0	0.0	24.7	0.0	0.0
LnGrp LOS	C	A	B	B	A	B	B	A	A	C	A	A
Approach Vol, veh/h	685			696			235			440		
Approach Delay, s/veh	16.3			13.9			16.8			24.7		
Approach LOS	B			B			B			C		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	24.0			36.0			24.0			36.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	20.0			32.0			20.0			32.0		
Max Q Clear Time (g_c+I1), s	7.9			33.4			16.2			17.9		
Green Ext Time (p_c), s	1.1			0.0			1.1			4.1		
Intersection Summary												
HCM 6th Ctrl Delay	17.4											
HCM 6th LOS	B											

HCM 6th Signalized Intersection Summary 24: US-34 / N Burlington Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔			↔↔		↗	↕↕		↗	↕↕	
Traffic Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Future Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	204	203	112	84	299	96	160	1146	101	67	1180	334
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	213	282	170	122	452	168	236	2008	177	269	1338	373
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.06	0.61	0.61	0.49	0.49	0.49
Sat Flow, veh/h	466	1026	617	219	1645	612	1767	3278	289	442	2722	759
Grp Volume(v), veh/h	232	0	287	232	0	247	160	616	631	67	758	756
Grp Sat Flow(s),veh/h/ln	531	0	1578	898	0	1578	1767	1763	1804	442	1763	1719
Q Serve(g_s), s	11.2	0.0	12.9	8.1	0.0	10.8	3.3	16.6	16.7	8.5	30.7	32.0
Cycle Q Clear(g_c), s	22.0	0.0	12.9	21.0	0.0	10.8	3.3	16.6	16.7	15.5	30.7	32.0
Prop In Lane	0.88		0.39	0.36		0.39	1.00		0.16	1.00		0.44
Lane Grp Cap(c), veh/h	231	0	434	308	0	434	236	1080	1105	269	866	845
V/C Ratio(X)	1.01	0.00	0.66	0.75	0.00	0.57	0.68	0.57	0.57	0.25	0.87	0.90
Avail Cap(c_a), veh/h	231	0	434	308	0	434	243	1080	1105	269	866	845
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.4	0.0	25.7	29.7	0.0	24.9	17.7	9.2	9.2	16.8	18.2	18.5
Incr Delay (d2), s/veh	61.4	0.0	3.7	9.9	0.0	1.8	7.1	2.2	2.1	2.2	12.0	14.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	13.2	0.0	8.8	8.9	0.0	7.5	3.3	9.8	10.0	1.7	19.9	20.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	97.9	0.0	29.4	39.6	0.0	26.7	24.8	11.4	11.4	19.0	30.1	32.5
LnGrp LOS	F	A	C	D	A	C	C	B	B	B	C	C
Approach Vol, veh/h		519			479			1407			1581	
Approach Delay, s/veh		60.1			32.9			12.9			30.8	
Approach LOS		E			C			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		53.5		26.5	9.7	43.8		26.5				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		49.0		22.0	5.5	39.0		22.0				
Max Q Clear Time (g_c+I1), s		18.7		24.0	5.3	34.0		23.0				
Green Ext Time (p_c), s		10.0		0.0	0.0	4.0		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				28.6								
HCM 6th LOS				C								

HCM 6th TWSC
3: N Adams Central Ave & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	9.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕			↕			↕	
Traffic Vol, veh/h	5	190	45	76	245	38	55	50	206	16	10	5
Future Vol, veh/h	5	190	45	76	245	38	55	50	206	16	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	225	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	6	213	51	85	275	43	62	56	231	18	11	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	318	0	0	264	0	0	700	713	213	861	743	297
Stage 1	-	-	-	-	-	-	225	225	-	467	467	-
Stage 2	-	-	-	-	-	-	475	488	-	394	276	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.14	6.54	6.24	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.14	5.54	-
Follow-up Hdwy	2.236	-	-	2.236	-	-	3.536	4.036	3.336	3.536	4.036	3.336
Pot Cap-1 Maneuver	1231	-	-	1289	-	-	351	355	822	273	341	738
Stage 1	-	-	-	-	-	-	773	714	-	572	558	-
Stage 2	-	-	-	-	-	-	567	547	-	627	678	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1231	-	-	1289	-	-	317	324	822	159	311	738
Mov Cap-2 Maneuver	-	-	-	-	-	-	317	324	-	159	311	-
Stage 1	-	-	-	-	-	-	768	710	-	569	513	-
Stage 2	-	-	-	-	-	-	506	503	-	412	674	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.7			23.2			24.2		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	538	1231	-	-	1289	-	-	222				
HCM Lane V/C Ratio	0.65	0.005	-	-	0.066	-	-	0.157				
HCM Control Delay (s)	23.2	7.9	0	-	8	0	-	24.2				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	4.6	0	-	-	0.2	-	-	0.5				

HCM 6th TWSC
6: Highland Rd & W 12th St

05/25/2023

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	367	40	27	303	10	60	10	22	5	10	10
Future Vol, veh/h	10	367	40	27	303	10	60	10	22	5	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	2
Mvmt Flow	11	422	46	31	348	11	69	11	25	6	11	11
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	359	0	0	468	0	0	871	865	422	901	906	354
Stage 1	-	-	-	-	-	-	444	444	-	416	416	-
Stage 2	-	-	-	-	-	-	427	421	-	485	490	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.13	6.53	6.23	7.13	6.53	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.13	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.527	4.027	3.327	3.527	4.027	3.318
Pot Cap-1 Maneuver	1194	-	-	1088	-	-	270	291	630	258	275	690
Stage 1	-	-	-	-	-	-	591	573	-	612	590	-
Stage 2	-	-	-	-	-	-	604	587	-	561	547	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1194	-	-	1088	-	-	247	277	630	231	262	690
Mov Cap-2 Maneuver	-	-	-	-	-	-	247	277	-	231	262	-
Stage 1	-	-	-	-	-	-	583	566	-	604	569	-
Stage 2	-	-	-	-	-	-	561	566	-	521	540	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.7			24.1			16.7		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	293	1194	-	-	1088	-	-	336				
HCM Lane V/C Ratio	0.361	0.01	-	-	0.029	-	-	0.086				
HCM Control Delay (s)	24.1	8	0	-	8.4	0	-	16.7				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	1.6	0	-	-	0.1	-	-	0.3				

HCM 6th TWSC
10: Sycamore Ave & W 12th St

05/25/2023

Intersection

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	374	20	27	310	25	21
Future Vol, veh/h	374	20	27	310	25	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	440	24	32	365	29	25

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	464
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1097
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1097
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	395	-	-	1097	-
HCM Lane V/C Ratio	0.137	-	-	0.029	-
HCM Control Delay (s)	15.6	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

HCM 6th TWSC
14: N Laird Ave & W 12th St

05/25/2023

Intersection

Int Delay, s/veh 9.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	23	630	23	105	561	15	6	10	105	5	15	35
Future Vol, veh/h	23	630	23	105	561	15	6	10	105	5	15	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	82	82	82	82	82	82	82	82	82	82	82	82
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	768	28	128	684	18	7	12	128	6	18	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	702	0	0	796	0	0	1818	1796	782	1857	1801	693
Stage 1	-	-	-	-	-	-	838	838	-	949	949	-
Stage 2	-	-	-	-	-	-	980	958	-	908	852	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	895	-	-	826	-	-	60	80	394	56	80	443
Stage 1	-	-	-	-	-	-	361	382	-	313	339	-
Stage 2	-	-	-	-	-	-	301	336	-	330	376	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	895	-	-	826	-	-	32	56	394	24	56	443
Mov Cap-2 Maneuver	-	-	-	-	-	-	32	56	-	24	56	-
Stage 1	-	-	-	-	-	-	341	361	-	295	253	-
Stage 2	-	-	-	-	-	-	188	250	-	203	355	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	1.6	68.4	96.7
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	191	895	-	-	826	-	-	99
HCM Lane V/C Ratio	0.773	0.031	-	-	0.155	-	-	0.678
HCM Control Delay (s)	68.4	9.2	0	-	10.2	0	-	96.7
HCM Lane LOS	F	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	5.2	0.1	-	-	0.5	-	-	3.4

Intersection												
Int Delay, s/veh	14.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	35	713	17	30	609	30	6	10	35	25	35	71
Future Vol, veh/h	35	713	17	30	609	30	6	10	35	25	35	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	775	18	33	662	33	7	11	38	27	38	77
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	695	0	0	793	0	0	1662	1621	784	1630	1614	679
Stage 1	-	-	-	-	-	-	860	860	-	745	745	-
Stage 2	-	-	-	-	-	-	802	761	-	885	869	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	901	-	-	828	-	-	77	103	393	81	104	452
Stage 1	-	-	-	-	-	-	351	373	-	406	421	-
Stage 2	-	-	-	-	-	-	378	414	-	340	369	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	901	-	-	828	-	-	39	89	393	60	90	452
Mov Cap-2 Maneuver	-	-	-	-	-	-	39	89	-	60	90	-
Stage 1	-	-	-	-	-	-	324	345	-	375	394	-
Stage 2	-	-	-	-	-	-	265	387	-	275	341	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.4			44.9			154.2		
HCM LOS							E			F		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	144	901	-	-	828	-	-	136				
HCM Lane V/C Ratio	0.385	0.042	-	-	0.039	-	-	1.047				
HCM Control Delay (s)	44.9	9.2	0	-	9.5	0	-	154.2				
HCM Lane LOS	E	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	1.6	0.1	-	-	0.1	-	-	7.7				

Intersection	
Intersection Delay, s/veh	128.7
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	448	70	198	417	5	50	20	235	5	15	15
Future Vol, veh/h	20	448	70	198	417	5	50	20	235	5	15	15
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	546	85	241	509	6	61	24	287	6	18	18
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	118.1	198.3	19.1	14.1
HCM LOS	F	F	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	71%	0%	4%	32%	14%
Vol Thru, %	29%	0%	83%	67%	43%
Vol Right, %	0%	100%	13%	1%	43%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	235	538	620	35
LT Vol	50	0	20	198	5
Through Vol	20	0	448	417	15
RT Vol	0	235	70	5	15
Lane Flow Rate	85	287	656	756	43
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.194	0.568	1.165	1.369	0.102
Departure Headway (Hd)	9.069	7.966	6.976	6.857	9.959
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	399	456	525	537	362
Service Time	6.769	5.666	4.976	4.857	7.959
HCM Lane V/C Ratio	0.213	0.629	1.25	1.408	0.119
HCM Control Delay	13.9	20.6	118.1	198.3	14.1
HCM Lane LOS	B	C	F	F	B
HCM 95th-tile Q	0.7	3.5	21.3	32.5	0.3

HCM 6th Signalized Intersection Summary 20: N Baltimore Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	237	483	29	25	453	30	29	130	40	30	185	198
Future Volume (veh/h)	237	483	29	25	453	30	29	130	40	30	185	198
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	272	555	33	29	521	34	33	149	46	34	213	228
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	405	932	55	382	926	60	112	414	116	86	271	270
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.33	0.33	0.33	0.33	0.33	0.33
Sat Flow, veh/h	854	1748	104	828	1737	113	130	1242	347	66	812	810
Grp Volume(v), veh/h	272	0	588	29	0	555	228	0	0	475	0	0
Grp Sat Flow(s),veh/h/ln	854	0	1852	828	0	1850	1719	0	0	1687	0	0
Q Serve(g_s), s	18.7	0.0	13.0	1.5	0.0	12.0	0.0	0.0	0.0	6.6	0.0	0.0
Cycle Q Clear(g_c), s	30.7	0.0	13.0	14.5	0.0	12.0	5.8	0.0	0.0	15.6	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.06	0.14		0.20	0.07		0.48
Lane Grp Cap(c), veh/h	405	0	988	382	0	987	642	0	0	627	0	0
V/C Ratio(X)	0.67	0.00	0.60	0.08	0.00	0.56	0.36	0.00	0.00	0.76	0.00	0.00
Avail Cap(c_a), veh/h	405	0	988	382	0	987	642	0	0	627	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.6	0.0	9.6	14.5	0.0	9.3	15.3	0.0	0.0	18.5	0.0	0.0
Incr Delay (d2), s/veh	8.6	0.0	2.6	0.4	0.0	2.3	1.5	0.0	0.0	8.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	7.6	0.0	8.6	0.5	0.0	8.0	4.4	0.0	0.0	11.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.2	0.0	12.2	14.9	0.0	11.7	16.8	0.0	0.0	26.8	0.0	0.0
LnGrp LOS	C	A	B	B	A	B	B	A	A	C	A	A
Approach Vol, veh/h	860			584			228			475		
Approach Delay, s/veh	17.3			11.8			16.8			26.8		
Approach LOS	B			B			B			C		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	24.0			36.0			24.0			36.0		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	20.0			32.0			20.0			32.0		
Max Q Clear Time (g_c+I1), s	7.8			32.7			17.6			16.5		
Green Ext Time (p_c), s	1.1			0.0			0.8			3.5		
Intersection Summary												
HCM 6th Ctrl Delay	17.8											
HCM 6th LOS	B											

HCM 6th Signalized Intersection Summary 24: US-34 / N Burlington Ave & W 12th St

05/25/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Future Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	233	251	157	54	183	103	168	1076	71	76	1054	241
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	295	324	229	129	427	275	268	1870	123	272	1188	270
Arrive On Green	0.31	0.31	0.31	0.31	0.31	0.31	0.08	0.56	0.56	0.42	0.42	0.42
Sat Flow, veh/h	651	1031	729	192	1359	876	1767	3357	221	486	2852	649
Grp Volume(v), veh/h	306	0	335	160	0	180	168	565	582	76	650	645
Grp Sat Flow(s),veh/h/ln	854	0	1557	897	0	1531	1767	1763	1816	486	1763	1739
Q Serve(g_s), s	15.6	0.0	13.2	2.1	0.0	6.4	3.5	14.6	14.6	8.5	23.8	24.1
Cycle Q Clear(g_c), s	22.0	0.0	13.2	15.2	0.0	6.4	3.5	14.6	14.6	13.2	23.8	24.1
Prop In Lane	0.76		0.47	0.34		0.57	1.00		0.12	1.00		0.37
Lane Grp Cap(c), veh/h	359	0	489	351	0	481	268	982	1012	272	734	724
V/C Ratio(X)	0.85	0.00	0.69	0.46	0.00	0.37	0.63	0.58	0.58	0.28	0.89	0.89
Avail Cap(c_a), veh/h	359	0	489	351	0	481	297	982	1012	272	734	724
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.2	0.0	21.0	19.7	0.0	18.6	15.3	10.1	10.1	17.6	18.9	19.0
Incr Delay (d2), s/veh	17.5	0.0	3.9	0.9	0.0	0.5	3.5	2.4	2.4	2.5	14.7	15.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	11.0	0.0	8.7	3.5	0.0	4.0	2.5	9.0	9.2	1.9	17.0	17.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	45.6	0.0	24.9	20.7	0.0	19.1	18.8	12.6	12.5	20.2	33.6	34.4
LnGrp LOS	D	A	C	C	A	B	B	B	B	C	C	C
Approach Vol, veh/h		641			340			1315			1371	
Approach Delay, s/veh		34.8			19.9			13.3			33.2	
Approach LOS		C			B			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		43.5		26.5	9.8	33.7		26.5				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		39.0		22.0	6.5	28.0		22.0				
Max Q Clear Time (g_c+I1), s		16.6		24.0	5.5	26.1		17.2				
Green Ext Time (p_c), s		8.0		0.0	0.0	1.5		0.9				
Intersection Summary												
HCM 6th Ctrl Delay				25.1								
HCM 6th LOS				C								

Appendix F: MUTCD Signal Warrant Sheets

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume															
Intersection:		W 12th St @ N Baltimore Ave													
Data Date		4/25/2023	by		1/0/1900										
2		: No. of Lanes on Major St?													
1		: No. of Lanes on Minor St?													
30		: Speed limit or 85th Percentile? (MPH)													
NO		: Is the intersection within an Isolated community?													
0		: if answer 4 is Yes, then what is the of the population isolated community?													
YES		: Have other remedial measures been tried?													
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B															
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?		
	E-W	N-S											A	B	
00:01 - 01:00	17	4	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
01:00 - 02:00	9	3	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
02:00 - 03:00	10	1	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
03:00 - 04:00	12	2	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
04:00 - 05:00	39	10	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
05:00 - 06:00	129	16	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
06:00 - 07:00	258	37	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
07:00 - 08:00	755	140	600	150	NO	900	75	NO	480	120	720	60	YES	YES	
08:00 - 09:00	494	90	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
09:00 - 10:00	394	70	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
10:00 - 11:00	373	72	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
11:00 - 12:00	451	91	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
12:00 - 13:00	462	98	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
13:00 - 14:00	443	87	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
14:00 - 15:00	404	100	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
15:00 - 16:00	777	154	600	150	YES	900	75	NO	480	120	720	60	YES	YES	
16:00 - 17:00	604	140	600	150	NO	900	75	NO	480	120	720	60	YES	NO	
17:00 - 18:00	700	138	600	150	NO	900	75	NO	480	120	720	60	YES	NO	
18:00 - 19:00	429	104	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
19:00 - 20:00	283	70	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
20:00 - 21:00	240	67	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
21:00 - 22:00	170	39	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
22:00 - 23:00	70	10	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
23:00 - 00:00	23	7	600	150	NO	900	75	NO	480	120	720	60	NO	NO	
												Number of Hours that met the warrant 1A =		1	
												Number of Hours that met the warrant 1B =		0	
												Number of Hours that met the warrant 1 A & B =		4	2
														4/2	
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)														NO	
B. Is the Interruption of Continuous Traffic Met? (Condition B)														NO	
C. Combination of Warrants A and B Criteria Met?														NO	

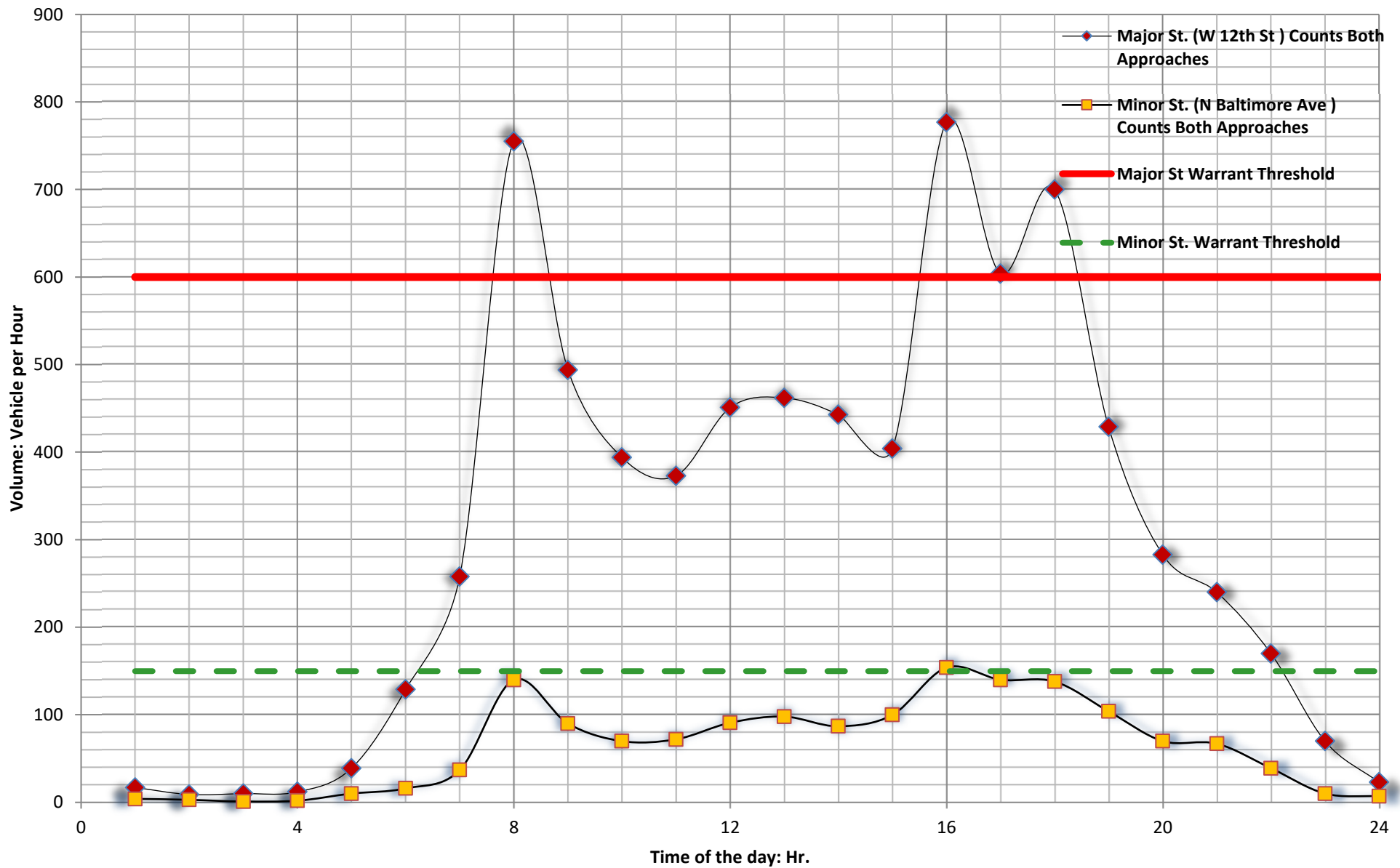


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 1

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

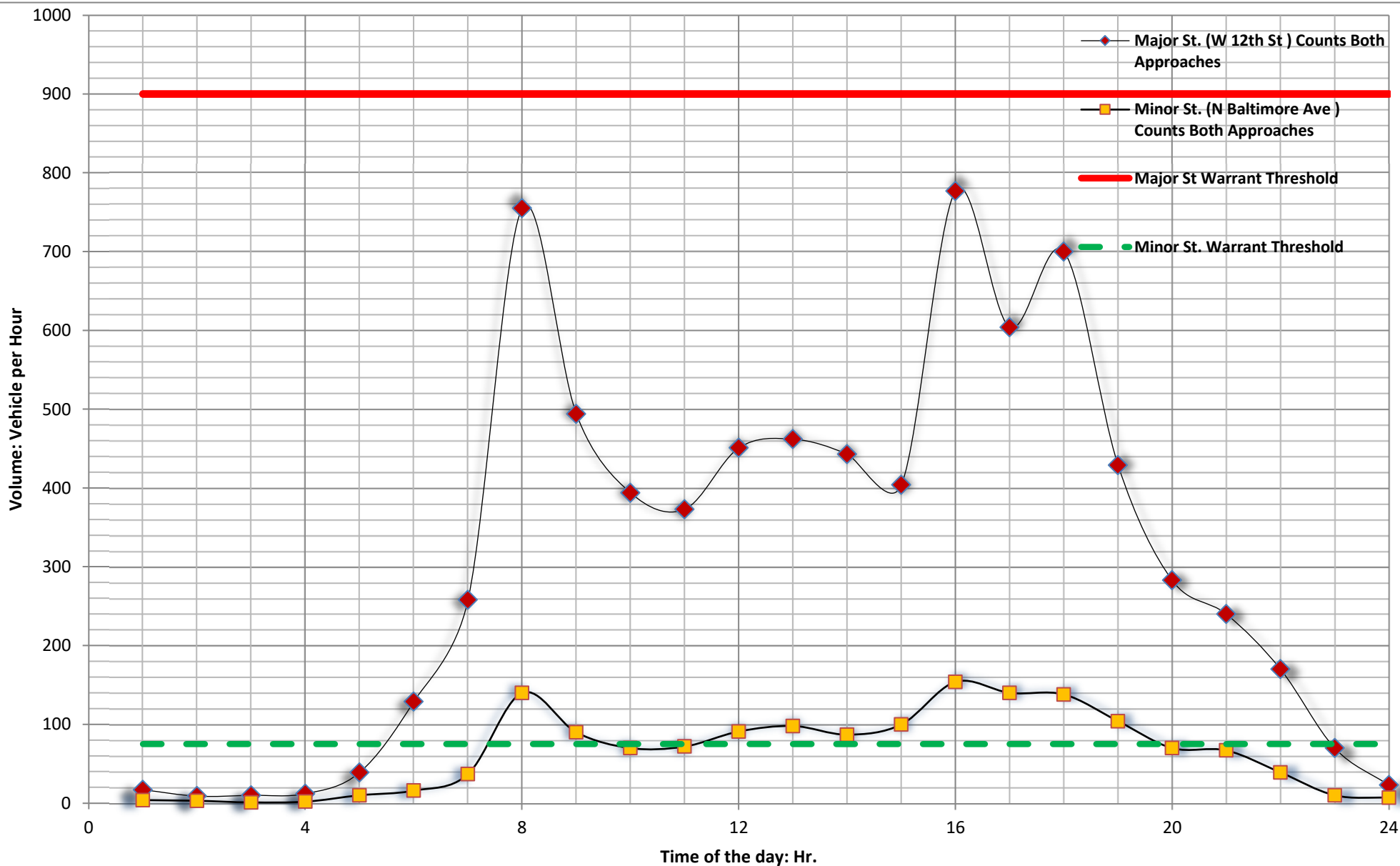


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 0

Does this intersection meet Warrant 1B for signal installation? NO

Data Collection Date: 4/25/2023

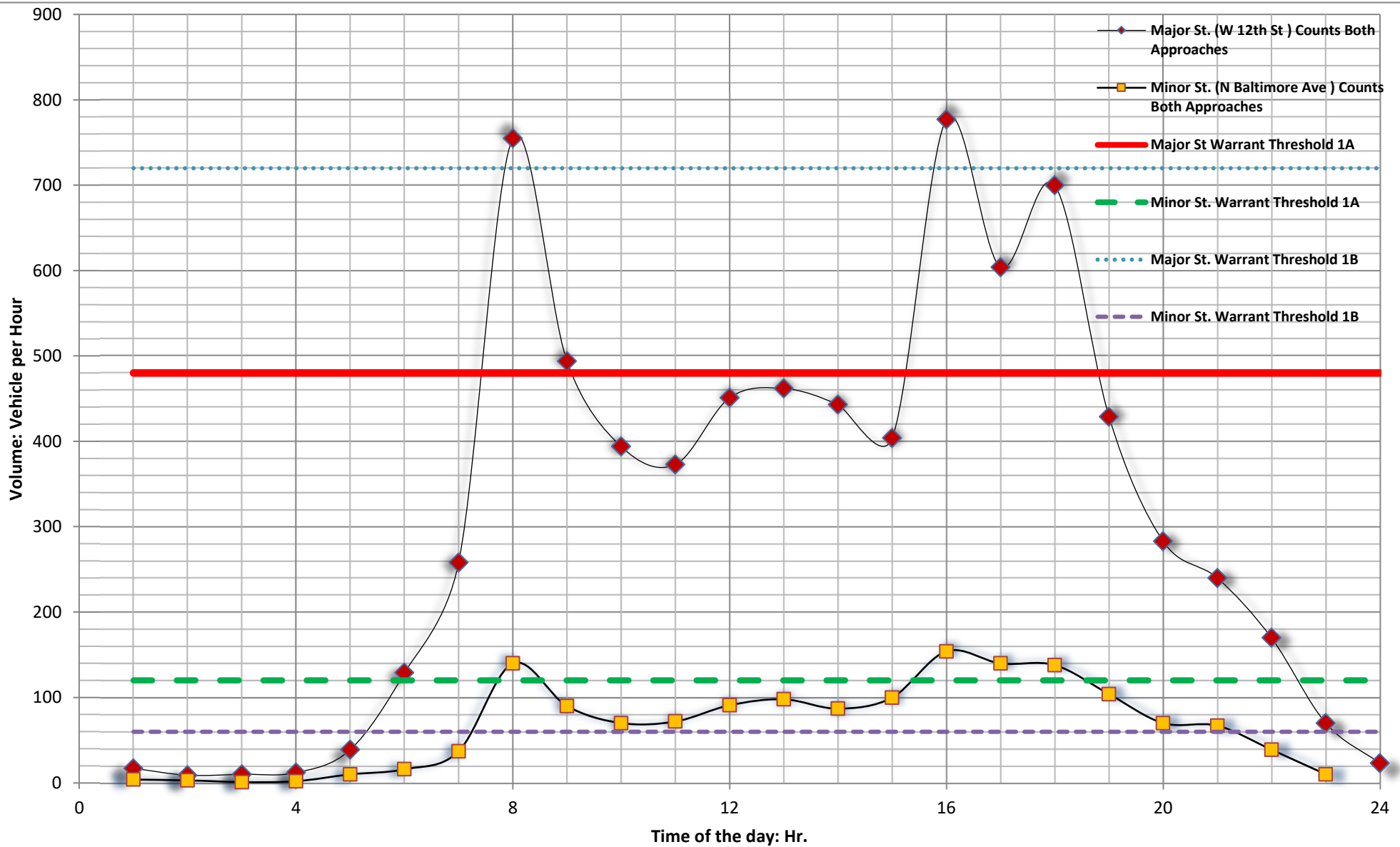


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 4/2

Does this intersection meet Warrant 1A&B for signal installation? NO

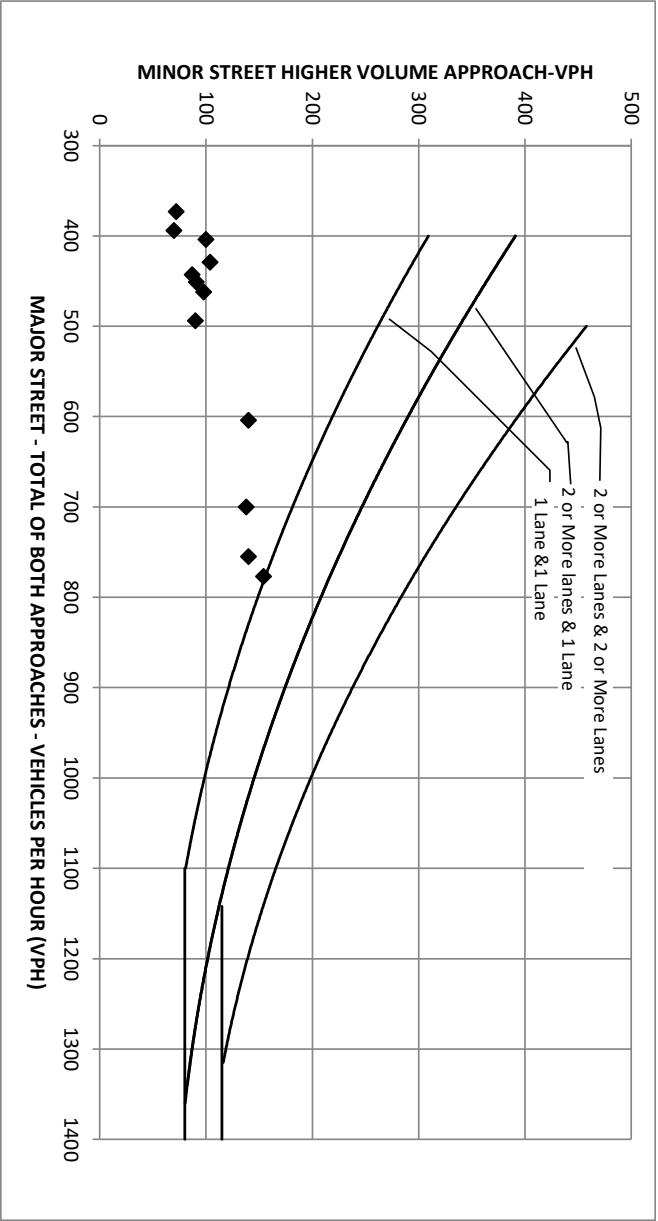
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	W 12th St @ N Baltimore Ave	
Data Date	4/25/2023	by 1/0/1900

2	: No. of Lanes on Major St.
1	: No. of Lanes on Minor St.
30	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met		0
Is Warrant 2 (100%) Met?		NO

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume														
Intersection:		W 12th St @ N Baltimore Ave												
Data Date		4/25/2023	by		1/0/1900									
2		: No. of Lanes on Major St?												
1		: No. of Lanes on Minor St?												
30		: Speed limit or 85th Percentile? (MPH)												
NO		: Is the intersection within an Isolated community?												
0		: if answer 4 is Yes, then what is the of the population isolated community?												
YES		: Have other remedial measures been tried?												
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B														
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?	
	E-W	N-S											A	B
00:01 - 01:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
01:00 - 02:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
02:00 - 03:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
03:00 - 04:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
04:00 - 05:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
05:00 - 06:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
06:00 - 07:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
07:00 - 08:00	1096	184	600	150	YES	900	75	YES	480	120	720	60	YES	YES
08:00 - 09:00	761	118	600	150	NO	900	75	NO	480	120	720	60	NO	YES
09:00 - 10:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
10:00 - 11:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
11:00 - 12:00	793	120	600	150	NO	900	75	NO	480	120	720	60	NO	YES
12:00 - 13:00	809	128	600	150	NO	900	75	NO	480	120	720	60	YES	YES
13:00 - 14:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
14:00 - 15:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
15:00 - 16:00	1215	202	600	150	YES	900	75	YES	480	120	720	60	YES	YES
16:00 - 17:00	989	185	600	150	YES	900	75	YES	480	120	720	60	YES	YES
17:00 - 18:00	1175	182	600	150	YES	900	75	YES	480	120	720	60	YES	YES
18:00 - 19:00	828	139	600	150	NO	900	75	NO	480	120	720	60	YES	YES
19:00 - 20:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
20:00 - 21:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
21:00 - 22:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
22:00 - 23:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
23:00 - 00:00	0	0	600	150	NO	900	75	NO	480	120	720	60	NO	NO
Number of Hours that met the warrant 1A =													4	
Number of Hours that met the warrant 1B =													4	
Number of Hours that met the warrant 1 A & B =													6	8
6/8														
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)													NO	
B. Is the Interruption of Continuous Traffic Met? (Condition B)													NO	
C. Combination of Warrants A and B Criteria Met?													NO	

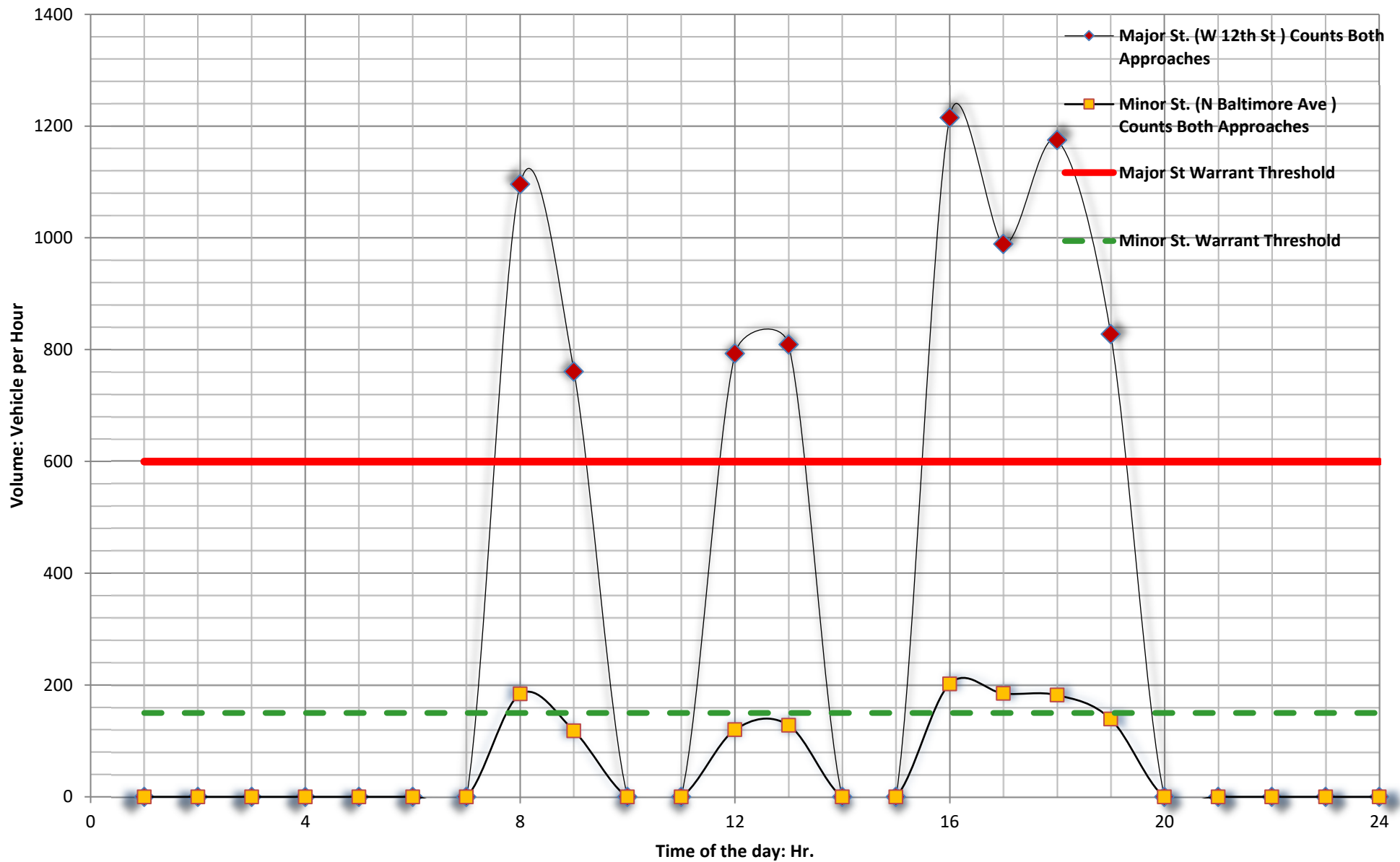


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 4

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

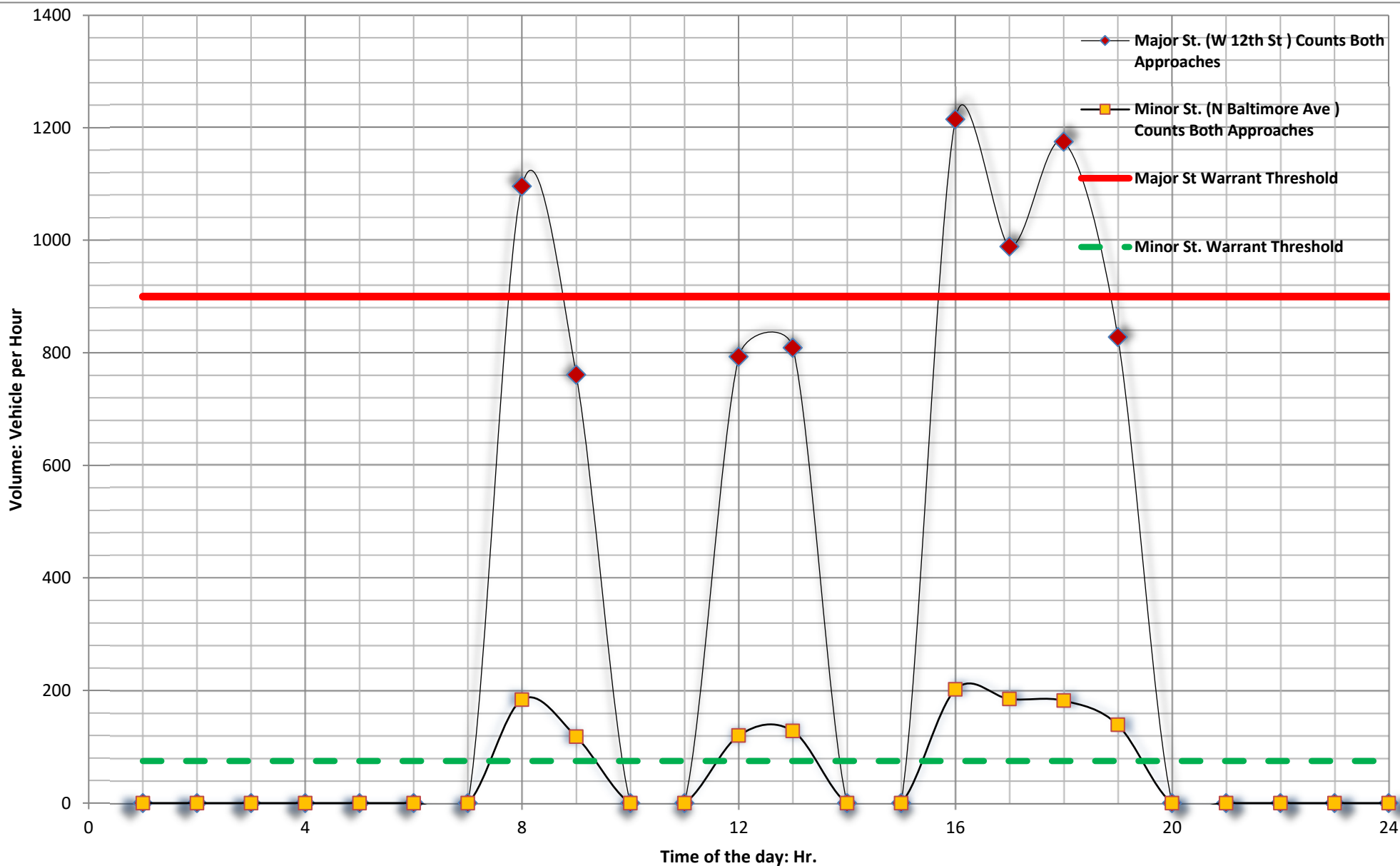


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 4

Does this intersection meet Warrant 1B for signal installation? NO

Data Collection Date: 4/25/2023

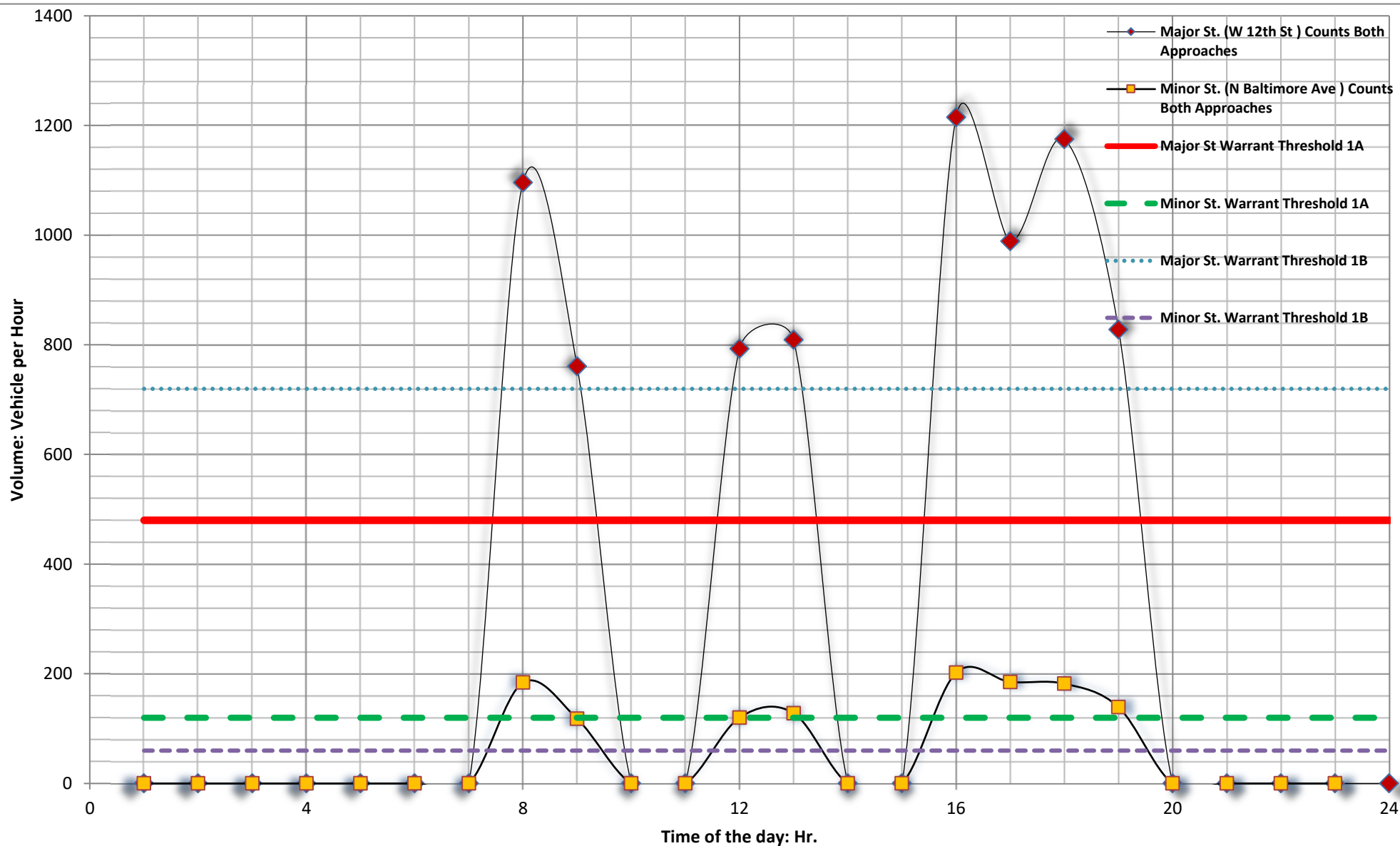


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Baltimore Ave

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 6/8

Does this intersection meet Warrant 1A&B for signal installation? NO

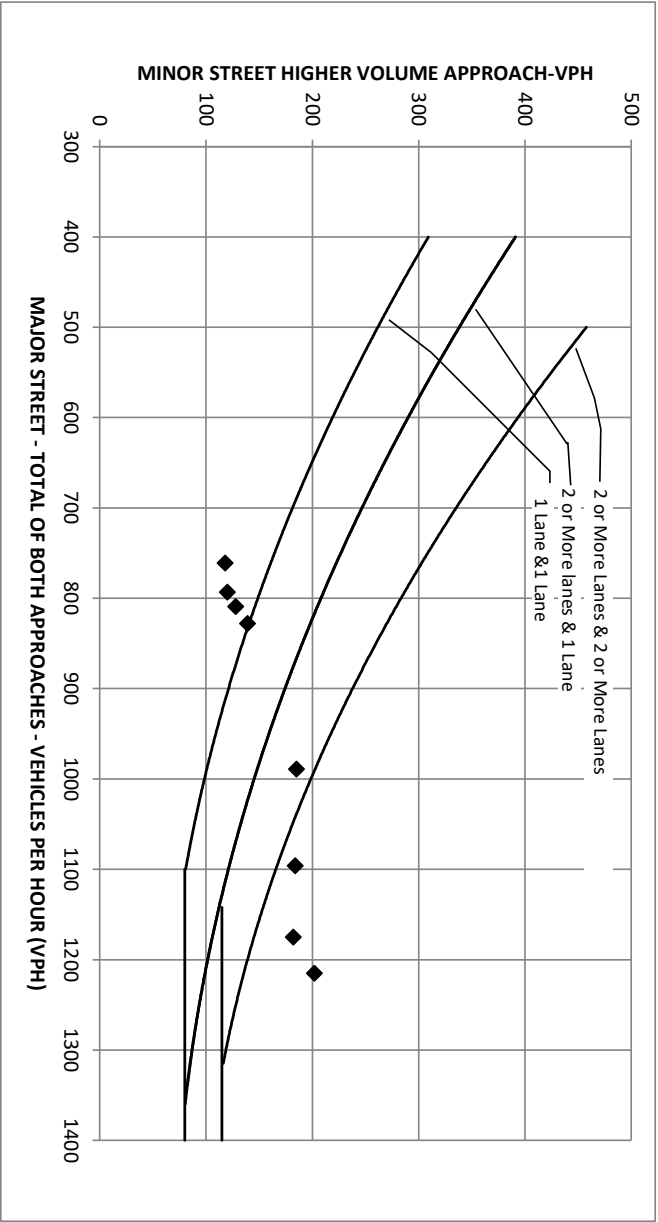
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	W 12th St @ N Baltimore Ave	
Data Date	4/25/2023	by 1/0/1900

2	: No. of Lanes on Major St.
1	: No. of Lanes on Minor St.
30	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met		4
Is Warrant 2 (100%) Met?		YES

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume														
Intersection:		N Burlington Ave @ W 12th St												
Data Date		4/25/2023	by		1/0/1900									
2		: No. of Lanes on Major St?												
2		: No. of Lanes on Minor St?												
35		: Speed limit or 85th Percentile? (MPH)												
NO		: Is the intersection within an Isolated community?												
0		: if answer 4 is Yes, then what is the of the population isolated community?												
YES		: Have other remedial measures been tried?												
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B														
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?	
	N-S	E-W											A	B
00:01 - 01:00	91	7	600	200	NO	900	100	NO	480	160	720	80	NO	NO
01:00 - 02:00	53	5	600	200	NO	900	100	NO	480	160	720	80	NO	NO
02:00 - 03:00	33	4	600	200	NO	900	100	NO	480	160	720	80	NO	NO
03:00 - 04:00	48	5	600	200	NO	900	100	NO	480	160	720	80	NO	NO
04:00 - 05:00	131	22	600	200	NO	900	100	NO	480	160	720	80	NO	NO
05:00 - 06:00	307	58	600	200	NO	900	100	NO	480	160	720	80	NO	NO
06:00 - 07:00	596	116	600	200	NO	900	100	NO	480	160	720	80	NO	NO
07:00 - 08:00	1369	297	600	200	YES	900	100	YES	480	160	720	80	YES	YES
08:00 - 09:00	1184	200	600	200	YES	900	100	YES	480	160	720	80	YES	YES
09:00 - 10:00	1182	158	600	200	NO	900	100	YES	480	160	720	80	NO	YES
10:00 - 11:00	1270	148	600	200	NO	900	100	YES	480	160	720	80	NO	YES
11:00 - 12:00	1485	153	600	200	NO	900	100	YES	480	160	720	80	NO	YES
12:00 - 13:00	1573	201	600	200	YES	900	100	YES	480	160	720	80	YES	YES
13:00 - 14:00	1467	159	600	200	NO	900	100	YES	480	160	720	80	NO	YES
14:00 - 15:00	1462	151	600	200	NO	900	100	YES	480	160	720	80	NO	YES
15:00 - 16:00	1799	268	600	200	YES	900	100	YES	480	160	720	80	YES	YES
16:00 - 17:00	1836	222	600	200	YES	900	100	YES	480	160	720	80	YES	YES
17:00 - 18:00	1911	214	600	200	YES	900	100	YES	480	160	720	80	YES	YES
18:00 - 19:00	1403	155	600	200	NO	900	100	YES	480	160	720	80	NO	YES
19:00 - 20:00	1016	100	600	200	NO	900	100	YES	480	160	720	80	NO	YES
20:00 - 21:00	827	85	600	200	NO	900	100	NO	480	160	720	80	NO	YES
21:00 - 22:00	543	72	600	200	NO	900	100	NO	480	160	720	80	NO	NO
22:00 - 23:00	326	26	600	200	NO	900	100	NO	480	160	720	80	NO	NO
23:00 - 00:00	142	10	600	200	NO	900	100	NO	480	160	720	80	NO	NO
Number of Hours that met the warrant 1A = 6 Number of Hours that met the warrant 1B = 13 Number of Hours that met the warrant 1 A & B = 6													14	6/14
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)														NO
B. Is the Interruption of Continuous Traffic Met? (Condition B)														YES
C. Combination of Warrants A and B Criteria Met?														NO

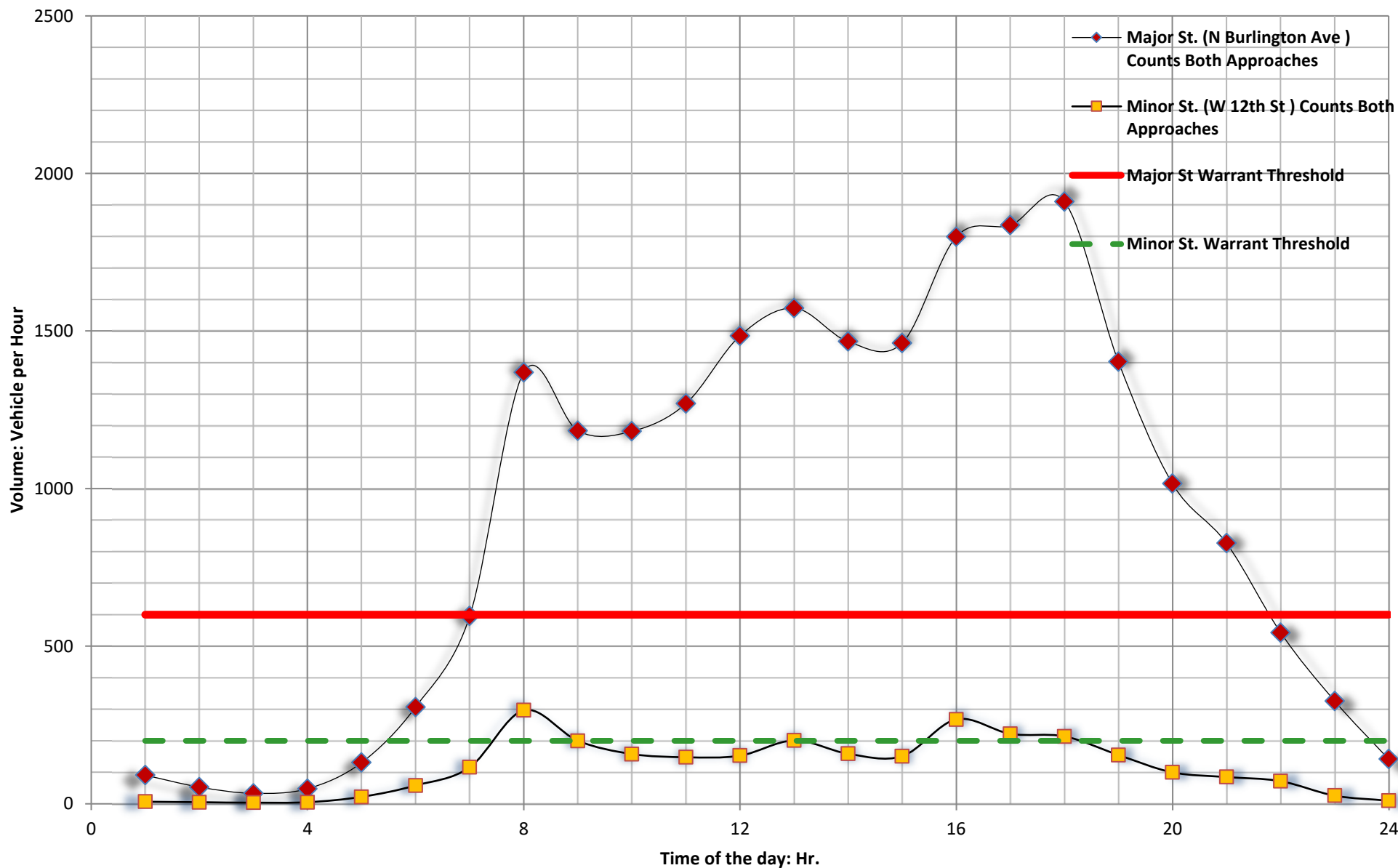


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 6

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

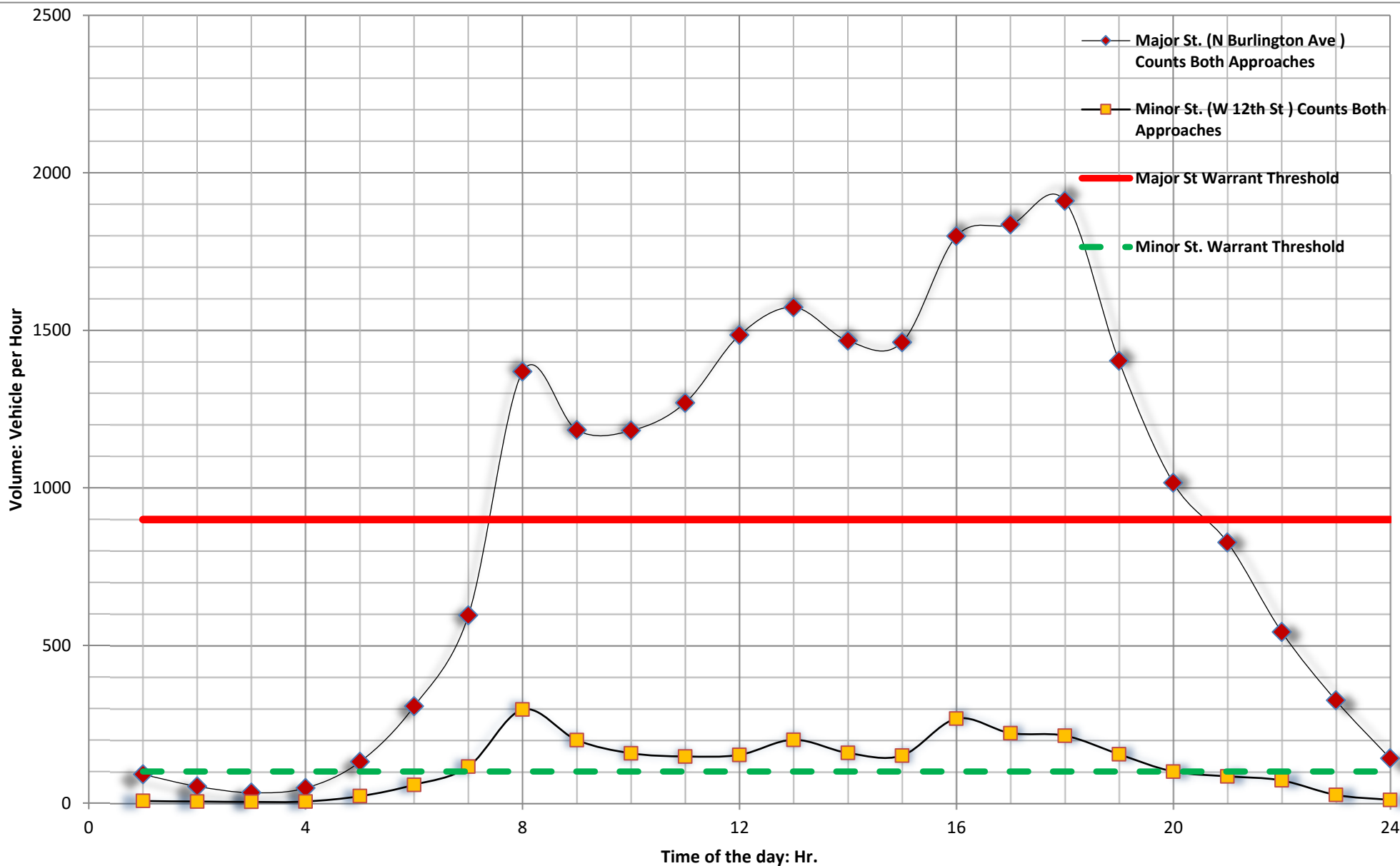


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 13

Does this intersection meet Warrant 1B for signal installation? YES

Data Collection Date: 4/25/2023

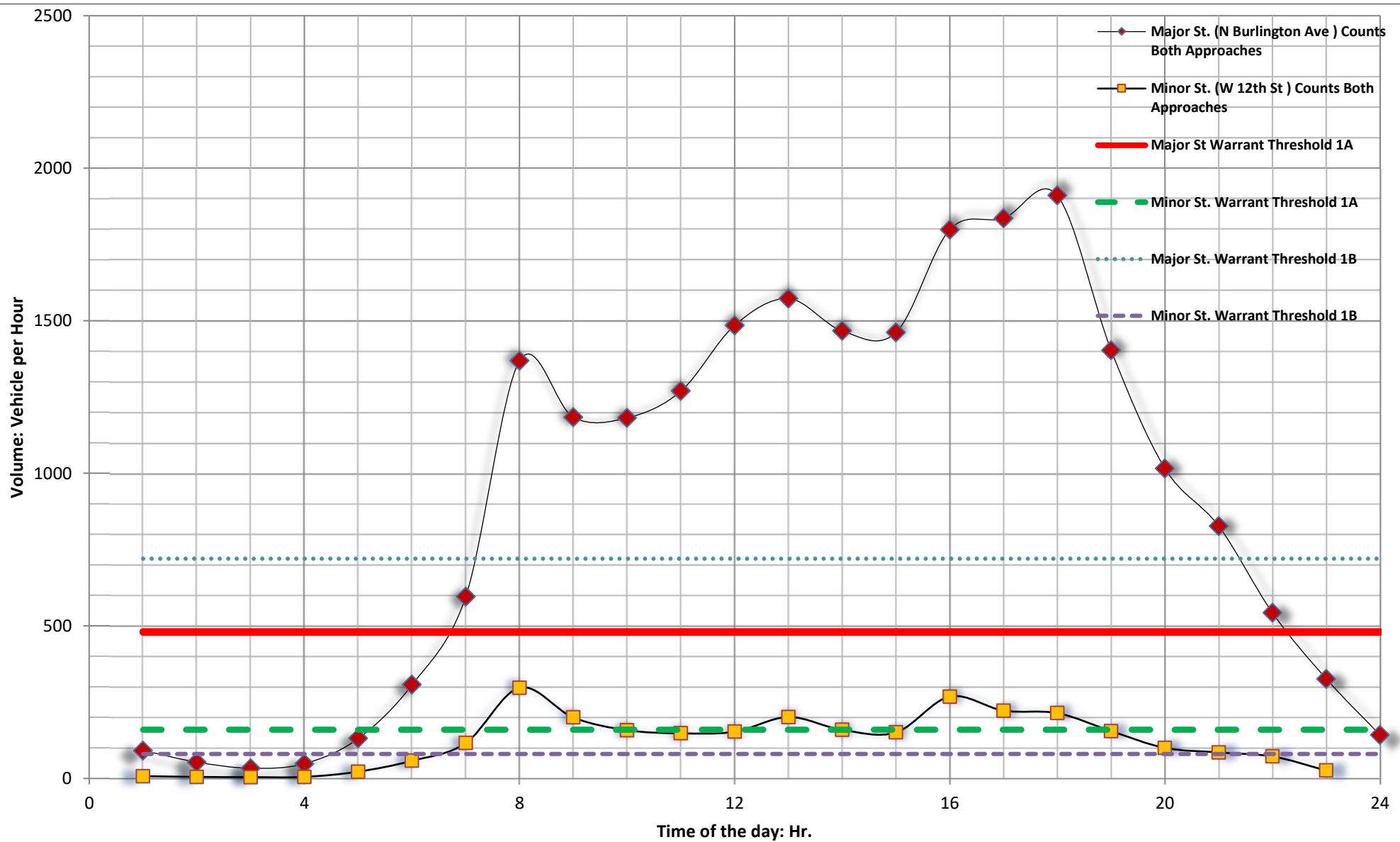


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 6/14

Does this intersection meet Warrant 1A&B for signal installation? NO

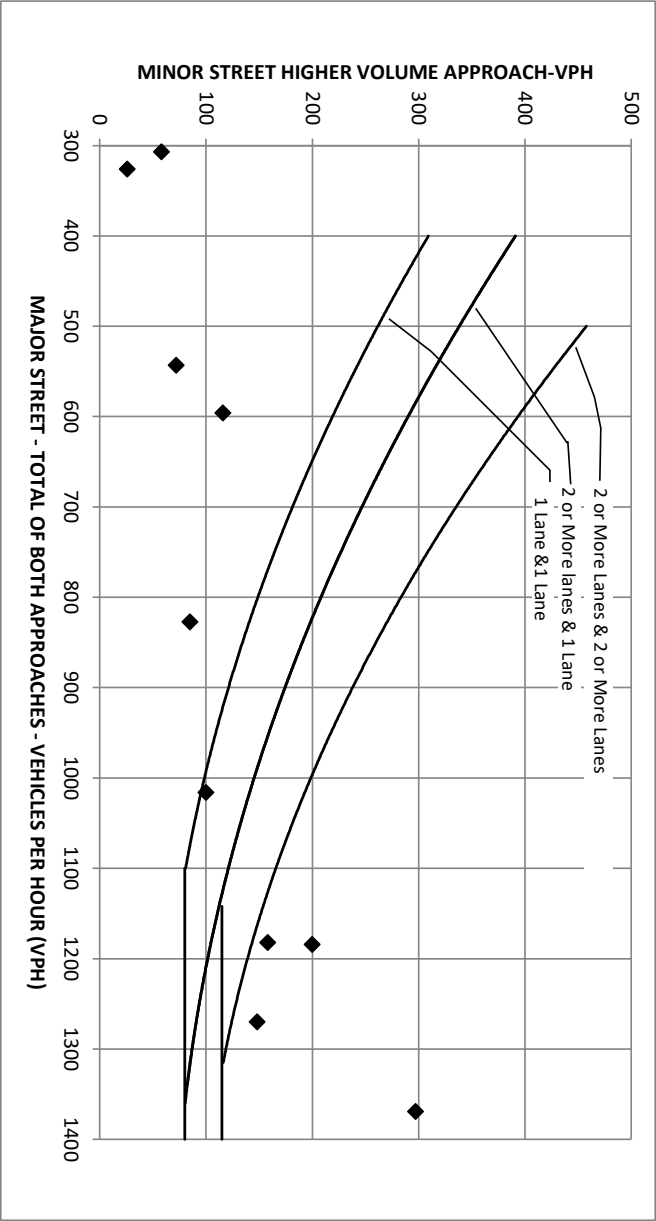
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	N Burlington Ave @ W 12th St	
Data Date	4/25/2023	by 1/0/1900

2	: No. of Lanes on Major St.
2	: No. of Lanes on Minor St.
35	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met		12
Is Warrant 2 (100%) Met?		YES

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume															
Intersection:		N Burlington Ave @ W 12th St													
Data Date		4/25/2023	by		1/0/1900										
2		: No. of Lanes on Major St?													
2		: No. of Lanes on Minor St?													
35		: Speed limit or 85th Percentile? (MPH)													
NO		: Is the intersection within an Isolated community?													
0		: if answer 4 is Yes, then what is the of the population isolated community?													
YES		: Have other remedial measures been tried?													
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B															
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?		
	N-S	E-W											A	B	
00:01 - 01:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
01:00 - 02:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
02:00 - 03:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
03:00 - 04:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
04:00 - 05:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
05:00 - 06:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
06:00 - 07:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
07:00 - 08:00	1997	481	600	200	YES	900	100	YES	480	160	720	80	YES	YES	
08:00 - 09:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
09:00 - 10:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
10:00 - 11:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
11:00 - 12:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
12:00 - 13:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
13:00 - 14:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
14:00 - 15:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
15:00 - 16:00	2472	445	600	200	YES	900	100	YES	480	160	720	80	YES	YES	
16:00 - 17:00	2659	363	600	200	YES	900	100	YES	480	160	720	80	YES	YES	
17:00 - 18:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
18:00 - 19:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
19:00 - 20:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
20:00 - 21:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
21:00 - 22:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
22:00 - 23:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
23:00 - 00:00	0	0	600	200	NO	900	100	NO	480	160	720	80	NO	NO	
													Number of Hours that met the warrant 1A =		3
													Number of Hours that met the warrant 1B =		3
													Number of Hours that met the warrant 1 A & B =		3
													3/3		
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)													NO		
B. Is the Interruption of Continuous Traffic Met? (Condition B)													NO		
C. Combination of Warrants A and B Criteria Met?													NO		

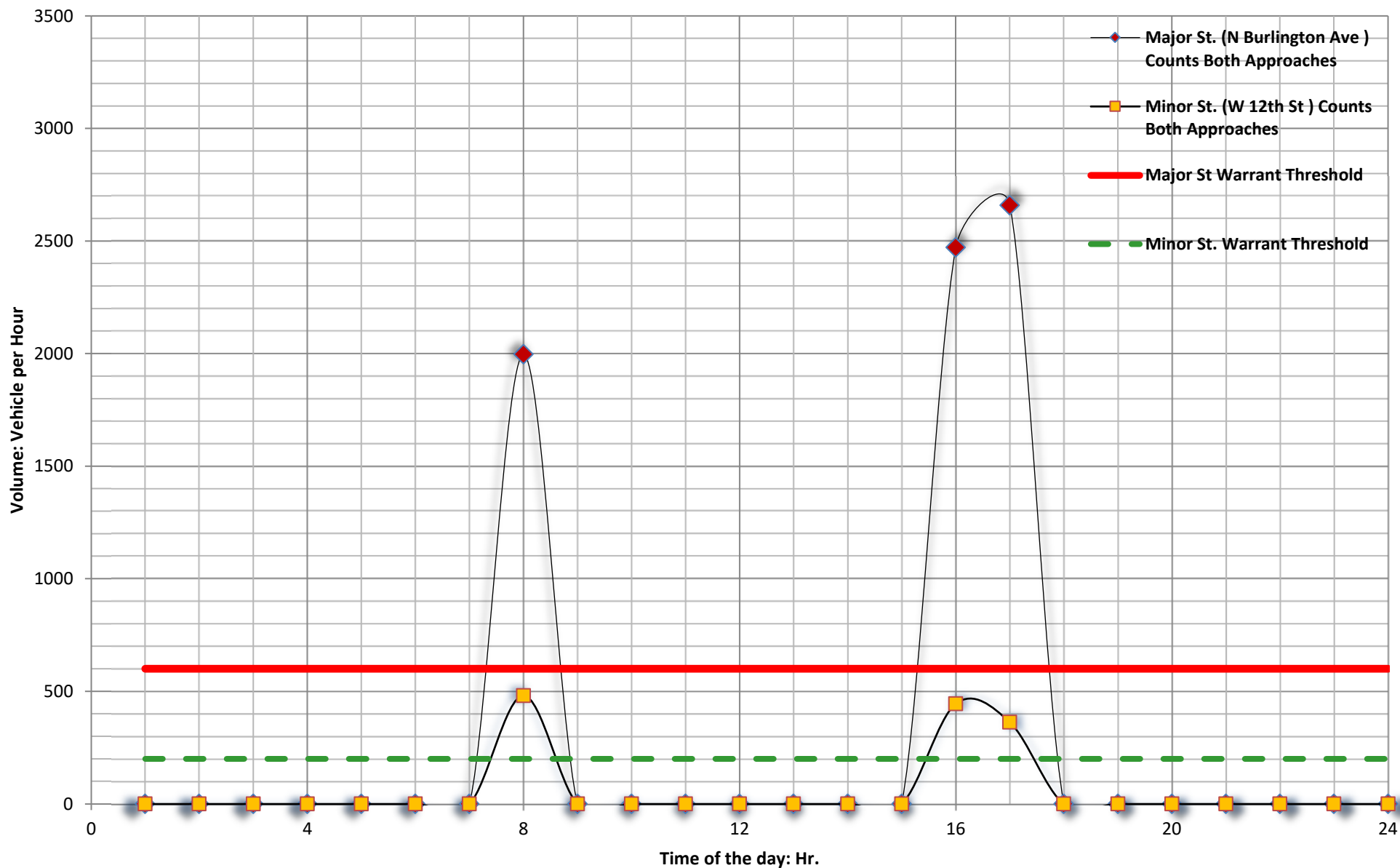


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 3

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

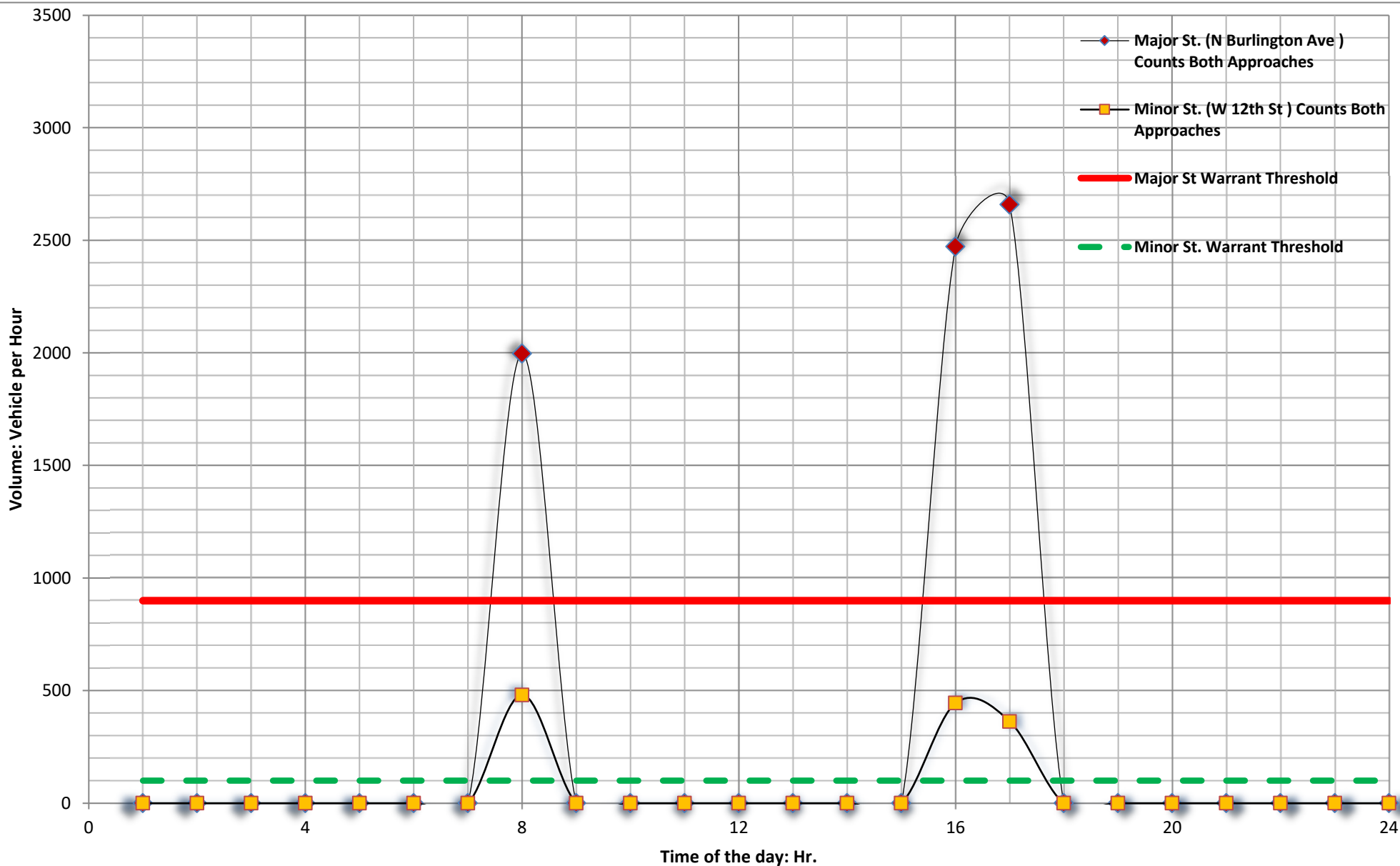


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 3

Does this intersection meet Warrant 1B for signal installation? NO

Data Collection Date: 4/25/2023

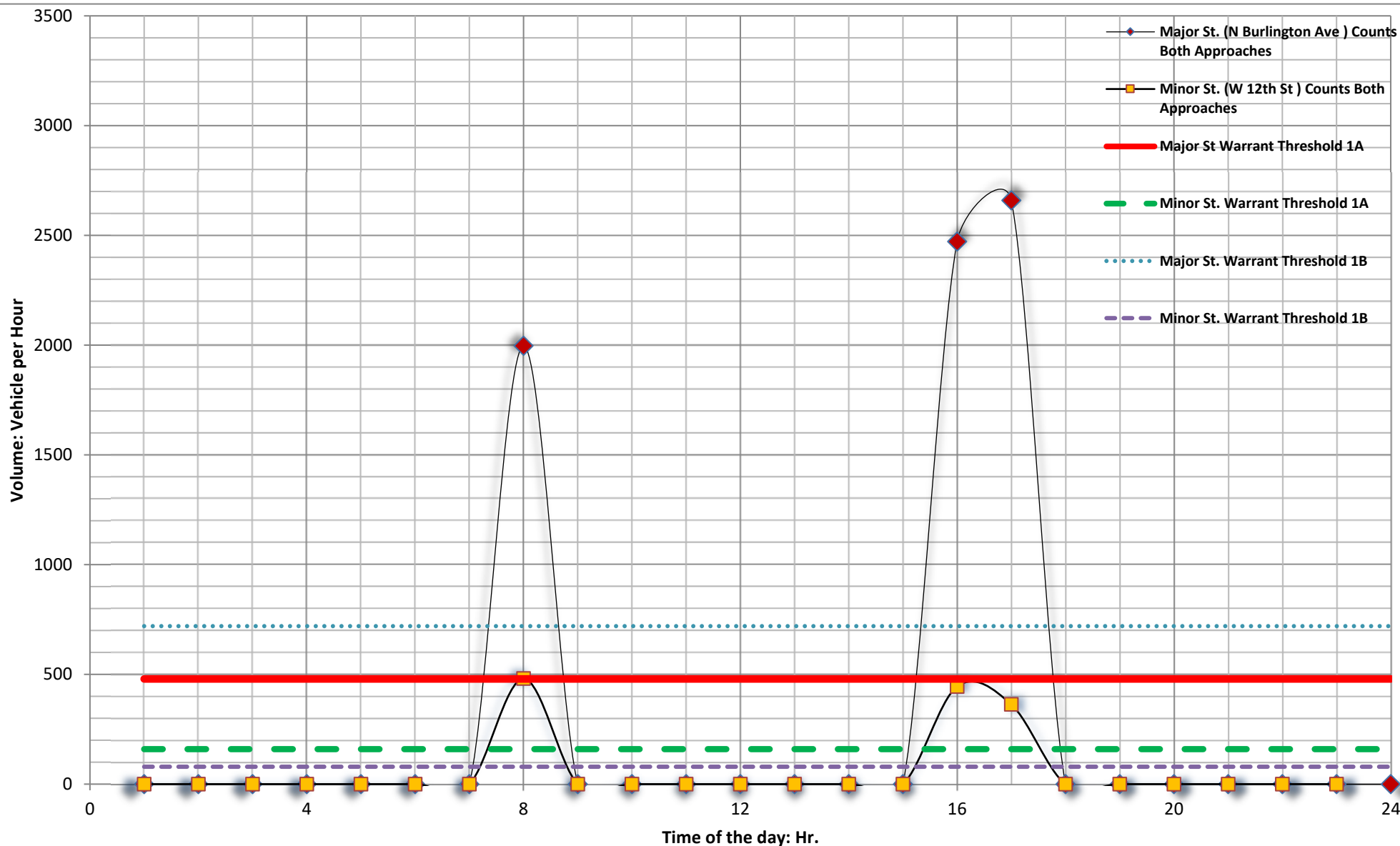


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

N Burlington Ave @ W 12th St

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 3/3

Does this intersection meet Warrant 1A&B for signal installation? NO

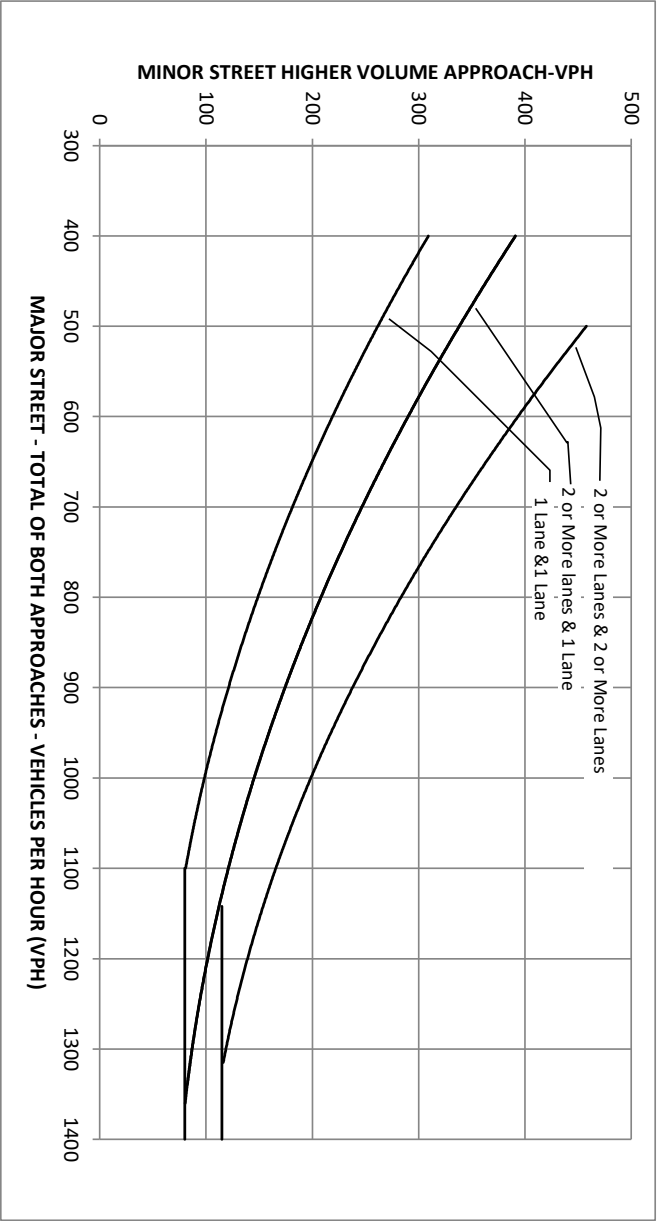
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	N Burlington Ave @ W 12th St	
Data Date	4/25/2023	by 1/0/1900

2	: No. of Lanes on Major St.
2	: No. of Lanes on Minor St.
35	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met	3
Is Warrant 2 (100%) Met?	NO

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume														
Intersection:		W 12th St @ N Marian Rd												
Data Date		4/25/2023	by		1/0/1900									
1		: No. of Lanes on Major St?												
2		: No. of Lanes on Minor St?												
35		: Speed limit or 85th Percentile? (MPH)												
NO		: Is the intersection within an Isolated community?												
0		: if answer 4 is Yes, then what is the of the population isolated community?												
YES		: Have other remedial measures been tried?												
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B														
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?	
	E-W	N-S											A	B
00:01 - 01:00	9	1	500	200	NO	750	100	NO	400	160	600	80	NO	NO
01:00 - 02:00	3	2	500	200	NO	750	100	NO	400	160	600	80	NO	NO
02:00 - 03:00	9	1	500	200	NO	750	100	NO	400	160	600	80	NO	NO
03:00 - 04:00	12	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
04:00 - 05:00	32	4	500	200	NO	750	100	NO	400	160	600	80	NO	NO
05:00 - 06:00	112	6	500	200	NO	750	100	NO	400	160	600	80	NO	NO
06:00 - 07:00	204	36	500	200	NO	750	100	NO	400	160	600	80	NO	NO
07:00 - 08:00	661	57	500	200	NO	750	100	NO	400	160	600	80	NO	NO
08:00 - 09:00	366	24	500	200	NO	750	100	NO	400	160	600	80	NO	NO
09:00 - 10:00	305	17	500	200	NO	750	100	NO	400	160	600	80	NO	NO
10:00 - 11:00	280	18	500	200	NO	750	100	NO	400	160	600	80	NO	NO
11:00 - 12:00	328	22	500	200	NO	750	100	NO	400	160	600	80	NO	NO
12:00 - 13:00	314	36	500	200	NO	750	100	NO	400	160	600	80	NO	NO
13:00 - 14:00	332	42	500	200	NO	750	100	NO	400	160	600	80	NO	NO
14:00 - 15:00	379	33	500	200	NO	750	100	NO	400	160	600	80	NO	NO
15:00 - 16:00	680	47	500	200	NO	750	100	NO	400	160	600	80	NO	NO
16:00 - 17:00	480	51	500	200	NO	750	100	NO	400	160	600	80	NO	NO
17:00 - 18:00	628	53	500	200	NO	750	100	NO	400	160	600	80	NO	NO
18:00 - 19:00	307	22	500	200	NO	750	100	NO	400	160	600	80	NO	NO
19:00 - 20:00	251	19	500	200	NO	750	100	NO	400	160	600	80	NO	NO
20:00 - 21:00	195	17	500	200	NO	750	100	NO	400	160	600	80	NO	NO
21:00 - 22:00	121	6	500	200	NO	750	100	NO	400	160	600	80	NO	NO
22:00 - 23:00	57	4	500	200	NO	750	100	NO	400	160	600	80	NO	NO
23:00 - 00:00	13	2	500	200	NO	750	100	NO	400	160	600	80	NO	NO
Number of Hours that met the warrant 1A =													0	
Number of Hours that met the warrant 1B =													0	
Number of Hours that met the warrant 1 A & B =													0	0/0
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)														NO
B. Is the Interruption of Continuous Traffic Met? (Condition B)														NO
C. Combination of Warrants A and B Criteria Met?														NO

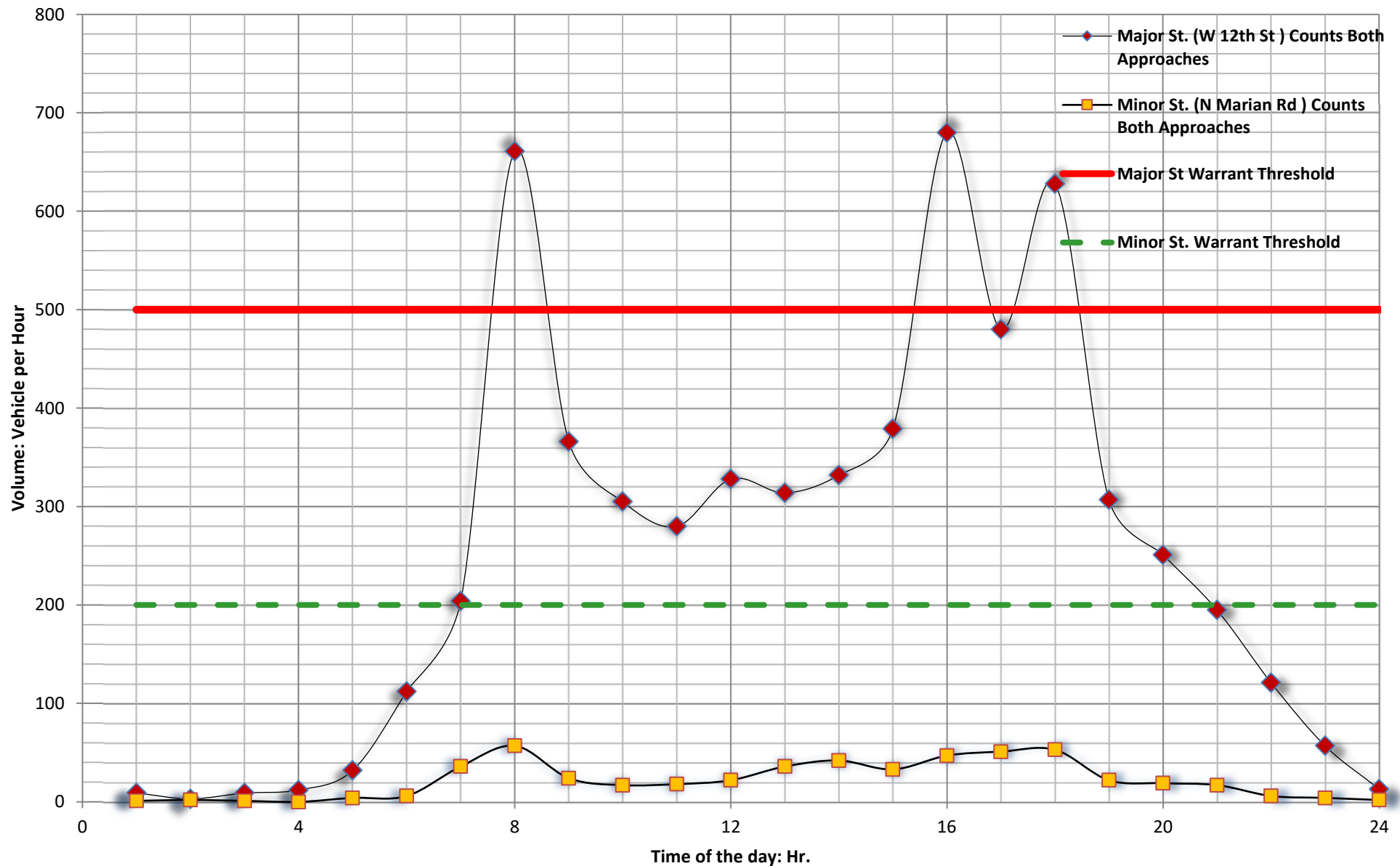


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

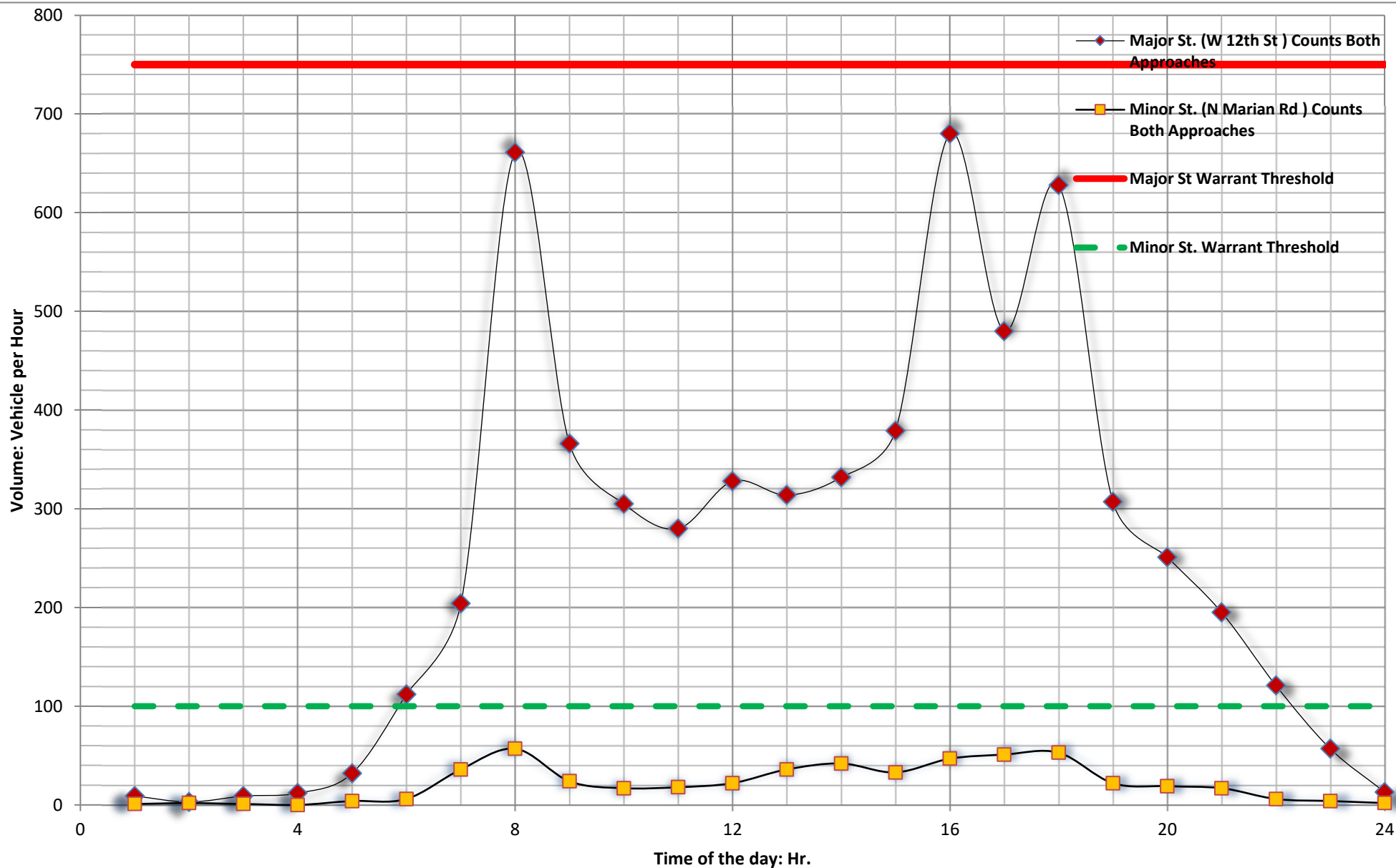


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0

Does this intersection meet Warrant 1B NO
for signal installation?

Data Collection Date: 4/25/2023

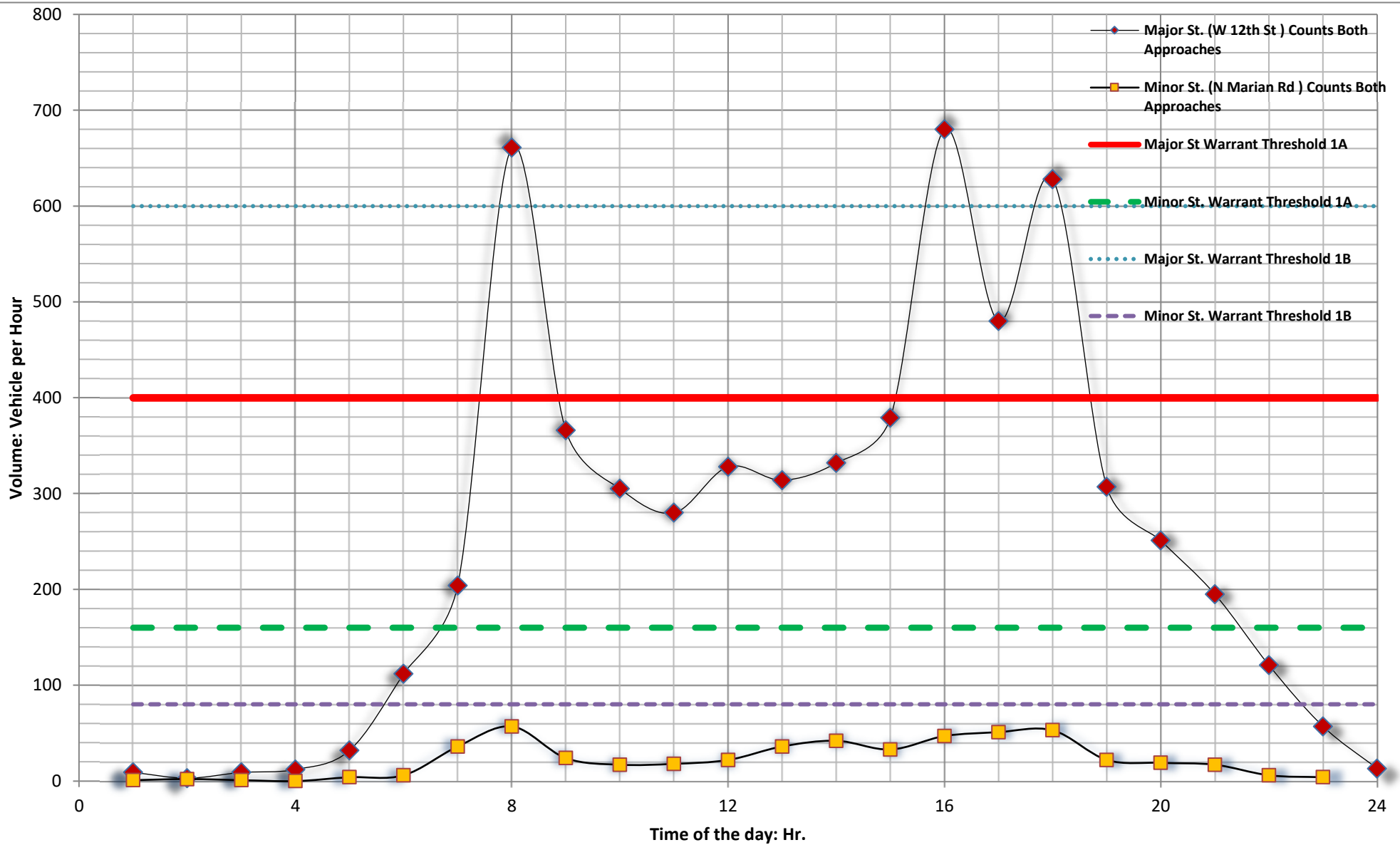


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0/0

Does this intersection meet Warrant 1A&B for signal installation? NO

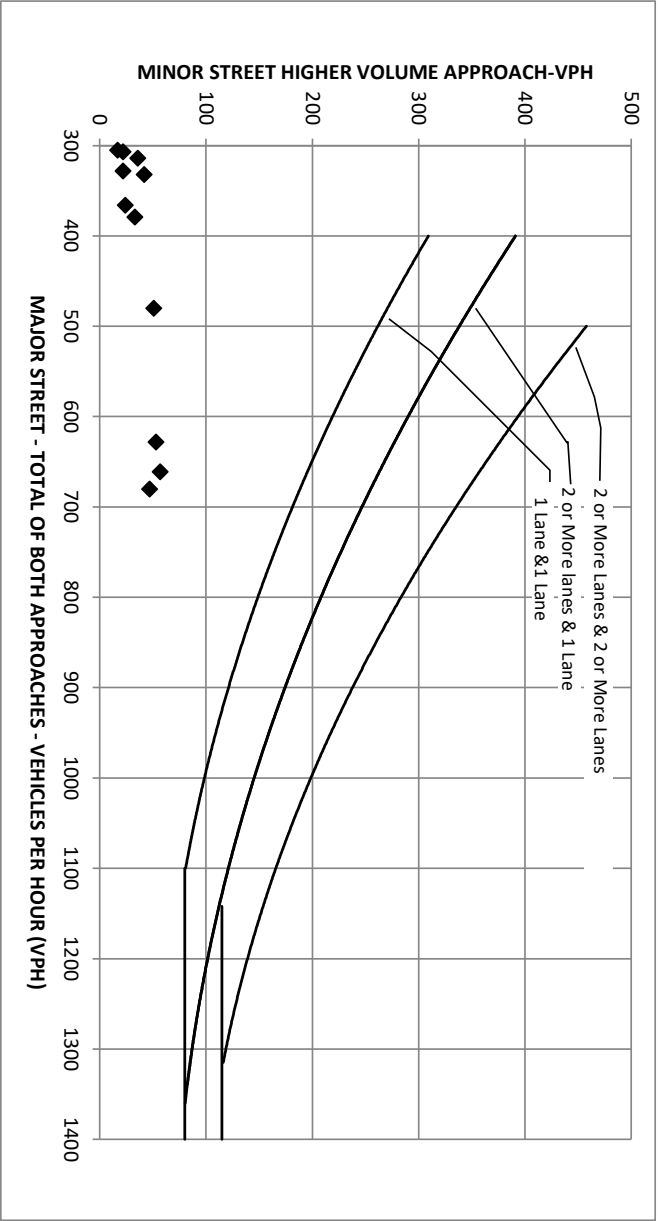
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	W 12th St @ N Marian Rd	
Data Date	4/25/2023	by 1/0/1900

1	: No. of Lanes on Major St.
2	: No. of Lanes on Minor St.
35	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met	0
Is Warrant 2 (100%) Met?	NO

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 1: Eight-Hour Vehicular Volume														
Intersection:		W 12th St @ N Marian Rd												
Data Date		4/25/2023	by		1/0/1900									
1		: No. of Lanes on Major St?												
2		: No. of Lanes on Minor St?												
35		: Speed limit or 85th Percentile? (MPH)												
NO		: Is the intersection within an Isolated community?												
0		: if answer 4 is Yes, then what is the of the population isolated community?												
YES		: Have other remedial measures been tried?												
USE 100% FOR WARRANTS 1A AND 1B. USE 80% FOR WARRANT 1A&B														
Time	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?	
	E-W	N-S											A	B
00:01 - 01:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
01:00 - 02:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
02:00 - 03:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
03:00 - 04:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
04:00 - 05:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
05:00 - 06:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
06:00 - 07:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
07:00 - 08:00	1115	109	500	200	NO	750	100	YES	400	160	600	80	NO	YES
08:00 - 09:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
09:00 - 10:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
10:00 - 11:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
11:00 - 12:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
12:00 - 13:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
13:00 - 14:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
14:00 - 15:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
15:00 - 16:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
16:00 - 17:00	1158	70	500	200	NO	750	100	NO	400	160	600	80	NO	NO
17:00 - 18:00	1162	90	500	200	NO	750	100	NO	400	160	600	80	NO	YES
18:00 - 19:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
19:00 - 20:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
20:00 - 21:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
21:00 - 22:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
22:00 - 23:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
23:00 - 00:00	0	0	500	200	NO	750	100	NO	400	160	600	80	NO	NO
Number of Hours that met the warrant 1A =												0		
Number of Hours that met the warrant 1B =												1		
Number of Hours that met the warrant 1 A & B =												0	2	0/2
A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)													NO	
B. Is the Interruption of Continuous Traffic Met? (Condition B)													NO	
C. Combination of Warrants A and B Criteria Met?													NO	

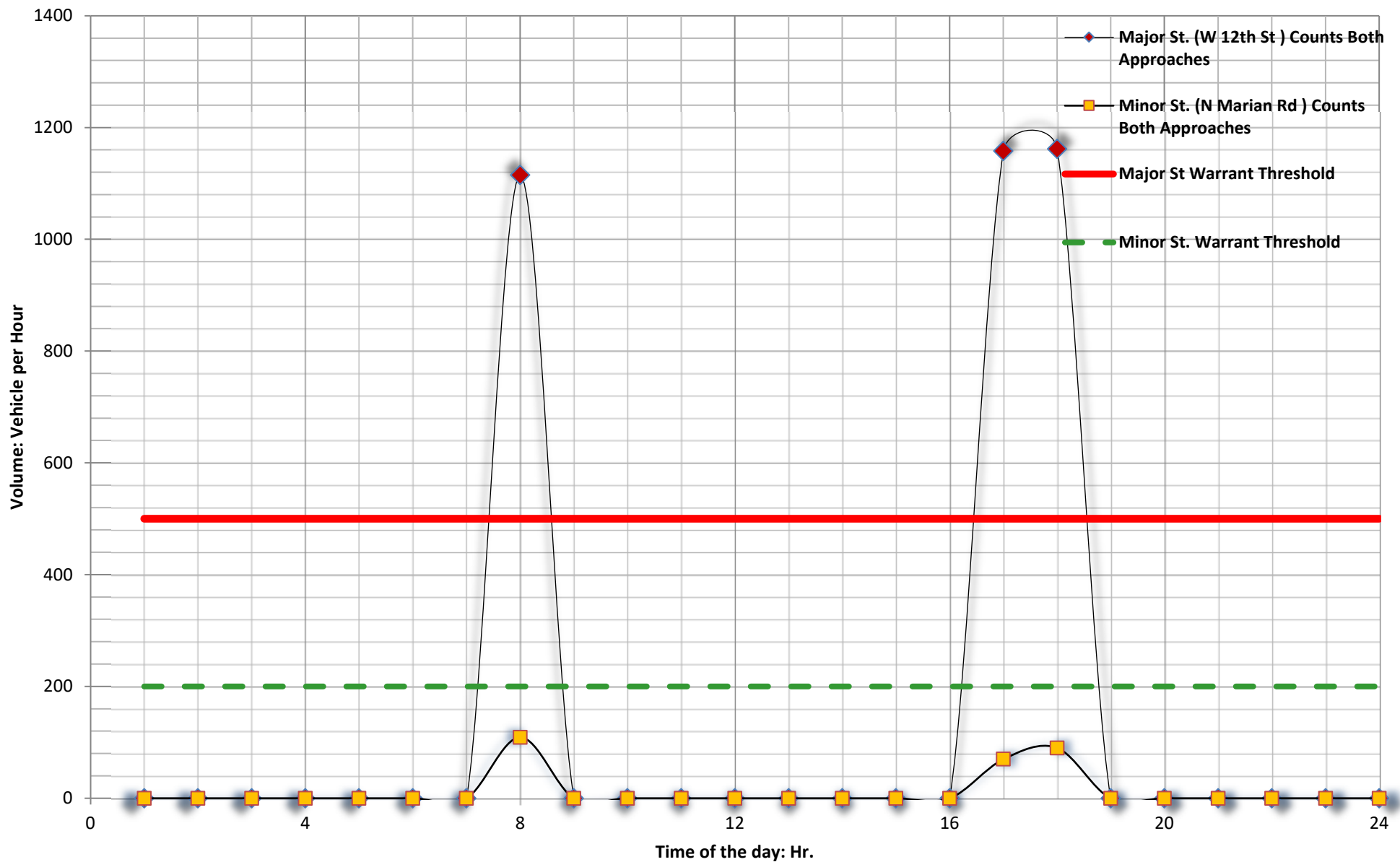


FIGURE 1: WARRANT 1A

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 4/25/2023

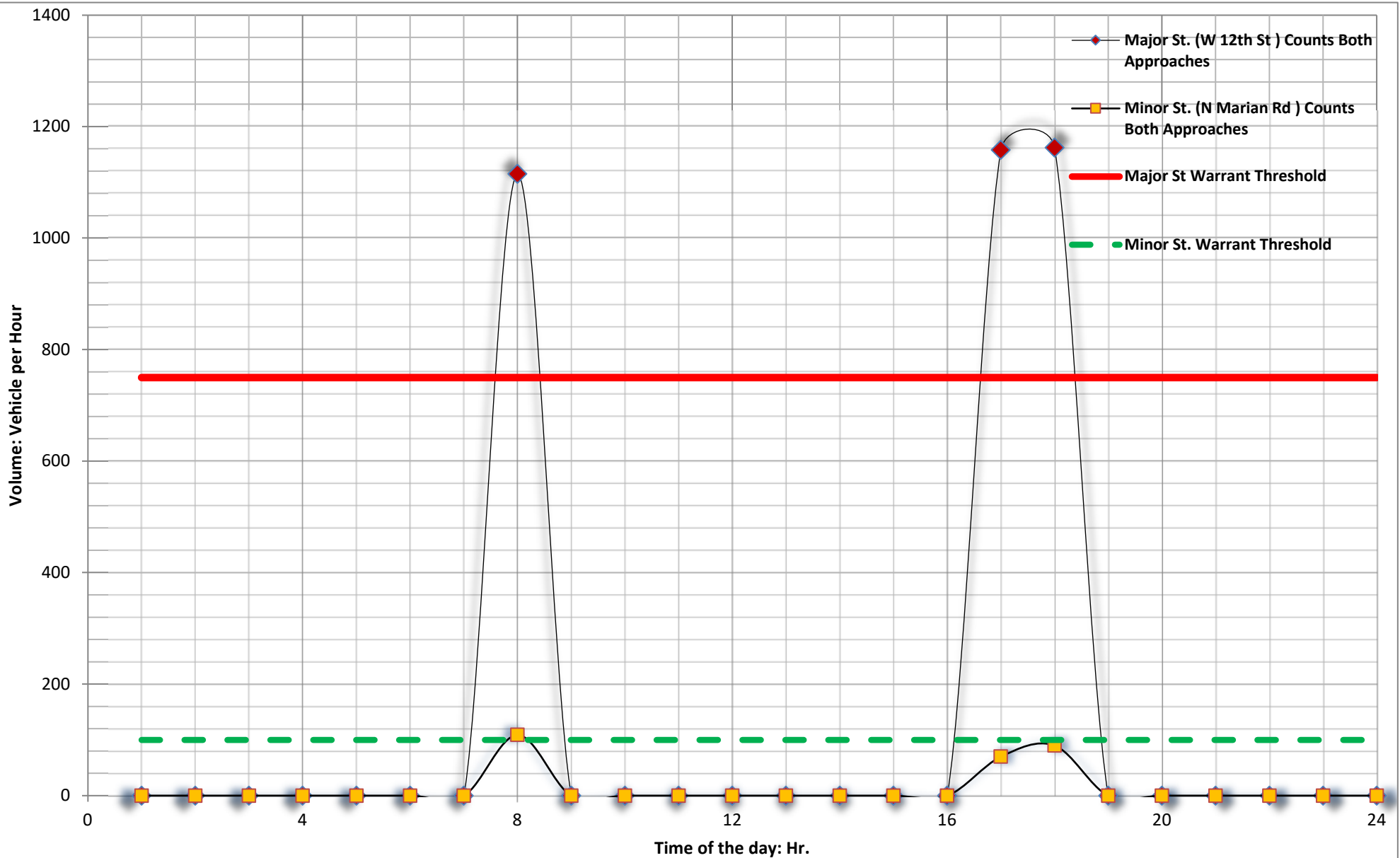


FIGURE 1: WARRANT 1B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 1

Does this intersection meet Warrant 1B NO
for signal installation?

Data Collection Date: 4/25/2023

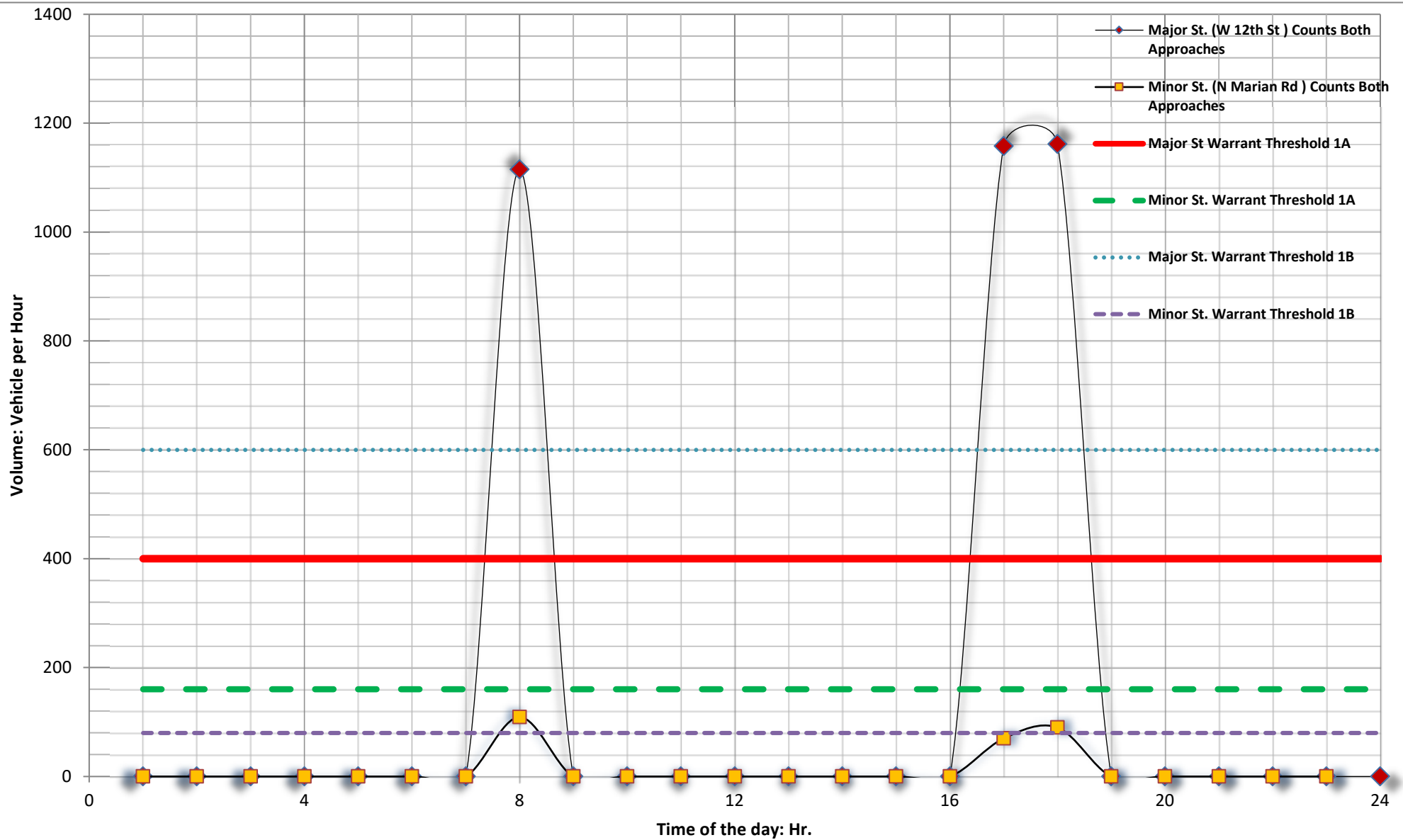


FIGURE 3: WARRANT 1A&B

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? NO

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

W 12th St @ N Marian Rd

NO. OF LANES ON MAJOR ST.? 1

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0/2

Does this intersection meet Warrant 1A&B for signal installation? NO

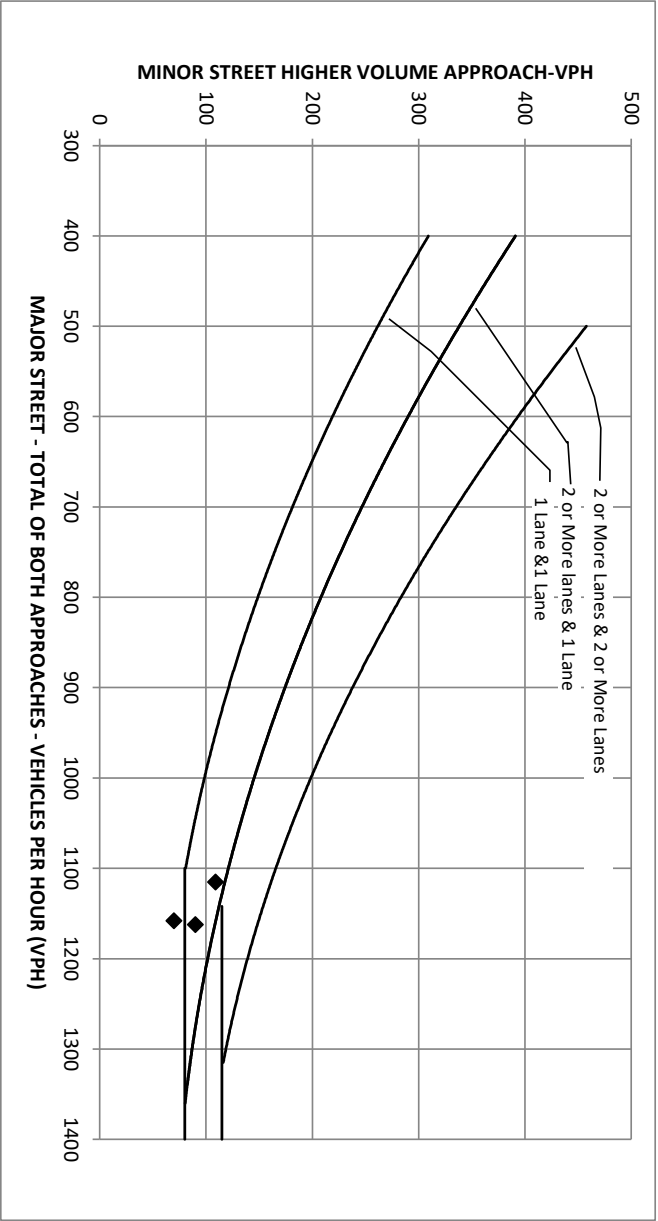
Data Collection Date: 4/25/2023

Source of below graphic is based on Michigan Manual of Uniform Traffic Control Devices' Warrant Analysis Excel workbook:

Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0	
Intersection:	W 12th St @ N Marian Rd	
Data Date	4/25/2023	by 1/0/1900

1	: No. of Lanes on Major St.
2	: No. of Lanes on Minor St.
35	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met	0
Is Warrant 2 (100%) Met?	NO

Appendix G: NCHRP 457 Warrant Sheets

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - AM Peak Hour - W 12th St & N Adams Central Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	0%
Advancing volume (V_A), veh/h:	358
Opposing volume (V_O), veh/h:	128

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	2447
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

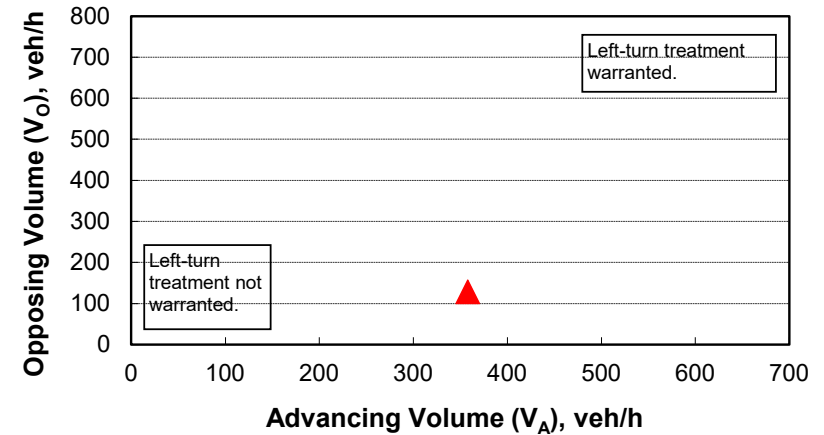


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - AM Peak Hour - W 12th St & N Adams Central Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	56%
Advancing volume (V_A), veh/h:	288
Opposing volume (V_O), veh/h:	357

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	201
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

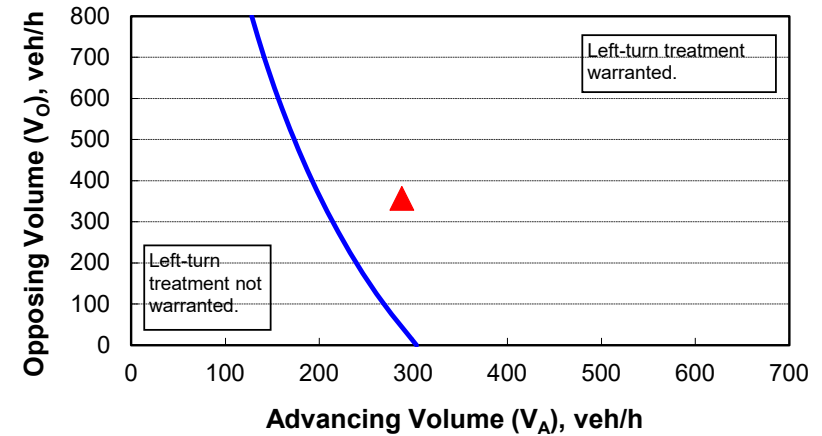


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - School Peak Hour - W 12th St & N Adams Central Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	169
Opposing volume (V_O), veh/h:	198

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1554
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

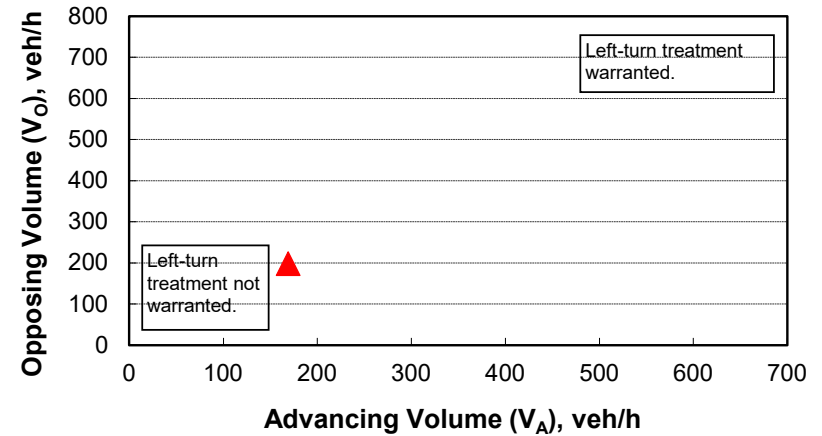


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - School Peak Hour - W 12th St & N Adams Central Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	21%
Advancing volume (V_A), veh/h:	250
Opposing volume (V_O), veh/h:	168

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	304
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

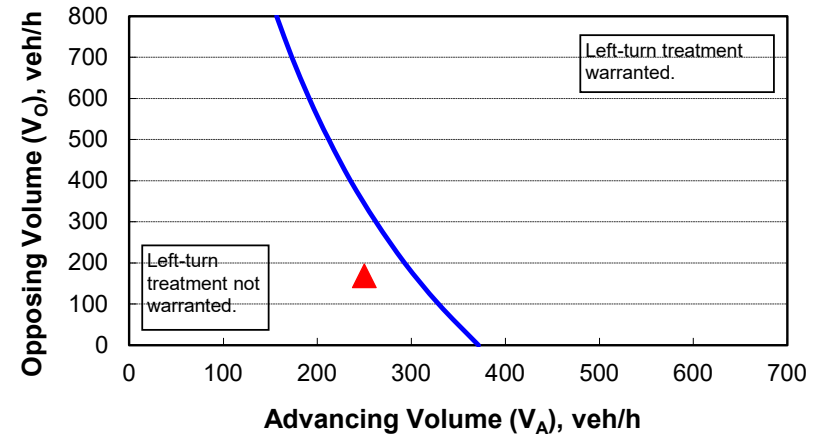


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - PM Peak Hour - W 12th St & N Adams Central Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	189
Opposing volume (V_O), veh/h:	289

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	862
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

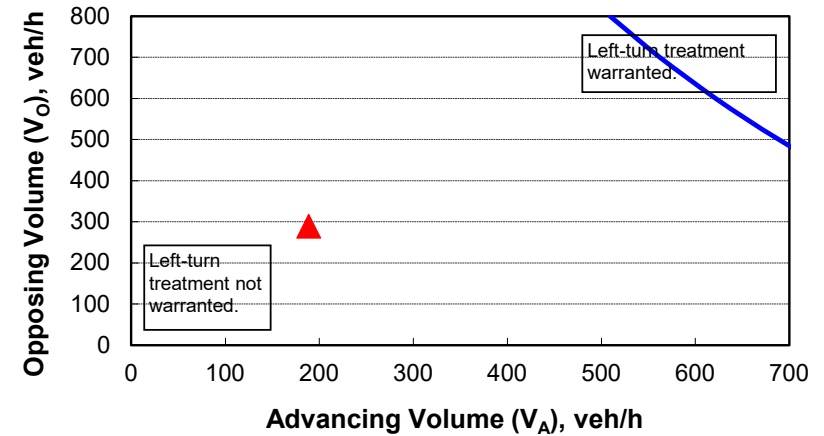


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - PM Peak Hour - W 12th St & N Adams Central Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	324
Opposing volume (V_O), veh/h:	186

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	389
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

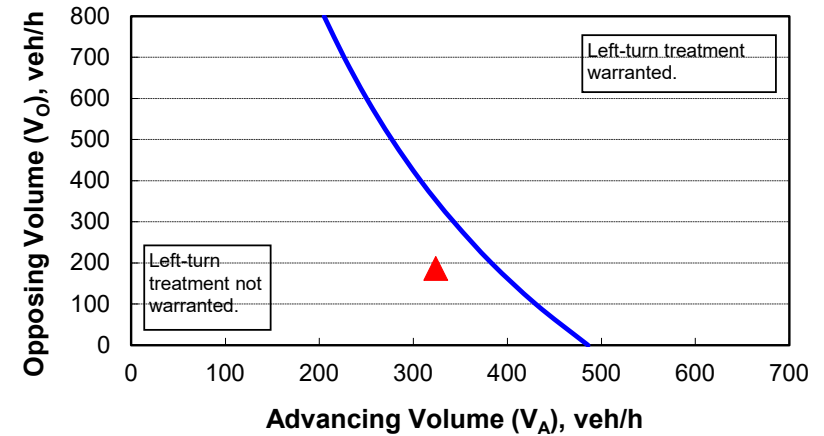


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	373
Opposing volume (V_O), veh/h:	242

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1190
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

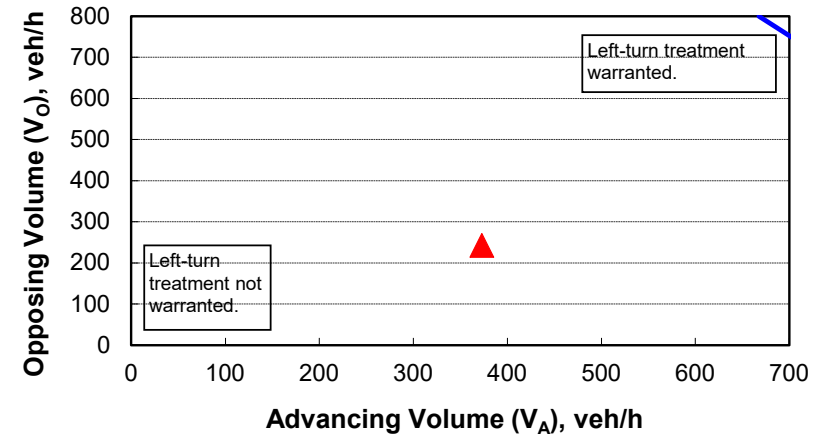


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	265
Opposing volume (V_O), veh/h:	369

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	379
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

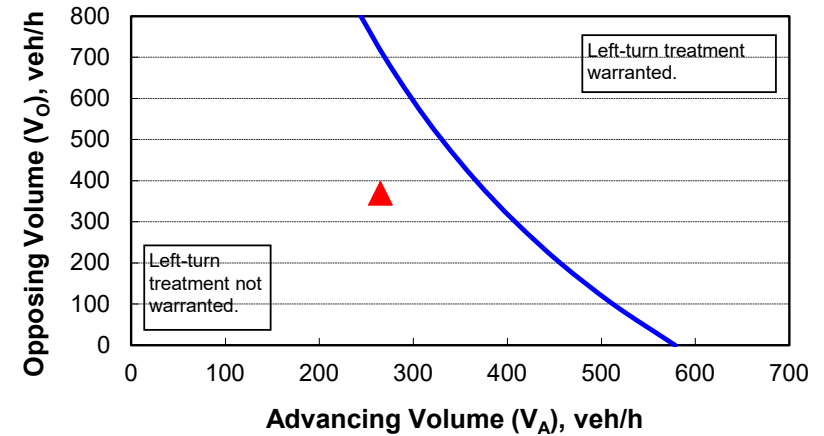


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	295
Opposing volume (V_O), veh/h:	218

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	975
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

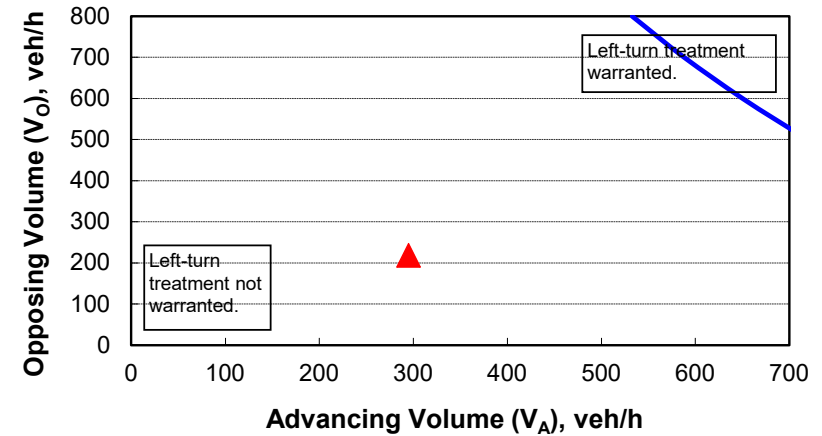


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	7%
Advancing volume (V_A), veh/h:	234
Opposing volume (V_O), veh/h:	290

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	460
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

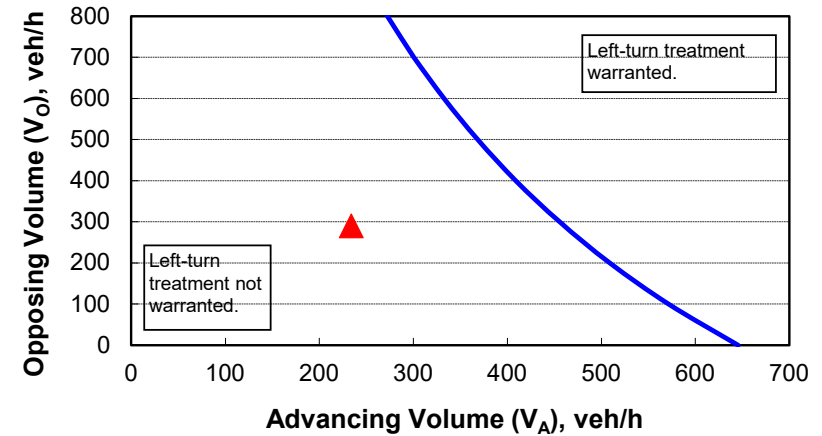


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	236
Opposing volume (V_O), veh/h:	264

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	926
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

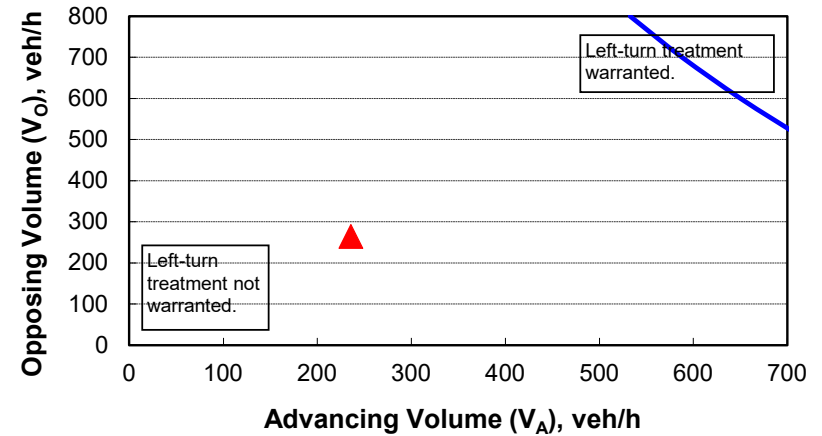


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	278
Opposing volume (V_O), veh/h:	232

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	567
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

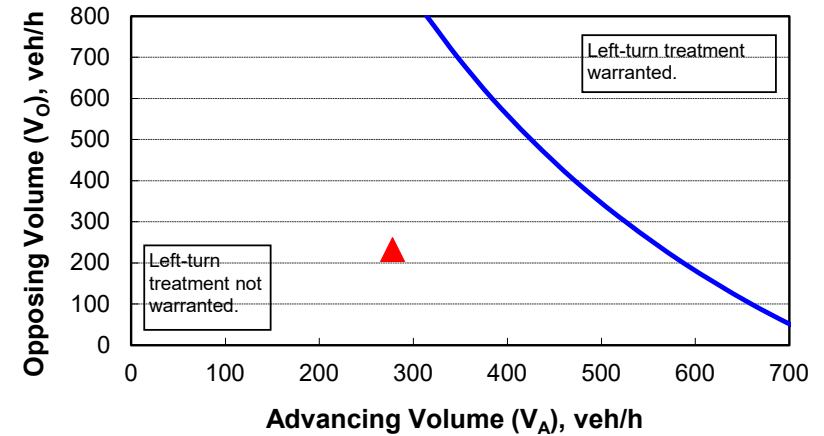


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	249
Opposing volume (V_O), veh/h:	317

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1264
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

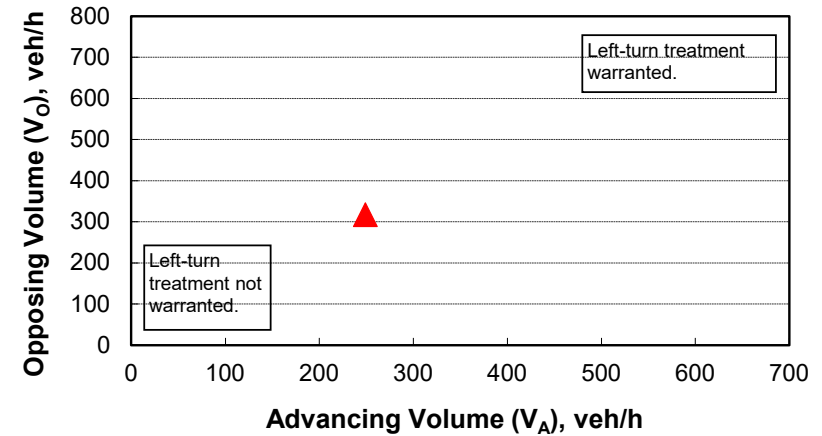


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - School Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	7%
Advancing volume (V_A), veh/h:	234
Opposing volume (V_O), veh/h:	276

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	455
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

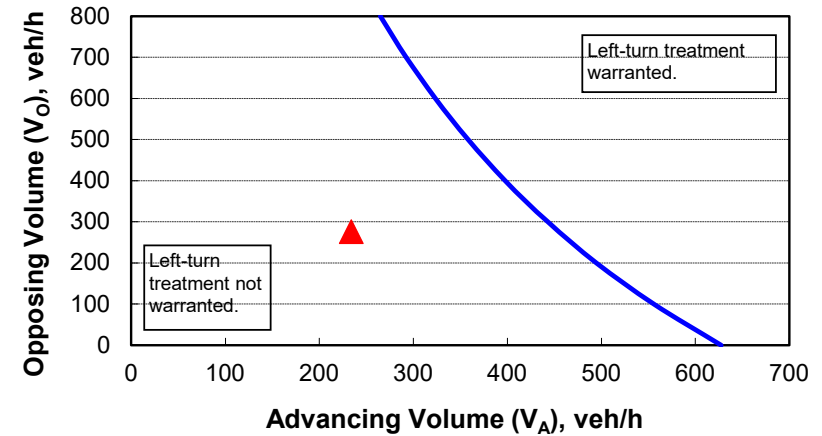


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	6%
Advancing volume (V_A), veh/h:	286
Opposing volume (V_O), veh/h:	213

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	551
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

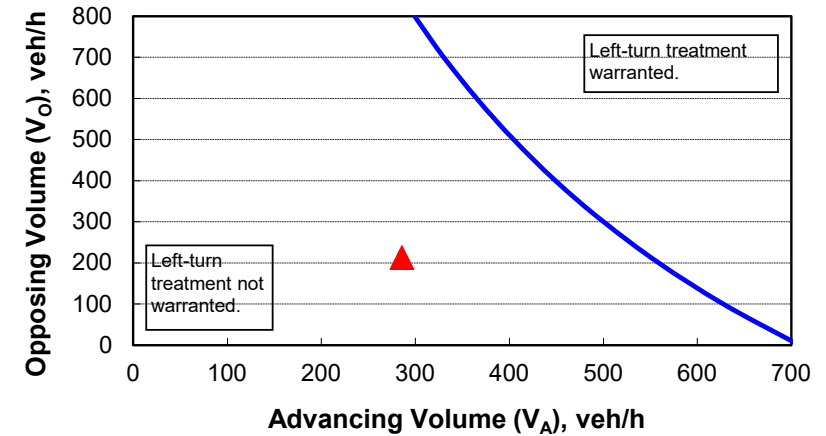


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	496
Opposing volume (V_O), veh/h:	343

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1112
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

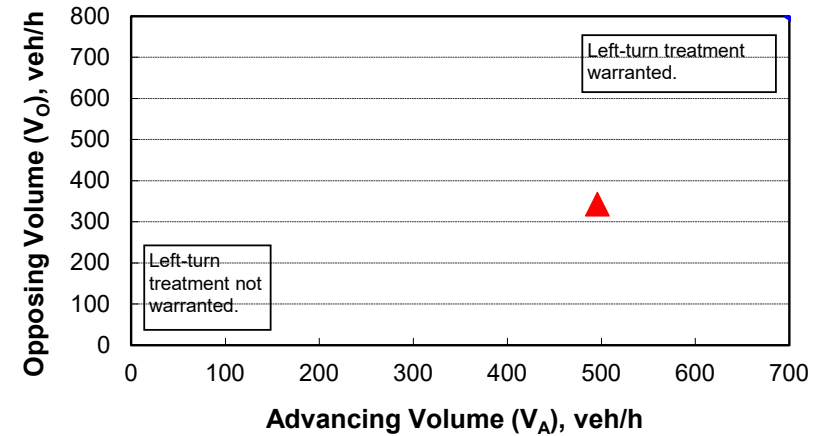


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	14%
Advancing volume (V_A), veh/h:	397
Opposing volume (V_O), veh/h:	489

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	328
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

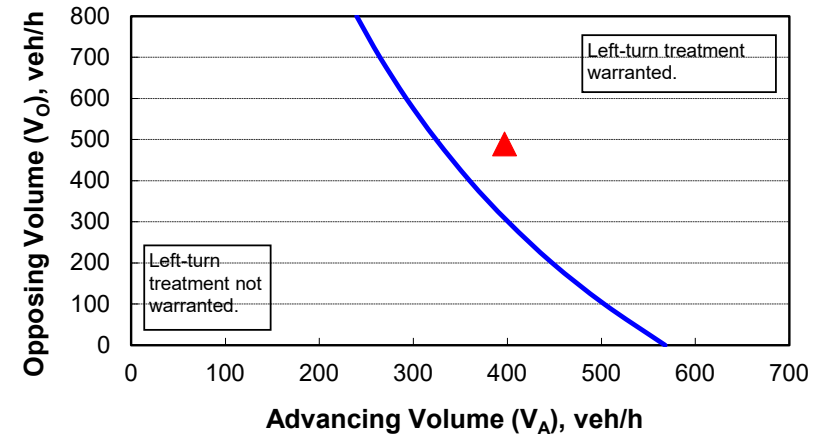


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	421
Opposing volume (V_O), veh/h:	339

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	734
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

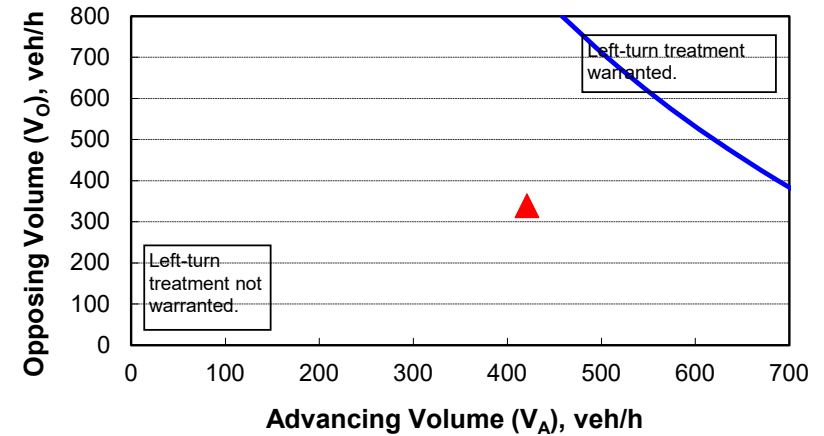


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	19%
Advancing volume (V_A), veh/h:	417
Opposing volume (V_O), veh/h:	407

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	314
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

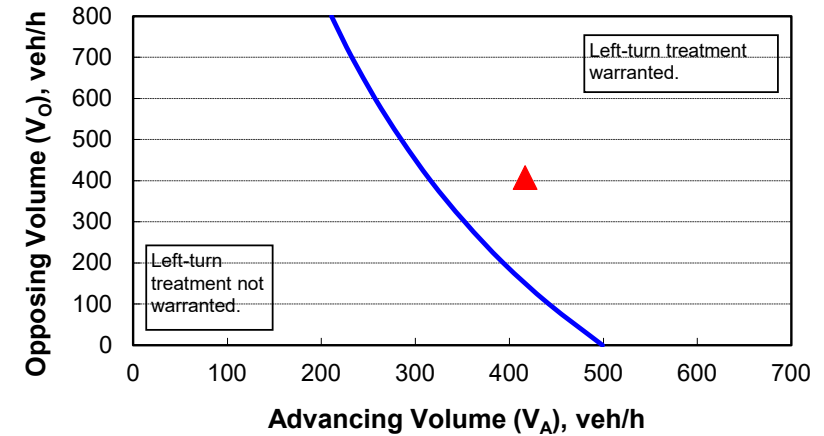


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	292
Opposing volume (V_O), veh/h:	348

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	919
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

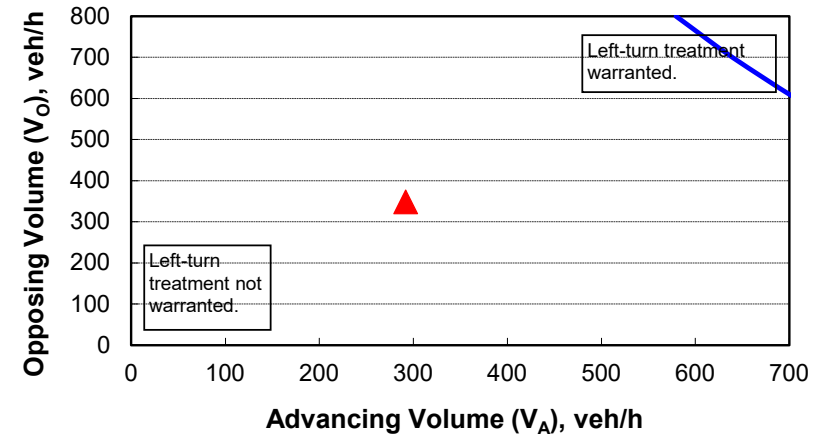


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	14%
Advancing volume (V_A), veh/h:	405
Opposing volume (V_O), veh/h:	286

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	401
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

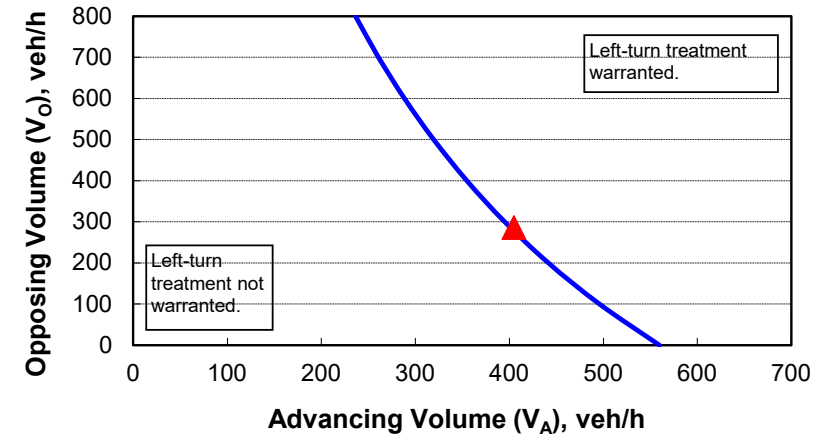


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	8%
Advancing volume (V_A), veh/h:	544
Opposing volume (V_O), veh/h:	404

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	442
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

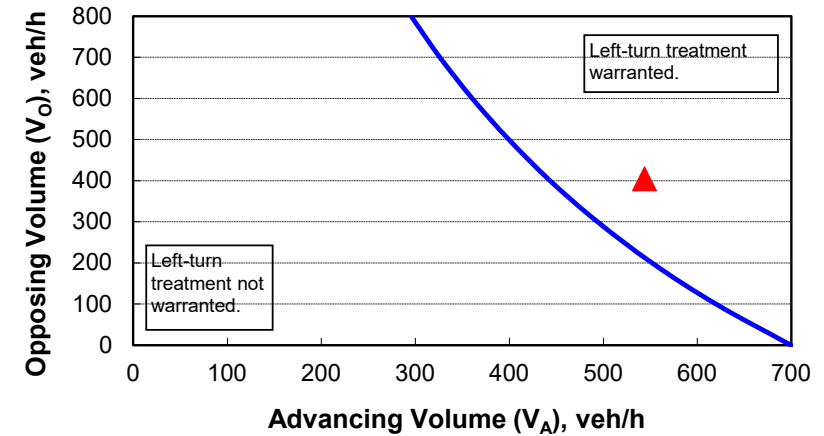


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - AM Peak Hour - W 12th St & Crane Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	8%
Advancing volume (V_A), veh/h:	437
Opposing volume (V_O), veh/h:	498

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	421
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

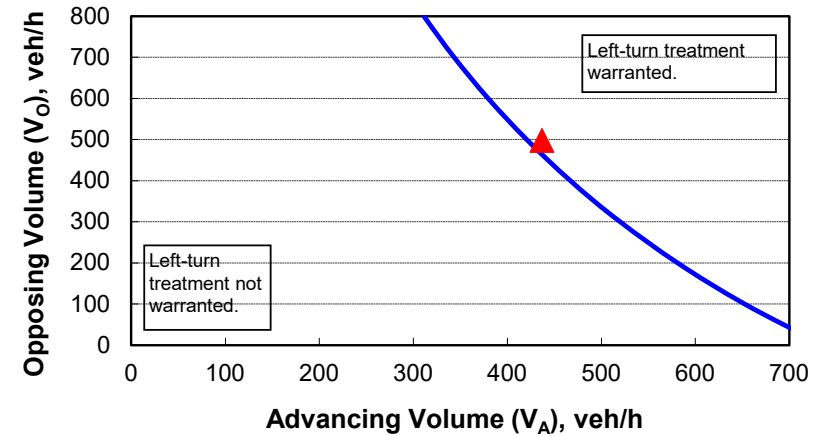


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	501
Opposing volume (V_O), veh/h:	397

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	591
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

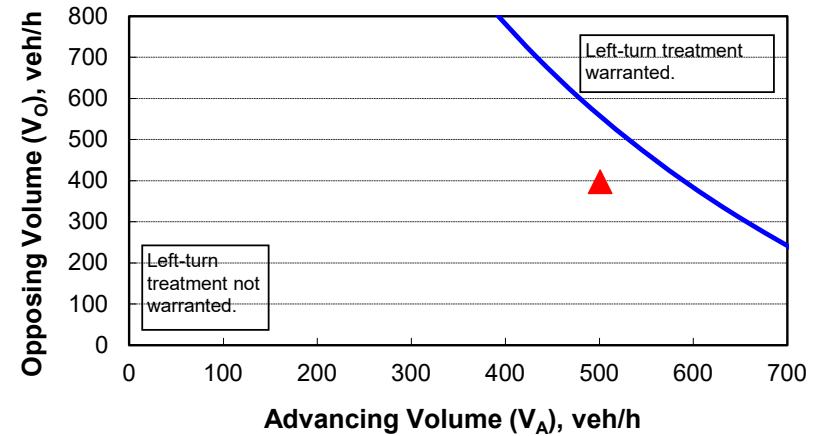


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & Crane Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	419
Opposing volume (V_O), veh/h:	478

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	510
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

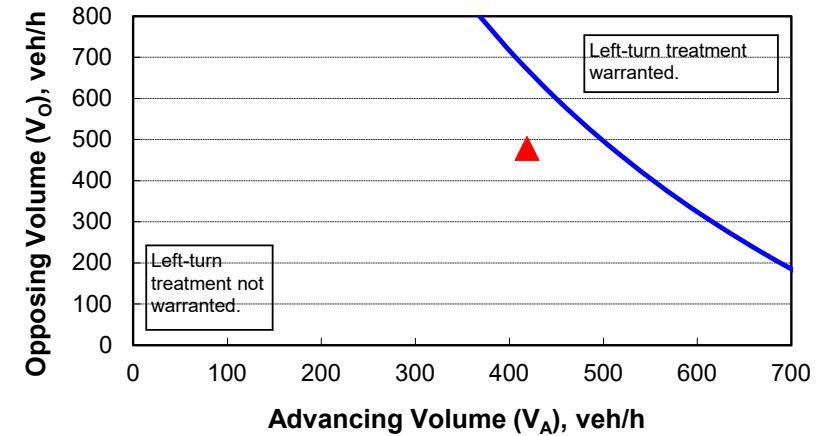


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	350
Opposing volume (V_O), veh/h:	423

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1015
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

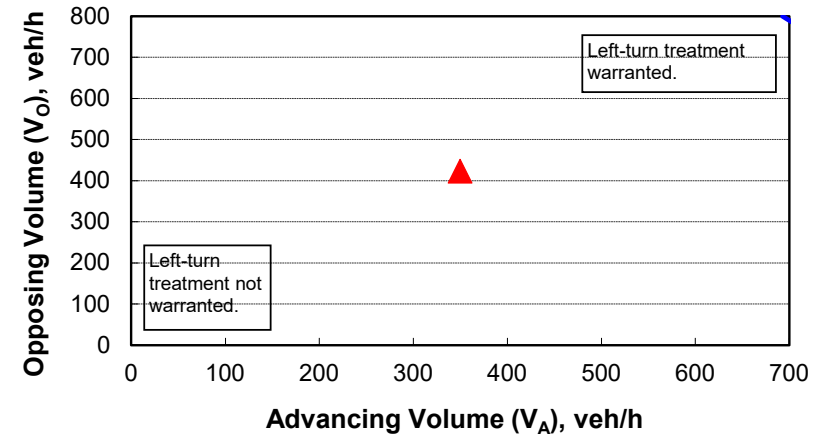


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - PM Peak Hour - W 12th St & Crane Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	442
Opposing volume (V_O), veh/h:	345

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	645
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

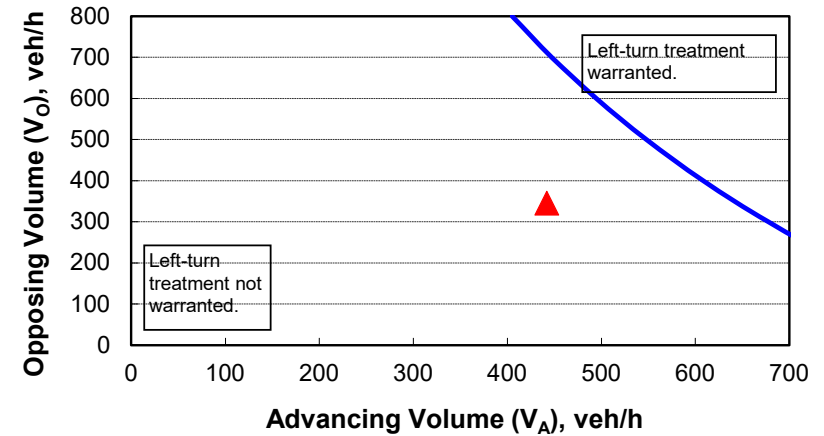


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - AM Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	27%
Advancing volume (V_A), veh/h:	540
Opposing volume (V_O), veh/h:	291

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	313
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

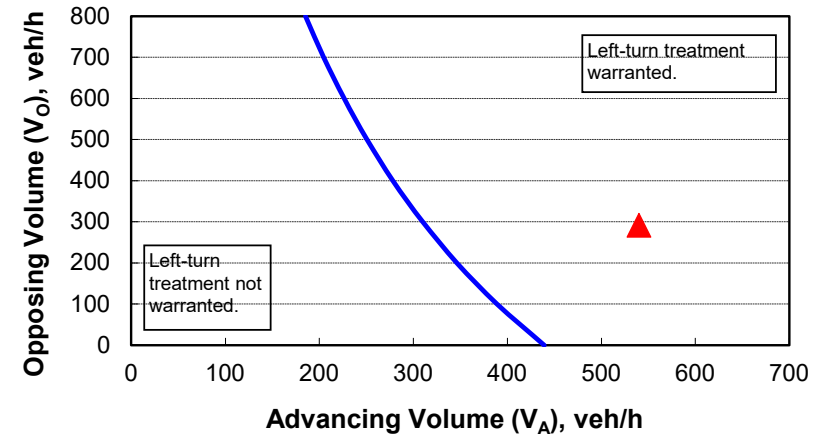


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - AM Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	6%
Advancing volume (V_A), veh/h:	310
Opposing volume (V_O), veh/h:	395

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	517
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

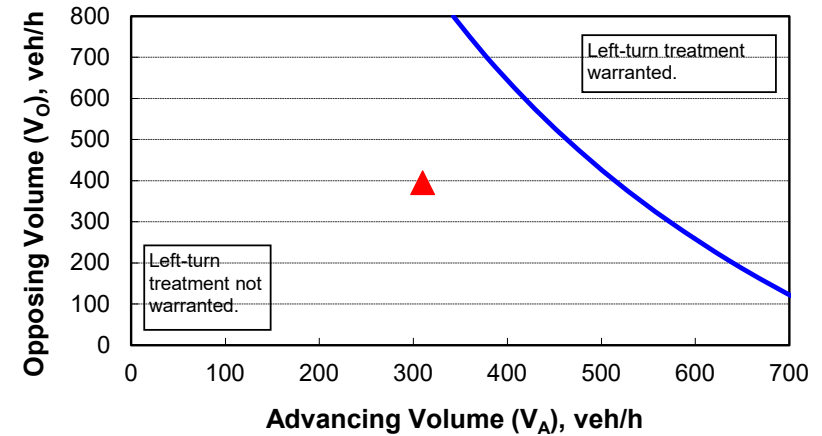


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - School Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	32%
Advancing volume (V_A), veh/h:	489
Opposing volume (V_O), veh/h:	301

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	293
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

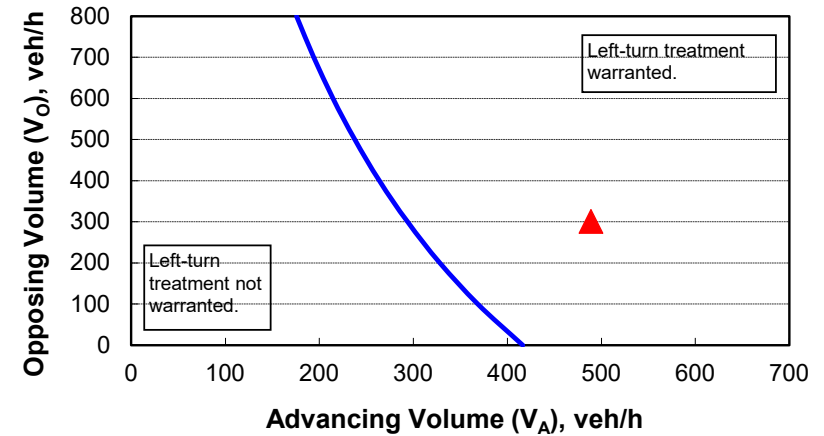


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2023 - School Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	318
Opposing volume (V_O), veh/h:	331

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	590
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

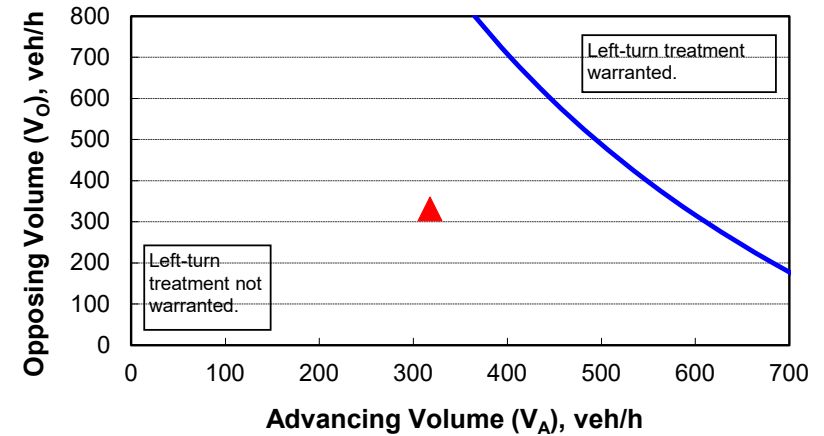


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - PM Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	30%
Advancing volume (V_A), veh/h:	357
Opposing volume (V_O), veh/h:	344

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	285
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

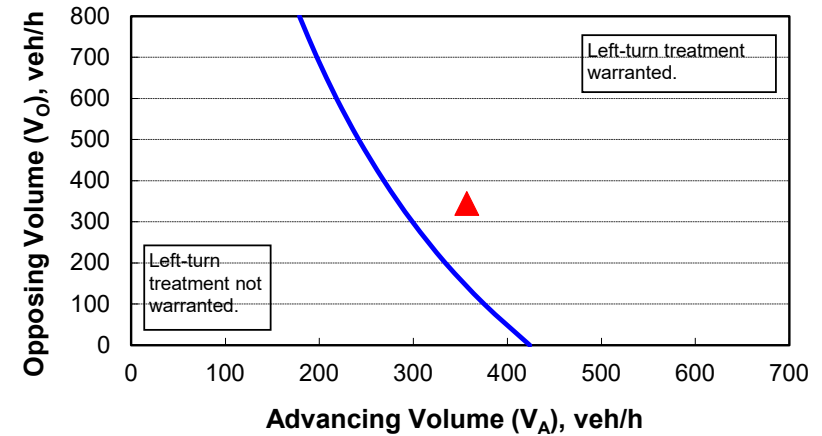


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2023 - PM Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	363
Opposing volume (V_O), veh/h:	249

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	652
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

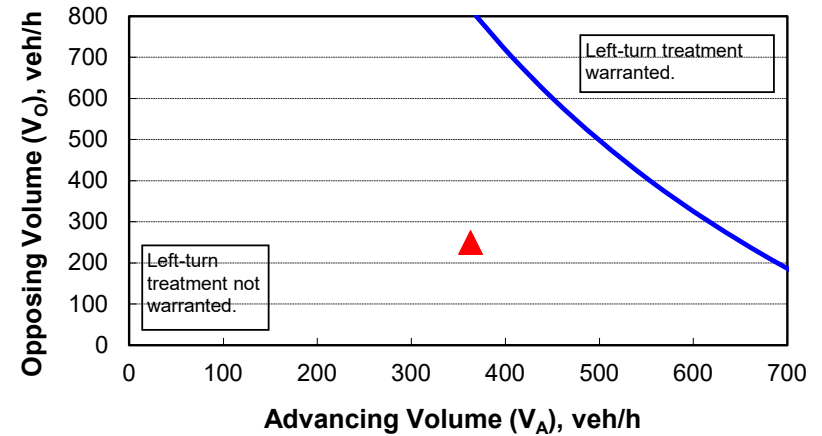


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	288
Right-turn volume, veh/h:	7

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	47
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

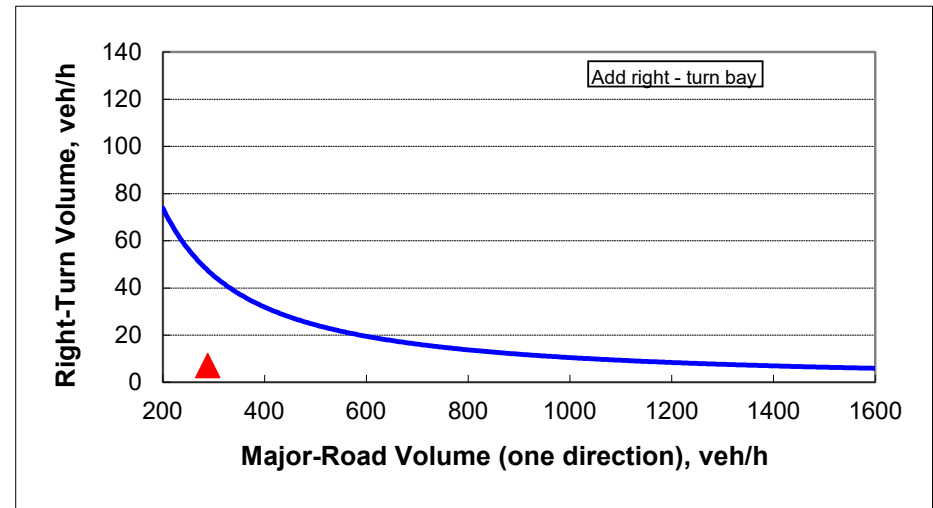


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	358
Right-turn volume, veh/h:	103

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	36
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

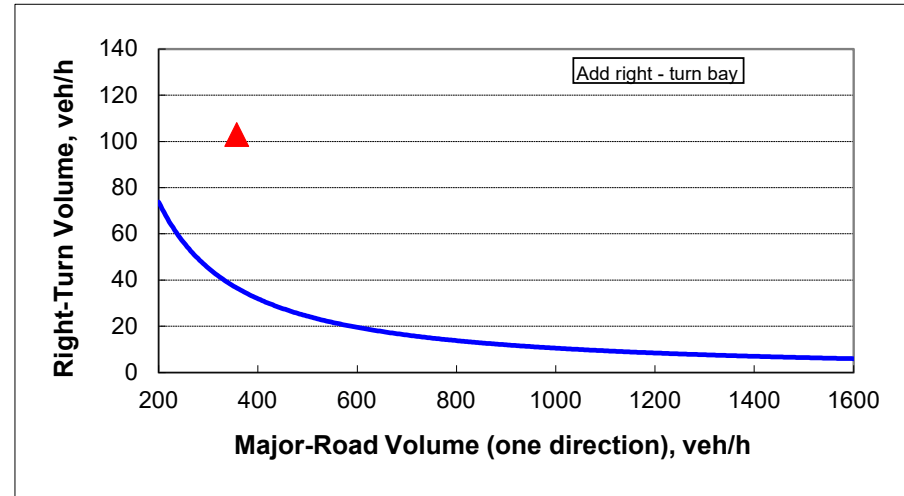


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	250
Right-turn volume, veh/h:	26

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	56
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

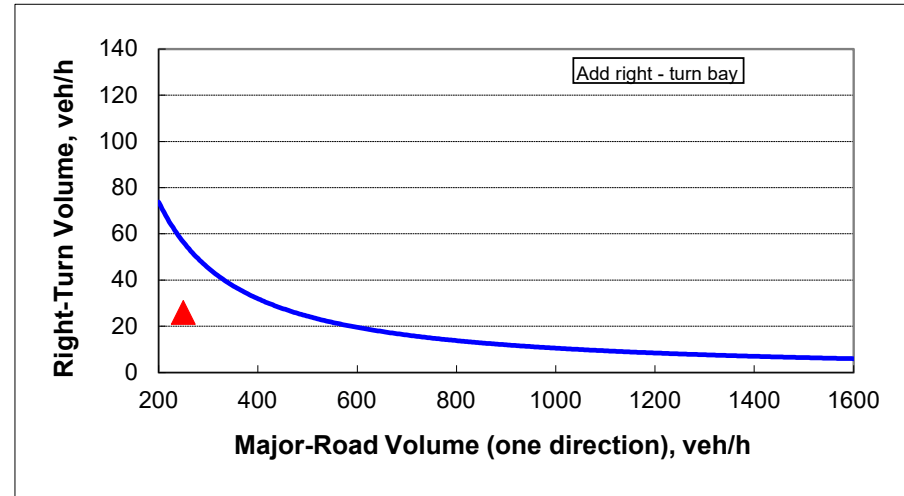


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	169
Right-turn volume, veh/h:	33

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	91
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

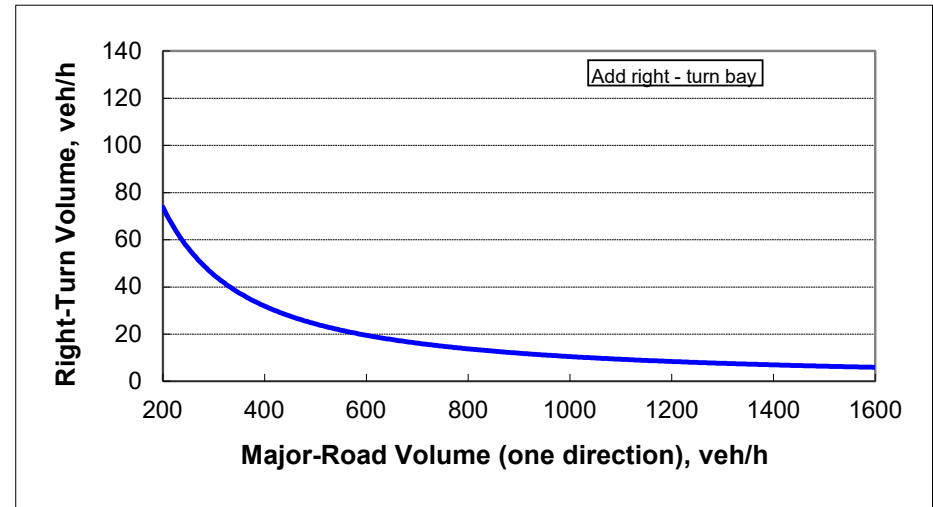


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	324
Right-turn volume, veh/h:	34

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	41
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

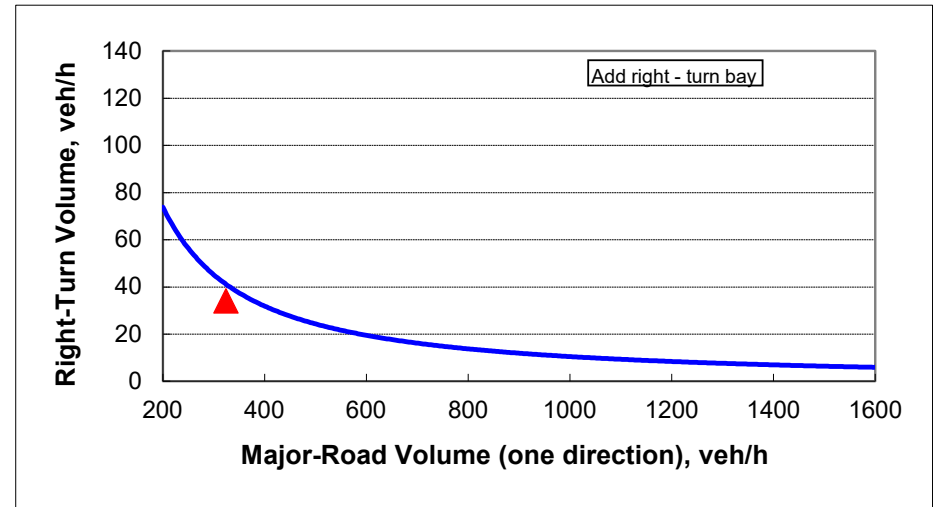


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	189
Right-turn volume, veh/h:	24

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	79
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

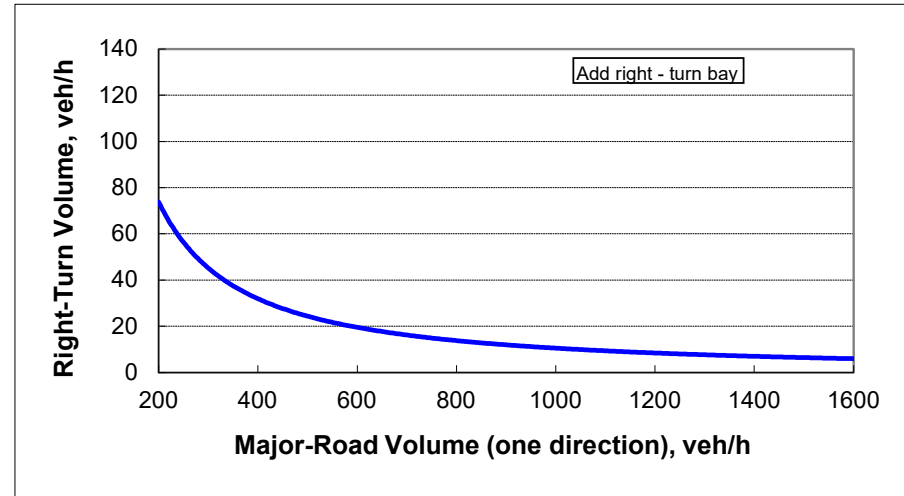


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	265
Right-turn volume, veh/h:	1

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	138
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

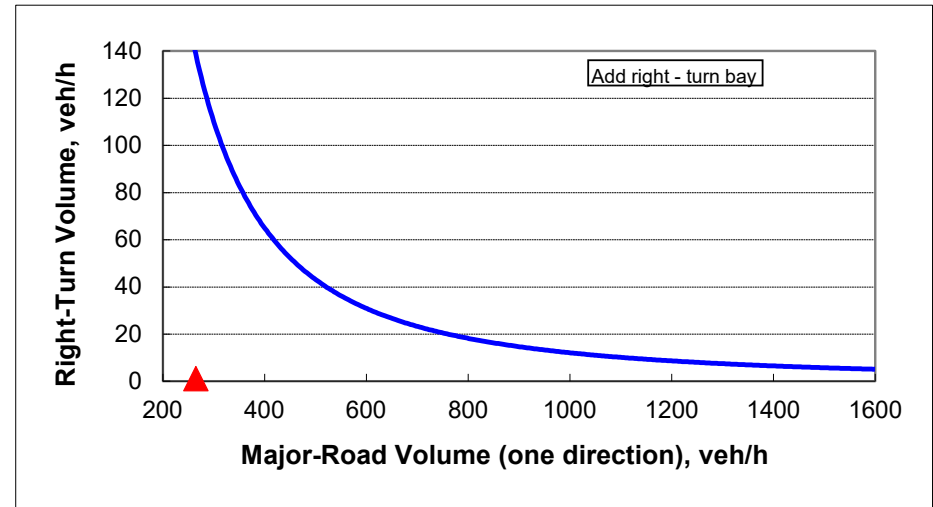


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	373
Right-turn volume, veh/h:	69

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	74
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

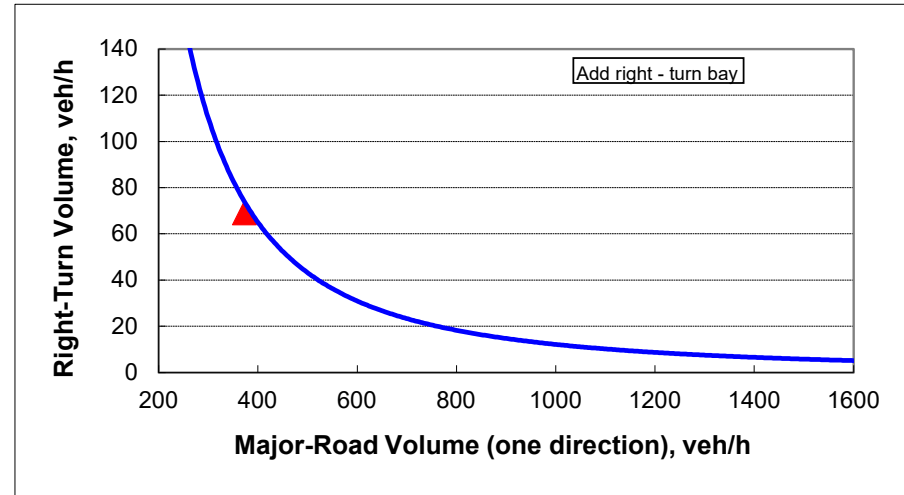


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	234
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	174
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

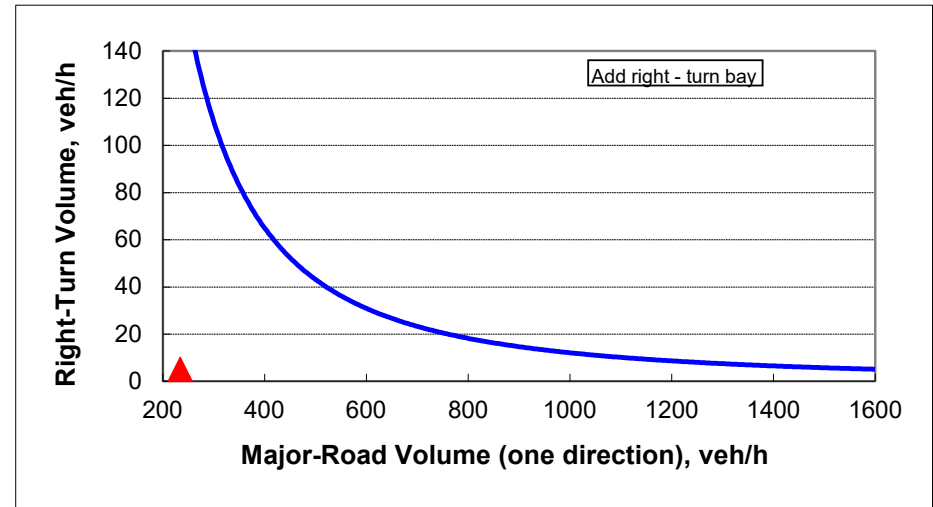


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	295
Right-turn volume, veh/h:	30

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	114
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

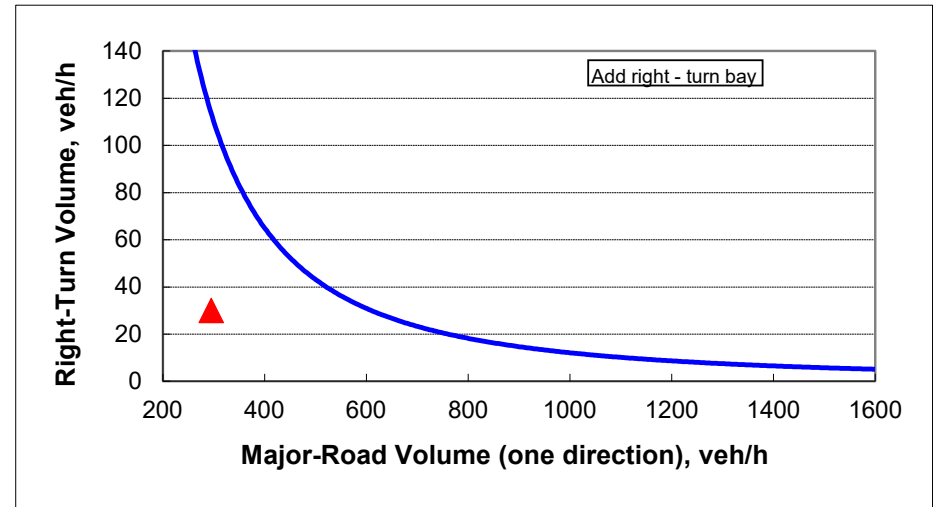


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	278
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	127
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

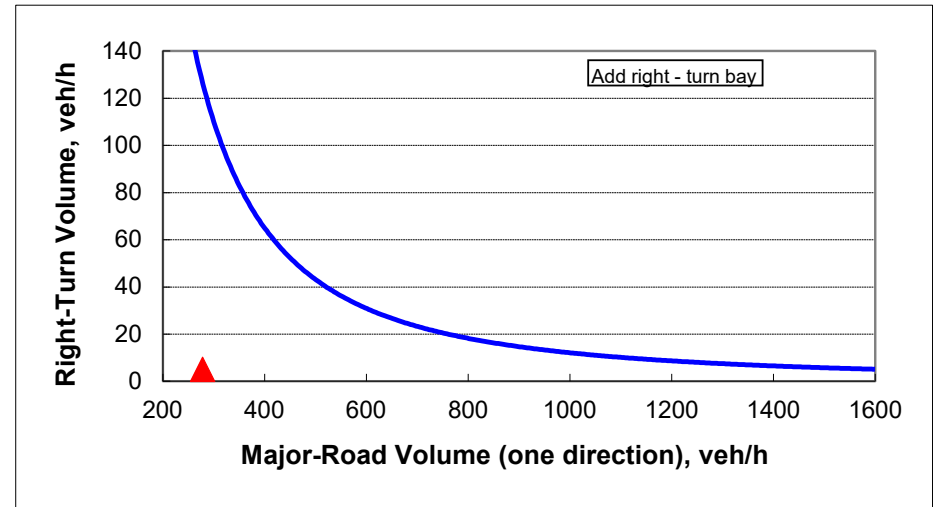


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	236
Right-turn volume, veh/h:	38

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	171
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

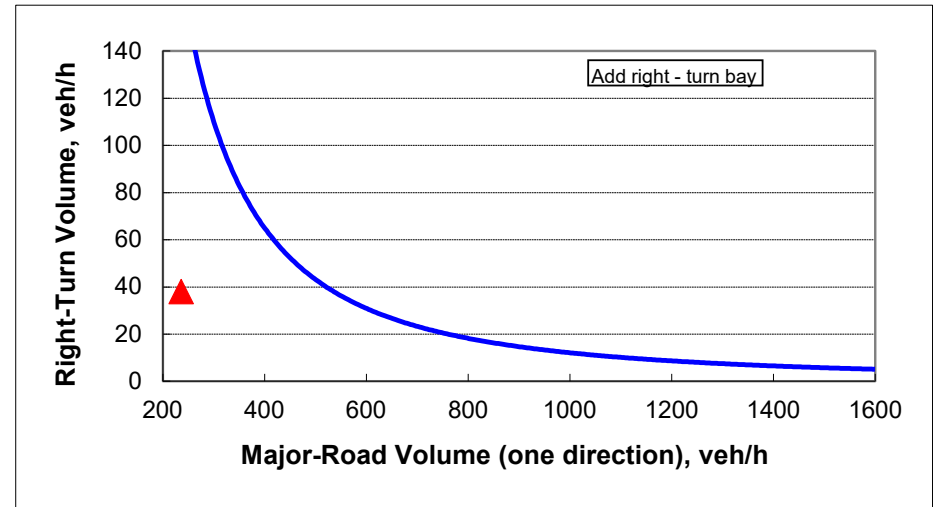


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	317
Right-turn volume, veh/h:	13

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	100
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

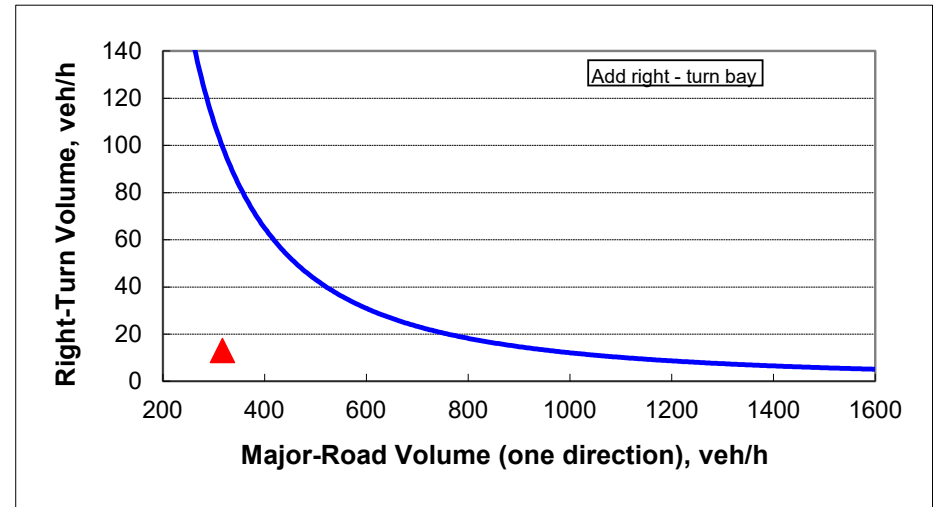


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	276
Right-turn volume, veh/h:	12

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	128
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

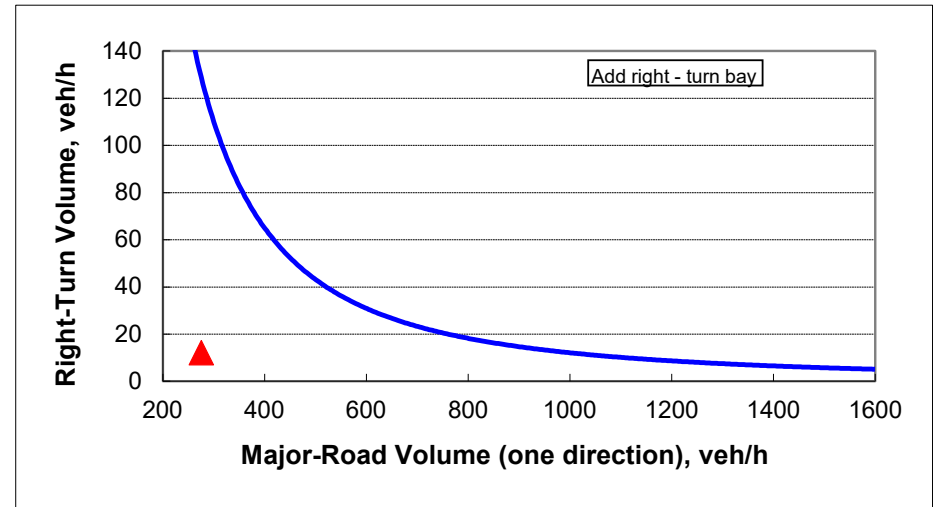


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	213
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	206
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

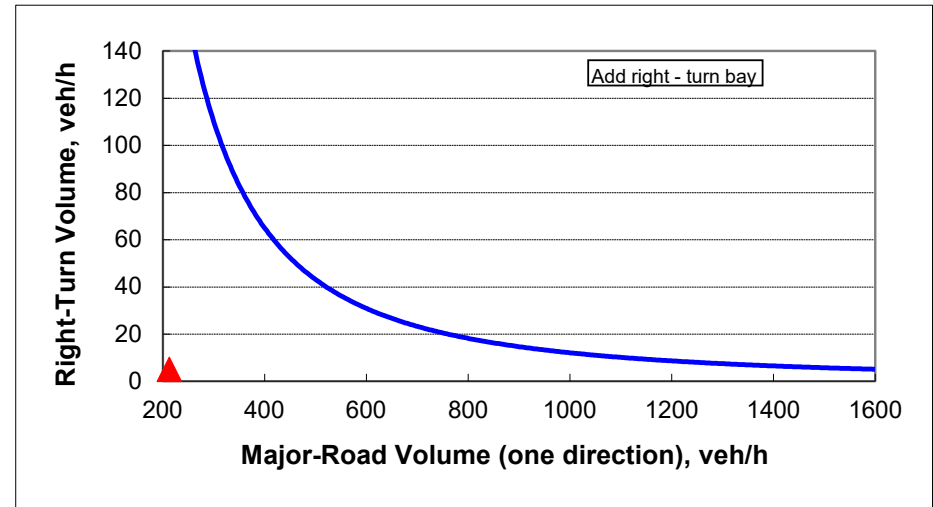


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	397
Right-turn volume, veh/h:	6

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1676
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

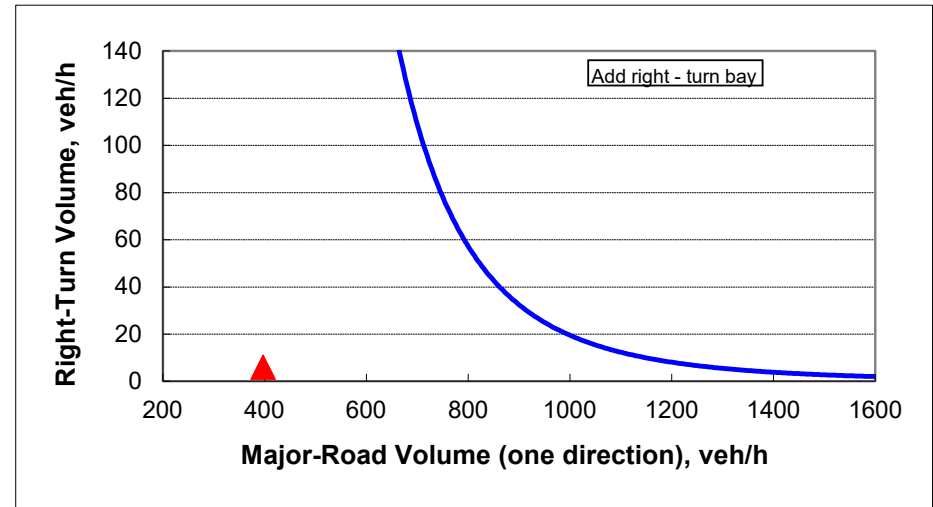


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Laird Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	496
Right-turn volume, veh/h:	14

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	573
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

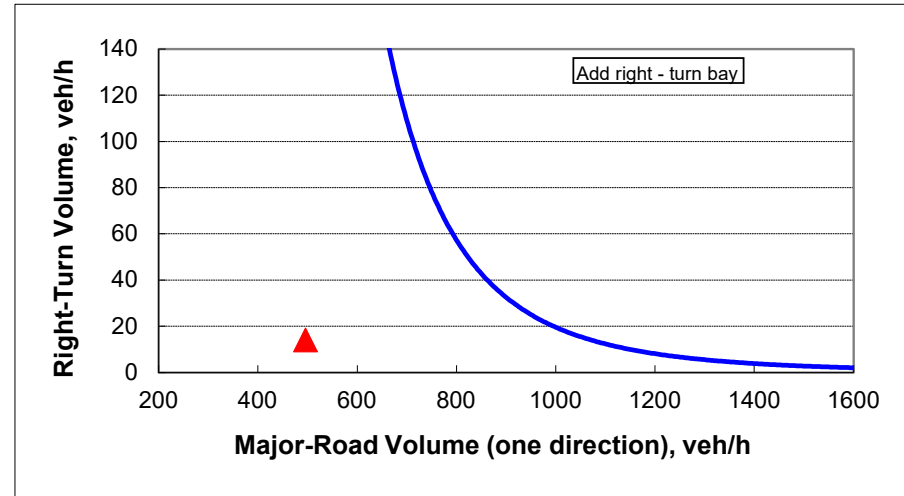


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	417
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1323
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

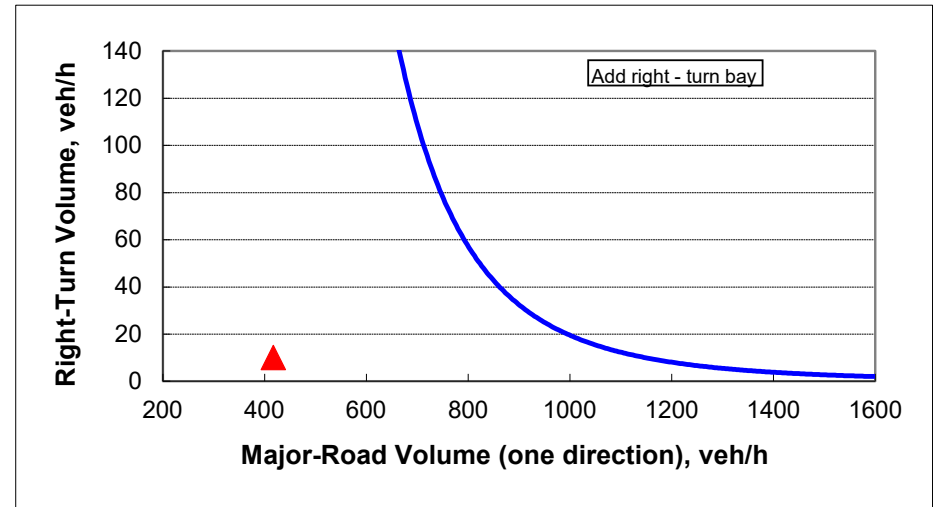


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

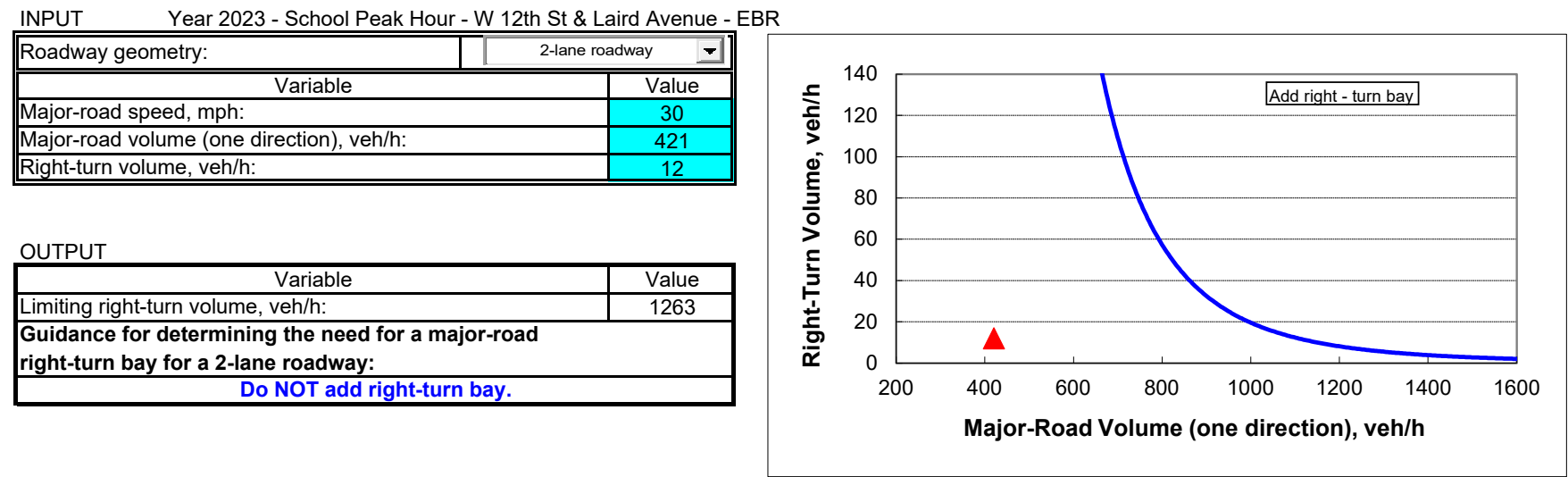


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	405
Right-turn volume, veh/h:	3

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1523
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

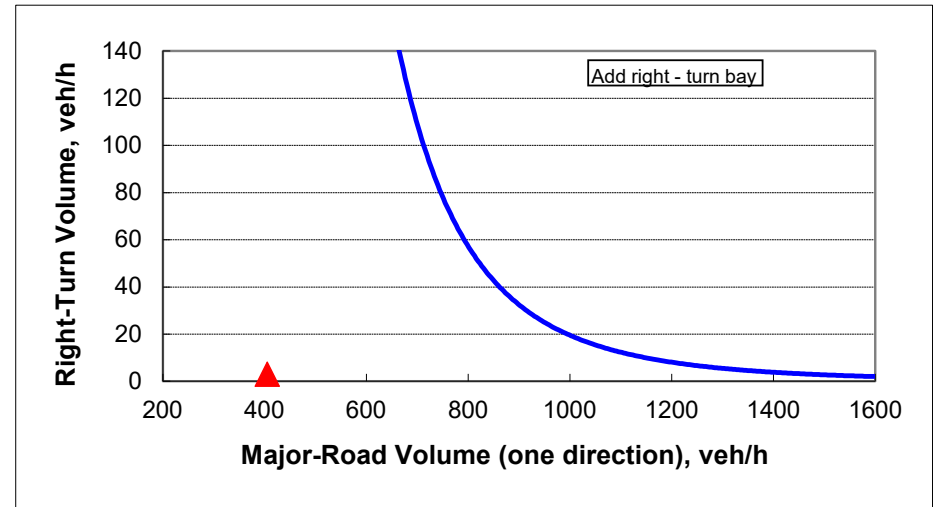


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Laird Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	292
Right-turn volume, veh/h:	7

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	7366
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

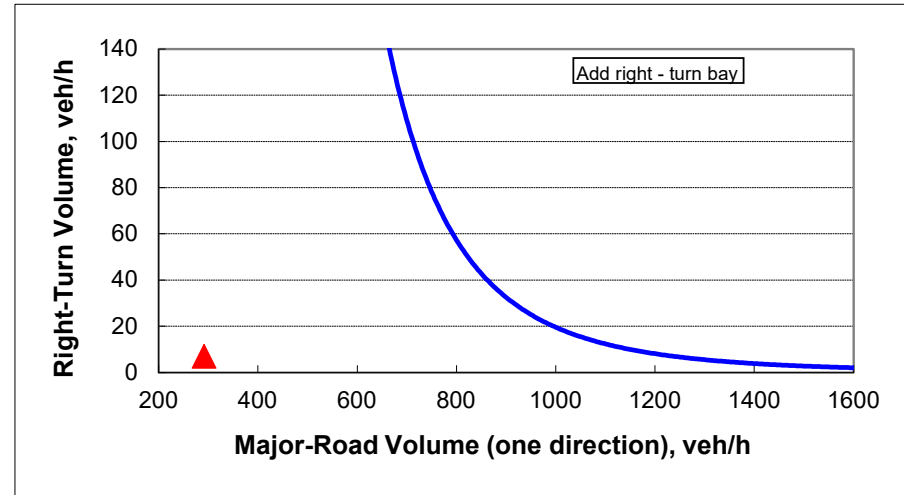


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	437
Right-turn volume, veh/h:	53

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1055
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

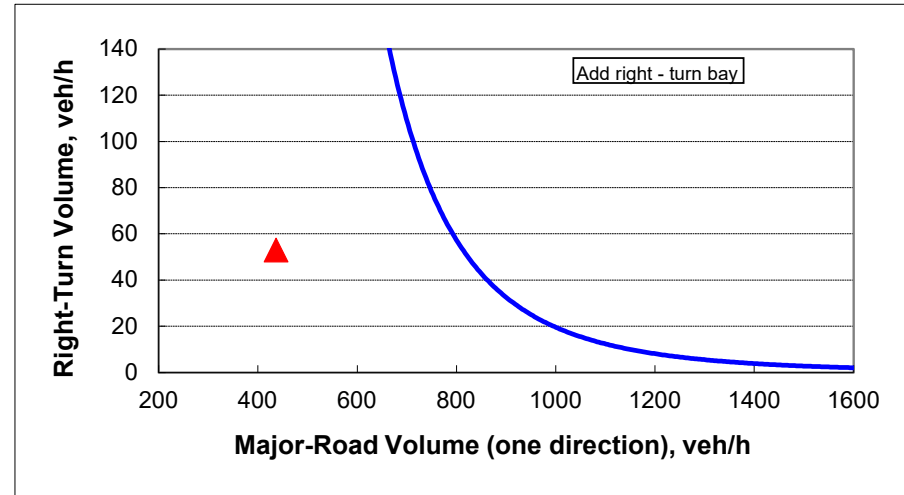


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	544
Right-turn volume, veh/h:	4

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	367
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

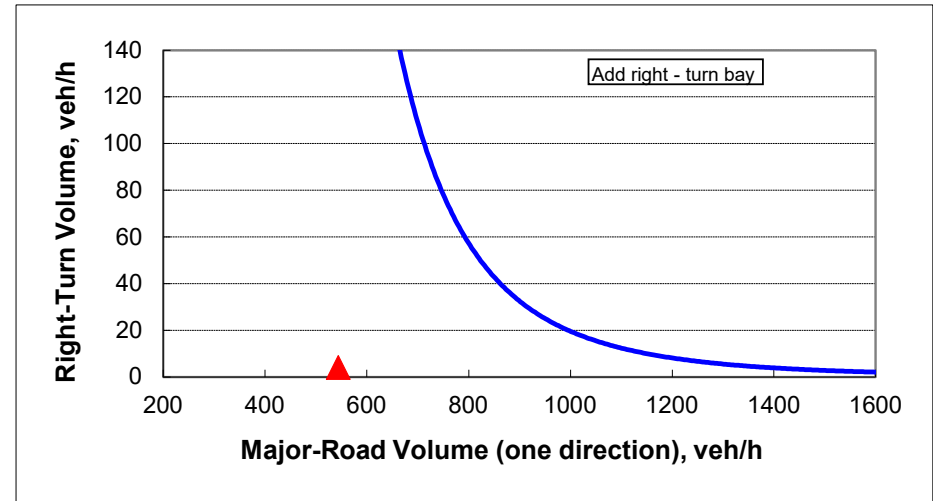


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	419
Right-turn volume, veh/h:	21

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1293
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

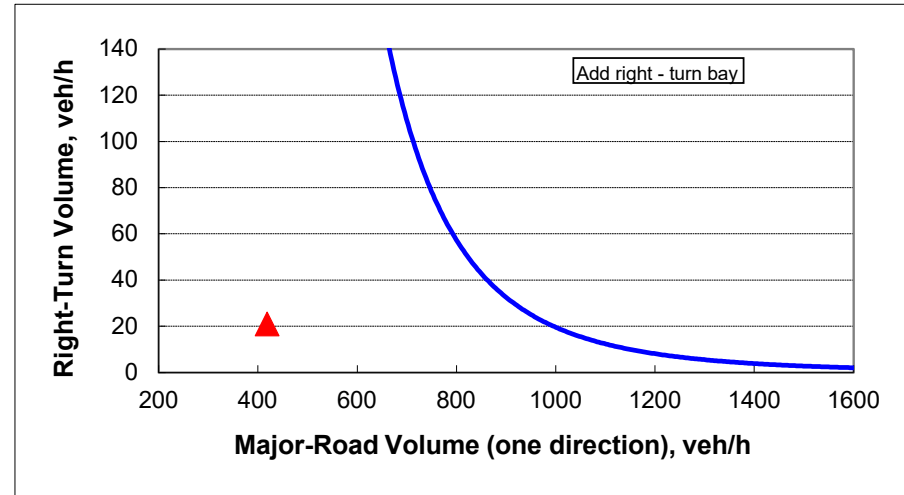


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	501
Right-turn volume, veh/h:	11

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	546
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

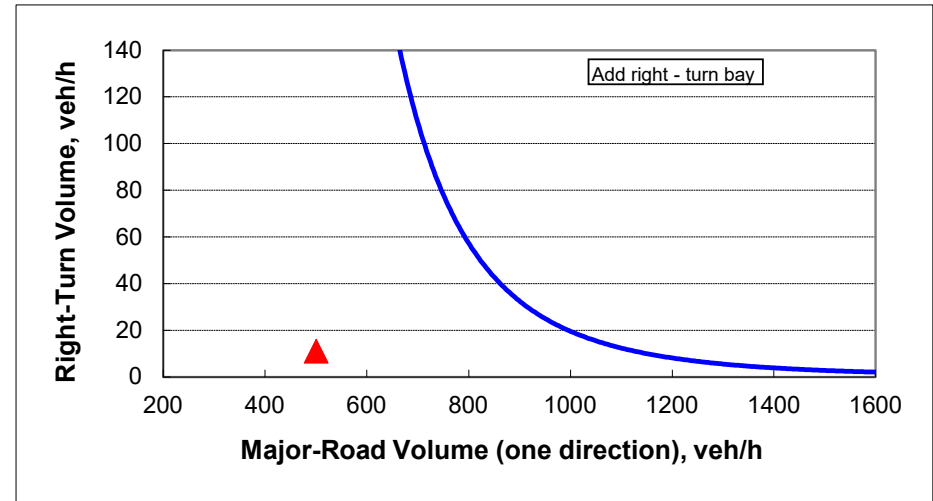


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	442
Right-turn volume, veh/h:	11

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	999
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

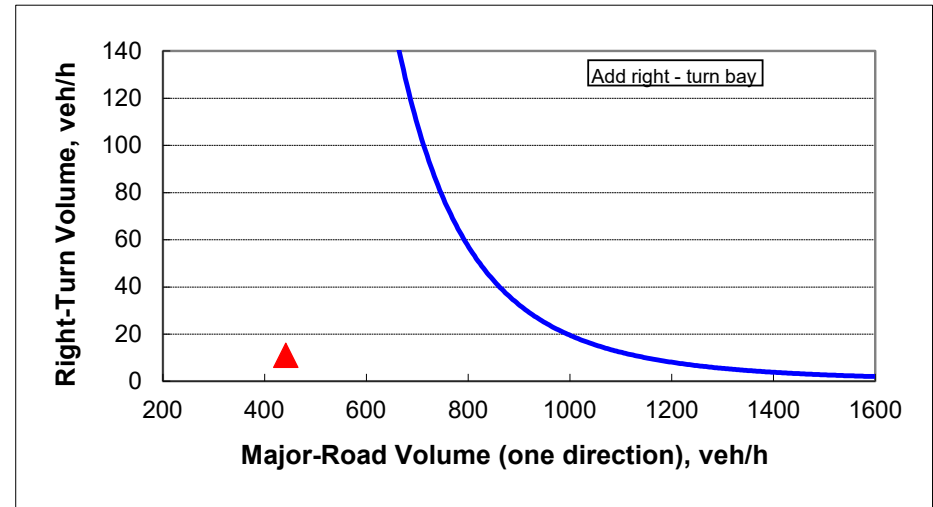


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	350
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	3076
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

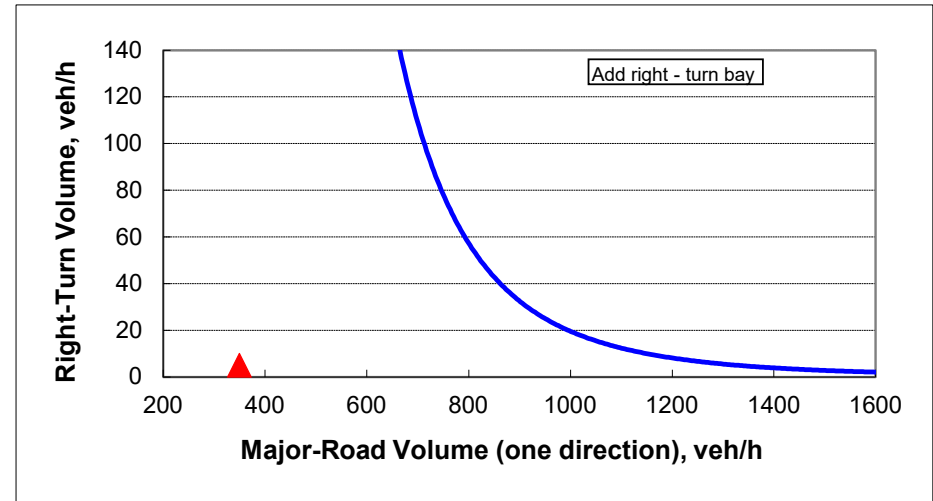


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & N Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	310
Right-turn volume, veh/h:	12

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	5521
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

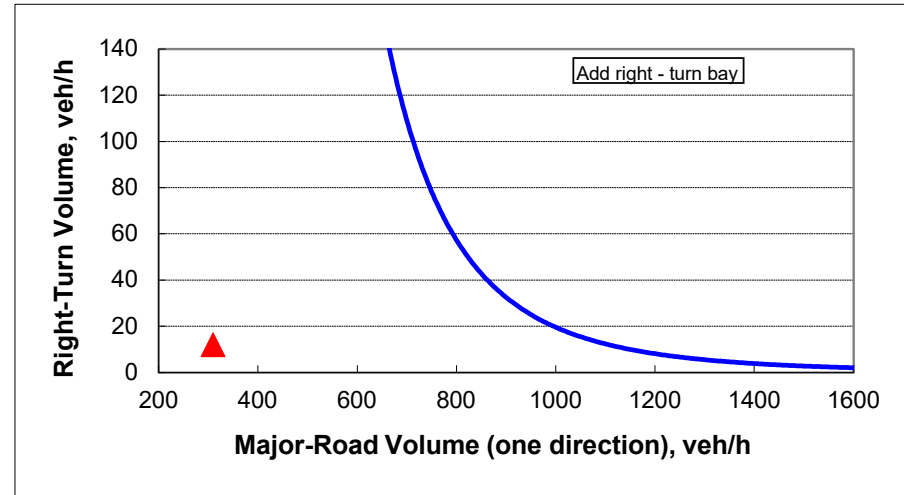


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - AM Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	540
Right-turn volume, veh/h:	18

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	381
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

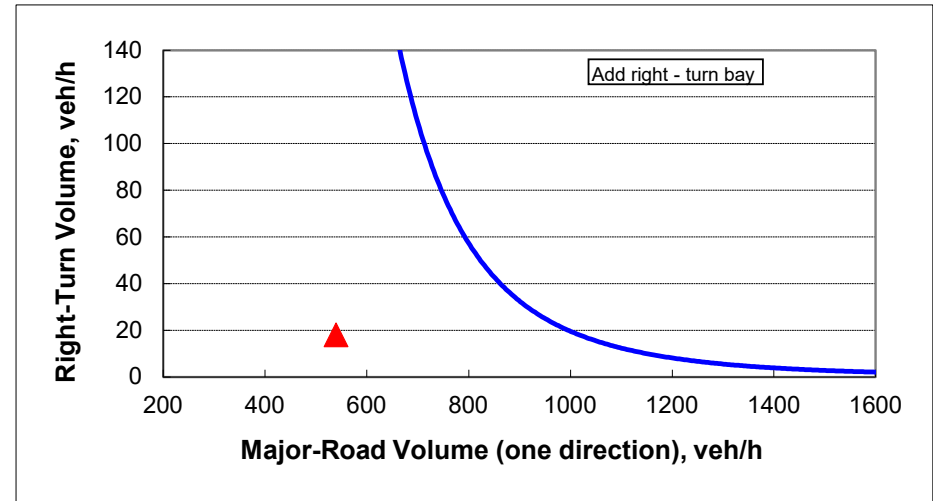


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & N Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	318
Right-turn volume, veh/h:	20

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	4883
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

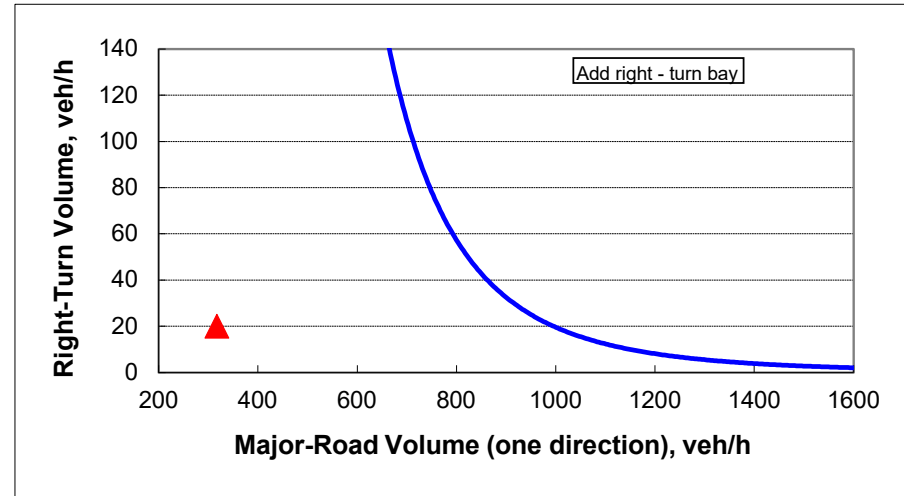


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - School Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	489
Right-turn volume, veh/h:	17

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	614
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

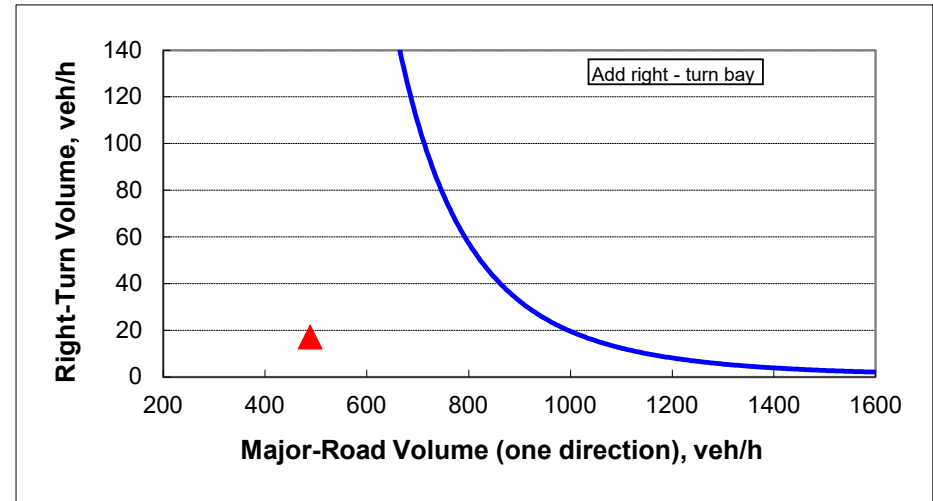


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & N Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	363
Right-turn volume, veh/h:	34

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	2581
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

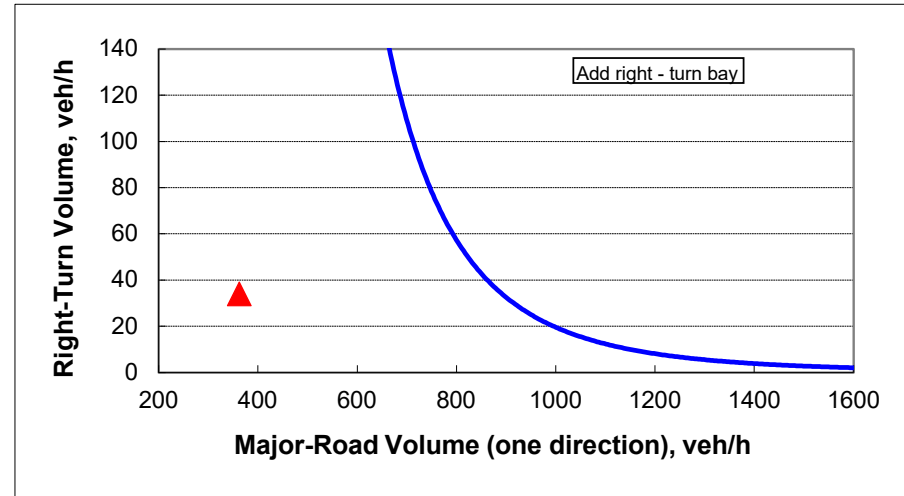


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2023 - PM Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	357
Right-turn volume, veh/h:	9

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	2796
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

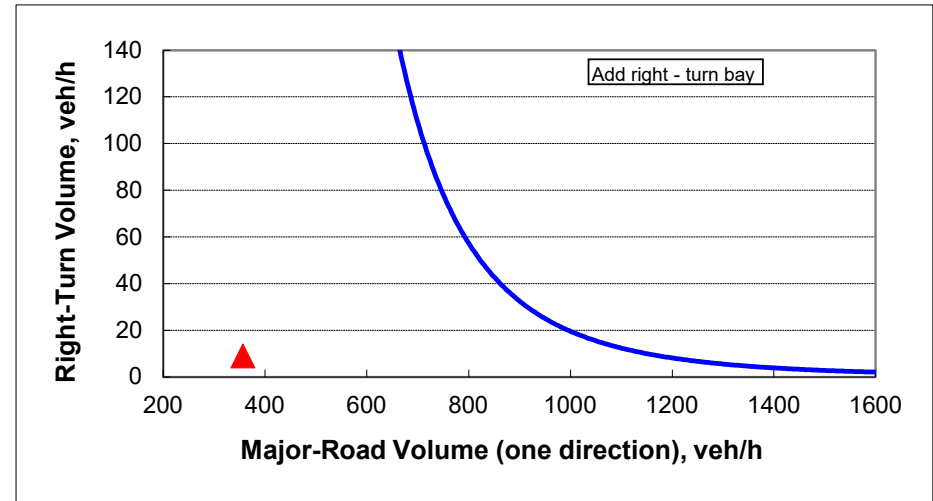


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - AM Peak Hour - W 12th St & N Adams Central Rd - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	485
Opposing volume (V_O), veh/h:	178

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1207
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

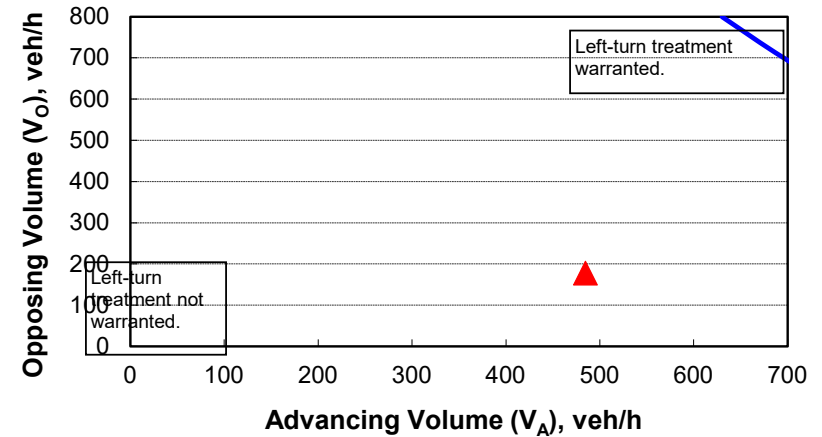


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - AM Peak Hour - W 12th St & N Adams Central Rd - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	55%
Advancing volume (V_A), veh/h:	397
Opposing volume (V_O), veh/h:	480

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	177
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

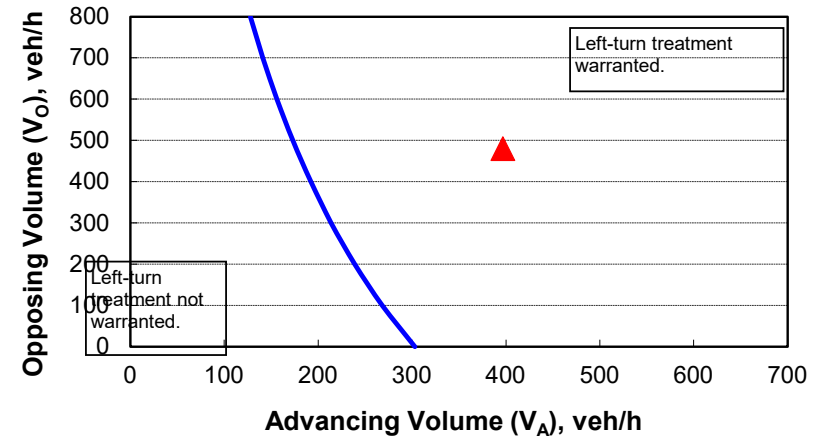


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - School Peak Hour - W 12th St & N Adams Central Rd - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	240
Opposing volume (V_O), veh/h:	282

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	760
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

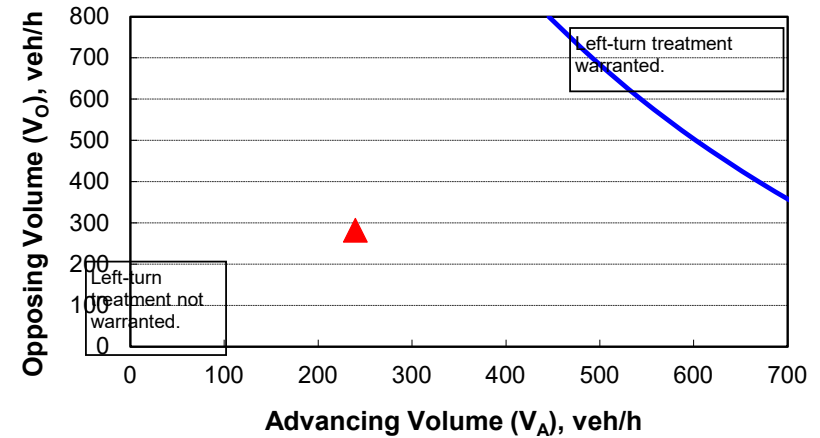


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & N Adams Central Rd - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	21%
Advancing volume (V_A), veh/h:	358
Opposing volume (V_O), veh/h:	235

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	280
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

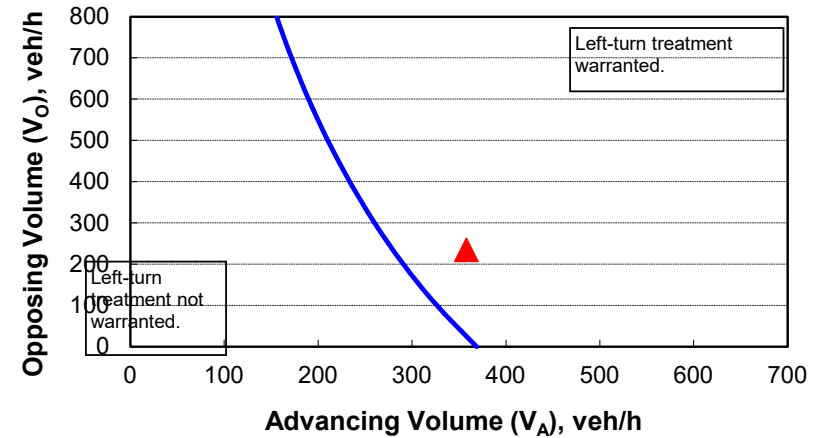


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - PM Peak Hour - W 12th St & N Adams Central Rd - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	280
Opposing volume (V_O), veh/h:	402

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	720
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

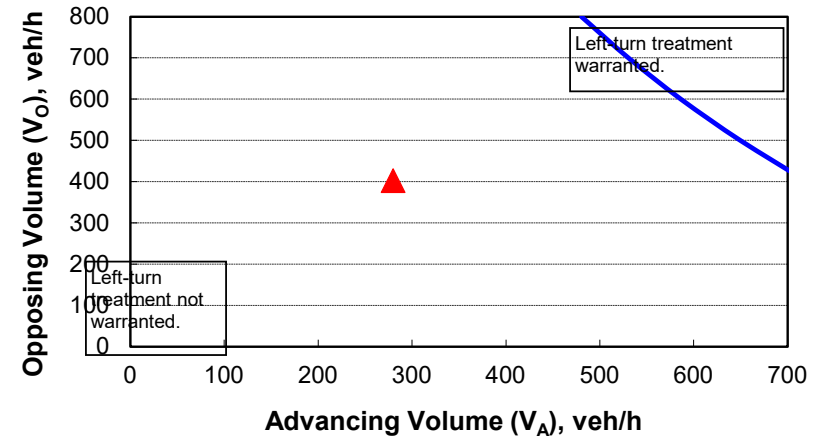


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - PM Peak Hour - W 12th St & N Adams Central Rd - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	450
Opposing volume (V_O), veh/h:	275

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	354
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

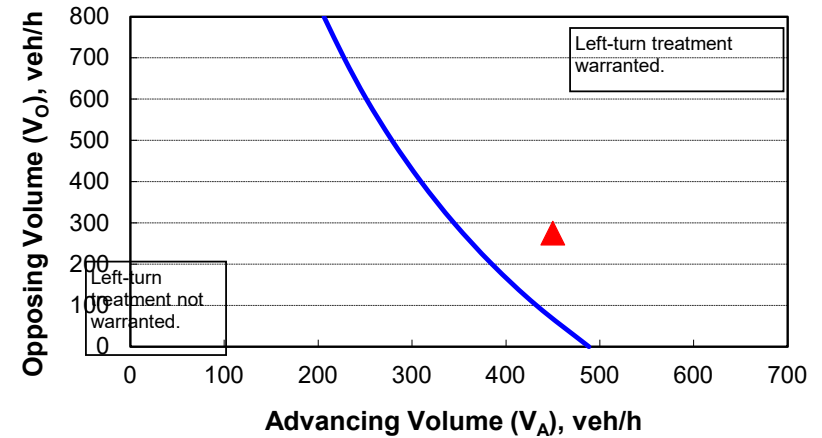


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	507
Opposing volume (V_O), veh/h:	332

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	798
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

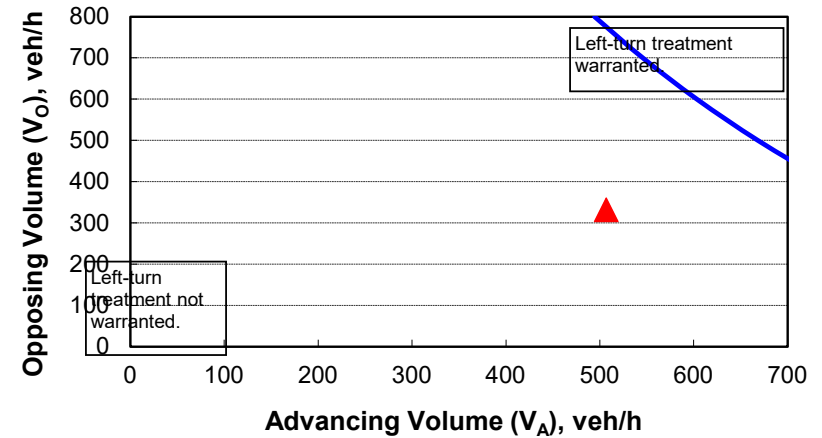


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	363
Opposing volume (V_O), veh/h:	497

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	334
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

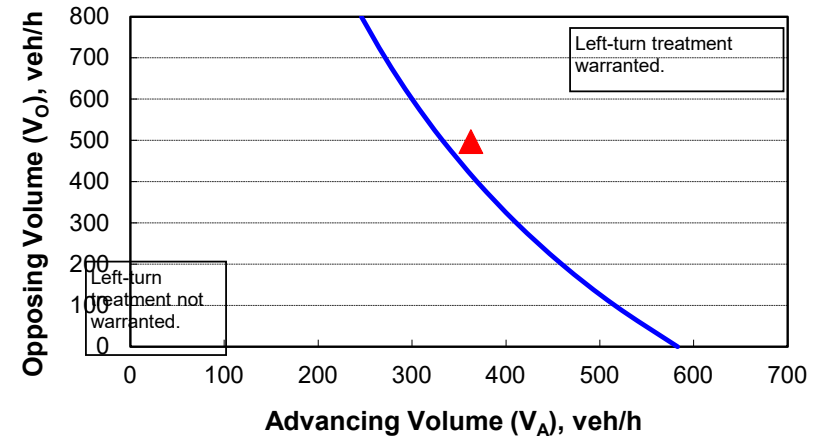


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	417
Opposing volume (V_O), veh/h:	313

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	741
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

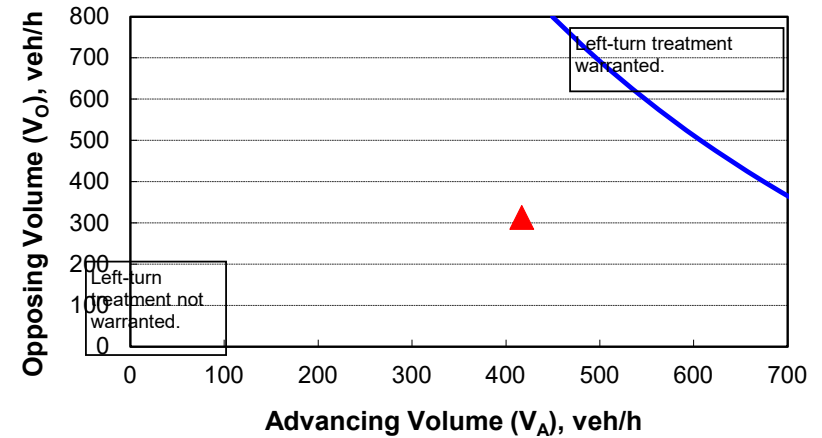


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	8%
Advancing volume (V_A), veh/h:	340
Opposing volume (V_O), veh/h:	407

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	379
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

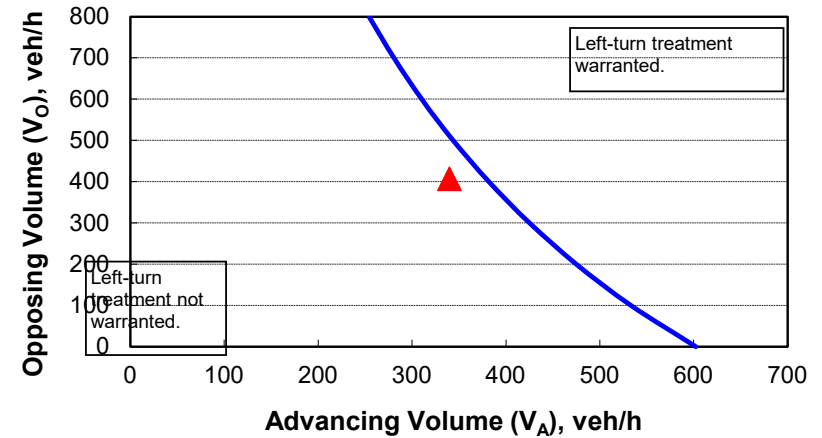


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Highland Road - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	352
Opposing volume (V_O), veh/h:	376

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	637
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

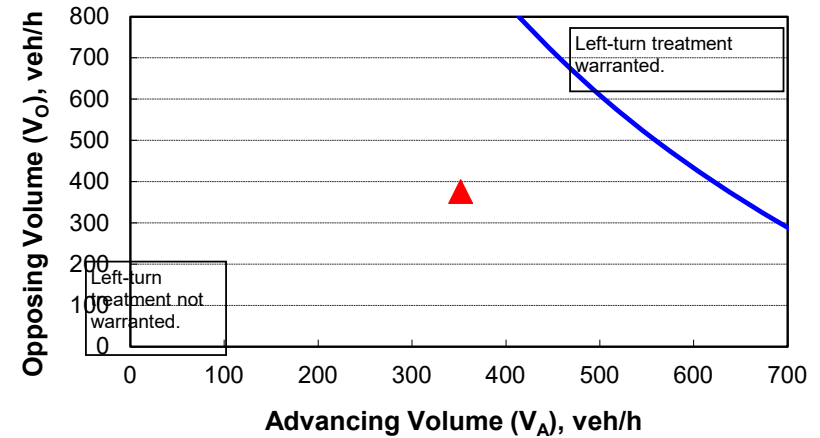


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Highland Road - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	397
Opposing volume (V_O), veh/h:	342

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	491
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

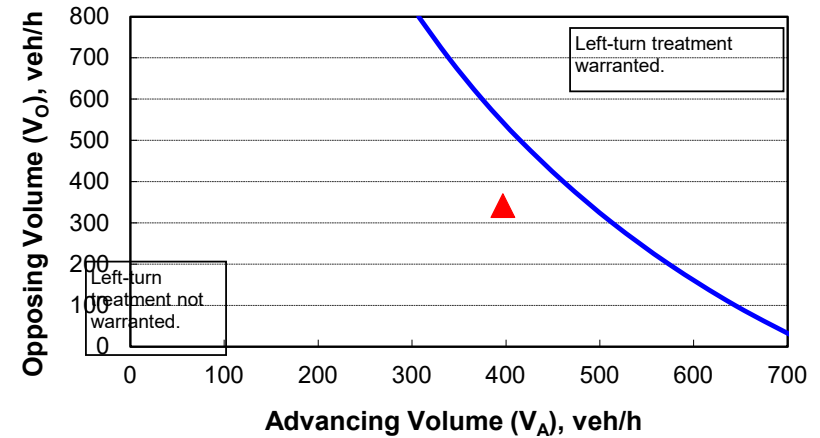


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	343
Opposing volume (V_O), veh/h:	432

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	833
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

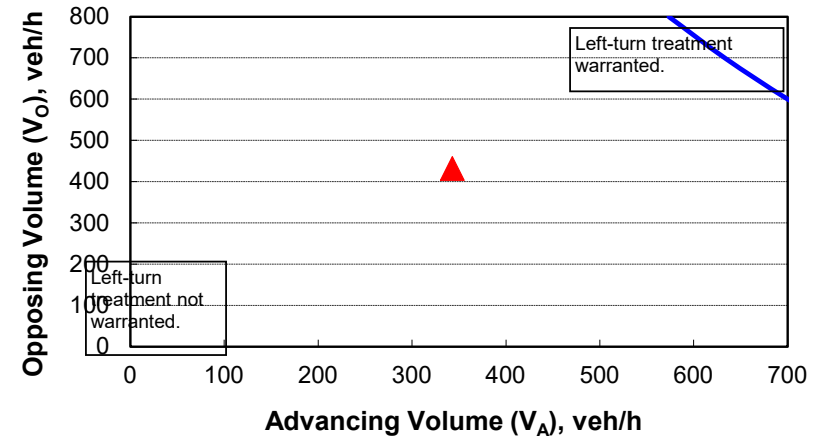


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	8%
Advancing volume (V_A), veh/h:	337
Opposing volume (V_O), veh/h:	394

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	383
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

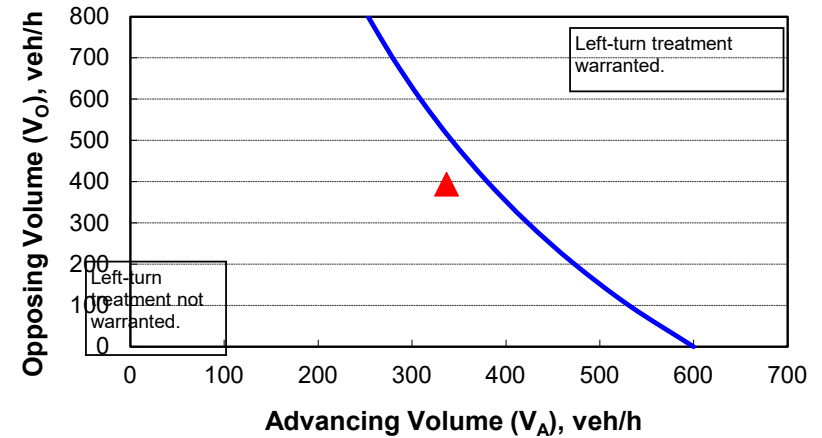


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Sycamore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	7%
Advancing volume (V_A), veh/h:	409
Opposing volume (V_O), veh/h:	326

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	450
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

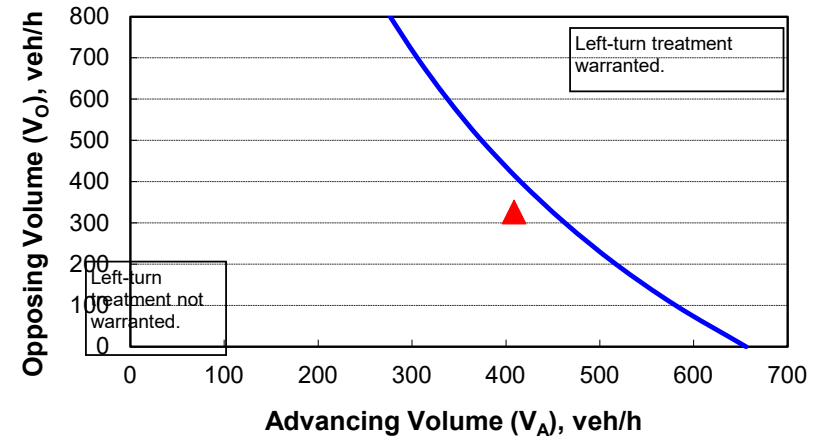


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	710
Opposing volume (V_O), veh/h:	531

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	872
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

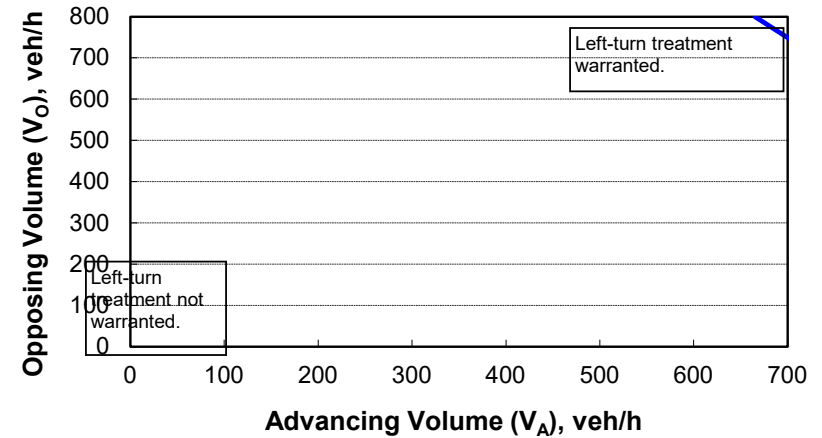


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	12%
Advancing volume (V_A), veh/h:	601
Opposing volume (V_O), veh/h:	699

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	283
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

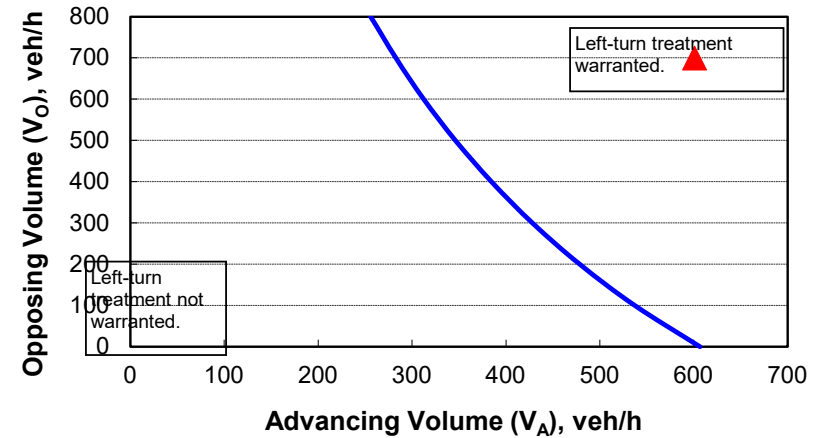


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	675
Opposing volume (V_O), veh/h:	576

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	567
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

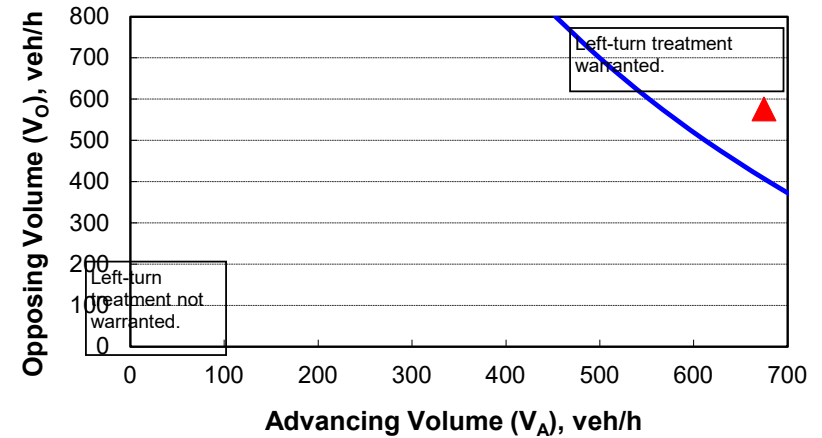


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	15%
Advancing volume (V_A), veh/h:	681
Opposing volume (V_O), veh/h:	652

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	264
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

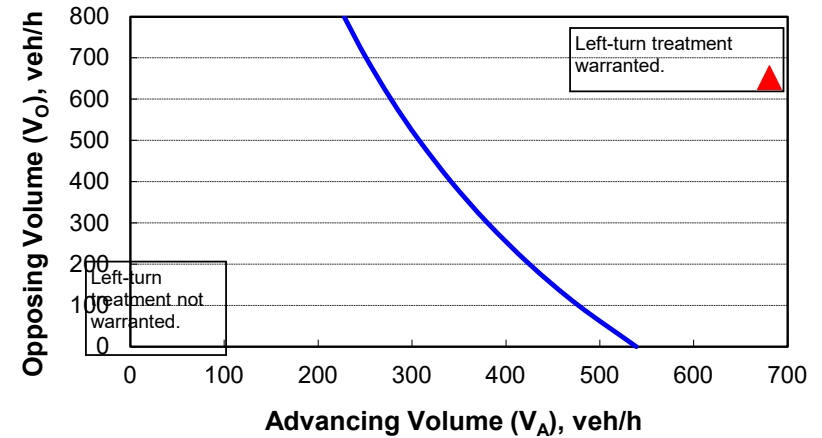


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Laird Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	519
Opposing volume (V_O), veh/h:	633

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	646
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

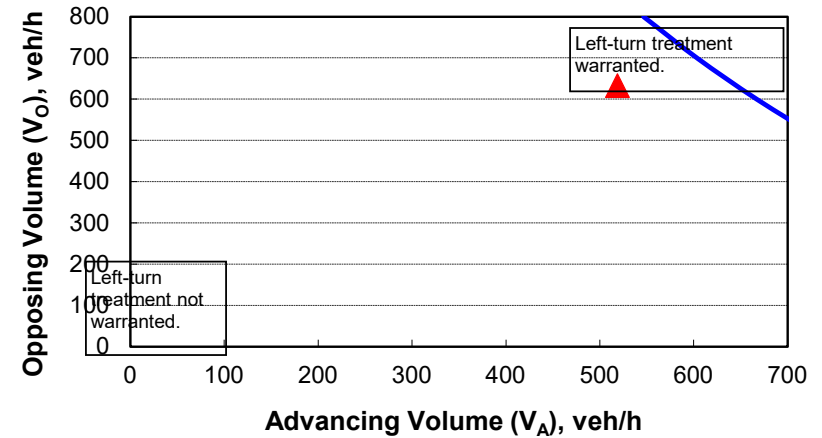


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Laird Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	11%
Advancing volume (V_A), veh/h:	708
Opposing volume (V_O), veh/h:	507

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	359
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

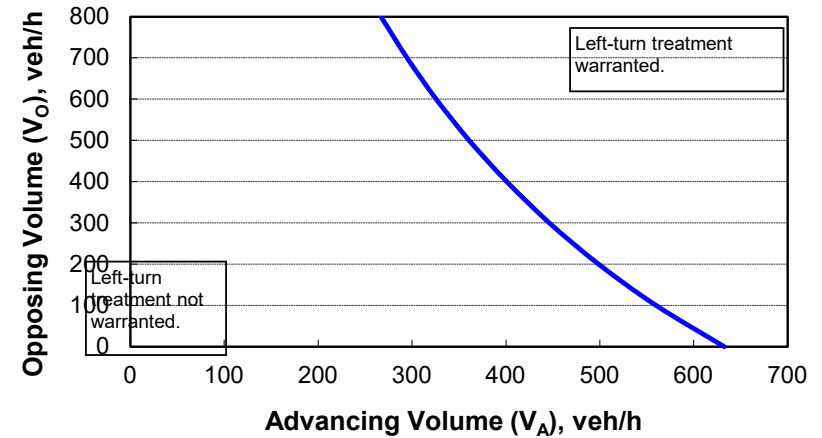


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	8%
Advancing volume (V_A), veh/h:	773
Opposing volume (V_O), veh/h:	601

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	361
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

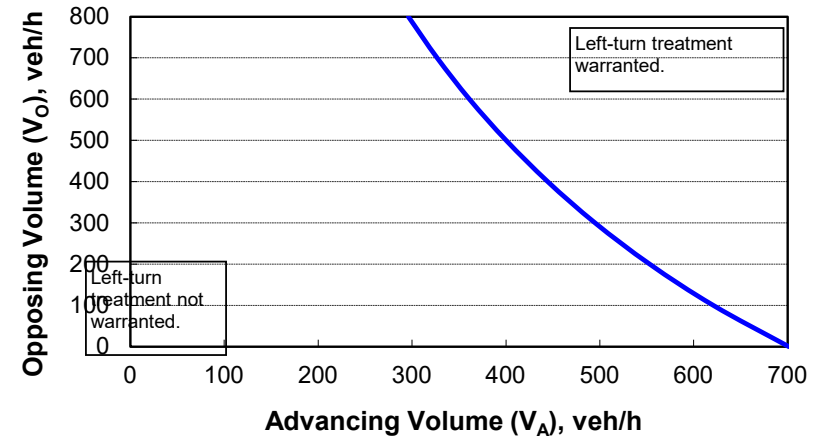


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - AM Peak Hour - W 12th St & Crane Avenue - WBL
INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	7%
Advancing volume (V_A), veh/h:	646
Opposing volume (V_O), veh/h:	708

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	354
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

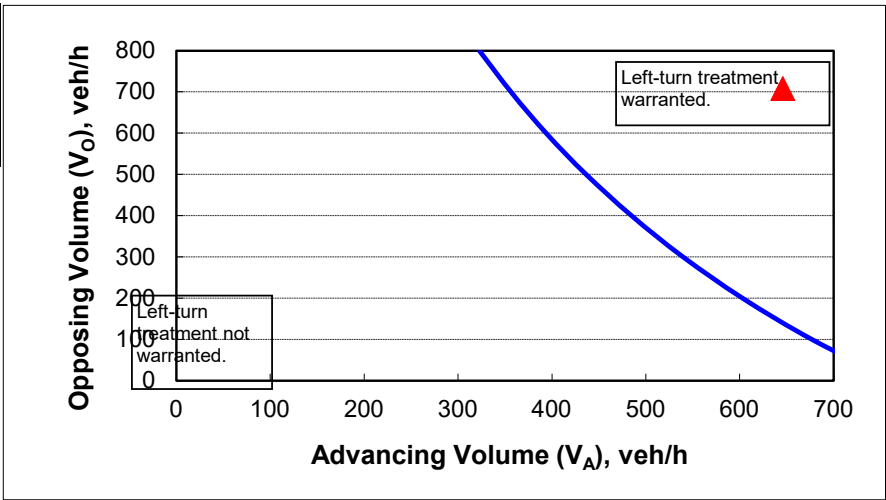


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	765
Opposing volume (V_O), veh/h:	639

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	462
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

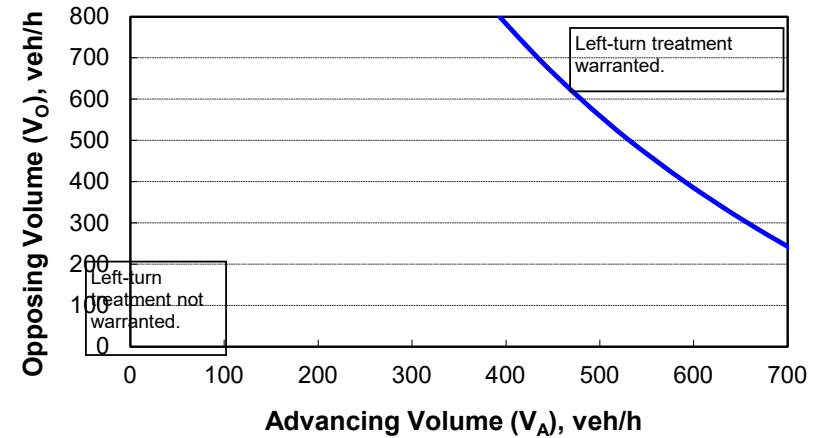


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & Crane Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	669
Opposing volume (V_O), veh/h:	730

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	426
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

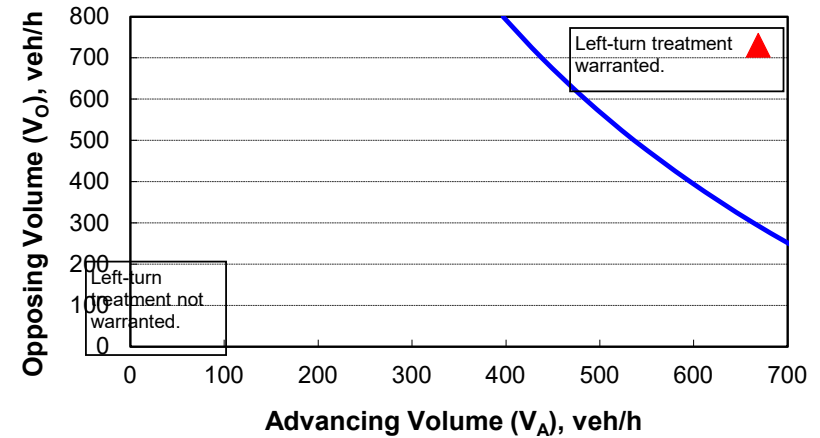


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Crane Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	2%
Advancing volume (V_A), veh/h:	595
Opposing volume (V_O), veh/h:	723

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	631
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

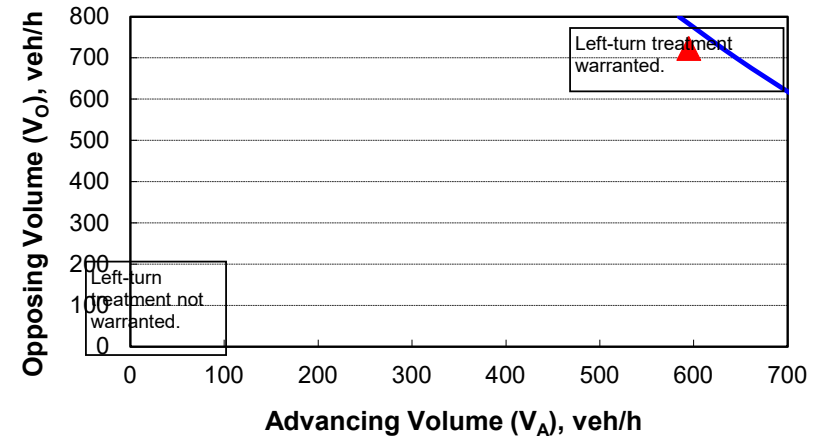


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - PM Peak Hour - W 12th St & Crane Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	748
Opposing volume (V_O), veh/h:	583

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	568
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

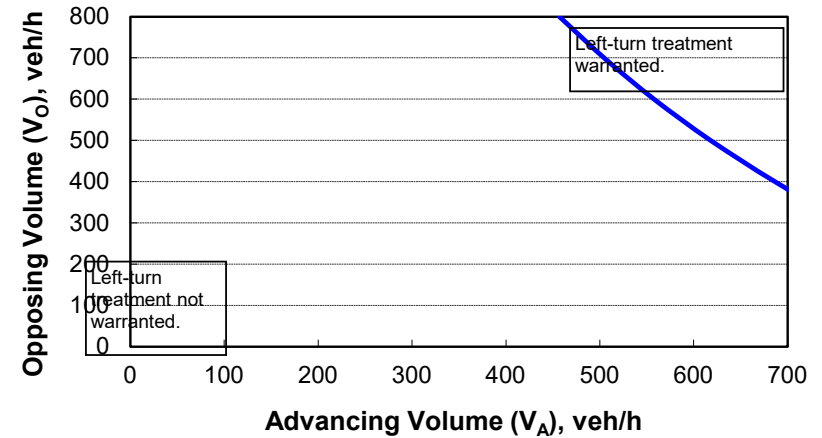


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - AM Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	27%
Advancing volume (V_A), veh/h:	763
Opposing volume (V_O), veh/h:	435

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	268
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

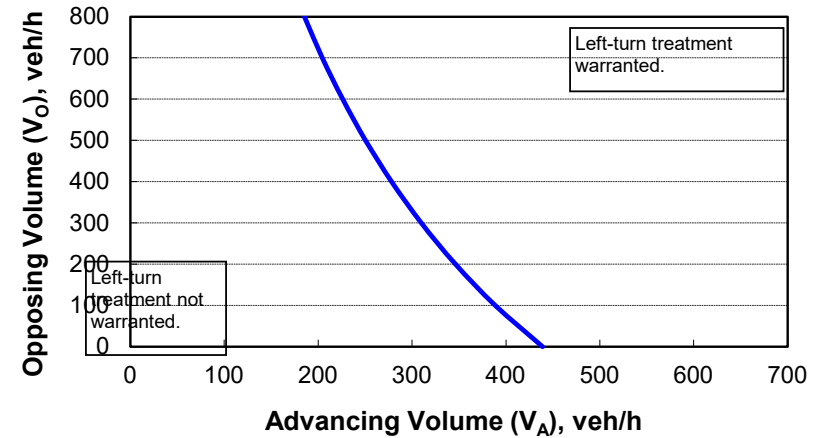


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - AM Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	460
Opposing volume (V_O), veh/h:	558

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	462
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

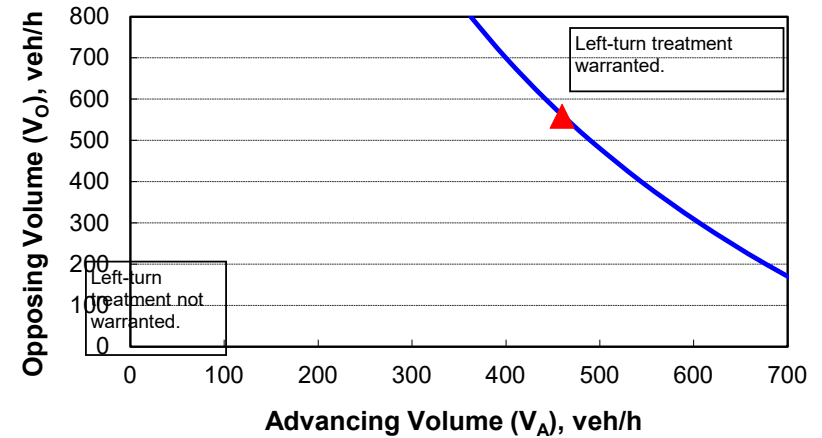


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English) Year 2048 - School Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	32%
Advancing volume (V_A), veh/h:	751
Opposing volume (V_O), veh/h:	483

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	243
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

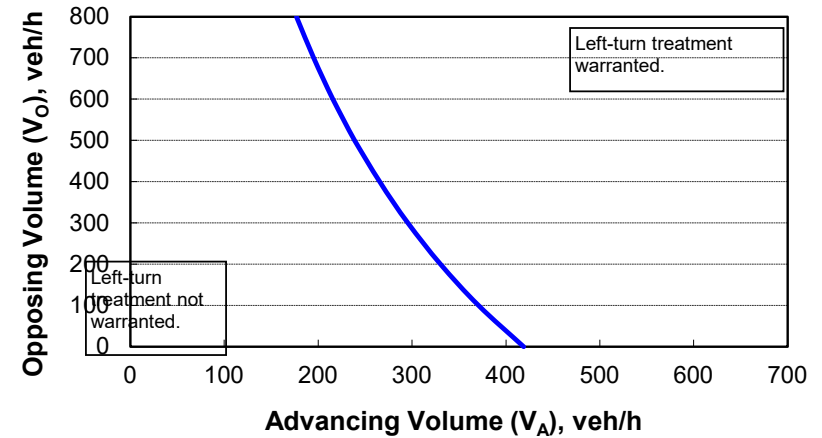


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - School Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	508
Opposing volume (V_O), veh/h:	514

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	506
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

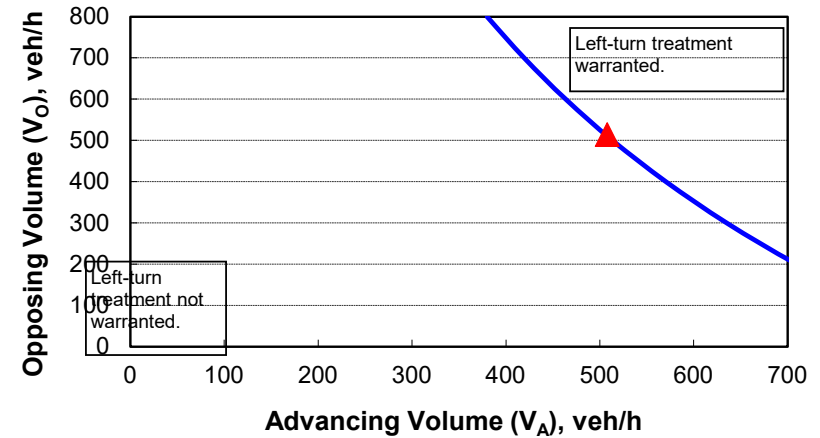


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - PM Peak Hour - W 12th St & N Baltimore Avenue - EBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	29%
Advancing volume (V_A), veh/h:	596
Opposing volume (V_O), veh/h:	580

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	225
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

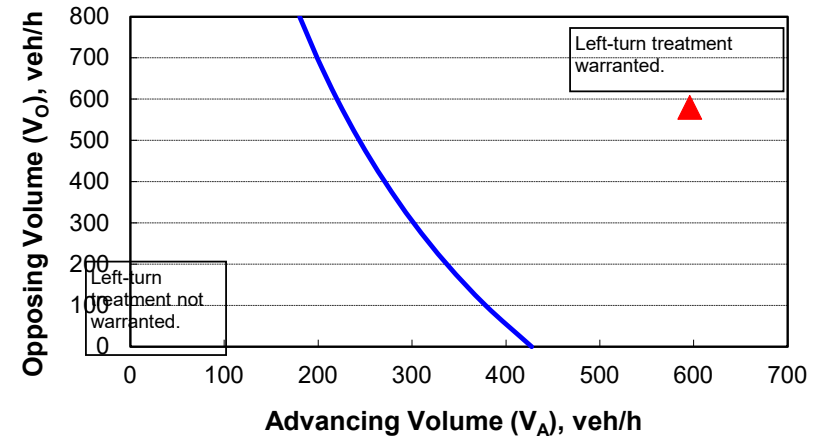


Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

Year 2048 - PM Peak Hour - W 12th St & N Baltimore Avenue - WBL

INPUT

Variable	Value
85 th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	4%
Advancing volume (V_A), veh/h:	605
Opposing volume (V_O), veh/h:	421

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	606
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

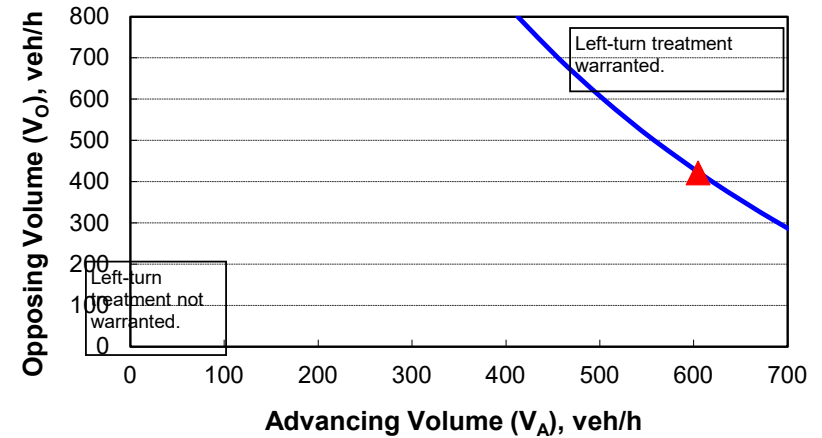


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	397
Right-turn volume, veh/h:	11

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	32
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

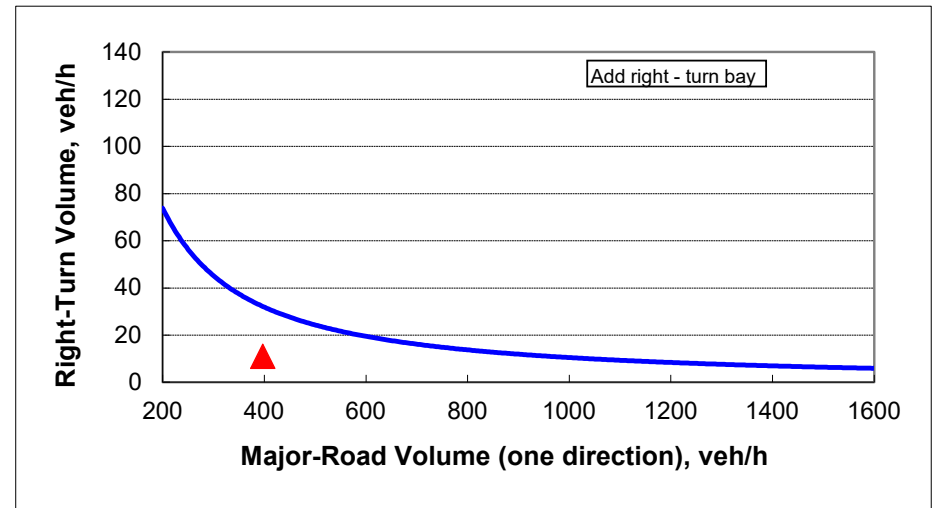


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway ▼
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	485
Right-turn volume, veh/h:	135

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	25
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

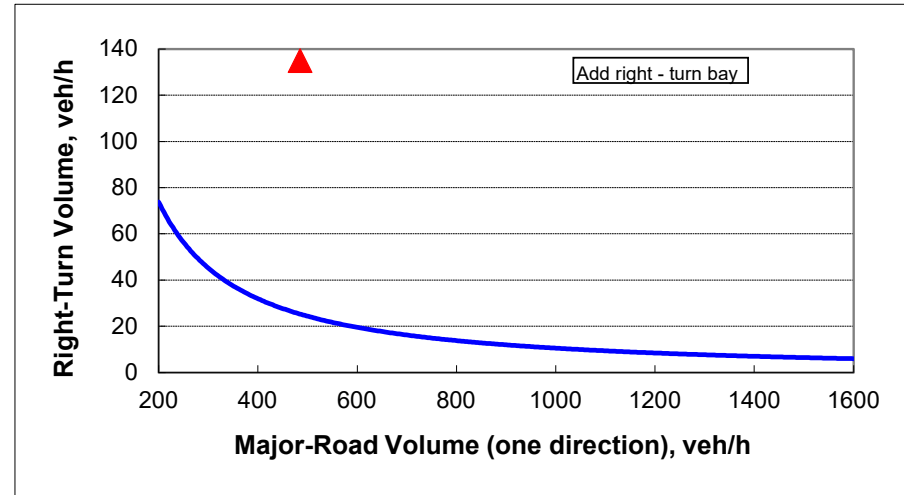


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	358
Right-turn volume, veh/h:	38

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	36
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

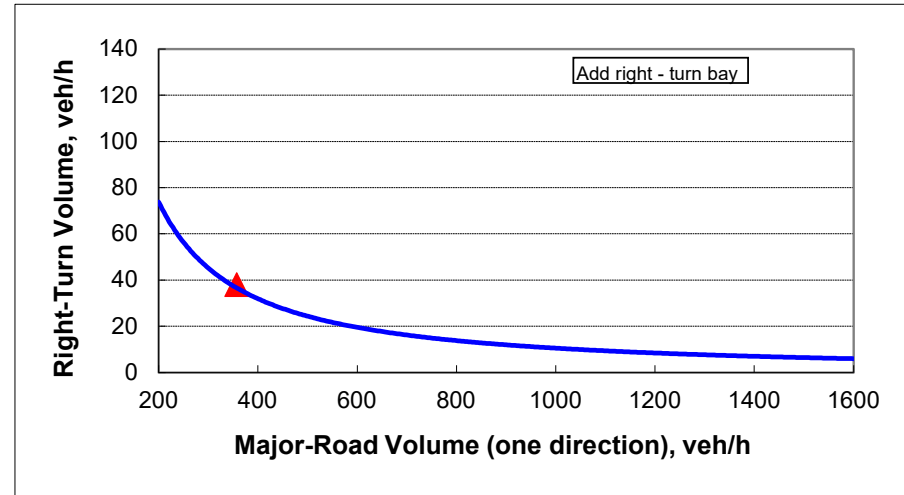


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	240
Right-turn volume, veh/h:	45

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	59
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

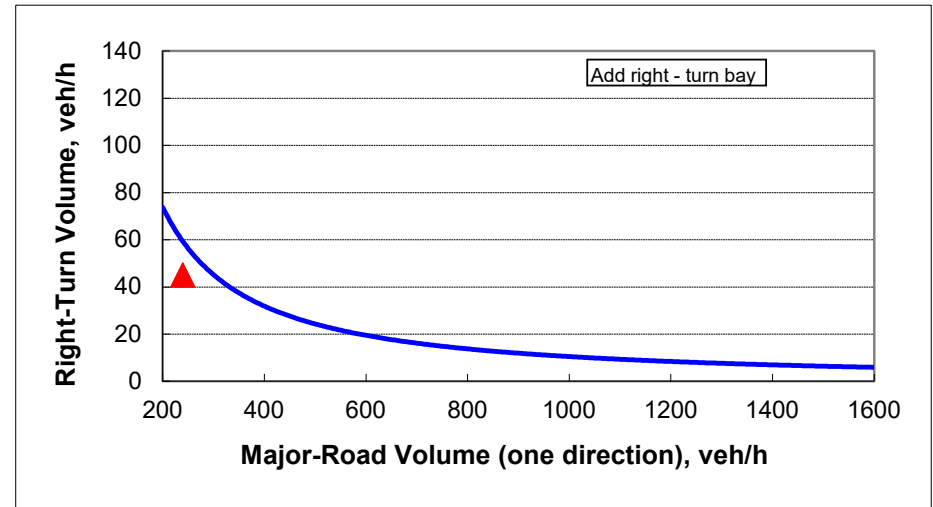


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & N Adams Central Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	450
Right-turn volume, veh/h:	48

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	28
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

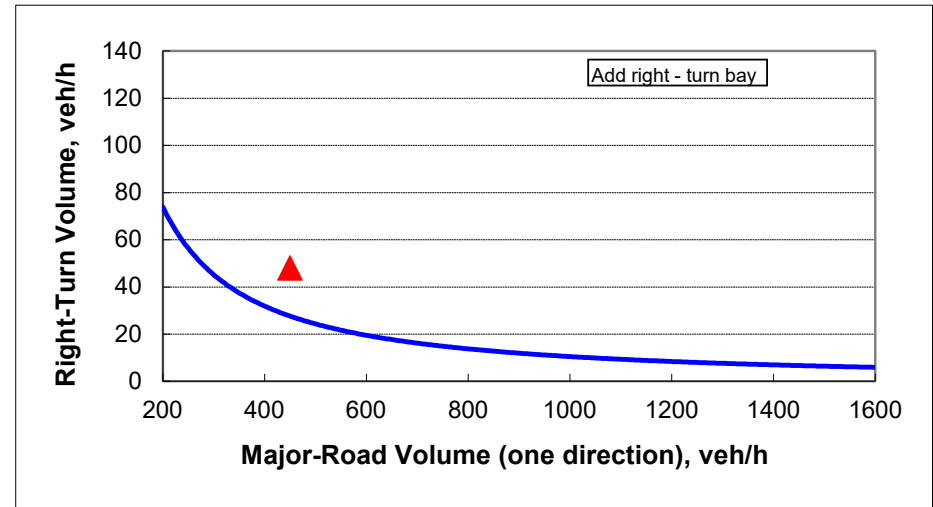


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & N Adams Central Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	280
Right-turn volume, veh/h:	35

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	49
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

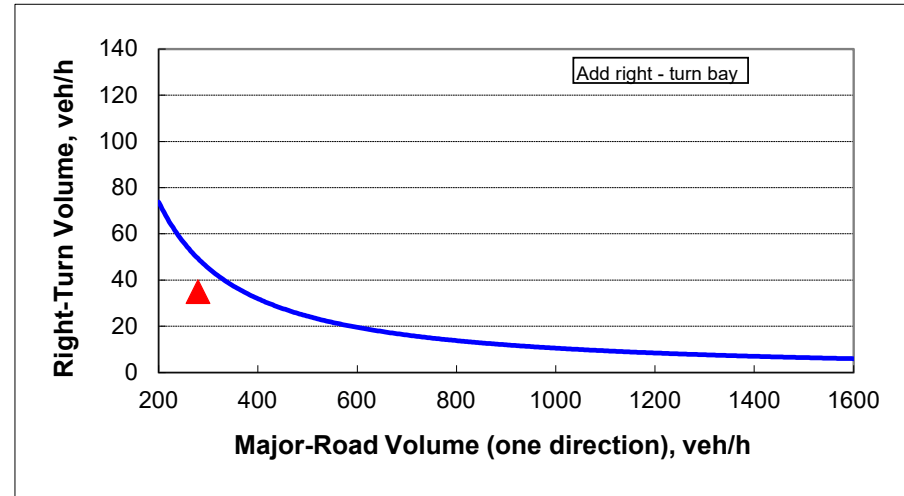


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	363
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	78
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

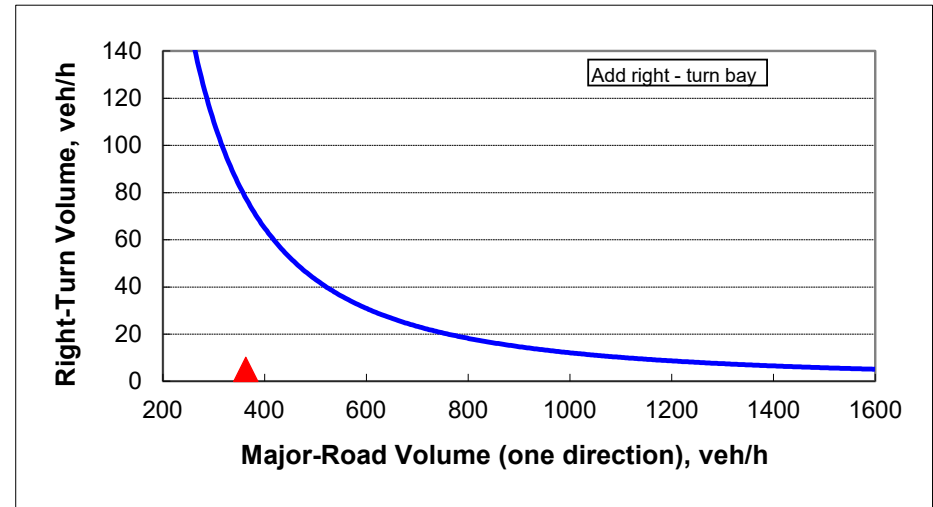


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	507
Right-turn volume, veh/h:	90

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	42
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Add right-turn bay.	

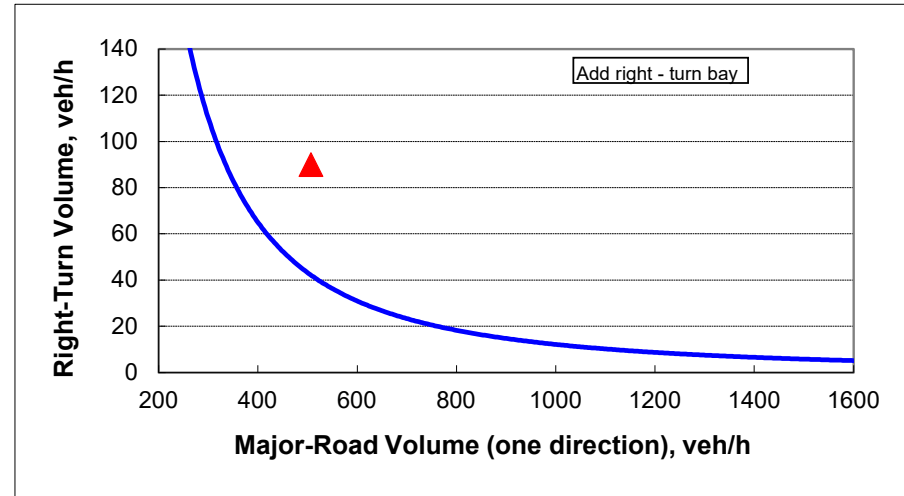


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	340
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	88
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

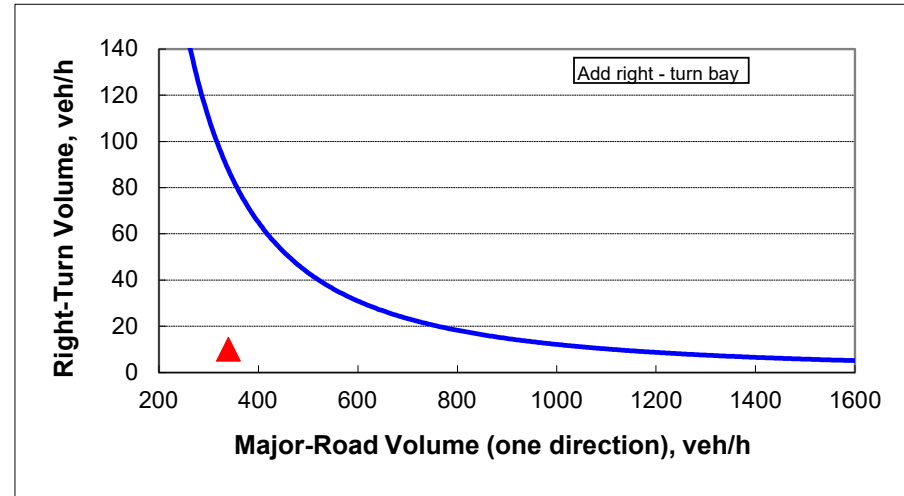


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	417
Right-turn volume, veh/h:	40

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	60
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

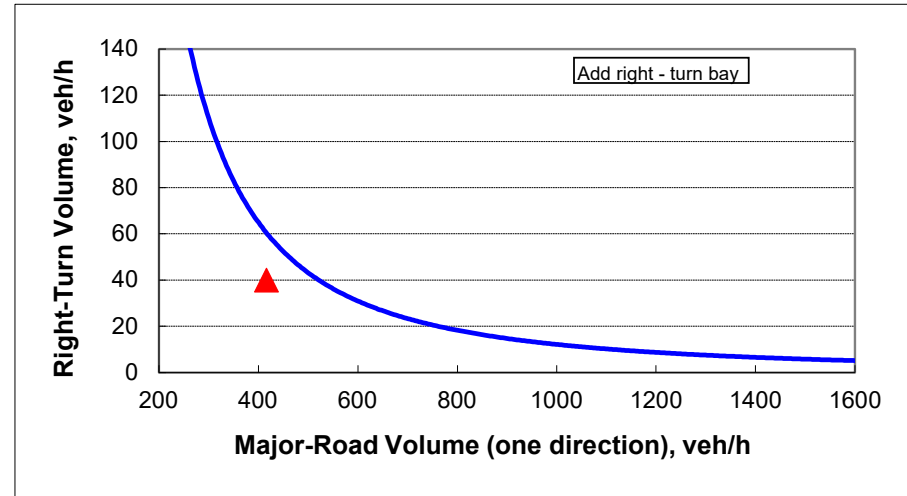


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Highland Road - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	397
Right-turn volume, veh/h:	11

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	66
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

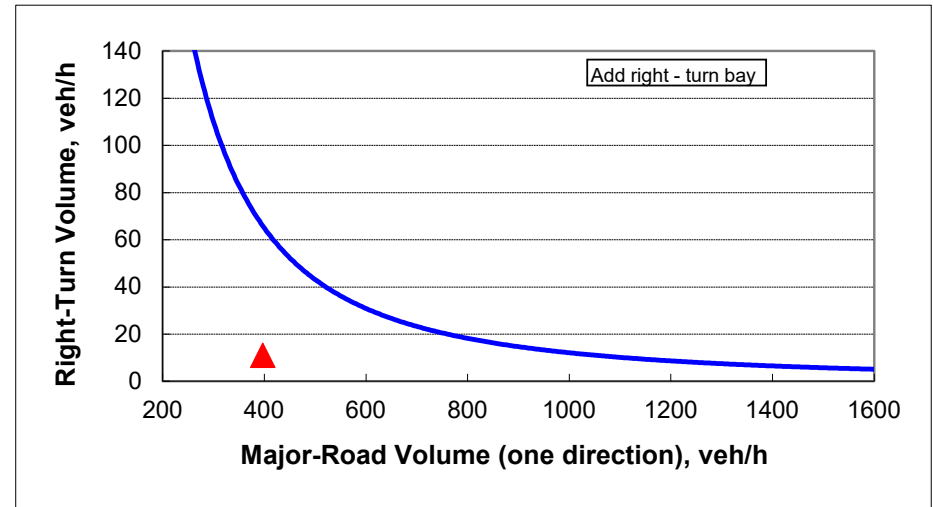


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Highland Road - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	352
Right-turn volume, veh/h:	50

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	82
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

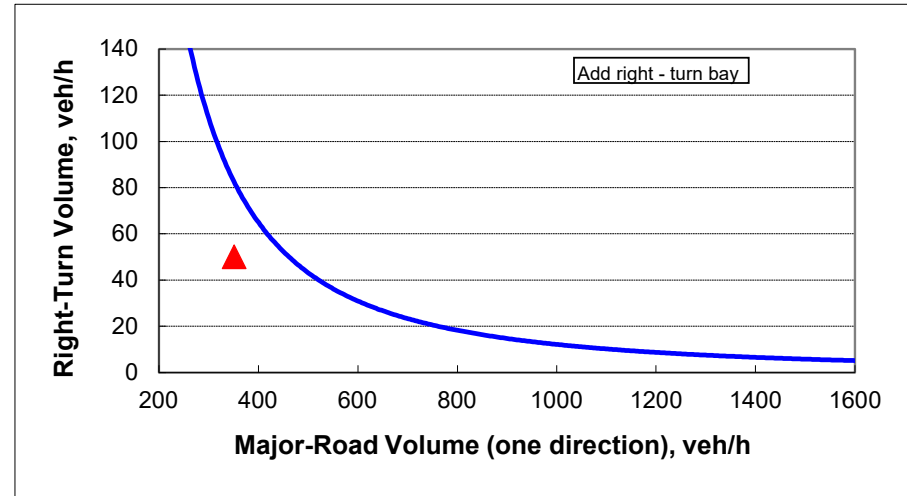


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	432
Right-turn volume, veh/h:	20

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	56
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

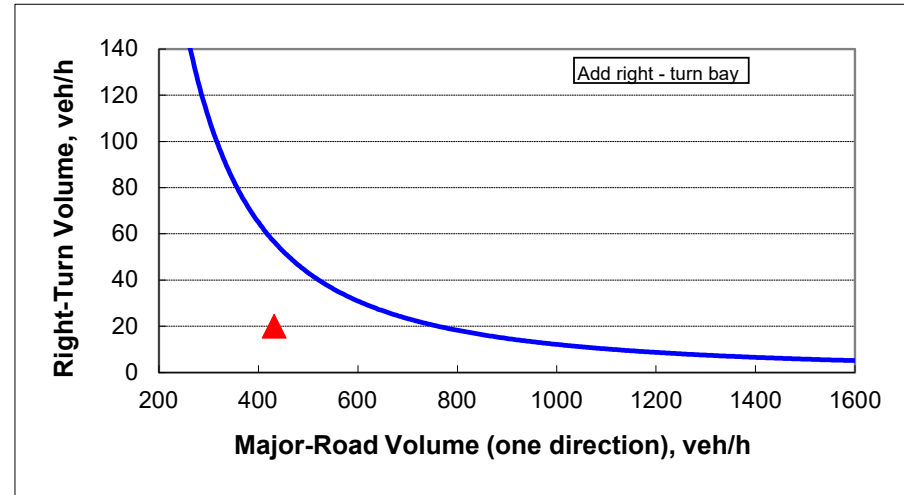


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	394
Right-turn volume, veh/h:	20

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	67
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

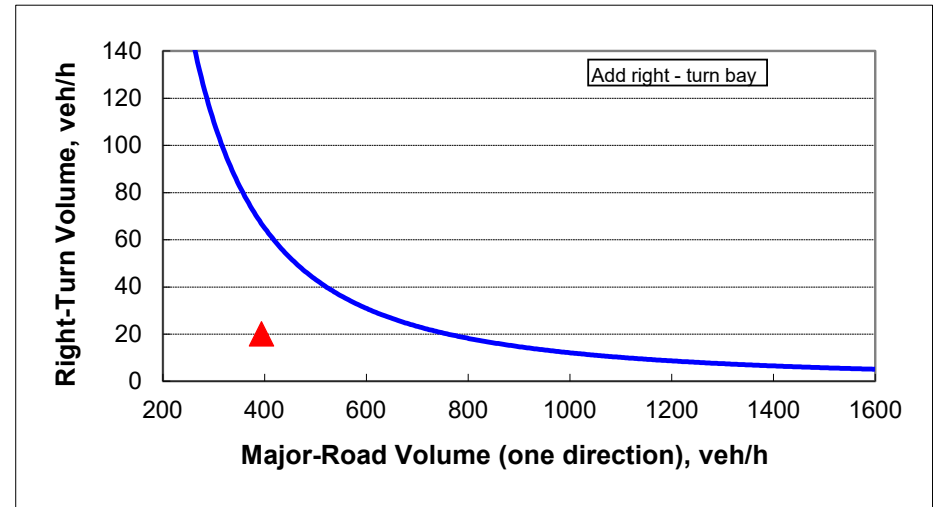


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Sycamore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	326
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	95
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

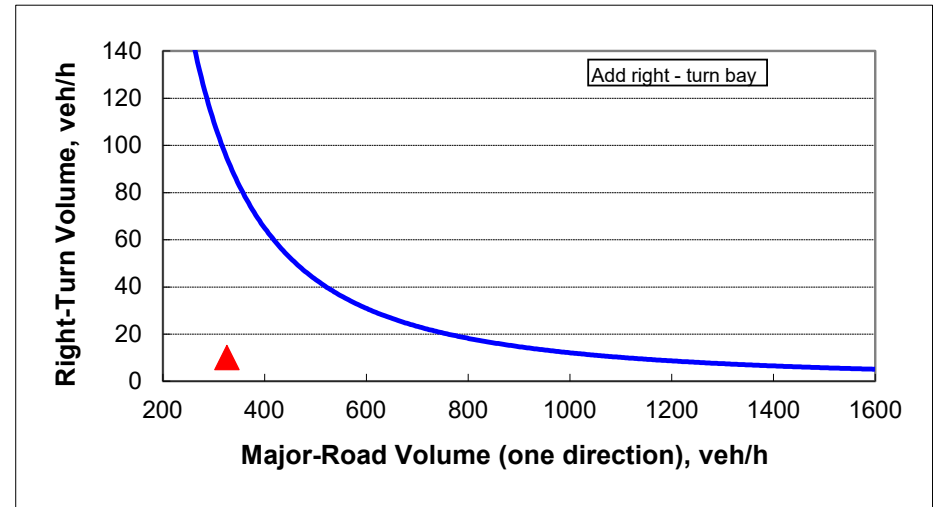


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	601
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	227
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

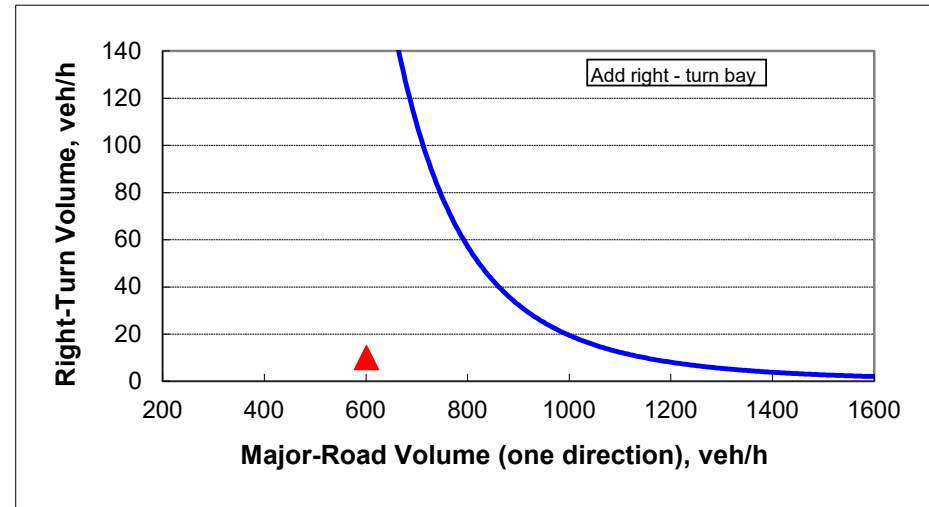


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Laird Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	710
Right-turn volume, veh/h:	21

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	102
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

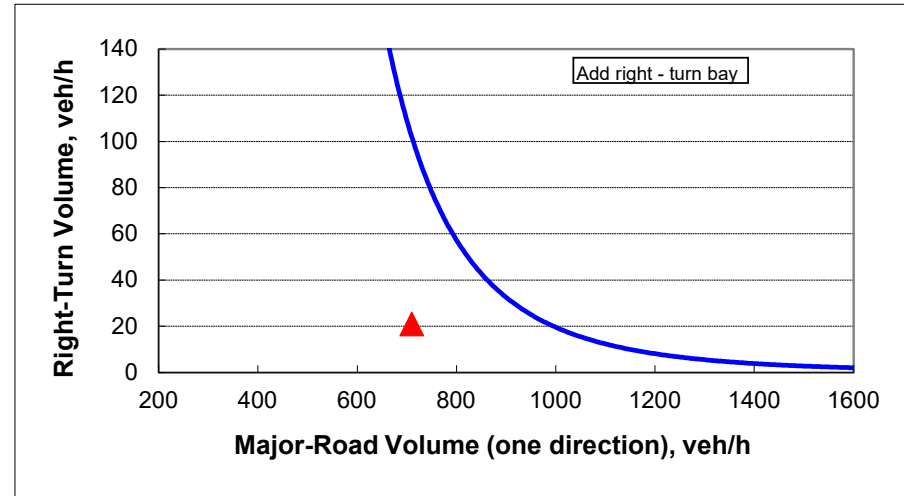


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	681
Right-turn volume, veh/h:	15

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	124
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

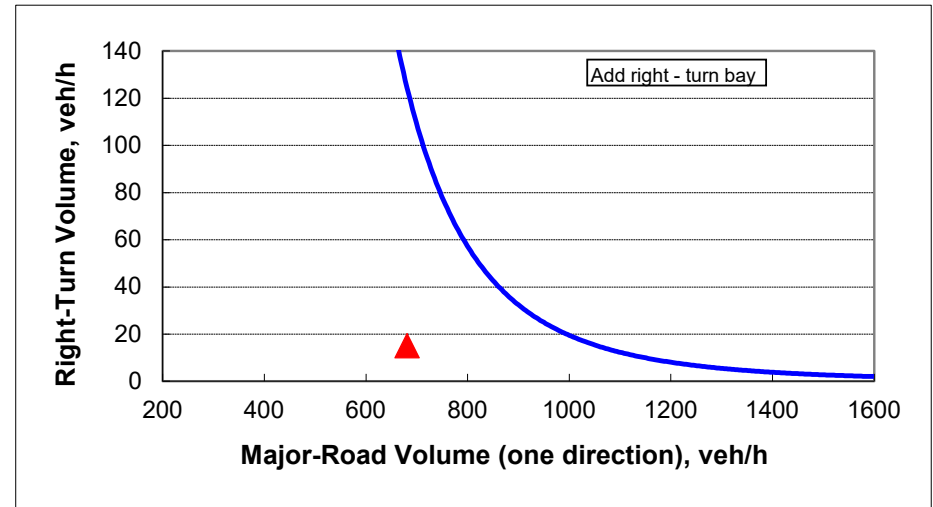


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Laird Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	675
Right-turn volume, veh/h:	22

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	130
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

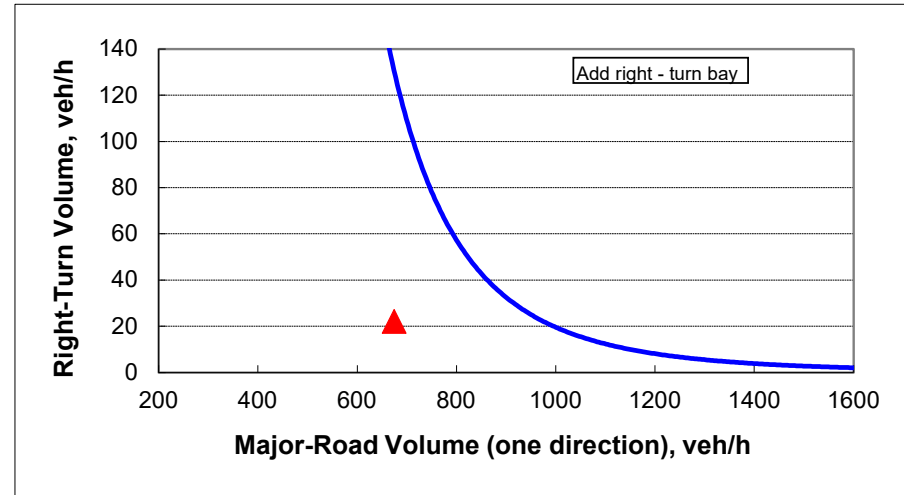


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Laird Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	708
Right-turn volume, veh/h:	5

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	103
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

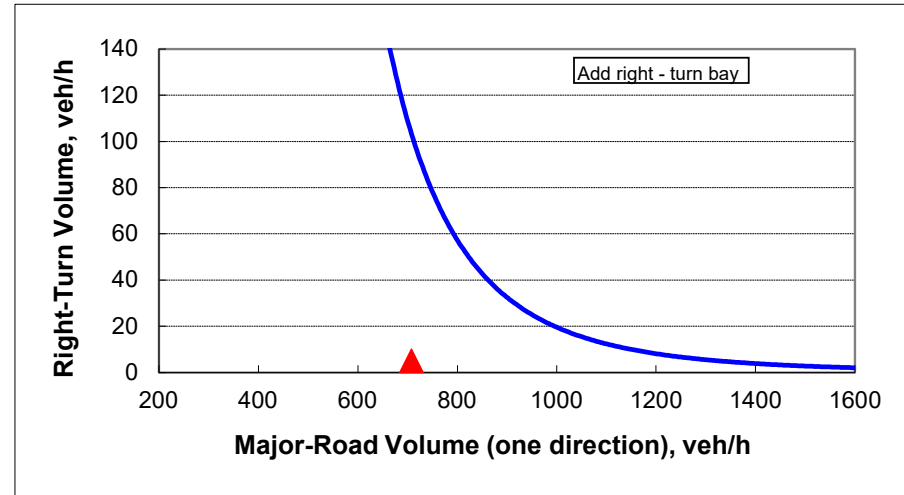


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Laird Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	519
Right-turn volume, veh/h:	12

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	461
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

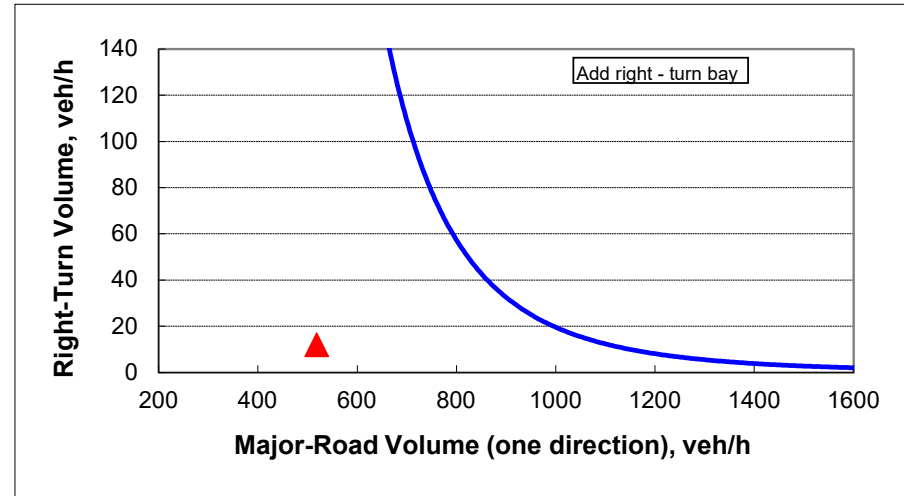


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	646
Right-turn volume, veh/h:	70

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	160
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

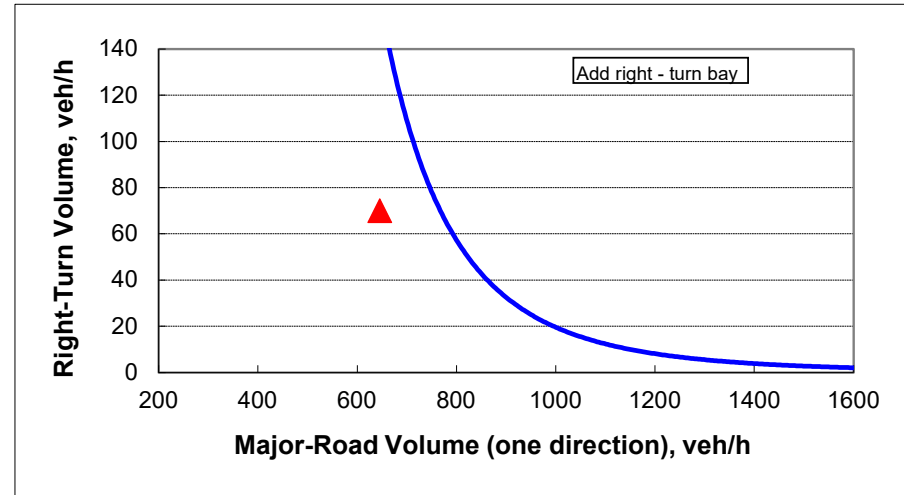


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	773
Right-turn volume, veh/h:	10

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	68
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

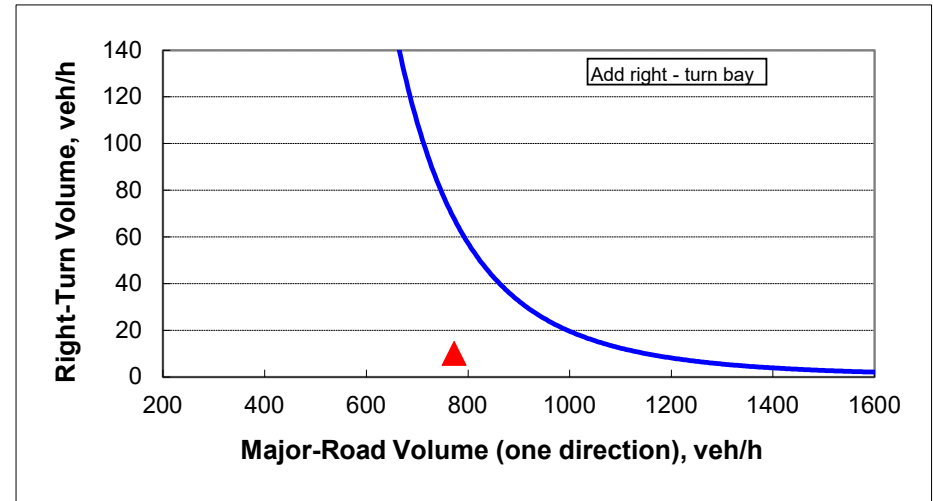


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	669
Right-turn volume, veh/h:	30

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	136
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

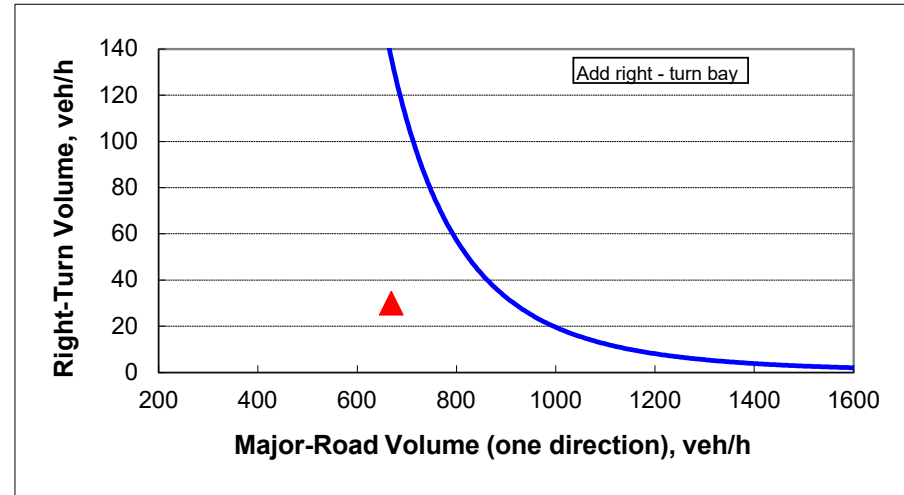


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	765
Right-turn volume, veh/h:	17

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	71
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

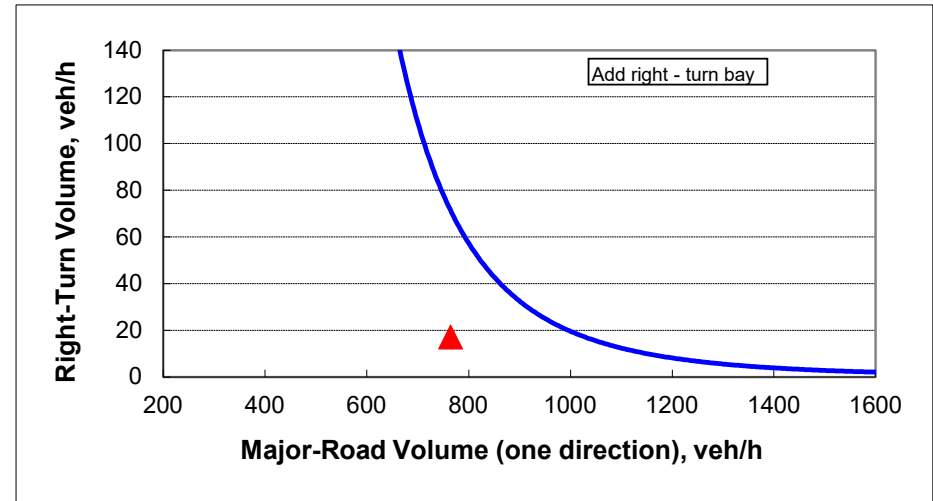


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Crane Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	748
Right-turn volume, veh/h:	15

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	79
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

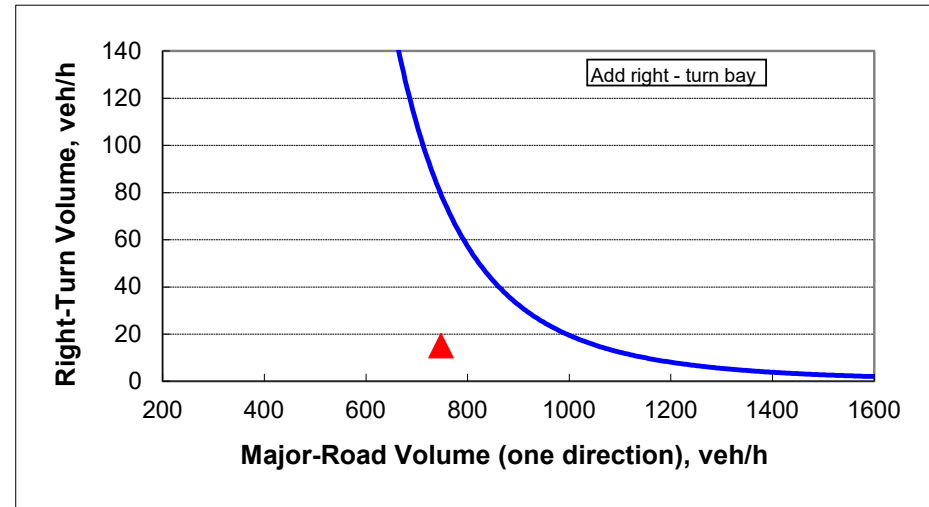


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Crane Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	595
Right-turn volume, veh/h:	12

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	239
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

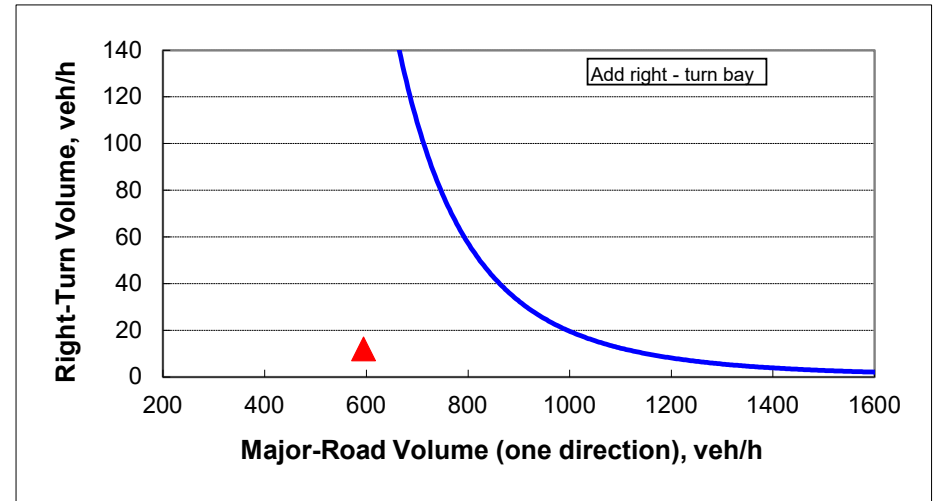


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	460
Right-turn volume, veh/h:	20

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	824
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

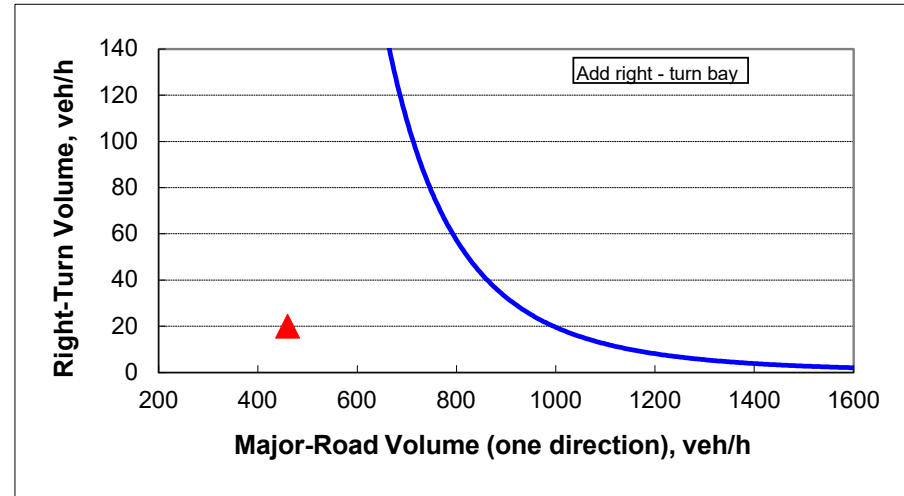


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - AM Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	763
Right-turn volume, veh/h:	27

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	72
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

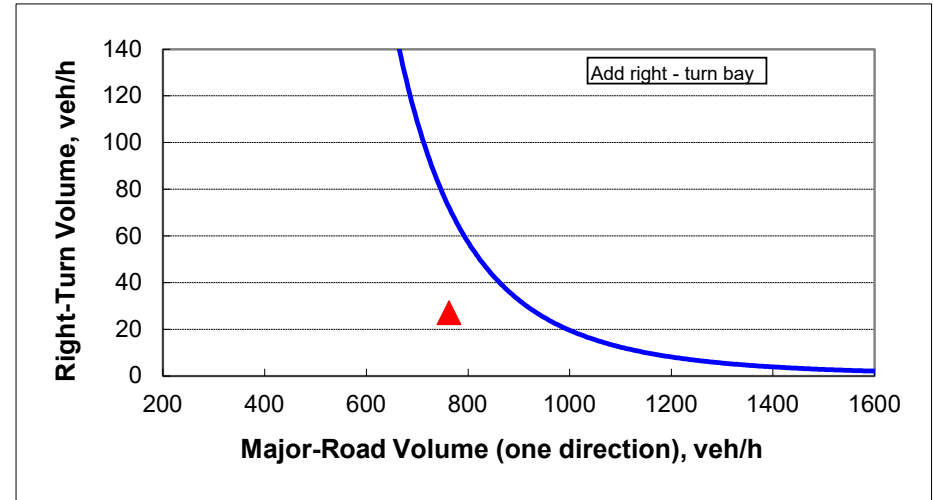


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	508
Right-turn volume, veh/h:	30

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	511
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

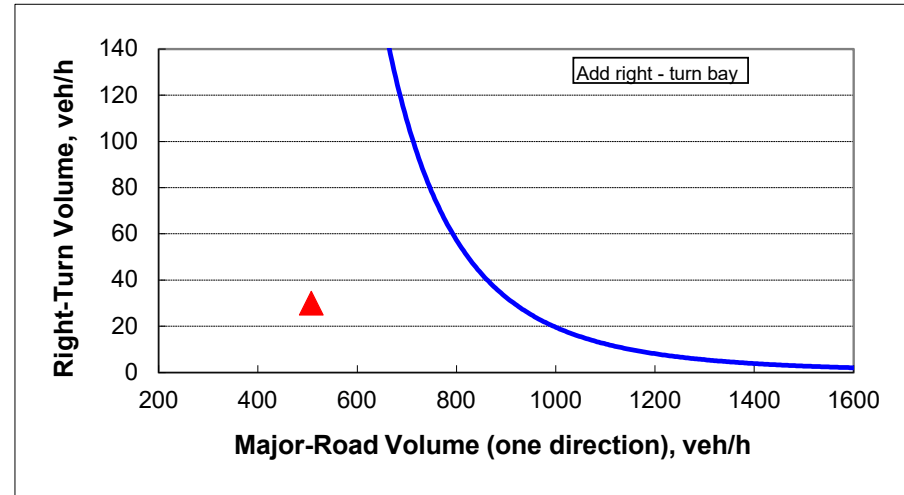


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - School Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	751
Right-turn volume, veh/h:	29

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	78
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

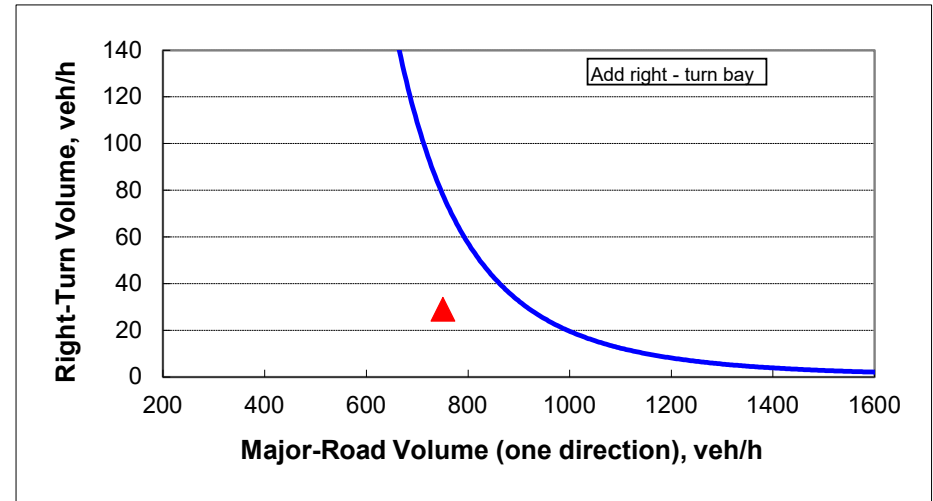


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & Baltimore Avenue - WBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	605
Right-turn volume, veh/h:	45

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	220
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

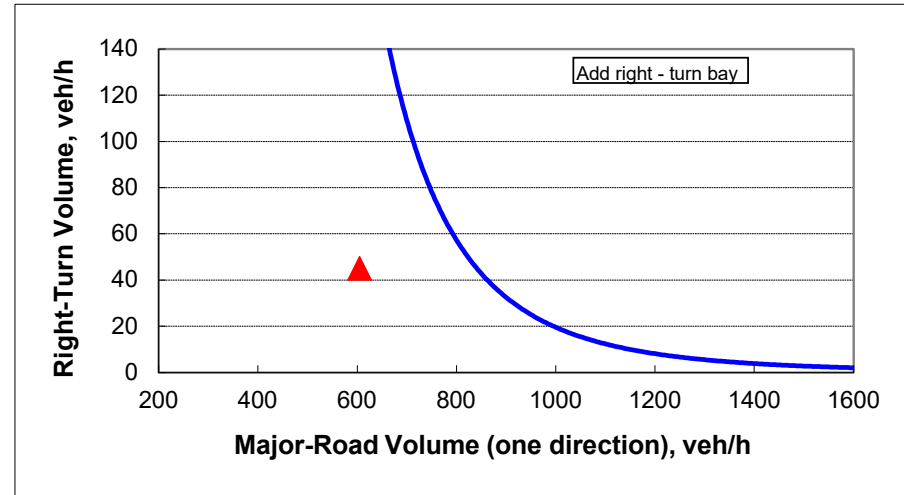


Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT Year 2048 - PM Peak Hour - W 12th St & N Baltimore Avenue - EBR

Roadway geometry:	2-lane roadway
Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	596
Right-turn volume, veh/h:	18

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	237
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	

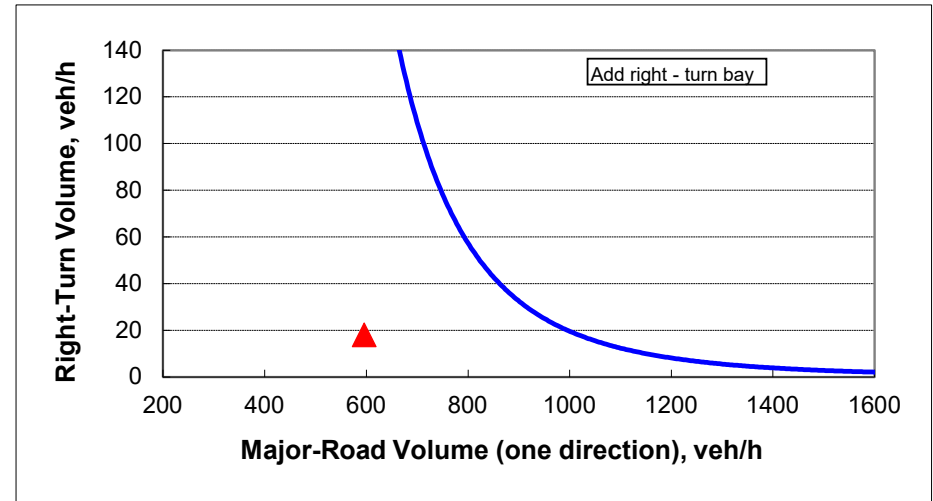


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - AM Peak Hour - W 12th St & N Laird Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1311
Percentage of right-turns on minor road, %:	84%
Minor-road volume (one direction), veh/h:	125

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	230
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

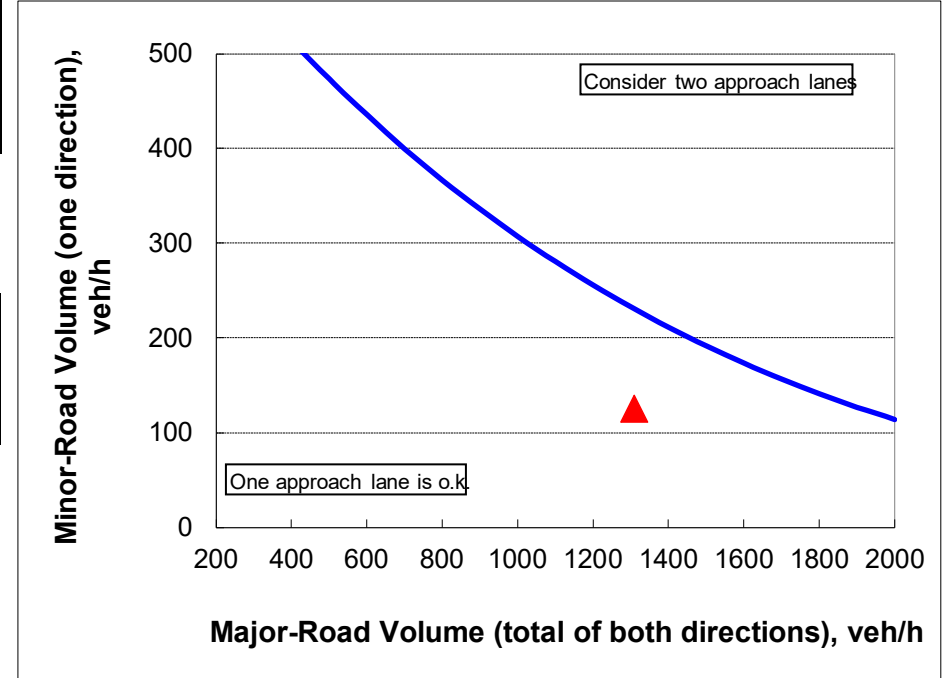


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - AM Peak Hour - W 12th St & N Laird Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1311
Percentage of right-turns on minor road, %:	74%
Minor-road volume (one direction), veh/h:	77

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	194
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

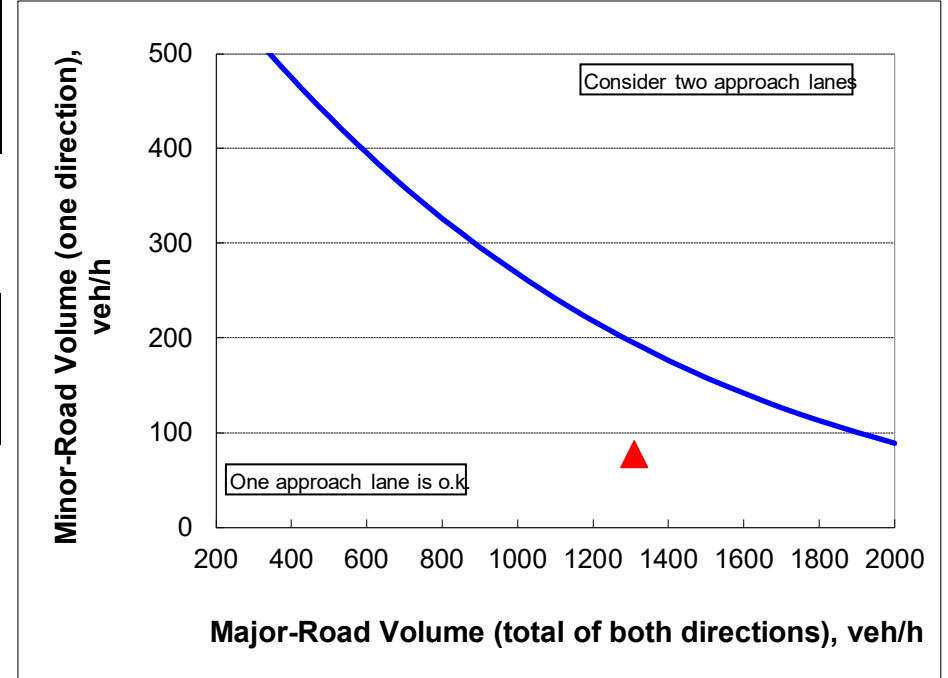


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - School PM Peak Hour - W 12th St & N Laird Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1357
Percentage of right-turns on minor road, %:	87%
Minor-road volume (one direction), veh/h:	121

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	233
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

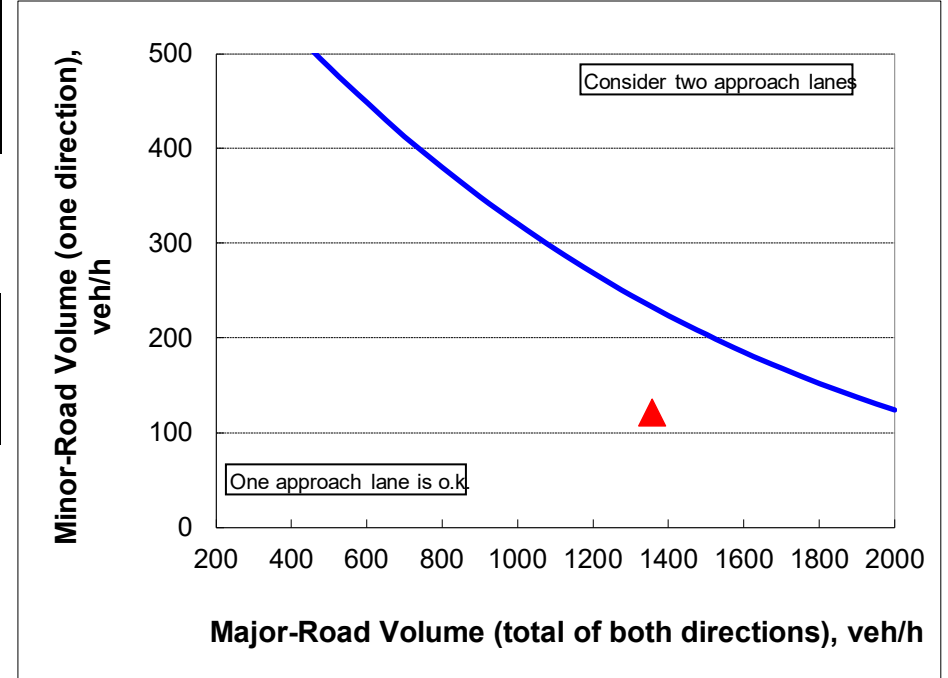


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - School PM Peak Hour - W 12th St & N Laird Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1357
Percentage of right-turns on minor road, %:	64%
Minor-road volume (one direction), veh/h:	55

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	158
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

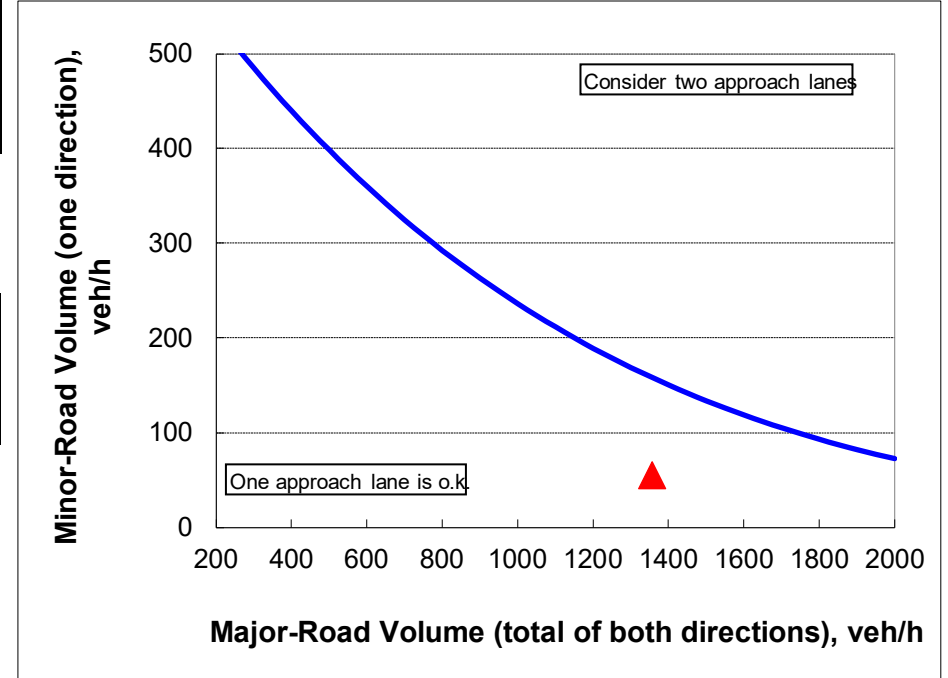


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - Commuter PM Peak Hour - W 12th St & N Laird Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1227
Percentage of right-turns on minor road, %:	69%
Minor-road volume (one direction), veh/h:	102

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	196
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

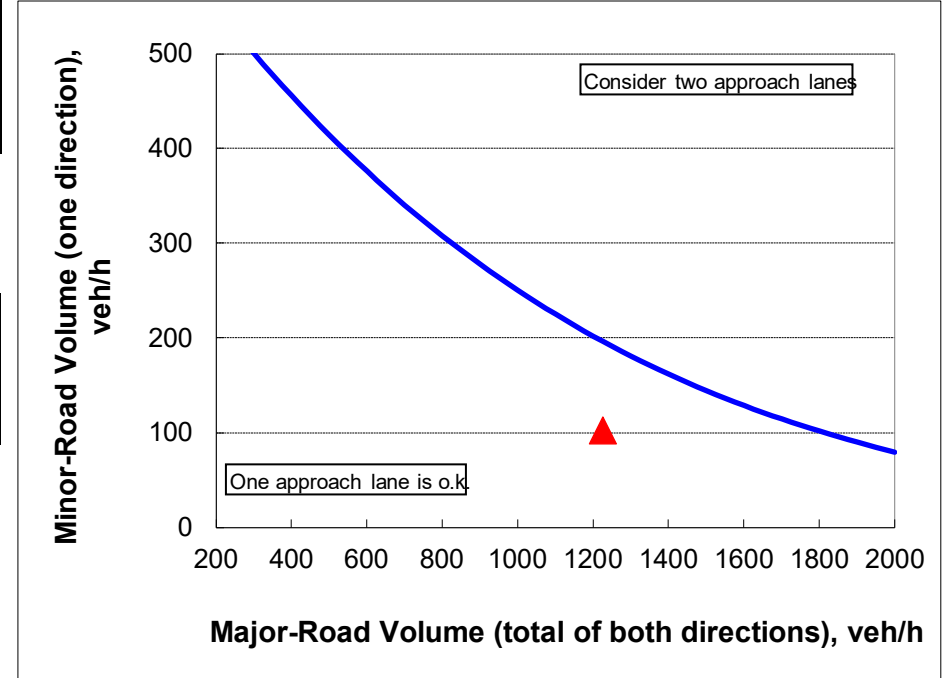


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - Commuter PM Peak Hour - W 12th St & N Laird Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1227
Percentage of right-turns on minor road, %:	42%
Minor-road volume (one direction), veh/h:	43

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	143
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

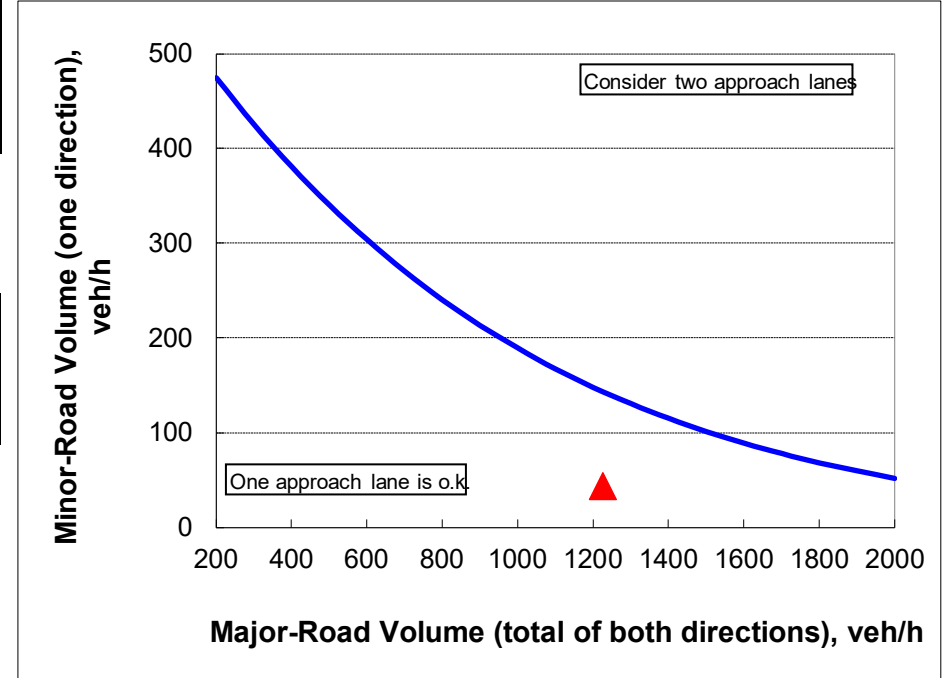


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - AM Peak Hour - W 12th St & Crane Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1419
Percentage of right-turns on minor road, %:	67%
Minor-road volume (one direction), veh/h:	60

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	154
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

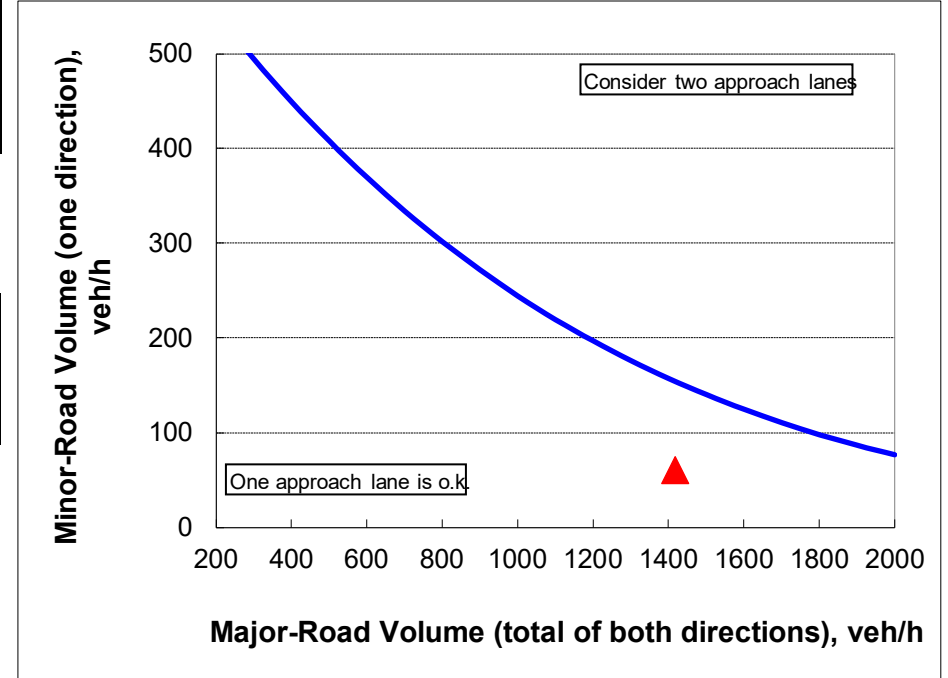


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - AM Peak Hour - W 12th St & Crane Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1419
Percentage of right-turns on minor road, %:	81%
Minor-road volume (one direction), veh/h:	105

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	196
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

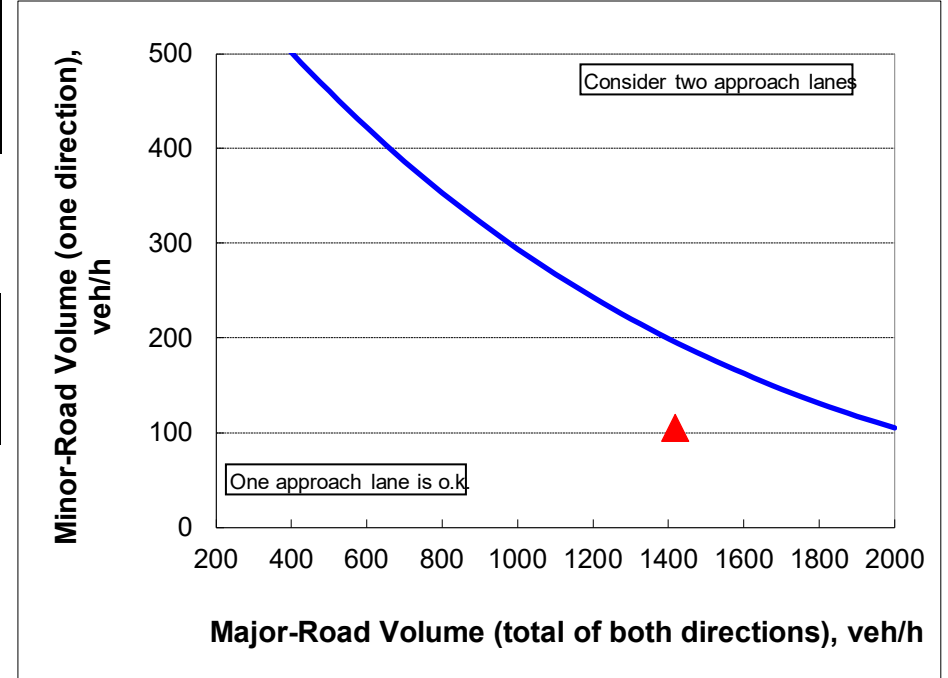


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - School PM Peak Hour - W 12th St & Crane Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1434
Percentage of right-turns on minor road, %:	69%
Minor-road volume (one direction), veh/h:	51

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	156
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

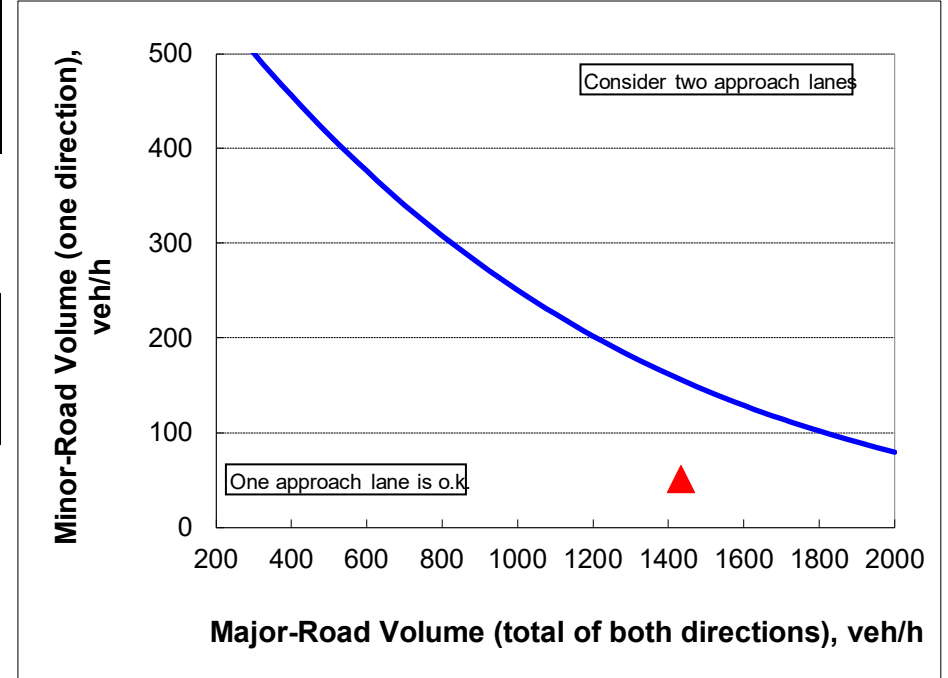


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - School PM Peak Hour - W 12th St & Crane Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1434
Percentage of right-turns on minor road, %:	54%
Minor-road volume (one direction), veh/h:	131

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	128
Guidance for determining minor-road approach geometry:	
Consider TWO approach lanes	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

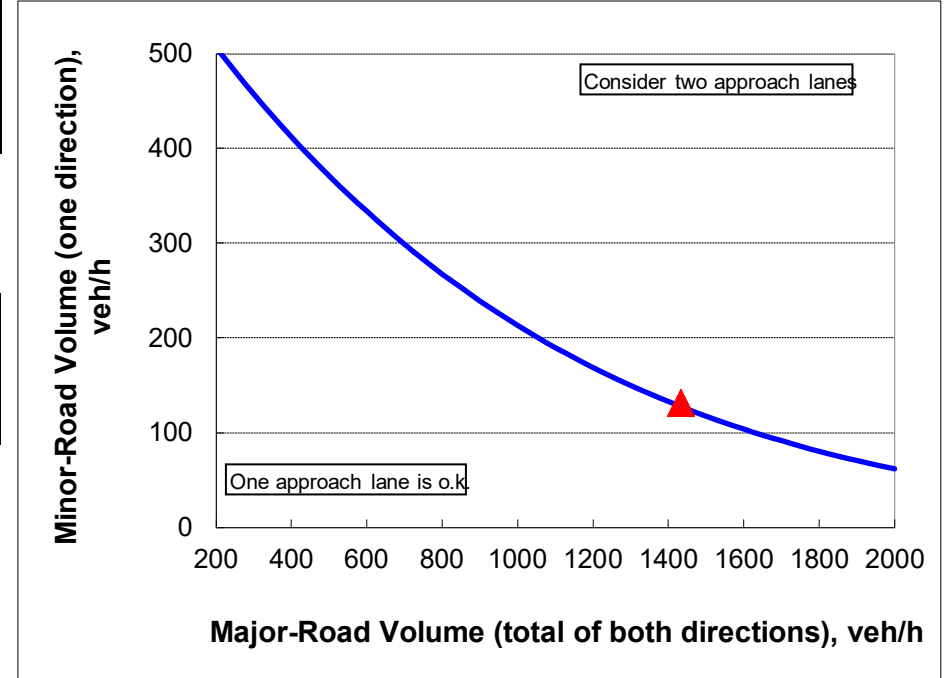


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - Commuter PM Peak Hour - W 12th St & Crane Ave - NB

Variable	Value
Major-road volume (total of both directions), veh/h:	1343
Percentage of right-turns on minor road, %:	54%
Minor-road volume (one direction), veh/h:	56

OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	141
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM

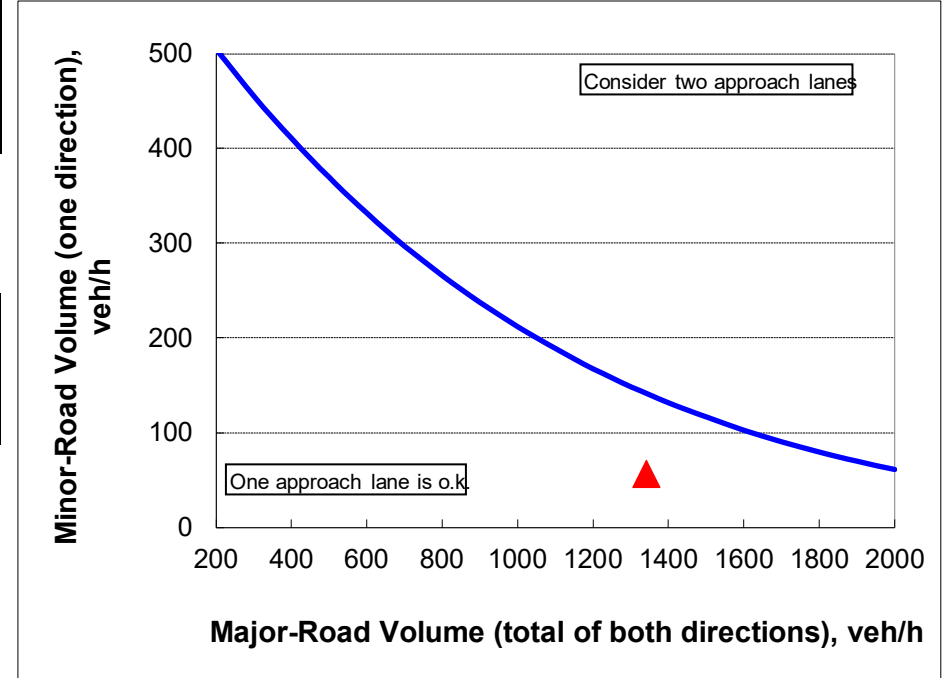


Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT Year 2048 - Commuter PM Peak Hour - W 12th St & Crane Ave - SB

Variable	Value
Major-road volume (total of both directions), veh/h:	1343
Percentage of right-turns on minor road, %:	49%
Minor-road volume (one direction), veh/h:	49

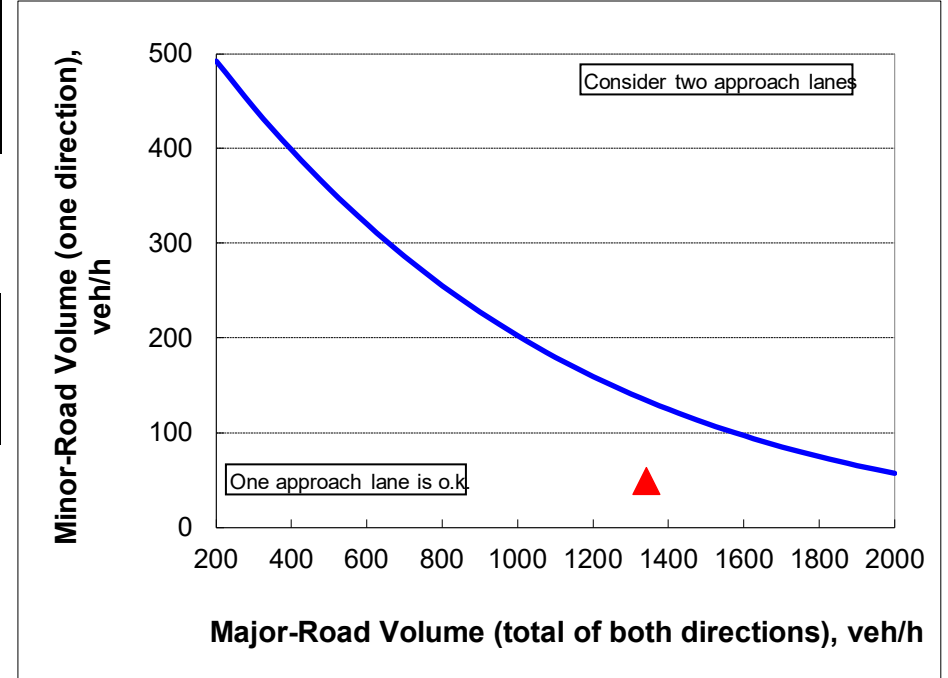
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	134
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



Appendix H:
Synchro/SIDRA Output Reports – Year 2048 N Adams Central Alternatives

HCM 6th AWSC
3: N Adams Central Ave & W 12th St

06/07/2023

Intersection	
Intersection Delay, s/veh	30.9
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	345	135	219	167	11	30	20	136	16	25	5
Future Vol, veh/h	5	345	135	219	167	11	30	20	136	16	25	5
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	7	454	178	288	220	14	39	26	179	21	33	7
Number of Lanes	0	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	28.1	43.8	15.5	12.3
HCM LOS	D	E	C	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	16%	1%	0%	55%	35%
Vol Thru, %	11%	99%	0%	42%	54%
Vol Right, %	73%	0%	100%	3%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	186	350	135	397	46
LT Vol	30	5	0	219	16
Through Vol	20	345	0	167	25
RT Vol	136	0	135	11	5
Lane Flow Rate	245	461	178	522	61
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.461	0.839	0.288	0.91	0.134
Departure Headway (Hd)	6.781	6.56	5.838	6.272	7.965
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	531	553	615	580	449
Service Time	4.829	4.305	3.583	4.314	6.039
HCM Lane V/C Ratio	0.461	0.834	0.289	0.9	0.136
HCM Control Delay	15.5	34.8	10.9	43.8	12.3
HCM Lane LOS	C	D	B	E	B
HCM 95th-tile Q	2.4	8.7	1.2	11.1	0.5

HCM 6th AWSC
3: N Adams Central Ave & W 12th St

06/07/2023

Intersection												
Intersection Delay, s/veh	15.2											
Intersection LOS	C											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	190	45	76	245	38	55	50	206	16	10	5
Future Vol, veh/h	5	190	45	76	245	38	55	50	206	16	10	5
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	6	213	51	85	275	43	62	56	231	18	11	6
Number of Lanes	0	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	12.2	18	14.8	10.2
HCM LOS	B	C	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	18%	3%	0%	21%	52%
Vol Thru, %	16%	97%	0%	68%	32%
Vol Right, %	66%	0%	100%	11%	16%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	311	195	45	359	31
LT Vol	55	5	0	76	16
Through Vol	50	190	0	245	10
RT Vol	206	0	45	38	5
Lane Flow Rate	349	219	51	403	35
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.536	0.383	0.078	0.632	0.064
Departure Headway (Hd)	5.521	6.299	5.574	5.638	6.603
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	650	570	639	637	538
Service Time	3.584	4.065	3.339	3.694	4.701
HCM Lane V/C Ratio	0.537	0.384	0.08	0.633	0.065
HCM Control Delay	14.8	13	8.8	18	10.2
HCM Lane LOS	B	B	A	C	B
HCM 95th-tile Q	3.2	1.8	0.3	4.5	0.2

HCM 6th AWSC
3: N Adams Central Ave & W 12th St

06/07/2023

Intersection	
Intersection Delay, s/veh	17.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	240	35	48	354	48	25	25	74	28	10	10
Future Vol, veh/h	5	240	35	48	354	48	25	25	74	28	10	10
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	4	4	4	4	4	4	4	4	4	4	4	4
Mvmt Flow	6	282	41	56	416	56	29	29	87	33	12	12
Number of Lanes	0	1	1	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	2
HCM Control Delay	12.8	22.5	10.9	10.3
HCM LOS	B	C	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	20%	2%	0%	11%	58%
Vol Thru, %	20%	98%	0%	79%	21%
Vol Right, %	60%	0%	100%	11%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	124	245	35	450	48
LT Vol	25	5	0	48	28
Through Vol	25	240	0	354	10
RT Vol	74	0	35	48	10
Lane Flow Rate	146	288	41	529	56
Geometry Grp	2	7	7	5	2
Degree of Util (X)	0.241	0.465	0.058	0.757	0.102
Departure Headway (Hd)	5.952	5.802	5.082	5.147	6.501
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	601	620	704	704	549
Service Time	4.007	3.54	2.82	3.181	4.567
HCM Lane V/C Ratio	0.243	0.465	0.058	0.751	0.102
HCM Control Delay	10.9	13.5	8.1	22.5	10.3
HCM Lane LOS	B	B	A	C	B
HCM 95th-tile Q	0.9	2.5	0.2	7	0.3

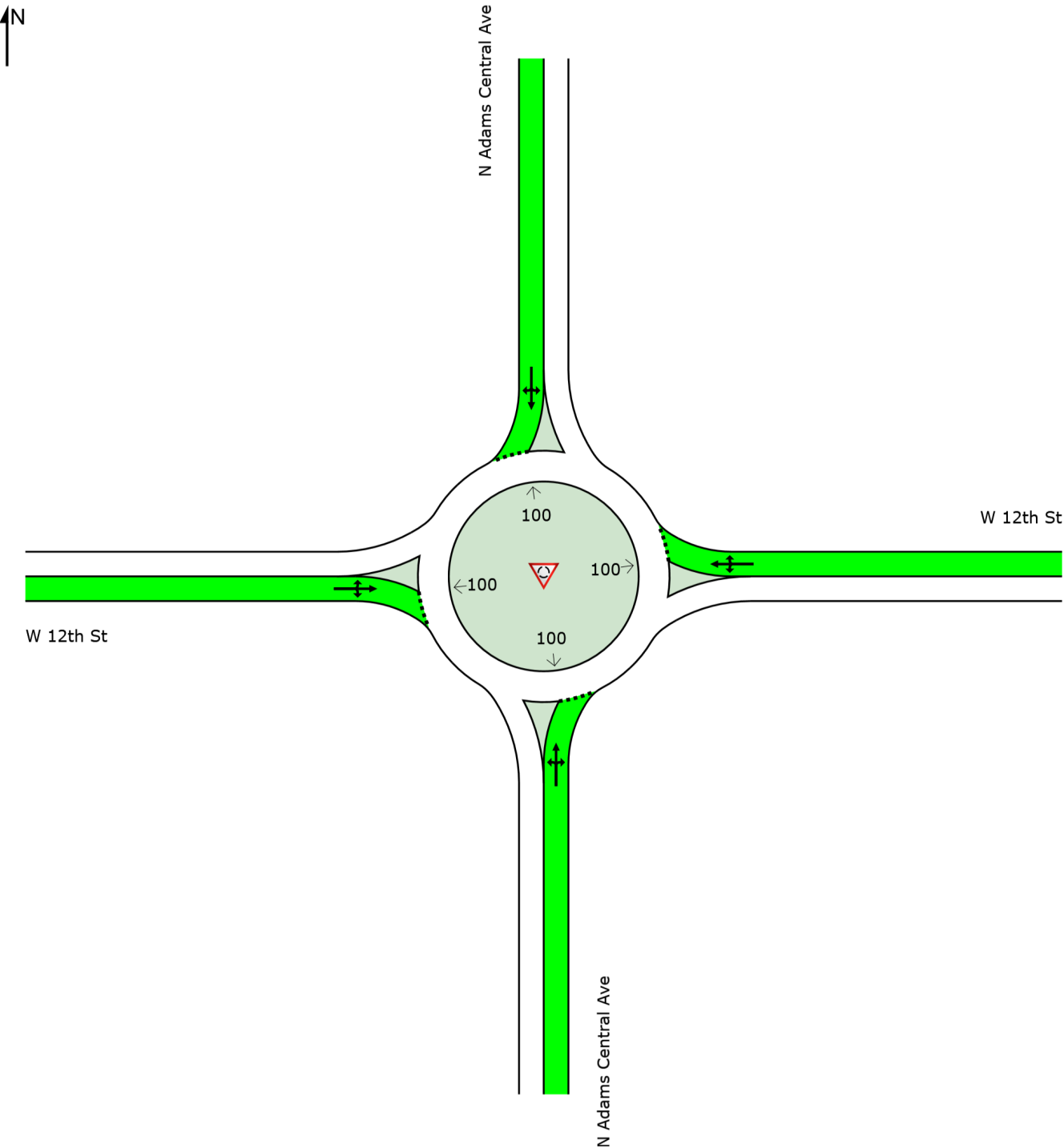
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Adams Central Ave - Commuter PM (Site Folder: 2048 - N Adams Central Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

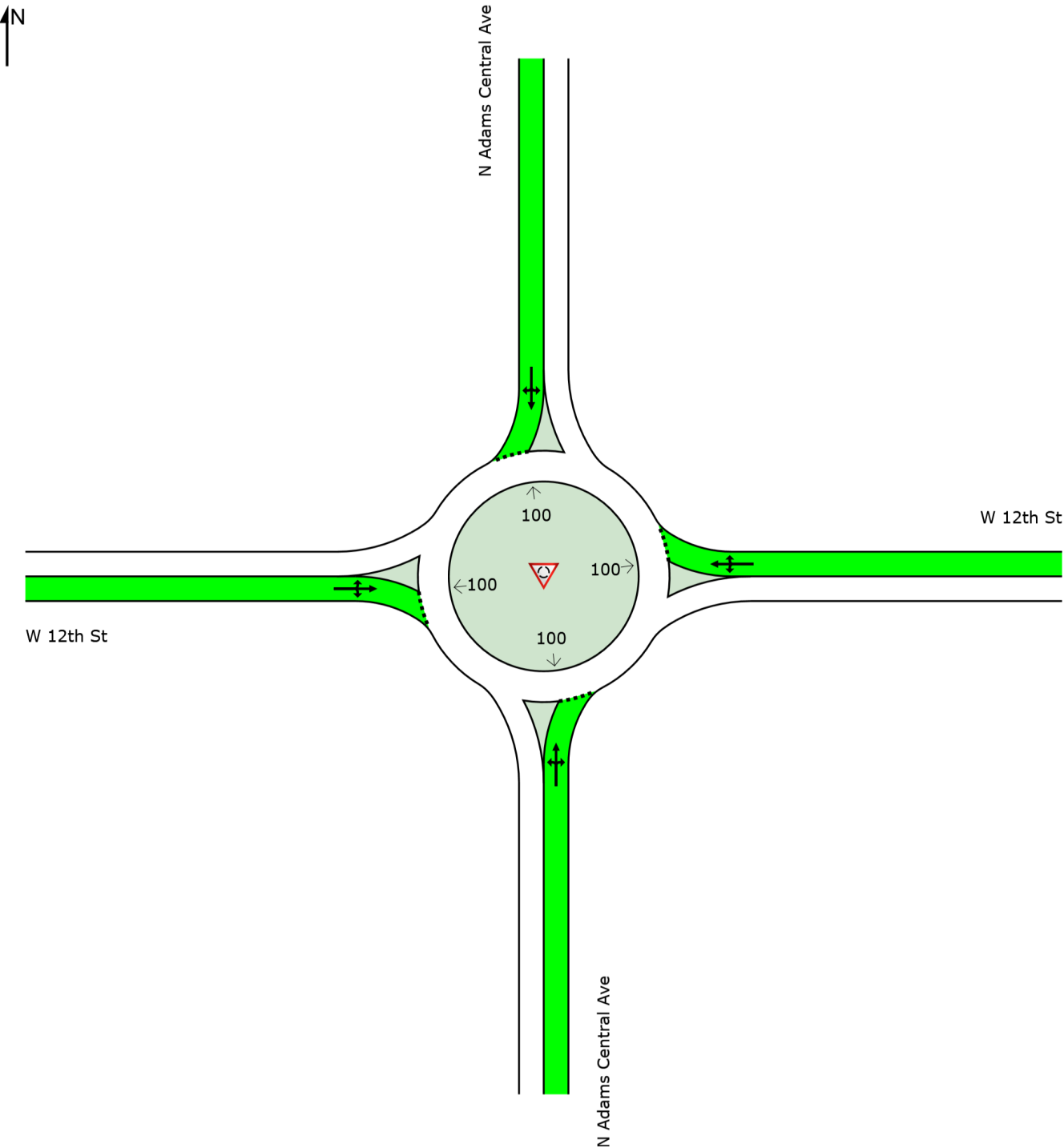
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Adams Central Ave - School PM (Site Folder: 2048 - N Adams Central Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	A	A



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

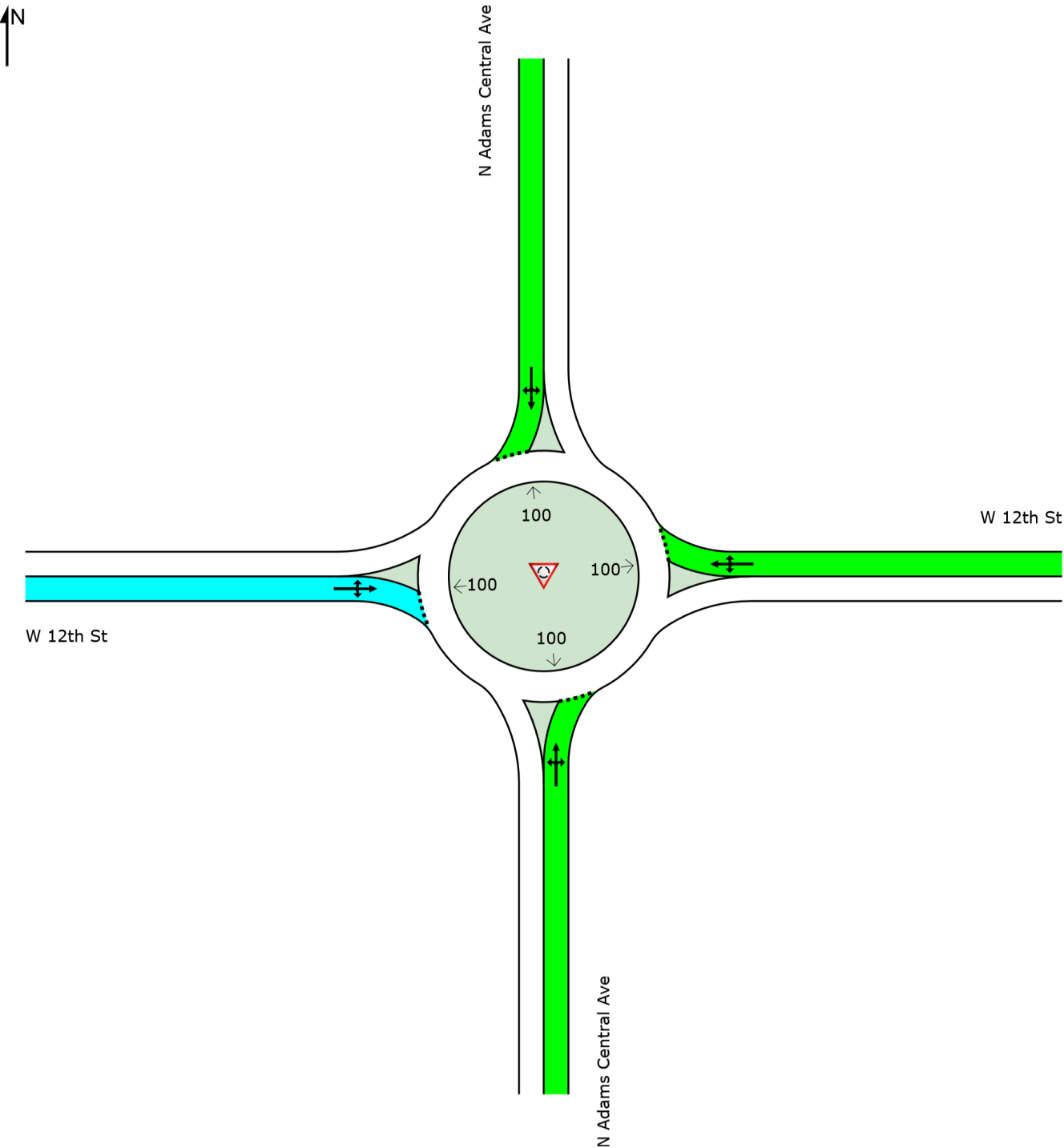
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Adams Central Ave - AM (Site Folder: 2048 - N Adams Central Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	A	A	B	A



Colour code based on Level of Service

LOS A

LOS B

LOS C

LOS D

LOS E

LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

Site: 1 [N Adams Central Ave - AM (Site Folder: 2048 - N Adams Central Ave)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh ft	Dist] ft				
South: N Adams Central Ave													
Lane 1 ^d	219	4.0	840	0.260	100	7.1	LOS A	1.2	30.1	Full	1600	0.0	0.0
Approach	219	4.0		0.260		7.1	LOS A	1.2	30.1				
East: W 12th St													
Lane 1 ^d	467	4.0	1239	0.377	100	6.5	LOS A	2.3	58.8	Full	1600	0.0	0.0
Approach	467	4.0		0.377		6.5	LOS A	2.3	58.8				
North: N Adams Central Ave													
Lane 1 ^d	54	4.0	790	0.069	100	5.2	LOS A	0.3	6.9	Full	1600	0.0	0.0
Approach	54	4.0		0.069		5.2	LOS A	0.3	6.9				
West: W 12th St													
Lane 1 ^d	571	4.0	959	0.595	100	12.1	LOS B	5.9	152.8	Full	1600	0.0	0.0
Approach	571	4.0		0.595		12.1	LOS B	5.9	152.8				
Intersection	1311	4.0		0.595		9.0	LOS A	5.9	152.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	35	24	160	219	4.0	840	0.260	100	NA	NA
Approach	35	24	160	219	4.0		0.260			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	258	196	13	467	4.0	1239	0.377	100	NA	NA
Approach	258	196	13	467	4.0		0.377			
North: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	19	29	6	54	4.0	790	0.069	100	NA	NA
Approach	19	29	6	54	4.0		0.069			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	6	406	159	571	4.0	959	0.595	100	NA	NA
Approach	6	406	159	571	4.0		0.595			
Total %HV Deg.Satn (v/c)										

Intersection	1311	4.0	0.595
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 1 [N Adams Central Ave - School PM (Site Folder: 2048 - N Adams Central Ave)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Adams Central Ave													
Lane 1 ^d	349	4.0	1032	0.339	100	7.0	LOS A	1.8	45.5	Full	1600	0.0	0.0
Approach	349	4.0		0.339		7.0	LOS A	1.8	45.5				
East: W 12th St													
Lane 1 ^d	403	4.0	1164	0.347	100	6.5	LOS A	1.9	50.0	Full	1600	0.0	0.0
Approach	403	4.0		0.347		6.5	LOS A	1.9	50.0				
North: N Adams Central Ave													
Lane 1 ^d	35	4.0	848	0.041	100	4.6	LOS A	0.2	4.1	Full	1600	0.0	0.0
Approach	35	4.0		0.041		4.6	LOS A	0.2	4.1				
West: W 12th St													
Lane 1 ^d	270	4.0	1175	0.229	100	5.1	LOS A	1.1	29.2	Full	1600	0.0	0.0
Approach	270	4.0		0.229		5.1	LOS A	1.1	29.2				
Intersection	1057	4.0		0.347		6.2	LOS A	1.9	50.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	62	56	231	349	4.0	1032	0.339	100	NA	NA
Approach	62	56	231	349	4.0		0.339			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	85	275	43	403	4.0	1164	0.347	100	NA	NA
Approach	85	275	43	403	4.0		0.347			
North: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	18	11	6	35	4.0	848	0.041	100	NA	NA
Approach	18	11	6	35	4.0		0.041			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	6	213	51	270	4.0	1175	0.229	100	NA	NA
Approach	6	213	51	270	4.0		0.229			
Total		%HV	Deg.Satn (v/c)							

Intersection	1057	4.0	0.347
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

 Site: 1 [N Adams Central Ave - Commuter PM (Site Folder: 2048 - N Adams Central Ave)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Adams Central Ave													
Lane 1 ^d	146	4.0	944	0.155	100	5.3	LOS A	0.7	17.1	Full	1600	0.0	0.0
Approach	146	4.0		0.155		5.3	LOS A	0.7	17.1				
East: W 12th St													
Lane 1 ^d	529	4.0	1239	0.427	100	7.2	LOS A	2.8	71.5	Full	1600	0.0	0.0
Approach	529	4.0		0.427		7.2	LOS A	2.8	71.5				
North: N Adams Central Ave													
Lane 1 ^d	56	4.0	779	0.073	100	5.3	LOS A	0.3	7.3	Full	1600	0.0	0.0
Approach	56	4.0		0.073		5.3	LOS A	0.3	7.3				
West: W 12th St													
Lane 1 ^d	329	4.0	1192	0.276	100	5.6	LOS A	1.4	37.2	Full	1600	0.0	0.0
Approach	329	4.0		0.276		5.6	LOS A	1.4	37.2				
Intersection	1061	4.0		0.427		6.3	LOS A	2.8	71.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	29	29	87	146	4.0	944	0.155	100	NA	NA
Approach	29	29	87	146	4.0		0.155			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	56	416	56	529	4.0	1239	0.427	100	NA	NA
Approach	56	416	56	529	4.0		0.427			
North: N Adams Central Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	33	12	12	56	4.0	779	0.073	100	NA	NA
Approach	33	12	12	56	4.0		0.073			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	6	282	41	329	4.0	1192	0.276	100	NA	NA
Approach	6	282	41	329	4.0		0.276			
Total		%HV	Deg.	Satn (v/c)						

Intersection	1061	4.0	0.427
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Adams Central Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

Appendix J:
SIDRA Output Reports – Year 2048 N Marian Road Alternative

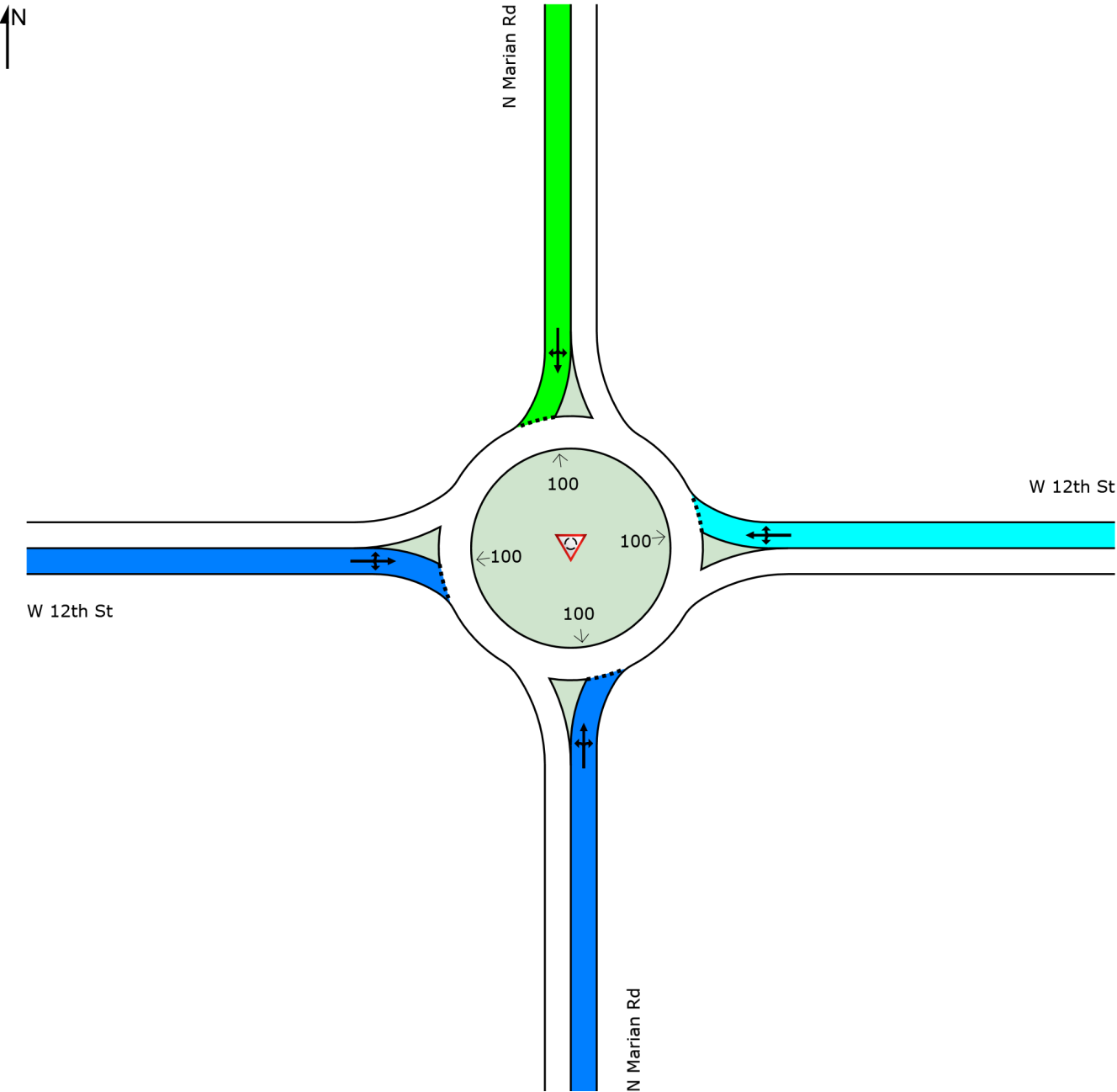
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Marian Rd - AM (Site Folder: 2048 - N Marian Rd)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	B	A	C	C



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if $v/c > 1$ irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

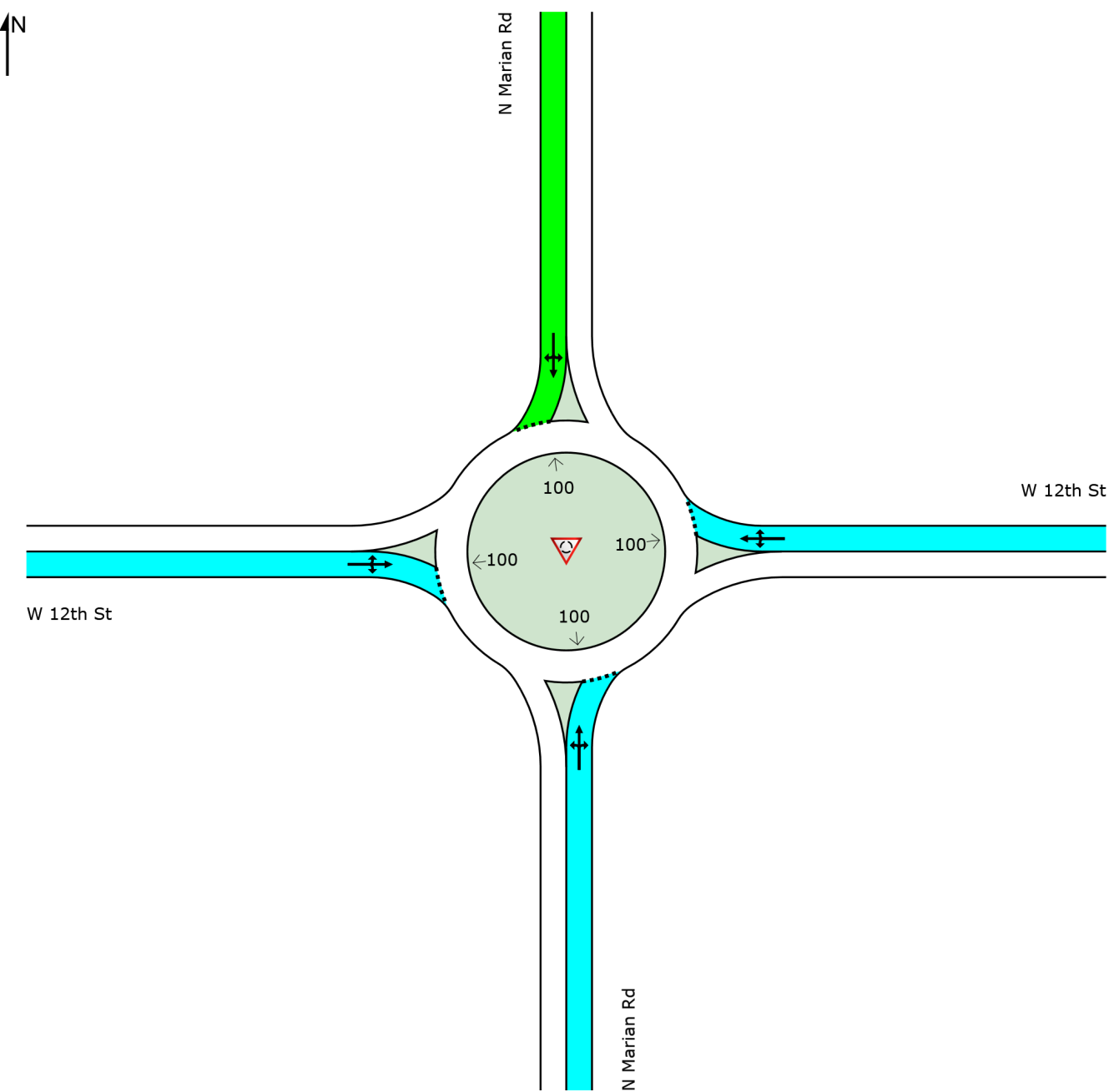
LEVEL OF SERVICE

Lane Level of Service

🚦 Site: 1 [N Marian Rd - School PM (Site Folder: 2048 - N Marian Rd)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	B	A	B	B



Colour code based on Level of Service

LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
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Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if $v/c > 1$ irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

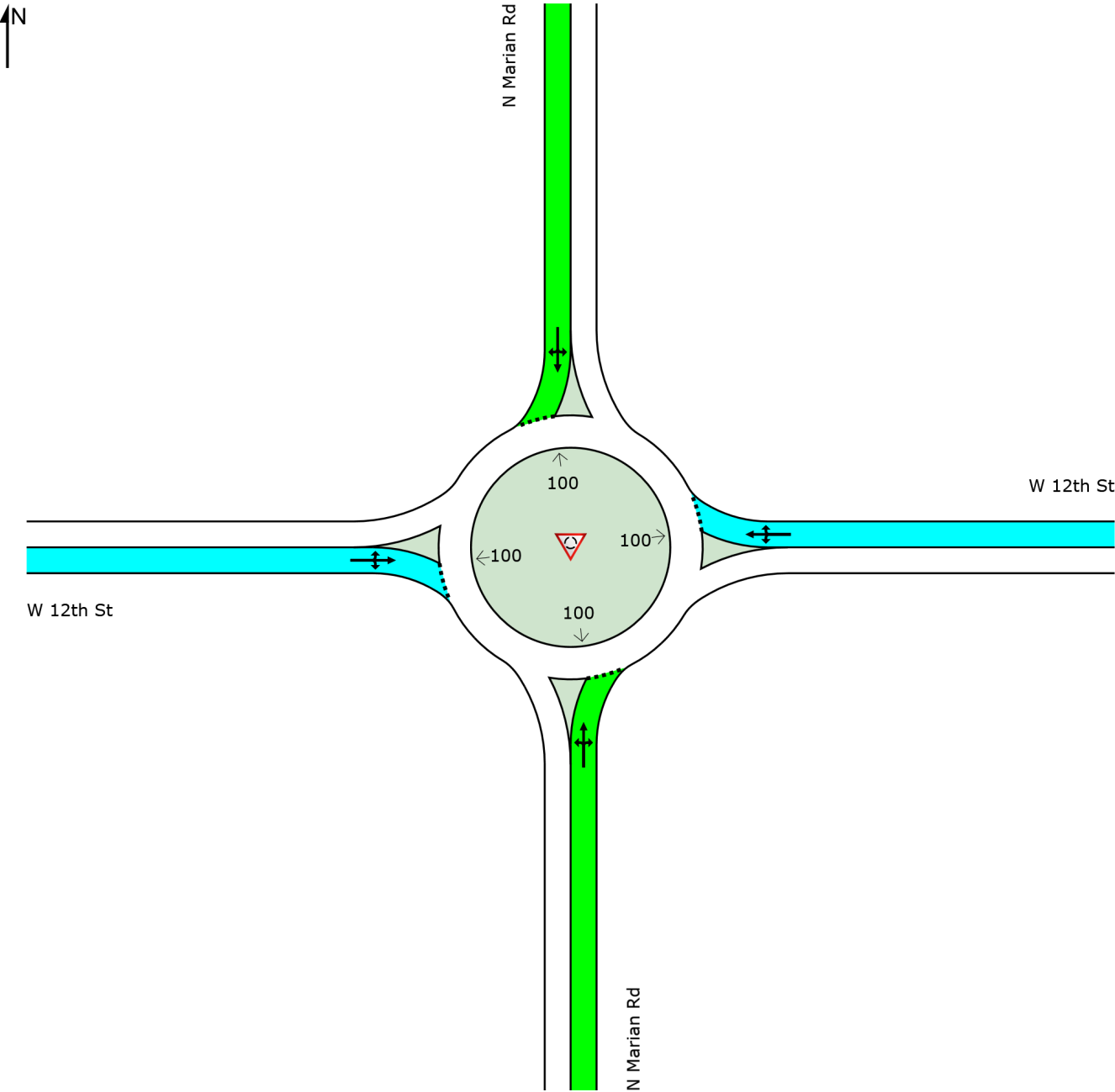
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Marian Rd - Commuter PM (Site Folder: 2048 - N Marian Rd)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	B	A	B	B



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

 Site: 1 [N Marian Rd - AM (Site Folder: 2048 - N Marian Rd)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh Dist]	ft				
South: N Marian Rd													
Lane 1 ^d	460	2.0	679	0.677	100	19.0	LOS C	6.3	160.3	Full	1600	0.0	0.0
Approach	460	2.0		0.677		19.0	LOS C	6.3	160.3				
East: W 12th St													
Lane 1 ^d	731	2.0	1121	0.652	100	12.3	LOS B	6.6	167.2	Full	1600	0.0	0.0
Approach	731	2.0		0.652		12.3	LOS B	6.6	167.2				
North: N Marian Rd													
Lane 1 ^d	156	2.0	572	0.272	100	10.0	LOS A	1.1	28.1	Full	1600	0.0	0.0
Approach	156	2.0		0.272		10.0	LOS A	1.1	28.1				
West: W 12th St													
Lane 1 ^d	717	2.0	921	0.779	100	20.1	LOS C	14.3	363.5	Full	1600	0.0	0.0
Approach	717	2.0		0.779		20.1	LOS C	14.3	363.5				
Intersection	2064	2.0		0.779		16.3	LOS C	14.3	363.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: N Marian Rd											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From S						Cap. veh/h	v/c	%	%		
To Exit:	W	N	E								
Lane 1	103	39	318	460	2.0	679	0.677	100	NA	NA	
Approach	103	39	318	460	2.0		0.677				
East: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From E						Cap. veh/h	v/c	%	%		
To Exit:	S	W	N								
Lane 1	286	439	6	731	2.0	1121	0.652	100	NA	NA	
Approach	286	439	6	731	2.0		0.652				
North: N Marian Rd											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From N						Cap. veh/h	v/c	%	%		
To Exit:	E	S	W								
Lane 1	13	71	71	156	2.0	572	0.272	100	NA	NA	
Approach	13	71	71	156	2.0		0.272				
West: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From W						Cap. veh/h	v/c	%	%		
To Exit:	N	E	S								
Lane 1	39	610	68	717	2.0	921	0.779	100	NA	NA	
Approach	39	610	68	717	2.0		0.779				
Total %HV Deg.Satn (v/c)											
Intersection	2064	2.0		0.779							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 1 [N Marian Rd - School PM (Site Folder: 2048 - N Marian Rd)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Marian Rd													
Lane 1 ^d	372	2.0	742	0.501	100	12.1	LOS B	3.4	86.5	Full	1600	0.0	0.0
Approach	372	2.0		0.501		12.1	LOS B	3.4	86.5				
East: W 12th St													
Lane 1 ^d	756	2.0	1207	0.626	100	11.0	LOS B	5.6	142.4	Full	1600	0.0	0.0
Approach	756	2.0		0.626		11.0	LOS B	5.6	142.4				
North: N Marian Rd													
Lane 1 ^d	43	2.0	582	0.073	100	7.0	LOS A	0.3	6.9	Full	1600	0.0	0.0
Approach	43	2.0		0.073		7.0	LOS A	0.3	6.9				
West: W 12th St													
Lane 1 ^d	656	2.0	1026	0.639	100	12.7	LOS B	7.8	197.9	Full	1600	0.0	0.0
Approach	656	2.0		0.639		12.7	LOS B	7.8	197.9				
Intersection	1827	2.0		0.639		11.7	LOS B	7.8	197.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Marian Rd										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	61	24	287	372	2.0	742	0.501	100	NA	NA
Approach	61	24	287	372	2.0		0.501			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	241	509	6	756	2.0	1207	0.626	100	NA	NA
Approach	241	509	6	756	2.0		0.626			
North: N Marian Rd										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	6	18	18	43	2.0	582	0.073	100	NA	NA
Approach	6	18	18	43	2.0		0.073			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap.	Satn	Util.	SL	Lane
						veh/h	v/c	%	%	No.
Lane 1	24	546	85	656	2.0	1026	0.639	100	NA	NA
Approach	24	546	85	656	2.0		0.639			
Total %HV Deg.Satn (v/c)										

Intersection	1827	2.0	0.639
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

Site: 1 [N Marian Rd - Commuter PM (Site Folder: 2048 - N Marian Rd)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Marian Rd													
Lane 1 ^d	308	2.0	789	0.390	100	9.4	LOS A	2.1	52.1	Full	1600	0.0	0.0
Approach	308	2.0		0.390		9.4	LOS A	2.1	52.1				
East: W 12th St													
Lane 1 ^d	869	2.0	1176	0.739	100	14.9	LOS B	8.1	204.5	Full	1600	0.0	0.0
Approach	869	2.0		0.739		14.9	LOS B	8.1	204.5				
North: N Marian Rd													
Lane 1 ^d	45	2.0	499	0.090	100	8.4	LOS A	0.3	8.3	Full	1600	0.0	0.0
Approach	45	2.0		0.090		8.4	LOS A	0.3	8.3				
West: W 12th St													
Lane 1 ^d	621	2.0	1051	0.590	100	11.2	LOS B	5.5	140.3	Full	1600	0.0	0.0
Approach	621	2.0		0.590		11.2	LOS B	5.5	140.3				
Intersection	1842	2.0		0.739		12.6	LOS B	8.1	204.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Marian Rd										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	96	19	192	308	2.0	789	0.390	100	NA	NA
Approach	96	19	192	308	2.0		0.390			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	217	646	6	869	2.0	1176	0.739	100	NA	NA
Approach	217	646	6	869	2.0		0.739			
North: N Marian Rd										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	6	19	19	45	2.0	499	0.090	100	NA	NA
Approach	6	19	19	45	2.0		0.090			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	19	492	109	621	2.0	1051	0.590	100	NA	NA
Approach	19	492	109	621	2.0		0.590			
Total %HV Deg.Satn (v/c)										

Intersection	1842	2.0	0.739
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Marian Rd Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

Appendix K:
SIDRA Output Reports – Year 2048 N Baltimore Avenue Alternatives

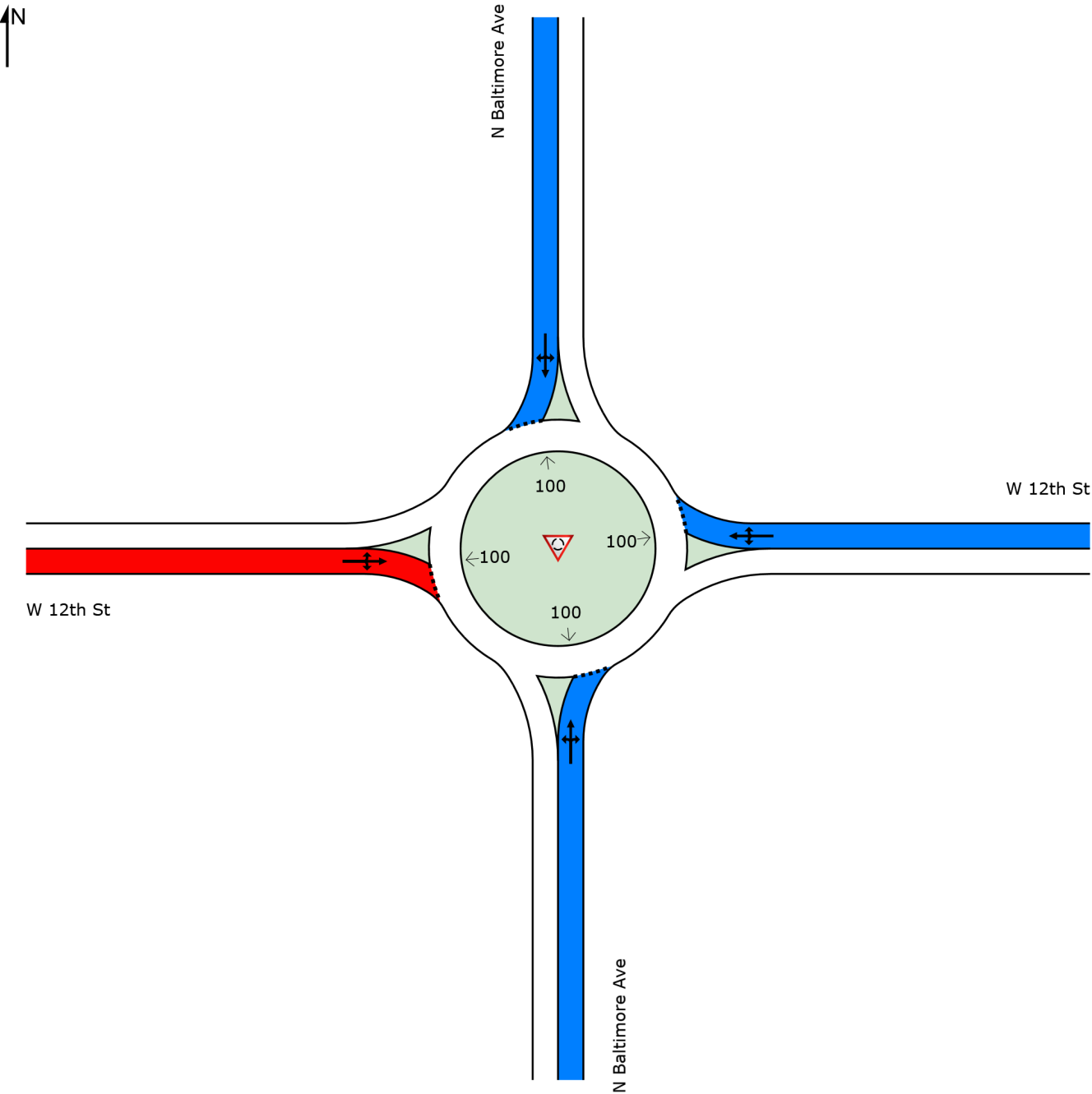
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Baltimore Ave - AM (Site Folder: 2045 - N Baltimore Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	C	F	D



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

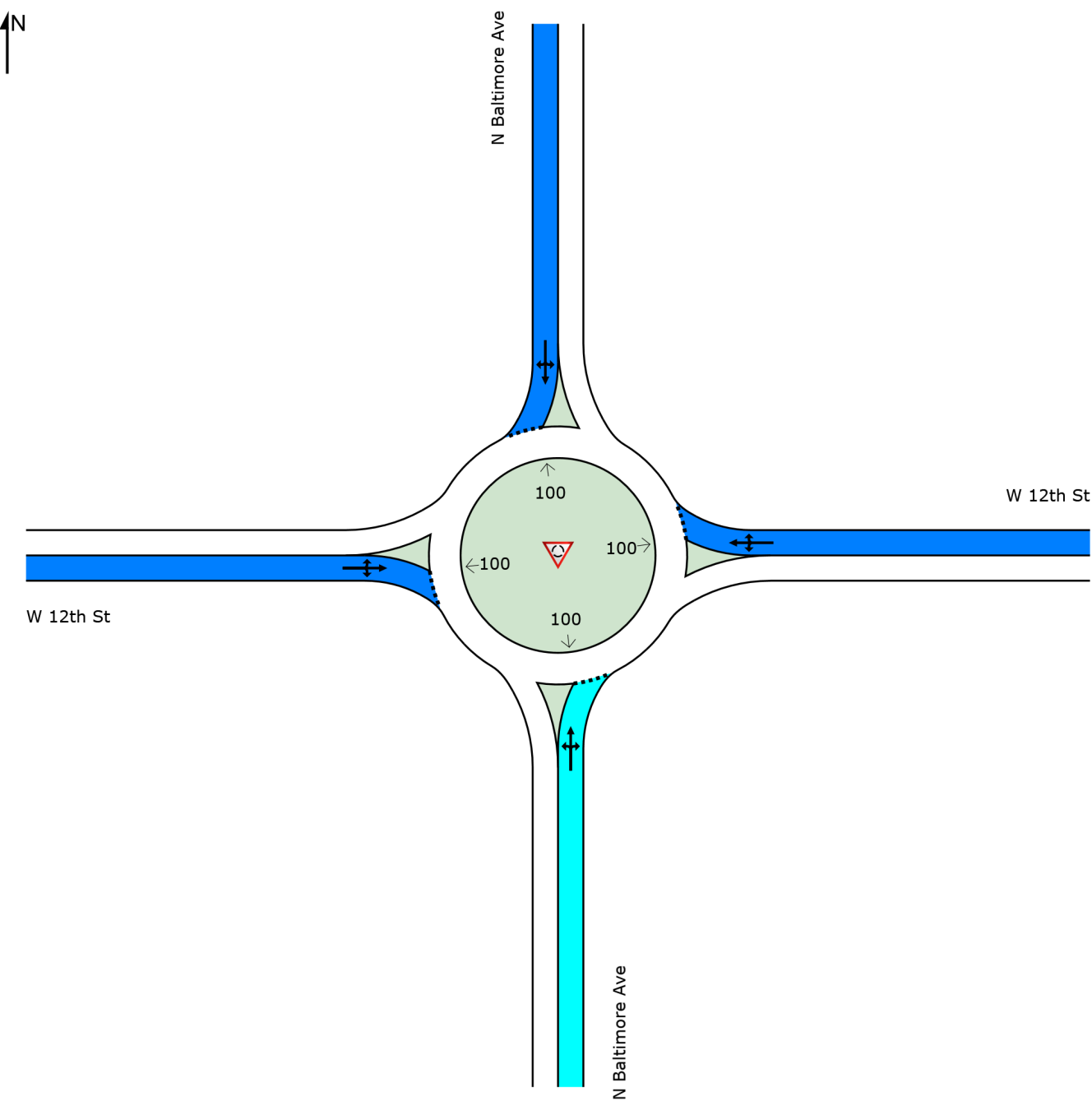
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Baltimore Ave - School PM (Site Folder: 2045 - N Baltimore Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	C	C



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

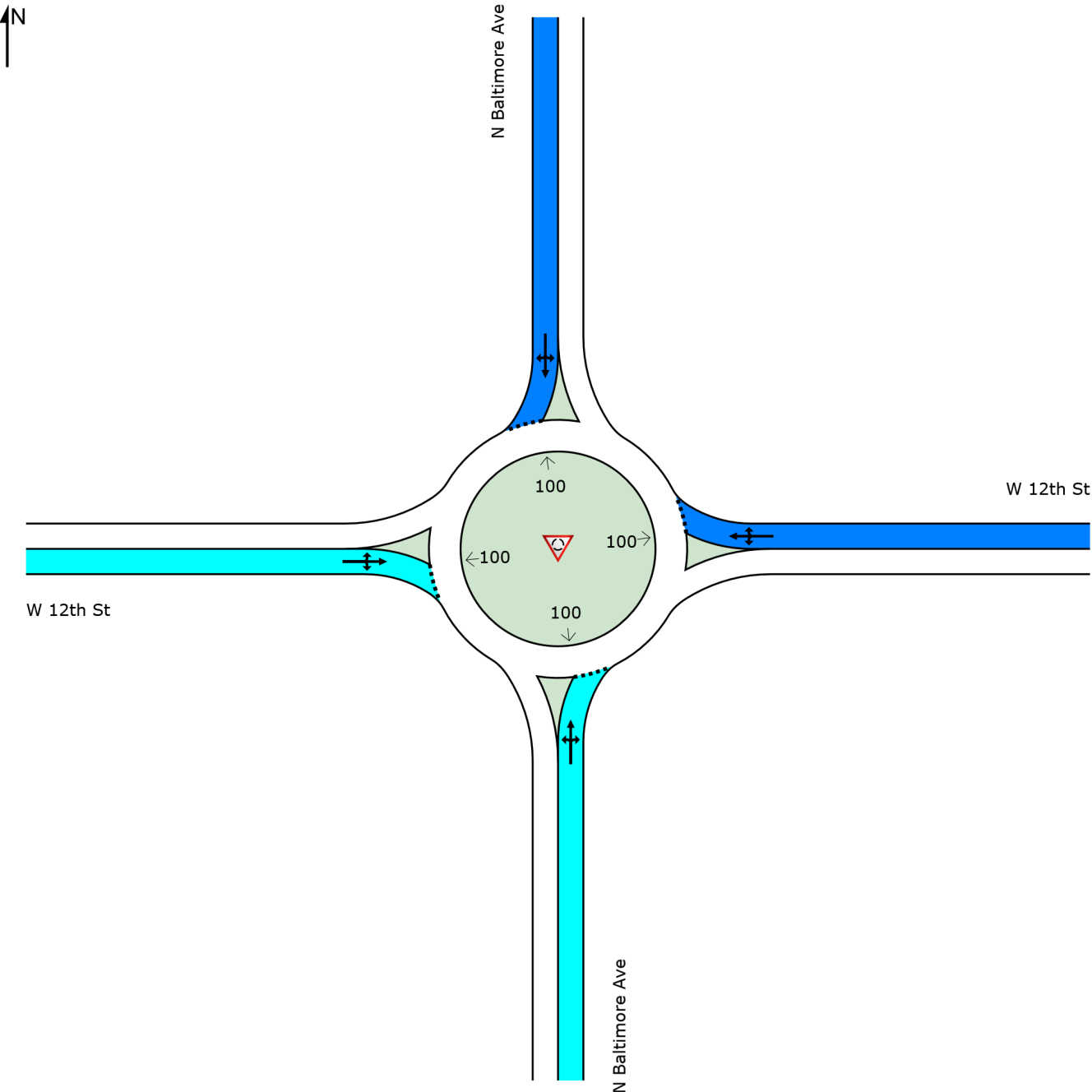
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Baltimore Ave - Commuter PM (Site Folder: 2045 - N Baltimore Ave)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	B	C



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

Intersection	2364	2.0	1.002
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

 Site: 1 [N Baltimore Ave - School PM (Site Folder: 2045 - N Baltimore Ave)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Baltimore Ave													
Lane 1 ^d	229	2.0	551	0.415	100	13.2	LOS B	2.1	53.2	Full	1600	0.0	0.0
Approach	229	2.0		0.415		13.2	LOS B	2.1	53.2				
East: W 12th St													
Lane 1 ^d	586	2.0	843	0.696	100	16.9	LOS C	8.6	218.9	Full	1600	0.0	0.0
Approach	586	2.0		0.696		16.9	LOS C	8.6	218.9				
North: N Baltimore Ave													
Lane 1 ^d	475	2.0	736	0.645	100	16.6	LOS C	6.0	153.1	Full	1600	0.0	0.0
Approach	475	2.0		0.645		16.6	LOS C	6.0	153.1				
West: W 12th St													
Lane 1 ^d	862	2.0	1015	0.849	100	23.9	LOS C	24.4	619.1	Full	1600	0.0	0.0
Approach	862	2.0		0.849		23.9	LOS C	24.4	619.1				
Intersection	2152	2.0		0.849		19.2	LOS C	24.4	619.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Baltimore Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	33	149	46	229	2.0	551	0.415	100	NA	NA
Approach	33	149	46	229	2.0		0.415			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	29	523	34	586	2.0	843	0.696	100	NA	NA
Approach	29	523	34	586	2.0		0.696			
North: N Baltimore Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	34	213	228	475	2.0	736	0.645	100	NA	NA
Approach	34	213	228	475	2.0		0.645			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	272	556	33	862	2.0	1015	0.849	100	NA	NA
Approach	272	556	33	862	2.0		0.849			
Total %HV Deg.Satn (v/c)										

Intersection	2152	2.0	0.849
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

 Site: 1 [N Baltimore Ave - Commuter PM (Site Folder: 2045 - N Baltimore Ave)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %						[Veh	Dist] ft				
South: N Baltimore Ave													
Lane 1 ^d	234	2.0	654	0.359	100	10.3	LOS B	1.7	43.8	Full	1600	0.0	0.0
Approach	234	2.0		0.359		10.3	LOS B	1.7	43.8				
East: W 12th St													
Lane 1 ^d	695	2.0	886	0.785	100	21.1	LOS C	13.9	352.4	Full	1600	0.0	0.0
Approach	695	2.0		0.785		21.1	LOS C	13.9	352.4				
North: N Baltimore Ave													
Lane 1 ^d	441	2.0	673	0.656	100	18.2	LOS C	5.8	146.8	Full	1600	0.0	0.0
Approach	441	2.0		0.656		18.2	LOS C	5.8	146.8				
West: W 12th St													
Lane 1 ^d	685	2.0	1059	0.647	100	12.6	LOS B	8.0	202.7	Full	1600	0.0	0.0
Approach	685	2.0		0.647		12.6	LOS B	8.0	202.7				
Intersection	2056	2.0		0.785		16.4	LOS C	13.9	352.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Sign Control.

Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.

LOS F will result if $v/c > 1$ irrespective of lane delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).

Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)										
South: N Baltimore Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From S To Exit:	W	N	E			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	28	178	29	234	2.0	654	0.359	100	NA	NA
Approach	28	178	29	234	2.0		0.359			
East: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	29	615	52	695	2.0	886	0.785	100	NA	NA
Approach	29	615	52	695	2.0		0.785			
North: N Baltimore Ave										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N To Exit:	E	S	W			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	34	172	234	441	2.0	673	0.656	100	NA	NA
Approach	34	172	234	441	2.0		0.656			
West: W 12th St										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W To Exit:	N	E	S			Cap. veh/h	Satn v/c	Util. %	SL %	Lane No.
Lane 1	201	463	21	685	2.0	1059	0.647	100	NA	NA
Approach	201	463	21	685	2.0		0.647			
Total %HV Deg.Satn (v/c)										

Intersection	2056	2.0	0.785
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Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

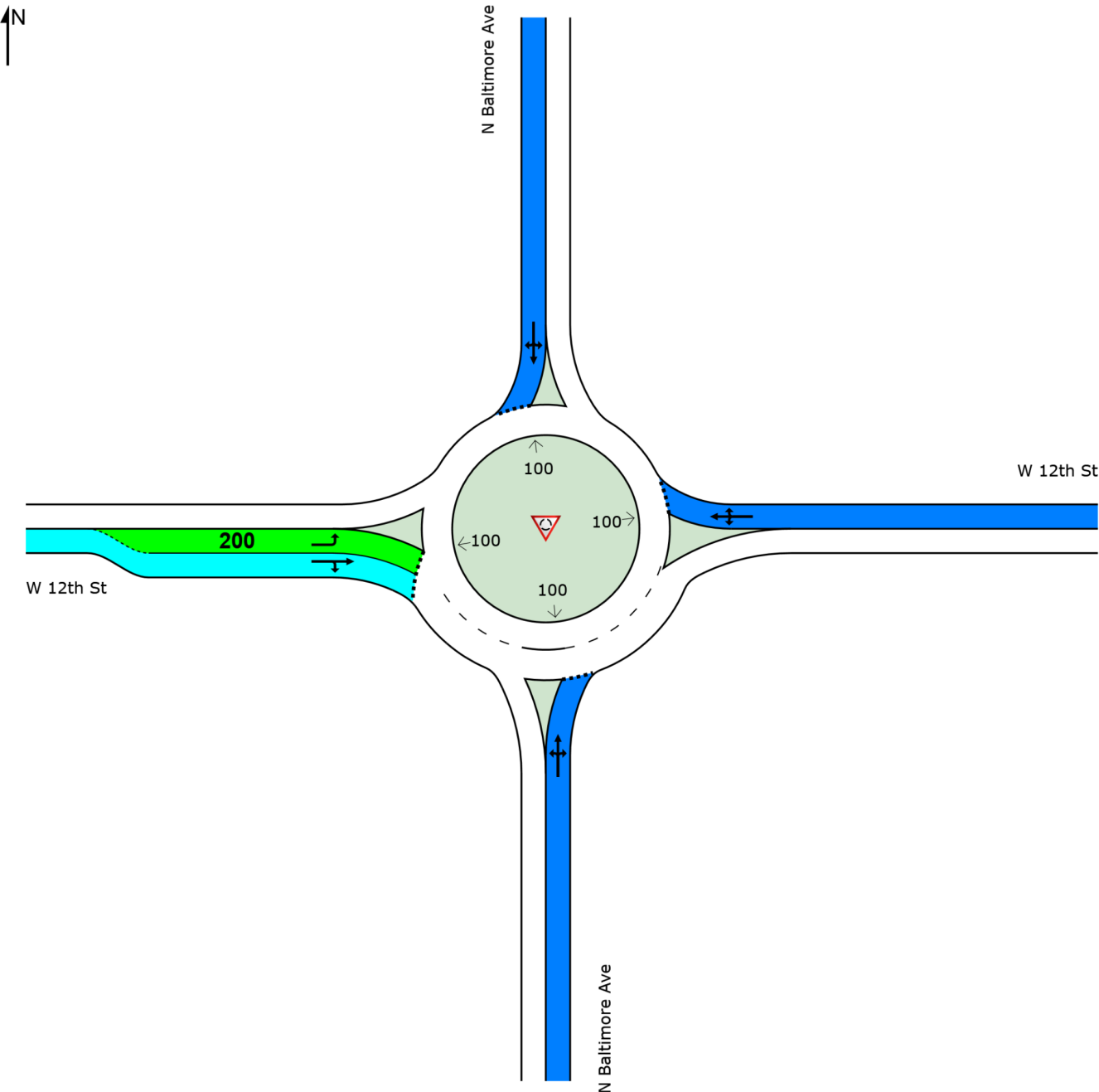
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Baltimore Ave - AM (Site Folder: 2045 - N Baltimore Ave - EB LT & R)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	C	C	C	B	C



Colour code based on Level of Service

					
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

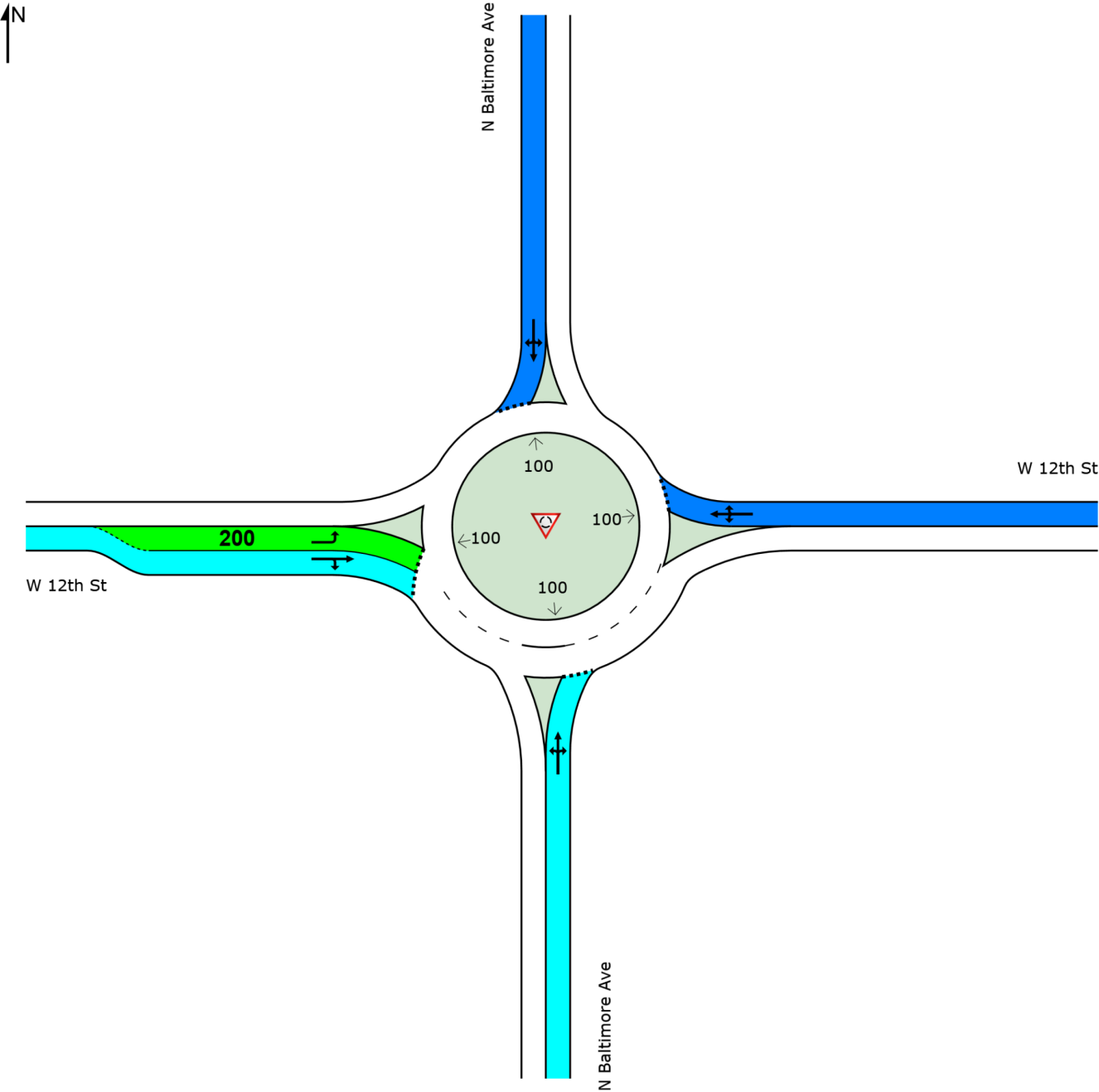
LEVEL OF SERVICE

Lane Level of Service

 **Site: 1 [N Baltimore Ave - School PM (Site Folder: 2045 - N Baltimore Ave - EB LT & R)]**

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	A	B



Colour code based on Level of Service

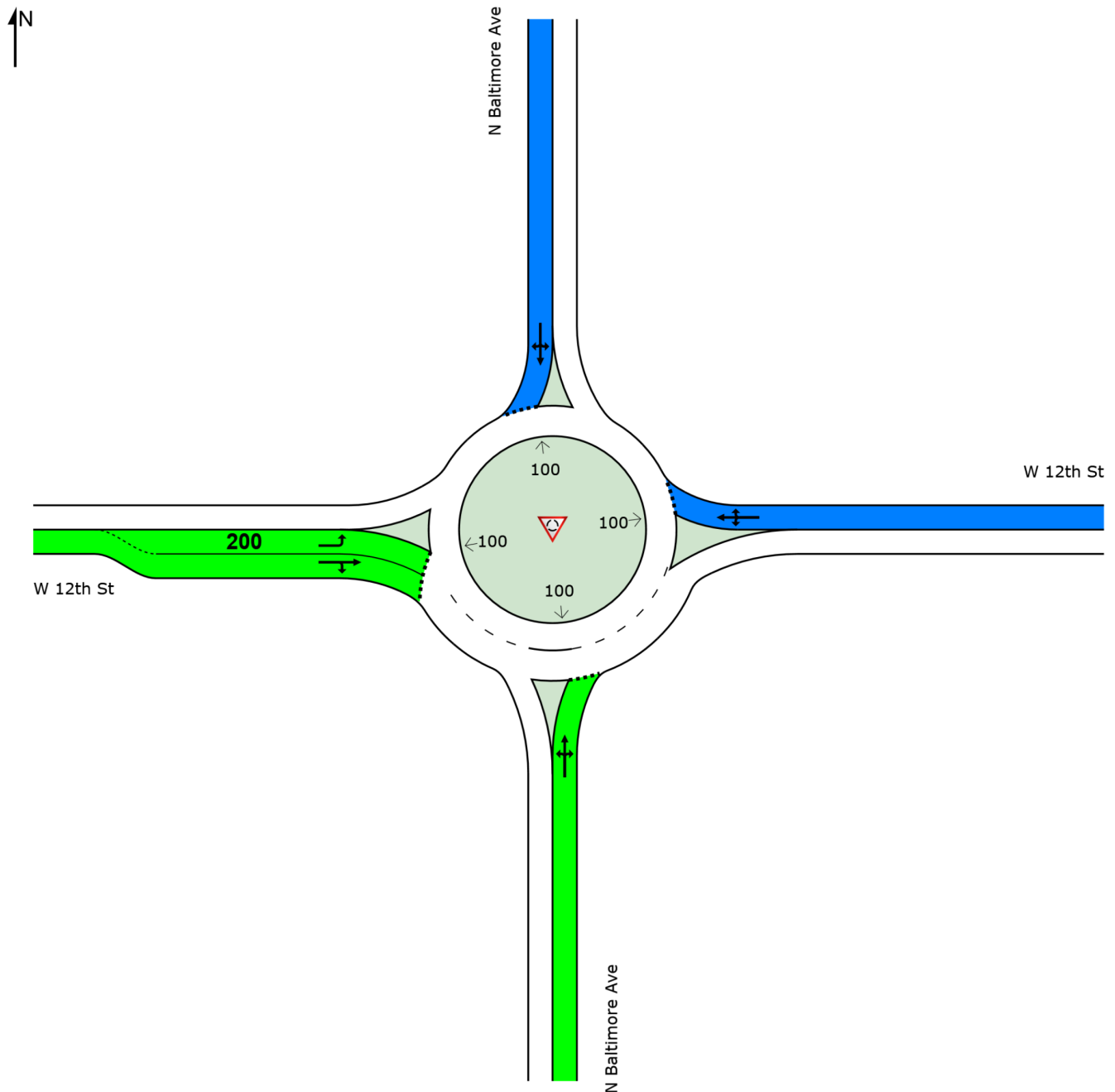
LOS A	LOS B	LOS C	LOS D	LOS E	LOS F
-------	-------	-------	-------	-------	-------

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
Delay Model: HCM Delay Formula (Geometric Delay is not included).

Lane Level of Service

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

	Approaches				Intersection
	South	East	North	West	
LOS	A	C	C	A	B



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

LOS F will result if $v/c > 1$ irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Sign Control

Delay Model: HCM Delay Formula (Geometric Delay is not included).

LANE SUMMARY

🚧 Site: 1 [N Baltimore Ave - AM (Site Folder: 2045 - N Baltimore Ave - EB LT & R)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: N Baltimore Ave													
Lane 1 ^d	317	2.0	597	0.530	100	15.3	LOS C	3.0	75.0	Full	1600	0.0	0.0
Approach	317	2.0		0.530		15.3	LOS C	3.0	75.0				
East: W 12th St													
Lane 1 ^d	590	2.0	781	0.755	100	21.1	LOS C	10.1	257.2	Full	1600	0.0	0.0
Approach	590	2.0		0.755		21.1	LOS C	10.1	257.2				
North: N Baltimore Ave													
Lane 1 ^d	479	2.0	735	0.652	100	16.8	LOS C	6.2	157.3	Full	1600	0.0	0.0
Approach	479	2.0		0.652		16.8	LOS C	6.2	157.3				
West: W 12th St													
Lane 1	263	2.0	1040	0.253	100	5.9	LOS A	1.1	28.7	Short	200	0.0	NA
Lane 2 ^d	715	2.0	1040	0.688	100	14.2	LOS B	9.8	248.5	Full	1600	0.0	0.0
Approach	978	2.0		0.688		11.9	LOS B	9.8	248.5				
Intersection													
	2364	2.0		0.755		15.7	LOS C	10.1	257.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From S						Cap. veh/h	v/c	%	%		
To Exit:	W	N	E								
Lane 1	22	244	51	317	2.0	597	0.530	100	NA	NA	
Approach	22	244	51	317	2.0		0.530				
East: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From E						Cap. veh/h	v/c	%	%		
To Exit:	S	W	N								
Lane 1	32	532	26	590	2.0	781	0.755	100	NA	NA	
Approach	32	532	26	590	2.0		0.755				
North: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From N						Cap. veh/h	v/c	%	%		
To Exit:	E	S	W								
Lane 1	32	250	197	479	2.0	735	0.652	100	NA	NA	
Approach	32	250	197	479	2.0		0.652				
West: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From W						Cap. veh/h	v/c	%	%		
To Exit:	N	E	S								
Lane 1	263	-	-	263	2.0	1040	0.253	100	0.0	2	
Lane 2	-	681	35	715	2.0	1040	0.688	100	NA	NA	
Approach	263	681	35	978	2.0		0.688				

	Total	%HV	Deg.Satn (v/c)
Intersection	2364	2.0	0.755

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

🚧 Site: 1 [N Baltimore Ave - Commuter PM (Site Folder: 2045 - N Baltimore Ave - EB LT & R)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: N Baltimore Ave													
Lane 1 ^d	234	2.0	760	0.309	100	8.4	LOS A	1.2	31.1	Full	1600	0.0	0.0
Approach	234	2.0		0.309		8.4	LOS A	1.2	31.1				
East: W 12th St													
Lane 1 ^d	695	2.0	886	0.785	100	21.1	LOS C	13.9	352.4	Full	1600	0.0	0.0
Approach	695	2.0		0.785		21.1	LOS C	13.9	352.4				
North: N Baltimore Ave													
Lane 1 ^d	441	2.0	673	0.656	100	18.2	LOS C	5.8	146.8	Full	1600	0.0	0.0
Approach	441	2.0		0.656		18.2	LOS C	5.8	146.8				
West: W 12th St													
Lane 1	201	2.0	1119	0.180	100	4.8	LOS A	0.8	19.6	Short	200	0.0	NA
Lane 2 ^d	484	2.0	1119	0.433	100	7.8	LOS A	2.4	61.3	Full	1600	0.0	0.0
Approach	685	2.0		0.433		6.9	LOS A	2.4	61.3				
Intersection	2056	2.0		0.785		14.3	LOS B	13.9	352.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From S						Cap. veh/h	v/c	%	%		
To Exit:	W	N	E								
Lane 1	28	178	29	234	2.0	760	0.309	100	NA	NA	
Approach	28	178	29	234	2.0		0.309				
East: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From E						Cap. veh/h	v/c	%	%		
To Exit:	S	W	N								
Lane 1	29	615	52	695	2.0	886	0.785	100	NA	NA	
Approach	29	615	52	695	2.0		0.785				
North: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From N						Cap. veh/h	v/c	%	%		
To Exit:	E	S	W								
Lane 1	34	172	234	441	2.0	673	0.656	100	NA	NA	
Approach	34	172	234	441	2.0		0.656				
West: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From W						Cap. veh/h	v/c	%	%		
To Exit:	N	E	S								
Lane 1	201	-	-	201	2.0	1119	0.180	100	0.0	2	
Lane 2	-	463	21	484	2.0	1119	0.433	100	NA	NA	
Approach	201	463	21	685	2.0		0.433				

	Total	%HV	Deg.Satn (v/c)
Intersection	2056	2.0	0.785

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

LANE SUMMARY

🚧 Site: 1 [N Baltimore Ave - School PM (Site Folder: 2045 - N Baltimore Ave - EB LT & R)]

Roundabout with 1-lane approaches and circulating road
MUTCD (FHWA 2009) example number: 2B-22
Roundabout Guide (TRB 2010) example number: A-1
Site Category: (None)
Roundabout

Lane Use and Performance													
	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: N Baltimore Ave													
Lane 1 ^d	229	2.0	659	0.347	100	10.1	LOS B	1.5	37.7	Full	1600	0.0	0.0
Approach	229	2.0		0.347		10.1	LOS B	1.5	37.7				
East: W 12th St													
Lane 1 ^d	586	2.0	843	0.696	100	16.9	LOS C	8.6	218.9	Full	1600	0.0	0.0
Approach	586	2.0		0.696		16.9	LOS C	8.6	218.9				
North: N Baltimore Ave													
Lane 1 ^d	475	2.0	736	0.645	100	16.6	LOS C	6.0	153.1	Full	1600	0.0	0.0
Approach	475	2.0		0.645		16.6	LOS C	6.0	153.1				
West: W 12th St													
Lane 1	272	2.0	1078	0.253	100	5.7	LOS A	1.1	29.1	Short	200	0.0	NA
Lane 2 ^d	590	2.0	1078	0.547	100	10.0	LOS B	4.2	106.0	Full	1600	0.0	0.0
Approach	862	2.0		0.547		8.7	LOS A	4.2	106.0				
Intersection	2152	2.0		0.696		12.8	LOS B	8.6	218.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From S						Cap. veh/h	v/c	%	%		
To Exit:	W	N	E							No.	
Lane 1	33	149	46	229	2.0	659	0.347	100	NA	NA	
Approach	33	149	46	229	2.0		0.347				
East: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From E						Cap. veh/h	v/c	%	%		
To Exit:	S	W	N							No.	
Lane 1	29	523	34	586	2.0	843	0.696	100	NA	NA	
Approach	29	523	34	586	2.0		0.696				
North: N Baltimore Ave											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From N						Cap. veh/h	v/c	%	%		
To Exit:	E	S	W							No.	
Lane 1	34	213	228	475	2.0	736	0.645	100	NA	NA	
Approach	34	213	228	475	2.0		0.645				
West: W 12th St											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From W						Cap. veh/h	v/c	%	%		
To Exit:	N	E	S							No.	
Lane 1	272	-	-	272	2.0	1078	0.253	100	0.0	2	
Lane 2	-	556	33	590	2.0	1078	0.547	100	NA	NA	
Approach	272	556	33	862	2.0		0.547				

	Total	%HV	Deg.Satn (v/c)
Intersection	2152	2.0	0.696

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis												
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: N Baltimore Ave Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: W 12th St Merge Type: Not Applied												
Full Length Lane	1	Merge Analysis not applied.										

Appendix L:
SIDRA Output Reports – Year 2048 US-34 / N Burlington Avenue Alternatives

HCM 6th Signalized Intersection Summary 24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Future Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	300	294	160	49	275	99	112	1074	99	49	975	156
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	342	772	654	298	304	109	199	1575	145	190	1469	235
Arrive On Green	0.13	0.42	0.42	0.23	0.23	0.23	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1767	1856	1572	930	1302	469	494	3264	301	475	3044	487
Grp Volume(v), veh/h	300	294	160	49	0	374	112	580	593	49	564	567
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	930	0	1771	494	1763	1801	475	1763	1768
Q Serve(g_s), s	11.1	9.8	5.9	3.8	0.0	18.2	19.8	22.5	22.5	7.9	21.6	21.6
Cycle Q Clear(g_c), s	11.1	9.8	5.9	3.8	0.0	18.2	41.5	22.5	22.5	30.4	21.6	21.6
Prop In Lane	1.00		1.00	1.00		0.26	1.00		0.17	1.00		0.28
Lane Grp Cap(c), veh/h	342	772	654	298	0	413	199	851	869	190	851	853
V/C Ratio(X)	0.88	0.38	0.24	0.16	0.00	0.91	0.56	0.68	0.68	0.26	0.66	0.66
Avail Cap(c_a), veh/h	342	799	677	312	0	439	199	851	869	190	851	853
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	18.0	16.8	27.5	0.0	33.0	33.3	17.7	17.7	29.4	17.5	17.5
Incr Delay (d2), s/veh	21.6	0.3	0.2	0.3	0.0	21.3	3.6	2.2	2.2	0.7	1.9	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.6	7.3	3.7	1.5	0.0	15.3	4.4	13.7	14.0	1.6	13.2	13.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	18.3	17.0	27.8	0.0	54.3	36.9	19.9	19.9	30.1	19.4	19.4
LnGrp LOS	D	B	B	C	A	D	D	B	B	C	B	B
Approach Vol, veh/h	754			423			1285			1180		
Approach Delay, s/veh	28.4			51.2			21.4			19.9		
Approach LOS	C			D			C			B		
Timer - Assigned Phs	2			4			6			7		
Phs Duration (G+Y+Rc), s	47.3			41.4			47.3			16.2		
Change Period (Y+Rc), s	4.5			4.5			4.5			4.5		
Max Green Setting (Gmax), s	42.8			38.2			42.8			11.7		
Max Q Clear Time (g_c+I1), s	43.5			11.8			32.4			13.1		
Green Ext Time (p_c), s	0.0			2.4			5.6			0.5		
Intersection Summary												
HCM 6th Ctrl Delay	25.8											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary 24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Future Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	233	251	157	54	183	103	168	1076	71	76	1054	241
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	278	622	642	280	220	124	255	1859	123	256	1211	276
Arrive On Green	0.08	0.34	0.34	0.20	0.20	0.20	0.07	0.55	0.55	0.42	0.42	0.42
Sat Flow, veh/h	1767	1856	1572	970	1115	628	1767	3357	221	486	2852	649
Grp Volume(v), veh/h	233	251	157	54	0	286	168	565	582	76	650	645
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	970	0	1743	1767	1763	1816	486	1763	1739
Q Serve(g_s), s	6.7	8.4	5.3	3.8	0.0	12.8	4.1	17.0	17.1	9.9	27.2	27.5
Cycle Q Clear(g_c), s	6.7	8.4	5.3	3.8	0.0	12.8	4.1	17.0	17.1	16.5	27.2	27.5
Prop In Lane	1.00		1.00	1.00		0.36	1.00		0.12	1.00		0.37
Lane Grp Cap(c), veh/h	278	622	642	280	0	343	255	976	1005	256	749	738
V/C Ratio(X)	0.84	0.40	0.24	0.19	0.00	0.83	0.66	0.58	0.58	0.30	0.87	0.87
Avail Cap(c_a), veh/h	278	761	760	352	0	473	267	1040	1072	270	801	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.8	20.7	15.7	27.7	0.0	31.2	17.6	11.9	11.9	20.7	21.2	21.3
Incr Delay (d2), s/veh	19.9	0.4	0.2	0.3	0.0	8.9	5.6	0.7	0.7	0.6	9.6	10.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.1	6.4	3.4	1.6	0.0	10.2	3.2	10.0	10.2	2.0	17.8	17.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.7	21.1	15.9	28.0	0.0	40.1	23.2	12.6	12.6	21.4	30.8	31.5
LnGrp LOS	D	C	B	C	A	D	C	B	B	C	C	C
Approach Vol, veh/h	641			340			1315			1371		
Approach Delay, s/veh	29.1			38.2			13.9			30.6		
Approach LOS	C			D			B			C		
Timer - Assigned Phs	2			4		5	6	7	8			
Phs Duration (G+Y+Rc), s	49.3			31.6		10.4	38.9	11.2	20.4			
Change Period (Y+Rc), s	4.5			4.5		4.5	4.5	4.5	4.5			
Max Green Setting (Gmax), s	47.8			33.2		6.5	36.8	6.7	22.0			
Max Q Clear Time (g_c+I1), s	19.1			10.4		6.1	29.5	8.7	14.8			
Green Ext Time (p_c), s	8.7			2.0		0.0	4.9	0.0	1.2			
Intersection Summary												
HCM 6th Ctrl Delay	25.1											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Future Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	204	203	112	84	299	96	160	1146	101	67	1180	334
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	222	649	651	304	296	95	192	1836	162	215	1228	342
Arrive On Green	0.09	0.35	0.35	0.22	0.22	0.22	0.06	0.56	0.56	0.45	0.45	0.45
Sat Flow, veh/h	1767	1856	1572	1056	1346	432	1767	3278	289	442	2722	759
Grp Volume(v), veh/h	204	203	112	84	0	395	160	616	631	67	758	756
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1056	0	1778	1767	1763	1804	442	1763	1719
Q Serve(g_s), s	8.5	8.0	4.5	6.7	0.0	22.0	4.6	23.6	23.7	12.1	41.4	43.1
Cycle Q Clear(g_c), s	8.5	8.0	4.5	6.7	0.0	22.0	4.6	23.6	23.7	24.9	41.4	43.1
Prop In Lane	1.00		1.00	1.00		0.24	1.00		0.16	1.00		0.44
Lane Grp Cap(c), veh/h	222	649	651	304	0	391	192	987	1010	215	795	775
V/C Ratio(X)	0.92	0.31	0.17	0.28	0.00	1.01	0.83	0.62	0.63	0.31	0.95	0.98
Avail Cap(c_a), veh/h	222	649	651	304	0	391	192	987	1010	215	795	775
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.2	23.7	18.5	33.0	0.0	39.0	22.9	14.9	14.9	27.0	26.4	26.9
Incr Delay (d2), s/veh	38.6	0.3	0.1	0.5	0.0	48.0	25.9	1.2	1.2	0.8	21.3	26.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.1	6.3	3.0	3.2	0.0	21.1	5.6	13.9	14.1	2.3	28.3	29.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.8	24.0	18.6	33.5	0.0	87.0	48.8	16.1	16.1	27.8	47.7	53.2
LnGrp LOS	E	C	B	C	A	F	D	B	B	C	D	D
Approach Vol, veh/h	519			479			1407			1581		
Approach Delay, s/veh	40.1			77.6			19.8			49.5		
Approach LOS	D			E			B			D		
Timer - Assigned Phs	2			4		5	6	7	8			
Phs Duration (G+Y+Rc), s	60.5			39.5		10.9	49.6	13.0	26.5			
Change Period (Y+Rc), s	4.5			4.5		4.5	4.5	4.5	4.5			
Max Green Setting (Gmax), s	56.0			35.0		6.4	45.1	8.5	22.0			
Max Q Clear Time (g_c+I1), s	25.7			10.0		6.6	45.1	10.5	24.0			
Green Ext Time (p_c), s	10.0			1.5		0.0	0.0	0.0	0.0			
Intersection Summary												
HCM 6th Ctrl Delay	41.2											
HCM 6th LOS	D											

HCM 6th Signalized Intersection Summary
24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Future Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	300	294	160	49	275	99	112	1074	99	49	975	156
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	347	410	223	219	345	292	239	1710	158	229	1595	255
Arrive On Green	0.12	0.36	0.36	0.19	0.19	0.19	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	1767	1130	615	930	1856	1572	494	3264	301	475	3044	487
Grp Volume(v), veh/h	300	0	454	49	275	99	112	580	593	49	564	567
Grp Sat Flow(s),veh/h/ln	1767	0	1745	930	1856	1572	494	1763	1801	475	1763	1768
Q Serve(g_s), s	9.5	0.0	17.8	3.8	11.2	4.3	16.3	18.5	18.5	6.5	17.8	17.8
Cycle Q Clear(g_c), s	9.5	0.0	17.8	7.6	11.2	4.3	34.1	18.5	18.5	25.0	17.8	17.8
Prop In Lane	1.00		0.35	1.00		1.00	1.00		0.17	1.00		0.28
Lane Grp Cap(c), veh/h	347	0	633	219	345	292	239	924	944	229	924	926
V/C Ratio(X)	0.86	0.00	0.72	0.22	0.80	0.34	0.47	0.63	0.63	0.21	0.61	0.61
Avail Cap(c_a), veh/h	347	0	792	304	515	436	260	1000	1022	249	1000	1003
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.2	0.0	21.8	31.1	30.8	28.0	25.2	13.4	13.4	22.3	13.2	13.2
Incr Delay (d2), s/veh	19.8	0.0	2.4	0.5	5.2	0.7	1.4	1.1	1.1	0.5	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.3	0.0	11.7	1.6	9.2	3.0	3.4	10.9	11.1	1.3	10.5	10.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.0	0.0	24.1	31.6	36.1	28.7	26.6	14.5	14.5	22.7	14.2	14.2
LnGrp LOS	D	A	C	C	D	C	C	B	B	C	B	B
Approach Vol, veh/h		754			423			1285			1180	
Approach Delay, s/veh		32.0			33.8			15.5			14.5	
Approach LOS		C			C			B			B	
Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		46.1		33.2		46.1	14.0	19.2				
Change Period (Y+Rc), s		4.5		4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		45.0		36.0		45.0	9.5	22.0				
Max Q Clear Time (g_c+I1), s		36.1		19.8		27.0	11.5	13.2				
Green Ext Time (p_c), s		5.5		2.7		7.8	0.0	1.5				
Intersection Summary												
HCM 6th Ctrl Delay				20.8								
HCM 6th LOS				C								

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Future Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	233	251	157	54	183	103	168	1076	71	76	1054	241
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	316	329	205	186	328	278	271	1928	127	276	1263	288
Arrive On Green	0.07	0.31	0.31	0.18	0.18	0.18	0.07	0.57	0.57	0.44	0.44	0.44
Sat Flow, veh/h	1767	1068	668	970	1856	1572	1767	3357	221	486	2852	649
Grp Volume(v), veh/h	233	0	408	54	183	103	168	565	582	76	650	645
Grp Sat Flow(s),veh/h/ln	1767	0	1735	970	1856	1572	1767	1763	1816	486	1763	1739
Q Serve(g_s), s	5.5	0.0	16.2	4.1	6.9	4.4	3.7	15.3	15.3	8.9	24.8	25.1
Cycle Q Clear(g_c), s	5.5	0.0	16.2	10.3	6.9	4.4	3.7	15.3	15.3	14.1	24.8	25.1
Prop In Lane	1.00		0.38	1.00		1.00	1.00		0.12	1.00		0.37
Lane Grp Cap(c), veh/h	316	0	534	186	328	278	271	1013	1043	276	781	770
V/C Ratio(X)	0.74	0.00	0.76	0.29	0.56	0.37	0.62	0.56	0.56	0.28	0.83	0.84
Avail Cap(c_a), veh/h	316	0	727	294	535	453	293	1131	1165	303	877	865
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.9	0.0	23.9	33.1	28.7	27.7	16.0	10.2	10.2	17.8	18.8	18.8
Incr Delay (d2), s/veh	8.8	0.0	3.3	0.8	1.5	0.8	3.5	0.5	0.5	0.5	6.3	6.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	4.0	0.0	11.0	1.8	5.7	3.0	2.7	8.7	8.9	1.7	15.6	15.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.7	0.0	27.2	34.0	30.2	28.5	19.5	10.7	10.6	18.3	25.0	25.5
LnGrp LOS	D	A	C	C	C	C	B	B	B	B	C	C
Approach Vol, veh/h	641		340			1315			1371			
Approach Delay, s/veh	30.3		30.3			11.8			24.9			
Approach LOS	C		C			B			C			
Timer - Assigned Phs	2		4		5	6	7	8				
Phs Duration (G+Y+Rc), s	48.4		28.0		10.1	38.3	10.0	18.0				
Change Period (Y+Rc), s	4.5		4.5		4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	49.0		32.0		6.5	38.0	5.5	22.0				
Max Q Clear Time (g_c+I1), s	17.3		18.2		5.7	27.1	7.5	12.3				
Green Ext Time (p_c), s	9.0		2.2		0.0	6.7	0.0	1.2				
Intersection Summary												
HCM 6th Ctrl Delay			21.6									
HCM 6th LOS			C									

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Future Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	204	203	112	84	299	96	160	1146	101	67	1180	334
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	241	353	195	258	363	308	215	1897	167	241	1248	348
Arrive On Green	0.07	0.31	0.31	0.20	0.20	0.20	0.07	0.58	0.58	0.46	0.46	0.46
Sat Flow, veh/h	1767	1124	620	1056	1856	1572	1767	3278	289	442	2722	759
Grp Volume(v), veh/h	204	0	315	84	299	96	160	616	631	67	758	756
Grp Sat Flow(s),veh/h/ln	1767	0	1744	1056	1856	1572	1767	1763	1804	442	1763	1719
Q Serve(g_s), s	5.5	0.0	12.7	6.1	13.0	4.4	3.8	19.1	19.1	9.8	34.4	35.9
Cycle Q Clear(g_c), s	5.5	0.0	12.7	8.8	13.0	4.4	3.8	19.1	19.1	18.7	34.4	35.9
Prop In Lane	1.00		0.36	1.00		1.00	1.00		0.16	1.00		0.44
Lane Grp Cap(c), veh/h	241	0	548	258	363	308	215	1020	1044	241	808	788
V/C Ratio(X)	0.85	0.00	0.57	0.33	0.82	0.31	0.74	0.60	0.60	0.28	0.94	0.96
Avail Cap(c_a), veh/h	241	0	662	327	484	410	216	1024	1048	242	811	791
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.8	0.0	24.2	32.1	32.5	29.0	19.1	11.5	11.5	20.9	21.7	22.1
Incr Delay (d2), s/veh	23.2	0.0	1.0	0.7	8.4	0.6	12.9	1.0	1.0	0.6	18.2	22.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.5	0.0	9.0	2.9	10.8	3.1	3.8	10.9	11.2	1.8	23.5	24.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.0	0.0	25.1	32.8	40.9	29.6	32.1	12.5	12.5	21.5	39.9	44.6
LnGrp LOS	D	A	C	C	D	C	C	B	B	C	D	D
Approach Vol, veh/h	519			479			1407			1581		
Approach Delay, s/veh	36.1			37.2			14.7			41.4		
Approach LOS	D			D			B			D		
Timer - Assigned Phs	2			4		5	6	7	8			
Phs Duration (G+Y+Rc), s	53.3			31.0		10.1	43.2	10.0	21.0			
Change Period (Y+Rc), s	4.5			4.5		4.5	4.5	4.5	4.5			
Max Green Setting (Gmax), s	49.0			32.0		5.7	38.8	5.5	22.0			
Max Q Clear Time (g_c+I1), s	21.1			14.7		5.8	37.9	7.5	15.0			
Green Ext Time (p_c), s	9.8			1.8		0.0	0.8	0.0	1.5			
Intersection Summary												
HCM 6th Ctrl Delay	30.8											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary

24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Future Volume (veh/h)	243	238	130	40	223	80	91	870	80	40	790	126
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	300	294	160	49	275	99	112	1074	99	49	975	156
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	342	470	256	277	304	109	199	1575	145	190	1469	235
Arrive On Green	0.13	0.42	0.42	0.23	0.23	0.23	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	1767	1130	615	930	1302	469	494	3264	301	475	3044	487
Grp Volume(v), veh/h	300	0	454	49	0	374	112	580	593	49	564	567
Grp Sat Flow(s),veh/h/ln	1767	0	1745	930	0	1771	494	1763	1801	475	1763	1768
Q Serve(g_s), s	11.1	0.0	18.2	3.9	0.0	18.2	19.8	22.5	22.5	7.9	21.6	21.6
Cycle Q Clear(g_c), s	11.1	0.0	18.2	5.9	0.0	18.2	41.5	22.5	22.5	30.4	21.6	21.6
Prop In Lane	1.00		0.35	1.00		0.26	1.00		0.17	1.00		0.28
Lane Grp Cap(c), veh/h	342	0	726	277	0	413	199	851	869	190	851	853
V/C Ratio(X)	0.88	0.00	0.63	0.18	0.00	0.91	0.56	0.68	0.68	0.26	0.66	0.66
Avail Cap(c_a), veh/h	342	0	752	291	0	439	199	851	869	190	851	853
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	0.0	20.4	29.2	0.0	33.0	33.3	17.7	17.7	29.4	17.5	17.5
Incr Delay (d2), s/veh	21.6	0.0	1.6	0.3	0.0	21.3	3.6	2.2	2.2	0.7	1.9	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.6	0.0	11.8	1.6	0.0	15.3	4.4	13.7	14.0	1.6	13.2	13.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	0.0	22.0	29.5	0.0	54.3	36.9	19.9	19.9	30.1	19.4	19.4
LnGrp LOS	D	A	C	C	A	D	D	B	B	C	B	B
Approach Vol, veh/h	754			423			1285			1180		
Approach Delay, s/veh	30.9			51.4			21.4			19.9		
Approach LOS	C			D			C			B		
Timer - Assigned Phs	2			4			6			7		
Phs Duration (G+Y+Rc), s	47.3			41.4			47.3			16.2		
Change Period (Y+Rc), s	4.5			4.5			4.5			4.5		
Max Green Setting (Gmax), s	42.8			38.2			42.8			11.7		
Max Q Clear Time (g_c+I1), s	43.5			20.2			32.4			13.1		
Green Ext Time (p_c), s	0.0			2.8			5.6			0.5		
Intersection Summary												
HCM 6th Ctrl Delay	26.4											
HCM 6th LOS	C											

HCM 6th Signalized Intersection Summary 24: US-34 / N Burlington Ave & W 12th St

06/12/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Future Volume (veh/h)	214	231	144	50	168	95	155	990	65	70	970	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	233	251	157	54	183	103	168	1076	71	76	1054	241
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	278	358	224	216	220	124	255	1859	123	256	1211	276
Arrive On Green	0.08	0.34	0.34	0.20	0.20	0.20	0.07	0.55	0.55	0.42	0.42	0.42
Sat Flow, veh/h	1767	1068	668	970	1115	628	1767	3357	221	486	2852	649
Grp Volume(v), veh/h	233	0	408	54	0	286	168	565	582	76	650	645
Grp Sat Flow(s),veh/h/ln	1767	0	1735	970	0	1743	1767	1763	1816	486	1763	1739
Q Serve(g_s), s	6.7	0.0	16.5	4.2	0.0	12.8	4.1	17.0	17.1	9.9	27.2	27.5
Cycle Q Clear(g_c), s	6.7	0.0	16.5	9.5	0.0	12.8	4.1	17.0	17.1	16.5	27.2	27.5
Prop In Lane	1.00		0.38	1.00		0.36	1.00		0.12	1.00		0.37
Lane Grp Cap(c), veh/h	278	0	582	216	0	343	255	976	1005	256	749	738
V/C Ratio(X)	0.84	0.00	0.70	0.25	0.00	0.83	0.66	0.58	0.58	0.30	0.87	0.87
Avail Cap(c_a), veh/h	278	0	711	288	0	473	267	1040	1072	270	801	790
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.8	0.0	23.4	32.4	0.0	31.2	17.6	11.9	11.9	20.7	21.2	21.3
Incr Delay (d2), s/veh	19.9	0.0	2.4	0.6	0.0	8.9	5.6	0.7	0.7	0.6	9.6	10.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	5.1	0.0	11.1	1.8	0.0	10.2	3.2	10.0	10.2	2.0	17.8	17.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.7	0.0	25.8	33.0	0.0	40.1	23.2	12.6	12.6	21.4	30.8	31.5
LnGrp LOS	D	A	C	C	A	D	C	B	B	C	C	C
Approach Vol, veh/h	641			340			1315			1371		
Approach Delay, s/veh	33.4			39.0			13.9			30.6		
Approach LOS	C			D			B			C		
Timer - Assigned Phs	2			4	5	6	7	8				
Phs Duration (G+Y+Rc), s	49.3			31.6	10.4	38.9	11.2	20.4				
Change Period (Y+Rc), s	4.5			4.5	4.5	4.5	4.5	4.5				
Max Green Setting (Gmax), s	47.8			33.2	6.5	36.8	6.7	22.0				
Max Q Clear Time (g_c+I1), s	19.1			18.5	6.1	29.5	8.7	14.8				
Green Ext Time (p_c), s	8.7			2.3	0.0	4.9	0.0	1.2				
Intersection Summary												
HCM 6th Ctrl Delay				25.9								
HCM 6th LOS				C								

HCM 6th Signalized Intersection Summary

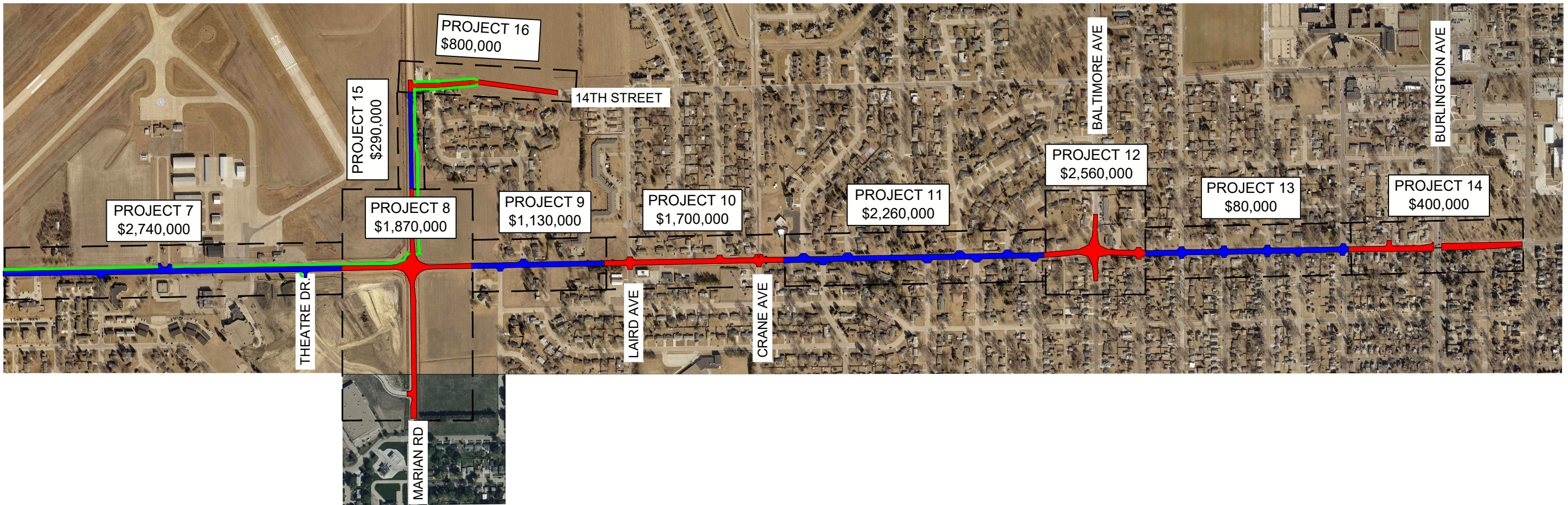
24: US-34 / N Burlington Ave & W 12th St

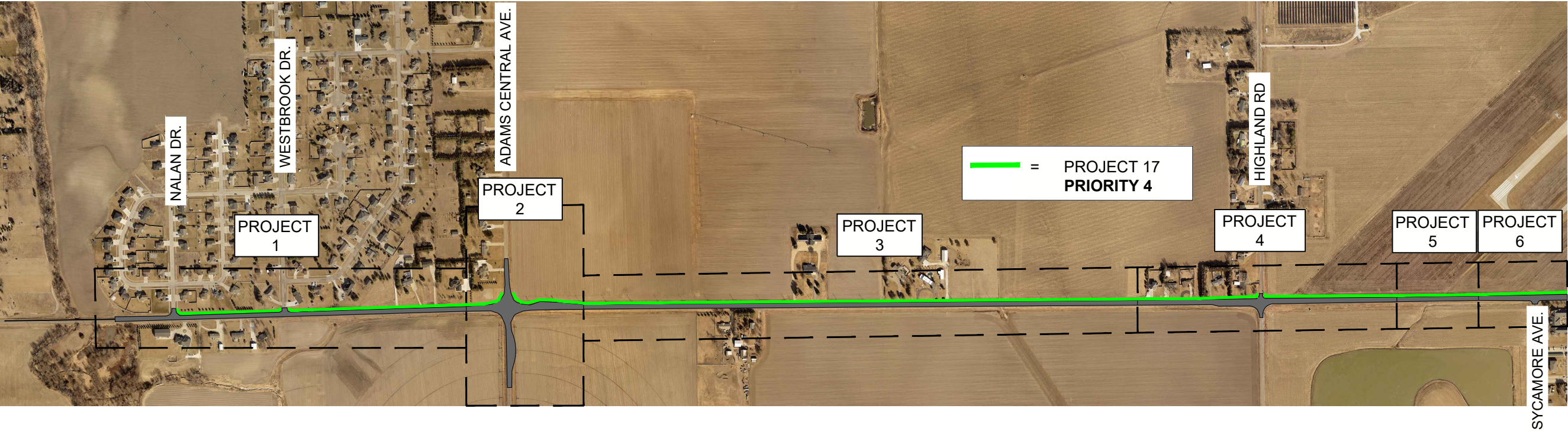
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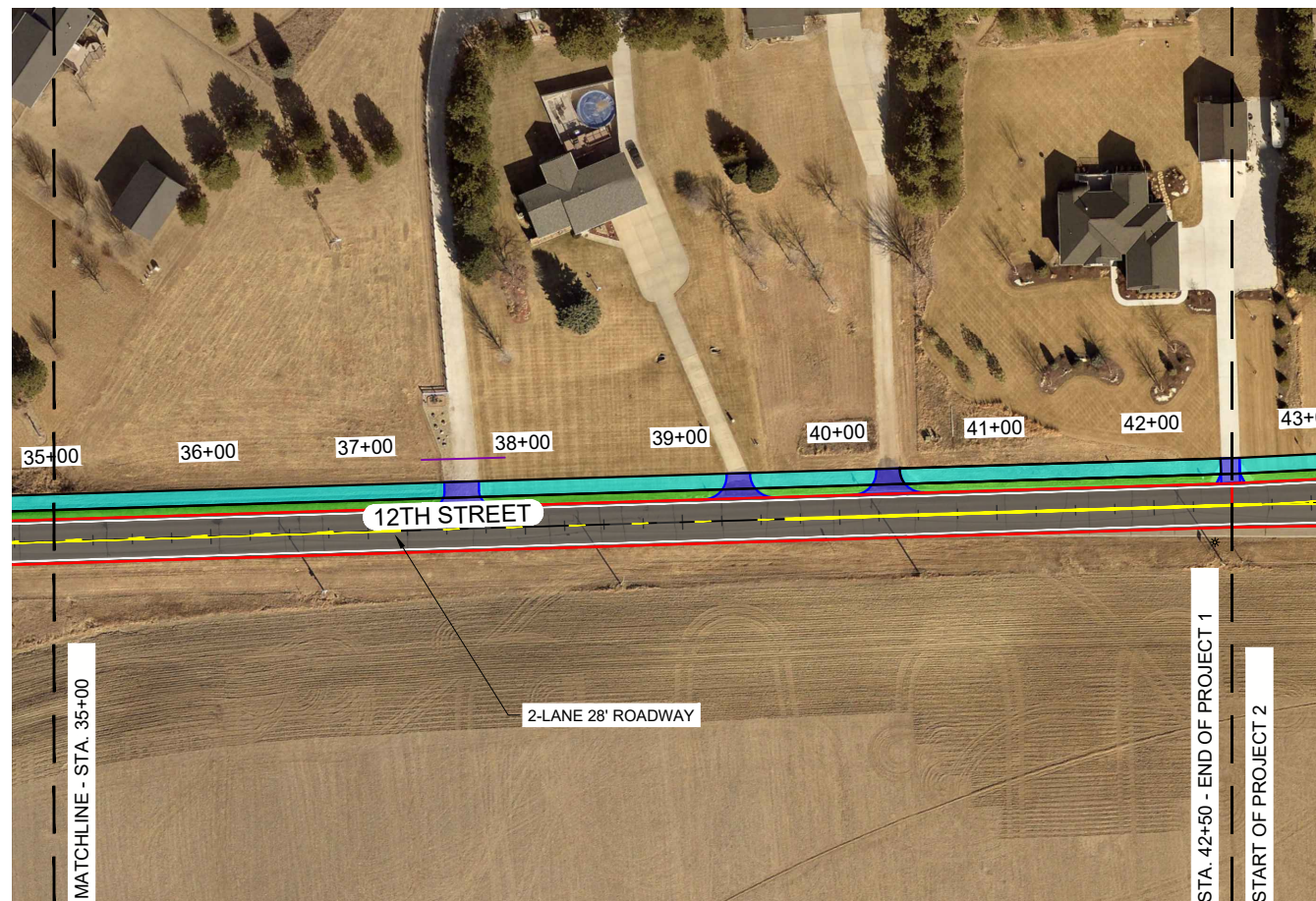
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Future Volume (veh/h)	182	181	100	75	266	85	142	1020	90	60	1050	297
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	204	203	112	84	299	96	160	1146	101	67	1180	334
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	222	393	217	290	296	95	192	1836	162	215	1228	342
Arrive On Green	0.09	0.35	0.35	0.22	0.22	0.22	0.06	0.56	0.56	0.45	0.45	0.45
Sat Flow, veh/h	1767	1124	620	1056	1346	432	1767	3278	289	442	2722	759
Grp Volume(v), veh/h	204	0	315	84	0	395	160	616	631	67	758	756
Grp Sat Flow(s),veh/h/ln	1767	0	1744	1056	0	1778	1767	1763	1804	442	1763	1719
Q Serve(g_s), s	8.5	0.0	14.3	6.9	0.0	22.0	4.6	23.6	23.7	12.1	41.4	43.1
Cycle Q Clear(g_c), s	8.5	0.0	14.3	8.2	0.0	22.0	4.6	23.6	23.7	24.9	41.4	43.1
Prop In Lane	1.00		0.36	1.00		0.24	1.00		0.16	1.00		0.44
Lane Grp Cap(c), veh/h	222	0	610	290	0	391	192	987	1010	215	795	775
V/C Ratio(X)	0.92	0.00	0.52	0.29	0.00	1.01	0.83	0.62	0.63	0.31	0.95	0.98
Avail Cap(c_a), veh/h	222	0	610	290	0	391	192	987	1010	215	795	775
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.2	0.0	25.8	34.2	0.0	39.0	22.9	14.9	14.9	27.0	26.4	26.9
Incr Delay (d2), s/veh	38.6	0.0	0.8	0.5	0.0	48.0	25.9	1.2	1.2	0.8	21.3	26.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	10.1	0.0	10.0	3.3	0.0	21.1	5.6	13.9	14.1	2.3	28.3	29.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.8	0.0	26.5	34.7	0.0	87.0	48.8	16.1	16.1	27.8	47.7	53.2
LnGrp LOS	E	A	C	C	A	F	D	B	B	C	D	D
Approach Vol, veh/h	519			479			1407			1581		
Approach Delay, s/veh	42.8			77.9			19.8			49.5		
Approach LOS	D			E			B			D		
Timer - Assigned Phs	2			4		5	6	7	8			
Phs Duration (G+Y+Rc), s	60.5			39.5		10.9	49.6	13.0	26.5			
Change Period (Y+Rc), s	4.5			4.5		4.5	4.5	4.5	4.5			
Max Green Setting (Gmax), s	56.0			35.0		6.4	45.1	8.5	22.0			
Max Q Clear Time (g_c+l1), s	25.7			16.3		6.6	45.1	10.5	24.0			
Green Ext Time (p_c), s	10.0			1.8		0.0	0.0	0.0	0.0			
Intersection Summary												
HCM 6th Ctrl Delay	41.5											
HCM 6th LOS	D											

APPENDIX B

Concept Illustrations (per project)







LEGEND:

-  CONCRETE PAVEMENT
-  CONCRETE CURB AND GUTTER
-  CONCRETE DRIVEWAY
-  5' CONCRETE SIDEWALK
-  10' CONCRETE BIKE TRAIL
-  FUTURE 5' CONCRETE SIDEWALK
-  FUTURE 10' CONCRETE BIKE TRAIL
-  PROJECT 17: 10' CONCRETE BIKE TRAIL
-  CONCRETE TRUCK APRON
-  RAISED MEDIAN
-  SEEDING, FERTILIZER, AND MULCH
-  DETECTABLE WARNING PANEL
-  RECTANGULAR RAPID FLASHING BEACON
-  EXISTING STORM SEWER
-  PROPOSED AREA INLET
-  PROPOSED STORM SEWER MANHOLE
-  PROPOSED CURB INLET
-  PROPOSED FLARED END SECTION
-  PROPOSED CONCRETE COLLAR

PROJECT 1 CONCEPT W 12TH ST CITY LIMITS TO ADAMS CENTRAL AVE

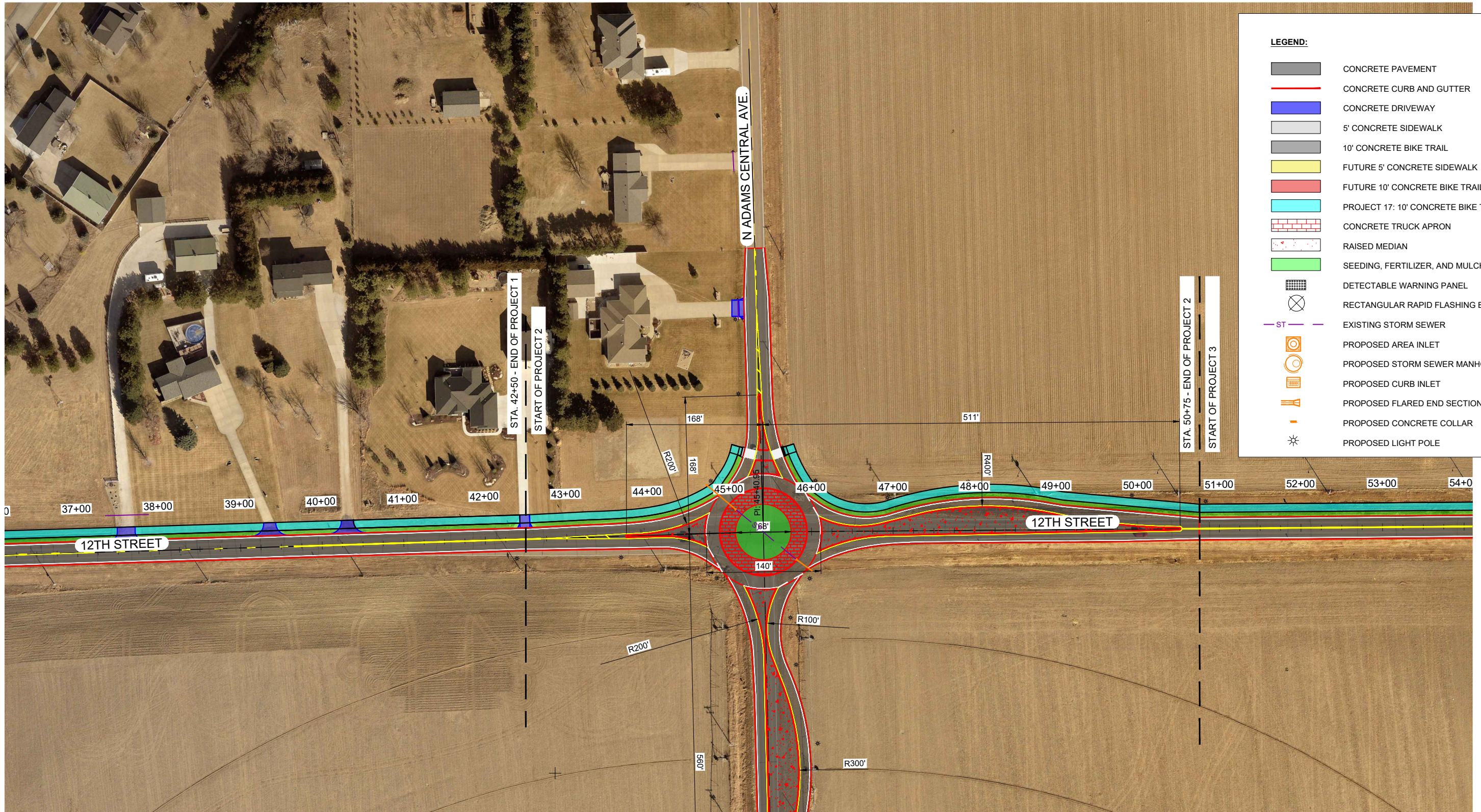
Date: 11/1/2023

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=60'

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=60'



LEGEND:	
	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR
	PROPOSED LIGHT POLE

PROJECT 2 CONCEPT INTERSECTION OF W 12TH ST & N ADAMS CENTRAL AVE

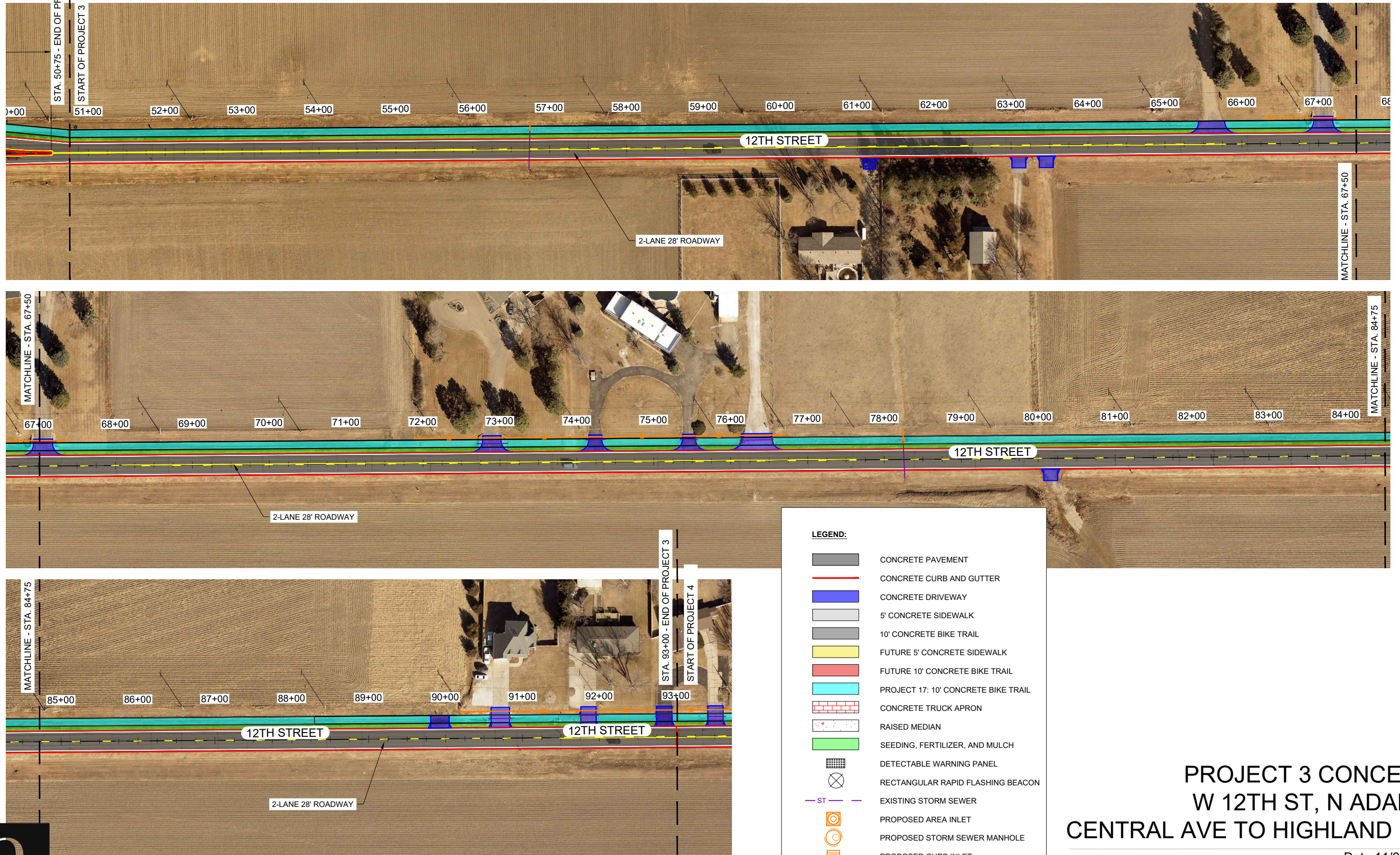
Date: 11/1/2023

Project No. 220893.00

12TH STREET CORRIDOR STUDY HASTINGS NEBRASKA

Scale: 1"=60'

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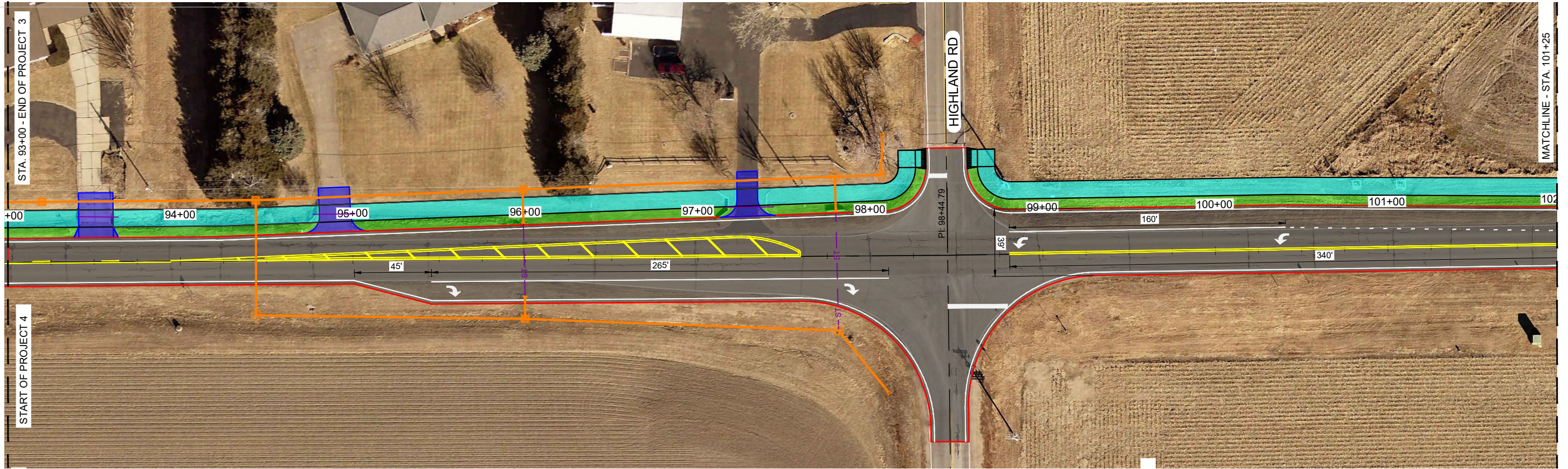
LEGEND:

- CONCRETE PAVEMENT
- CONCRETE CURB AND GUTTER
- CONCRETE DRIVEWAY
- 5' CONCRETE SIDEWALK
- 10' CONCRETE BIKE TRAIL
- FUTURE 5' CONCRETE SIDEWALK
- FUTURE 10' CONCRETE BIKE TRAIL
- PROJECT 17: 10' CONCRETE BIKE TRAIL
- CONCRETE TRUCK APRON
- RAISED MEDIAN
- SEEDING, FERTILIZER, AND MULCH
- DETECTABLE WARNING PANEL
- RECTANGULAR RAPID FLASHING BEACON
- EXISTING STORM SEWER
- PROPOSED AREA INLET
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CURB INLET
- PROPOSED FLARED END SECTION
- PROPOSED CONCRETE COLLAR

PROJECT 3 CONCEPT W 12TH ST, N ADAMS CENTRAL AVE TO HIGHLAND RD

Date: 11/2/2023

Project No. 220893.00

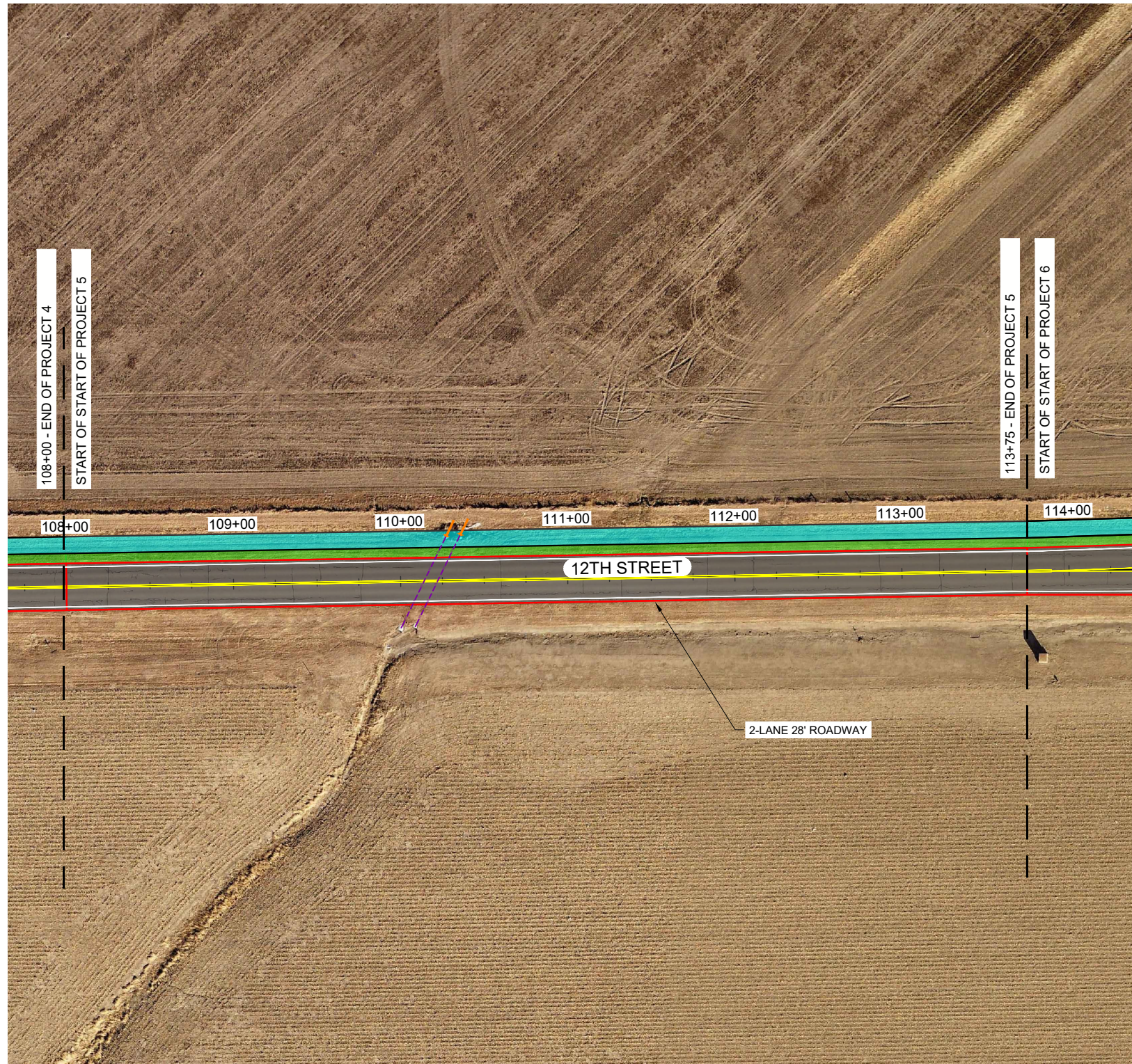


LEGEND:	
	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR

12 STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=30'

PROJECT 4 CONCEPT
INTERSECTION OF W 12TH ST & HIGHLAND RD



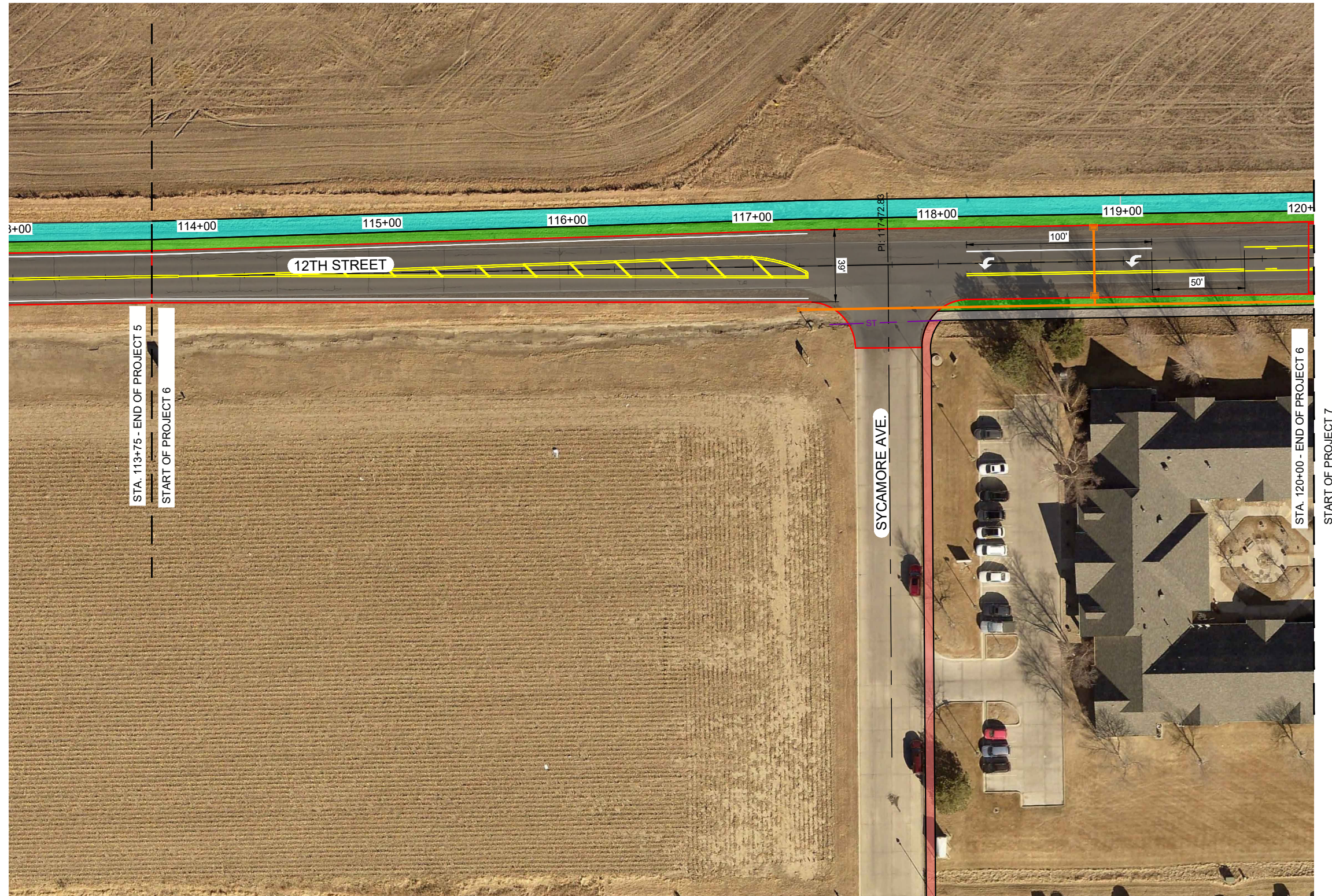
LEGEND:	
	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=40'

PROJECT 5 CONCEPT W 12TH ST, HIGHLAND RD TO SYCAMORE AVE

Date: 11/1/2023

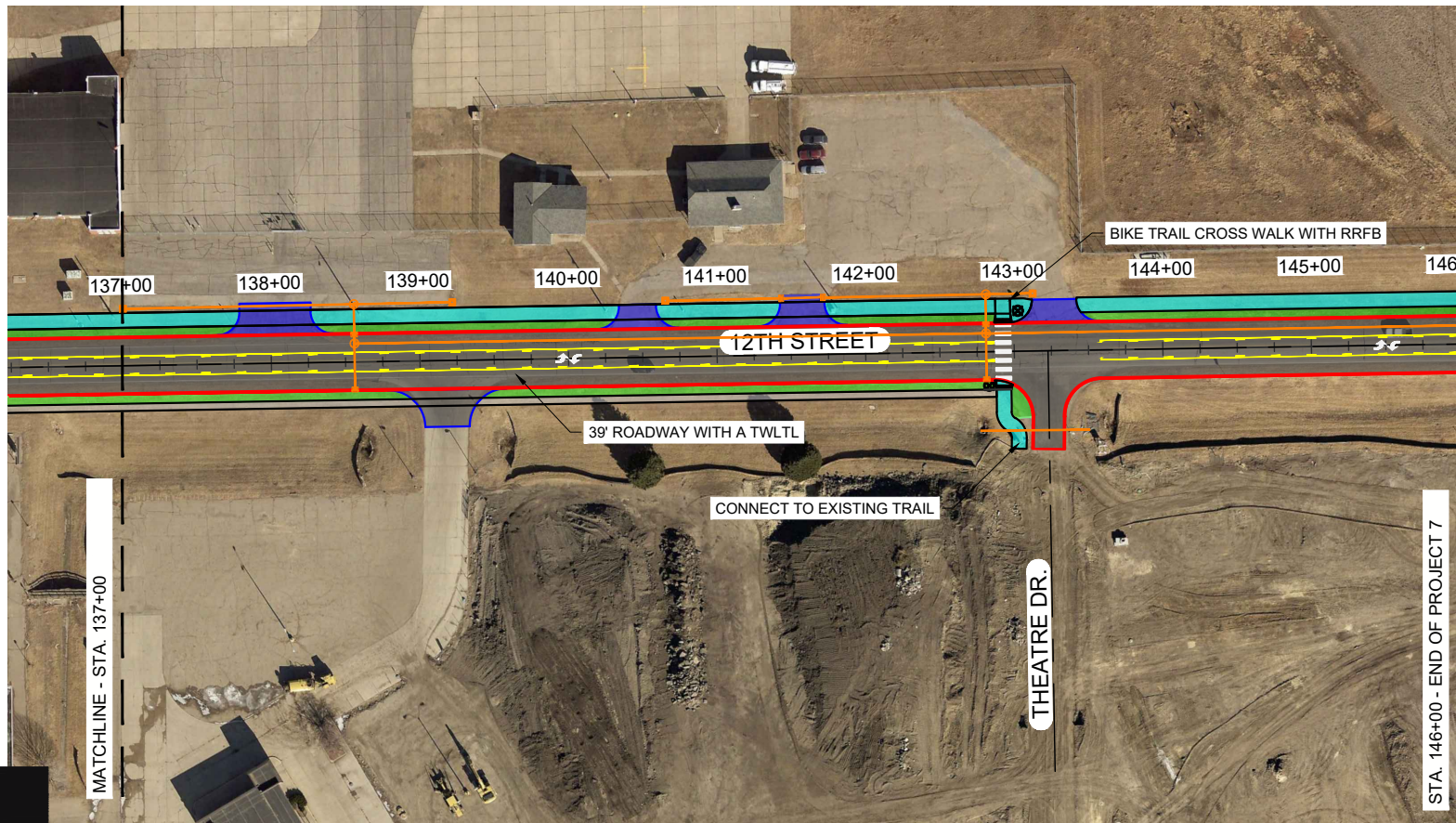
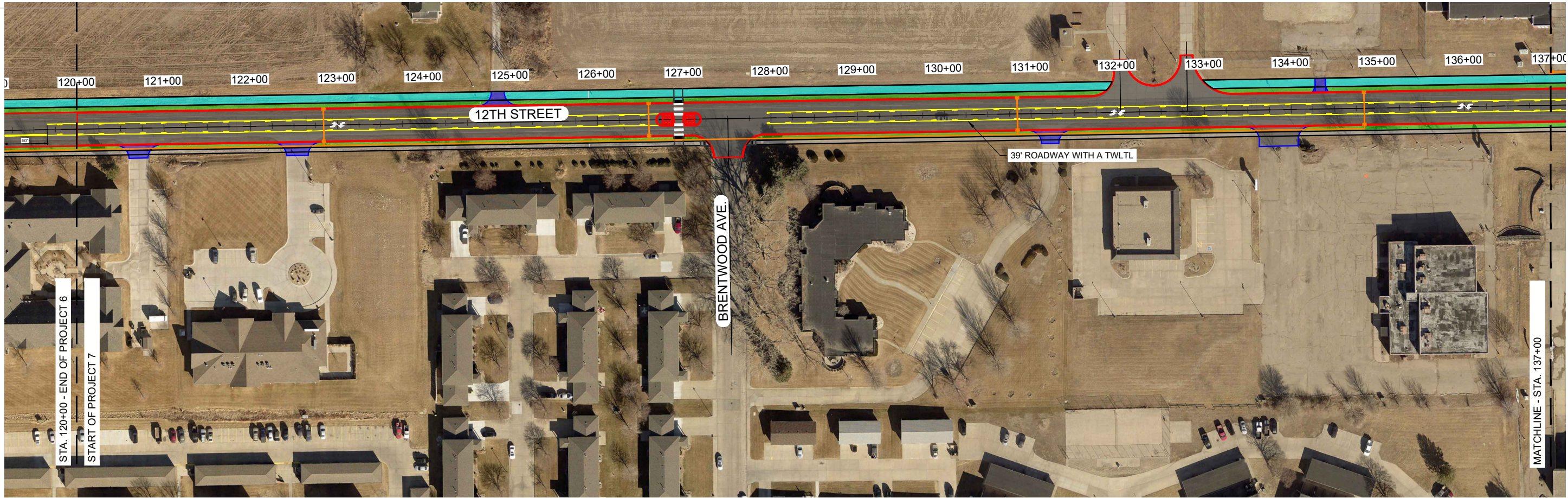


12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=30'

PROJECT 6 CONCEPT INTERSECTION OF W 12TH ST & SYCAMORE AVE

Date: 11/1/2023



START OF PROJECT 8

LEGEND:

-  CONCRETE PAVEMENT
-  CONCRETE CURB AND GUTTER
-  CONCRETE DRIVEWAY
-  5' CONCRETE SIDEWALK
-  10' CONCRETE BIKE TRAIL
-  FUTURE 5' CONCRETE SIDEWALK
-  FUTURE 10' CONCRETE BIKE TRAIL
-  PROJECT 17: 10' CONCRETE BIKE TRAIL
-  CONCRETE TRUCK APRON
-  RAISED MEDIAN
-  SEEDING, FERTILIZER, AND MULCH
-  DETECTABLE WARNING PANEL
-  RECTANGULAR RAPID FLASHING BEACON
-  EXISTING STORM SEWER
-  PROPOSED AREA INLET
-  PROPOSED STORM SEWER MANHOLE
-  PROPOSED CURB INLET
-  PROPOSED FLARED END SECTION
-  PROPOSED CONCRETE COLLAR

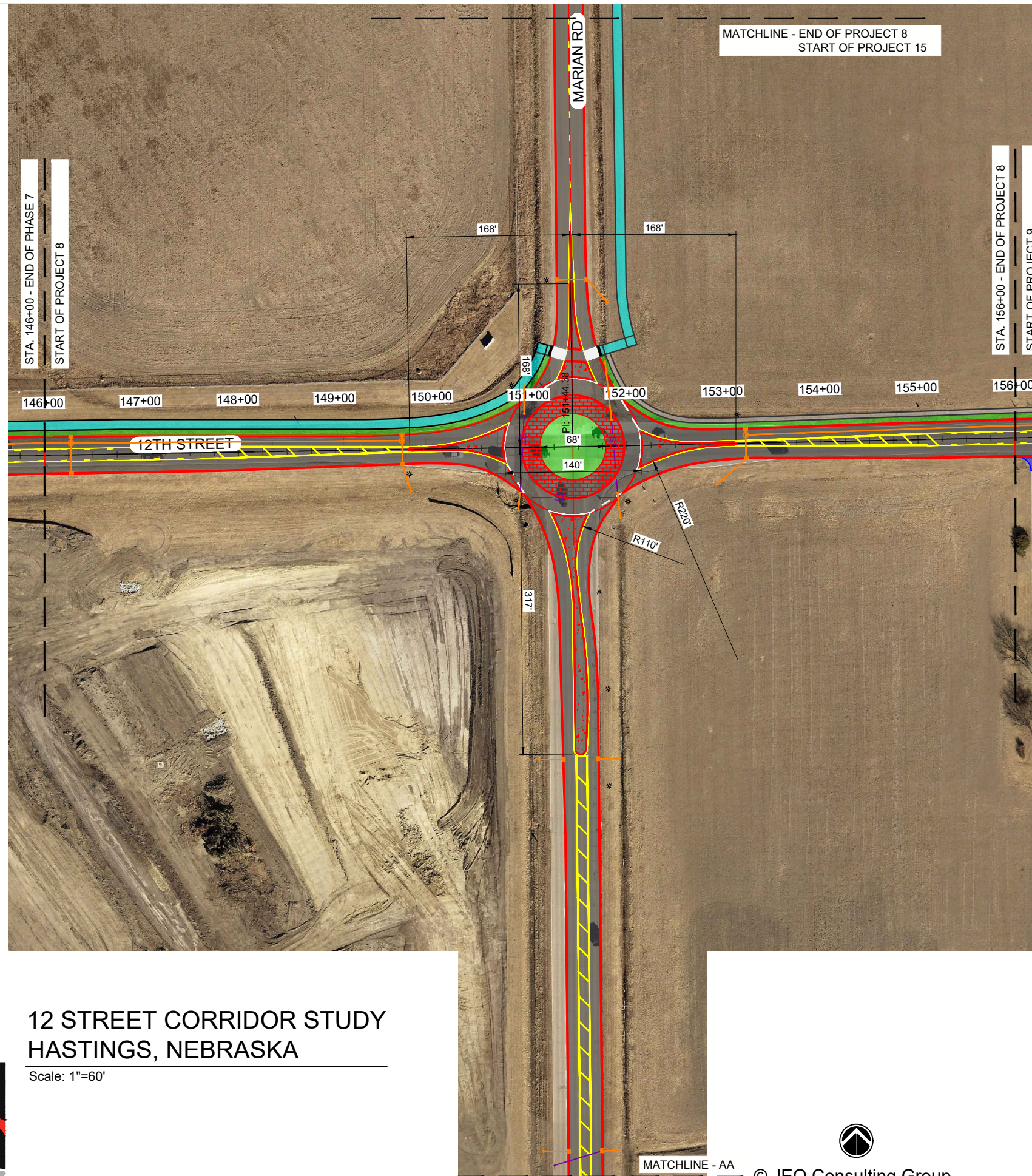
PROJECT 7 CONCEPT W 12TH ST, SYCAMORE AVE TO MARIAN RD

12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=60'

12 STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=60'



LEGEND:

	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR
	PROPOSED LIGHT POLE

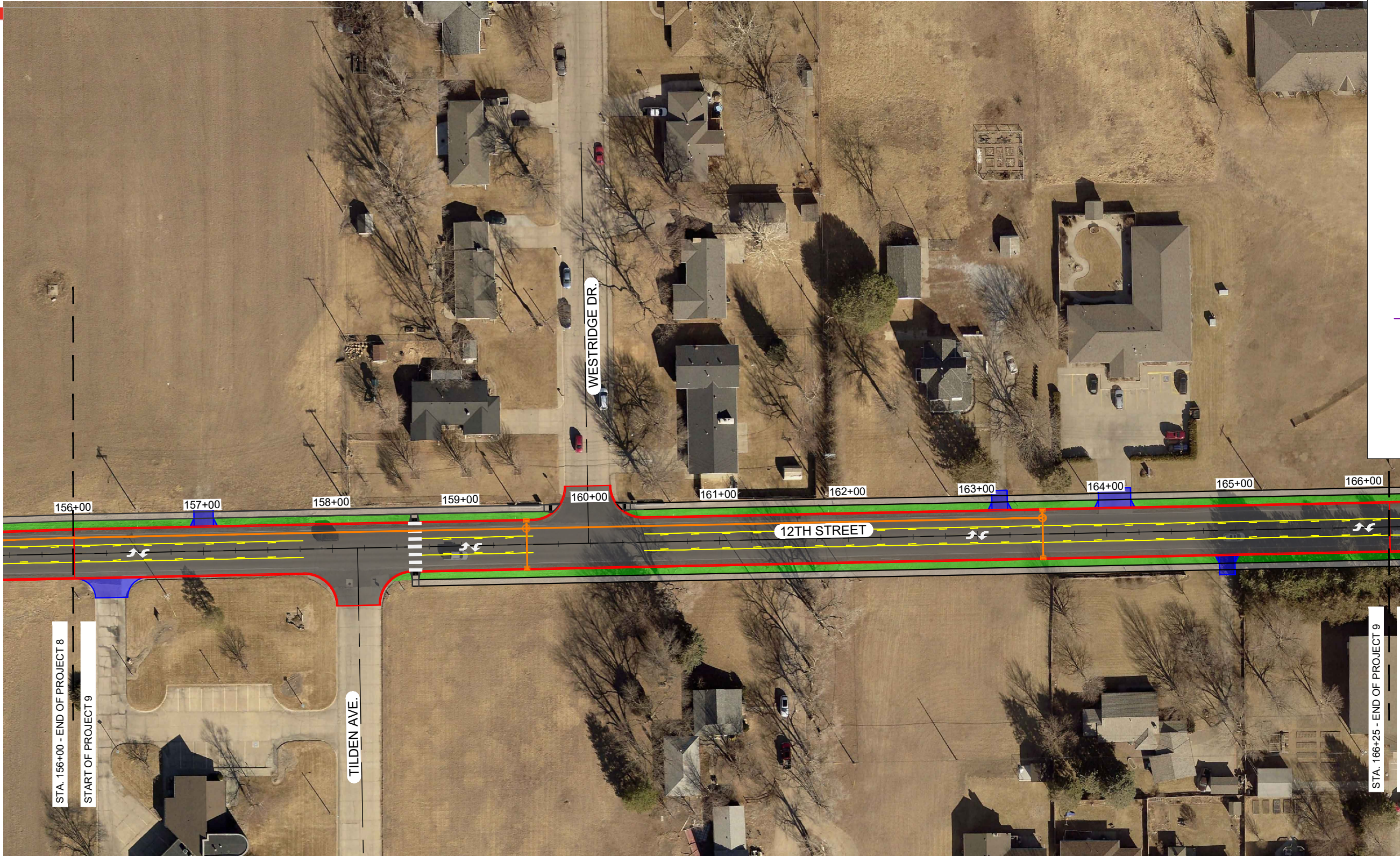
PROJECT 8 CONCEPT INTERSECTION OF W 12TH ST & N MARIAN RD

Date: 11/2/2023

Project No. 220893.00



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LEGEND:

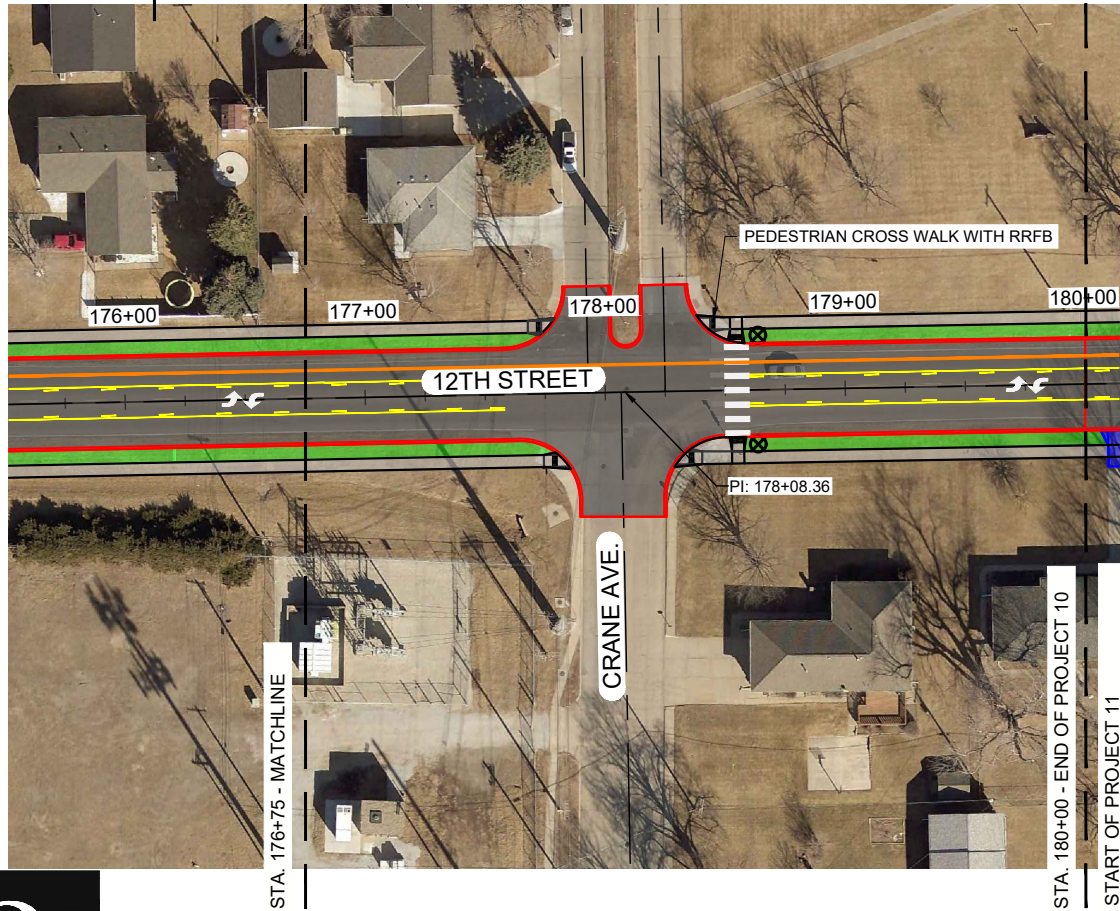
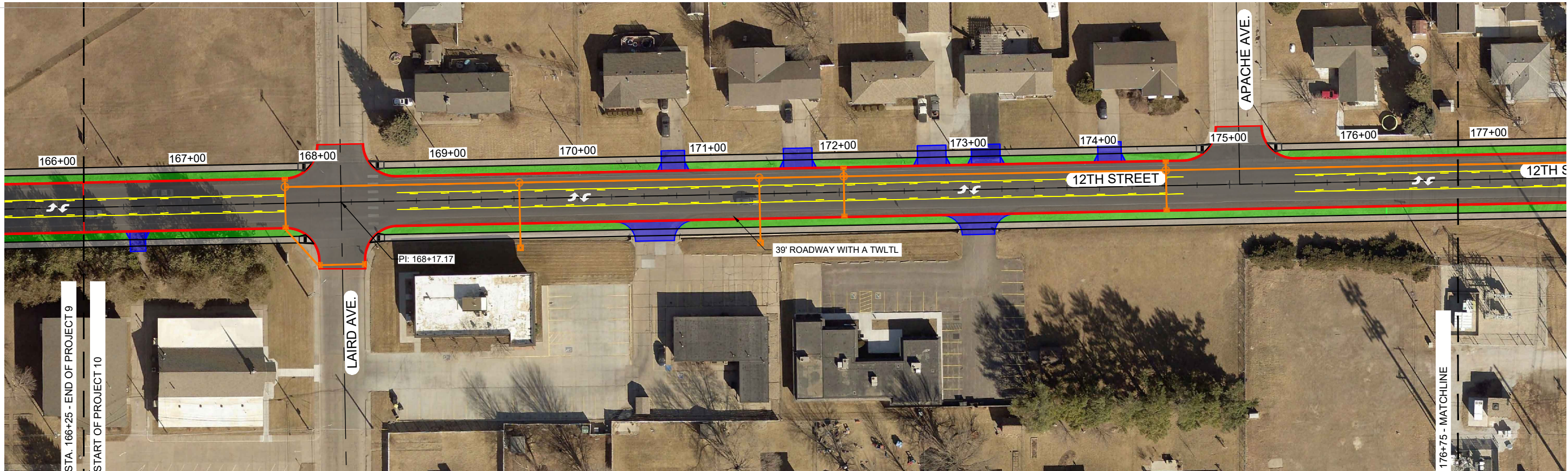
- CONCRETE PAVEMENT
- CONCRETE CURB AND GUTTER
- CONCRETE DRIVEWAY
- 5' CONCRETE SIDEWALK
- 10' CONCRETE BIKE TRAIL
- FUTURE 5' CONCRETE SIDEWALK
- FUTURE 10' CONCRETE BIKE TRAIL
- PROJECT 17: 10' CONCRETE BIKE TRAIL
- CONCRETE TRUCK APRON
- RAISED MEDIAN
- SEEDING, FERTILIZER, AND MULCH
- DETECTABLE WARNING PANEL
- RECTANGULAR RAPID FLASHING BEACON
- EXISTING STORM SEWER
- PROPOSED AREA INLET
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CURB INLET
- PROPOSED FLARED END SECTION
- PROPOSED CONCRETE COLLAR

12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=40'

PROJECT 9 CONCEPT
W 12TH ST, N MARIAN RD TO N LAIRD AVE

Date: 11/1/2023



LEGEND:

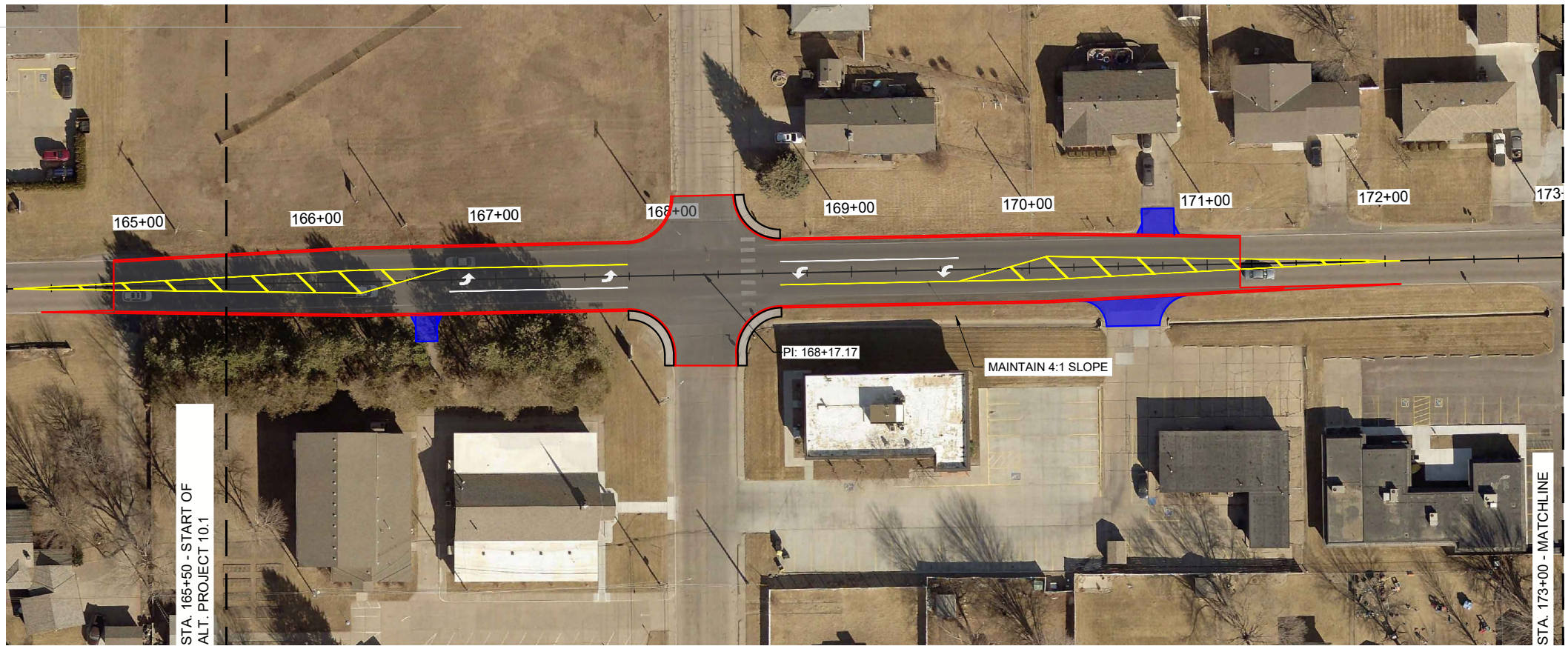
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	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR

PROJECT 10 CONCEPT INTERSECTION OF LAIRD AVE, CRANE AVE, AND W 12TH ST

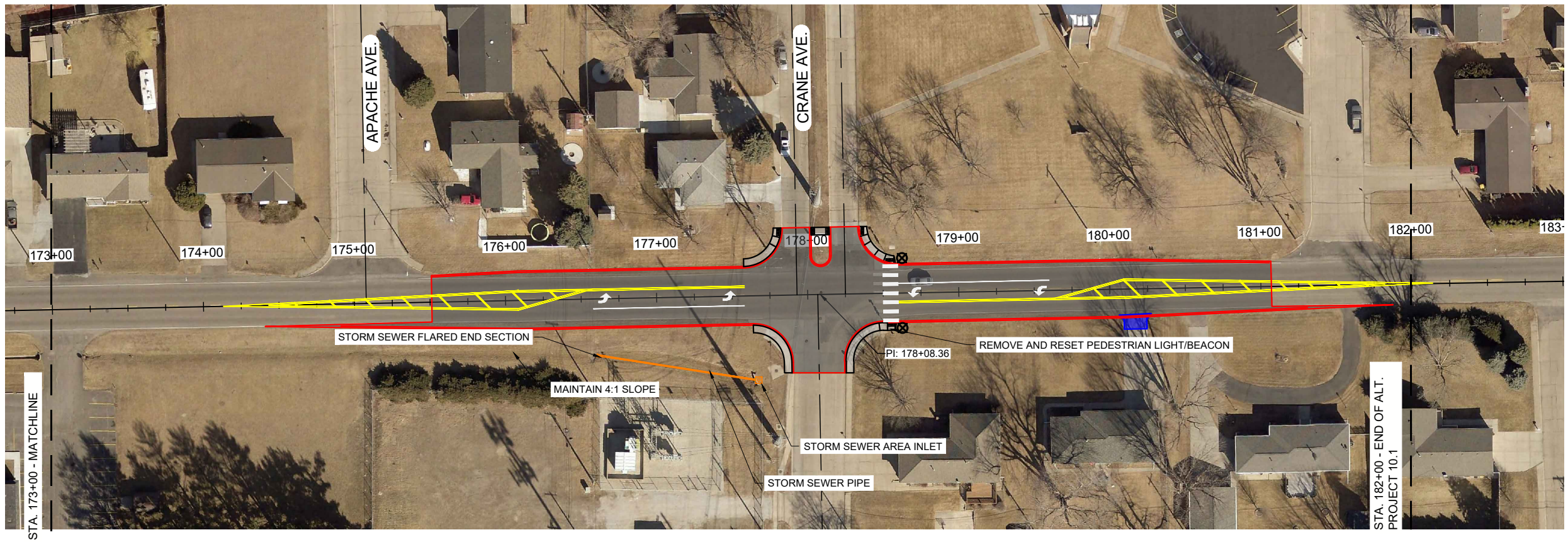
Date:11/1/2023

12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=40'



LEGEND:	
	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR



PROJECT 10 ALTERNATIVE CONCEPT
INTERSECTION OF LAIRD AVE, CRANE AVE, AND W. 12TH STREET

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

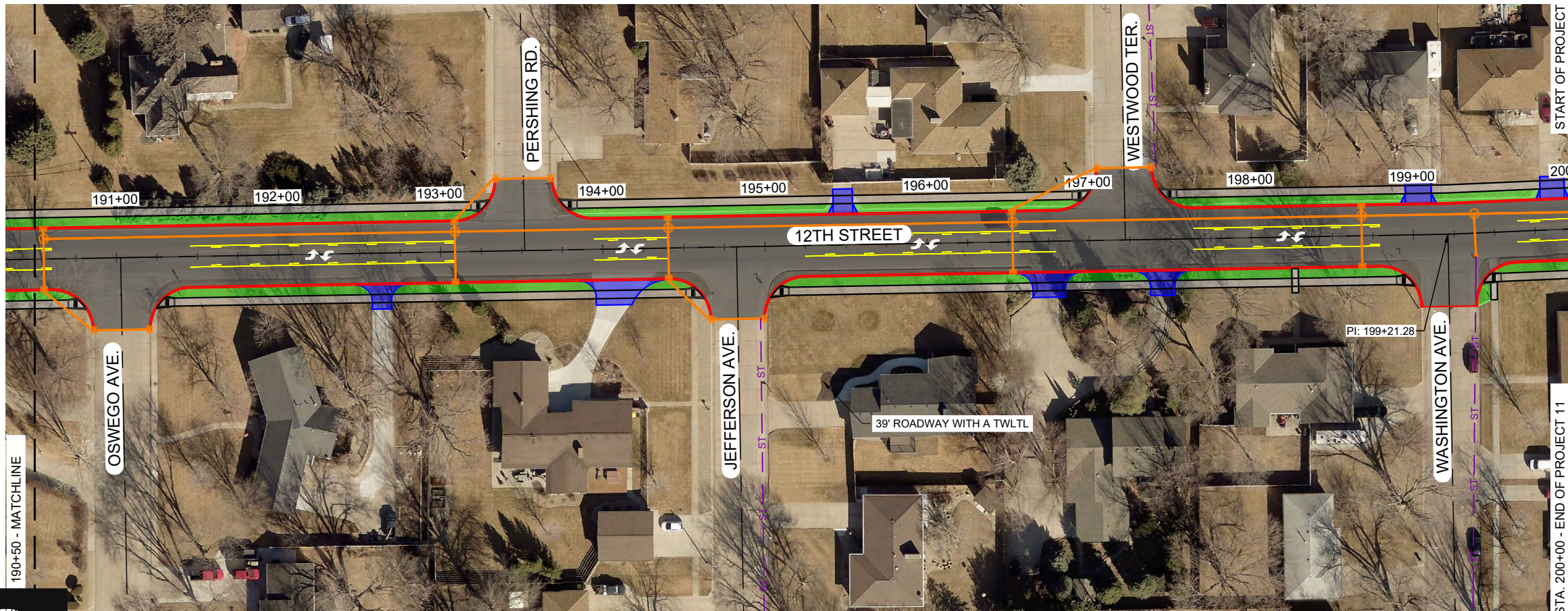
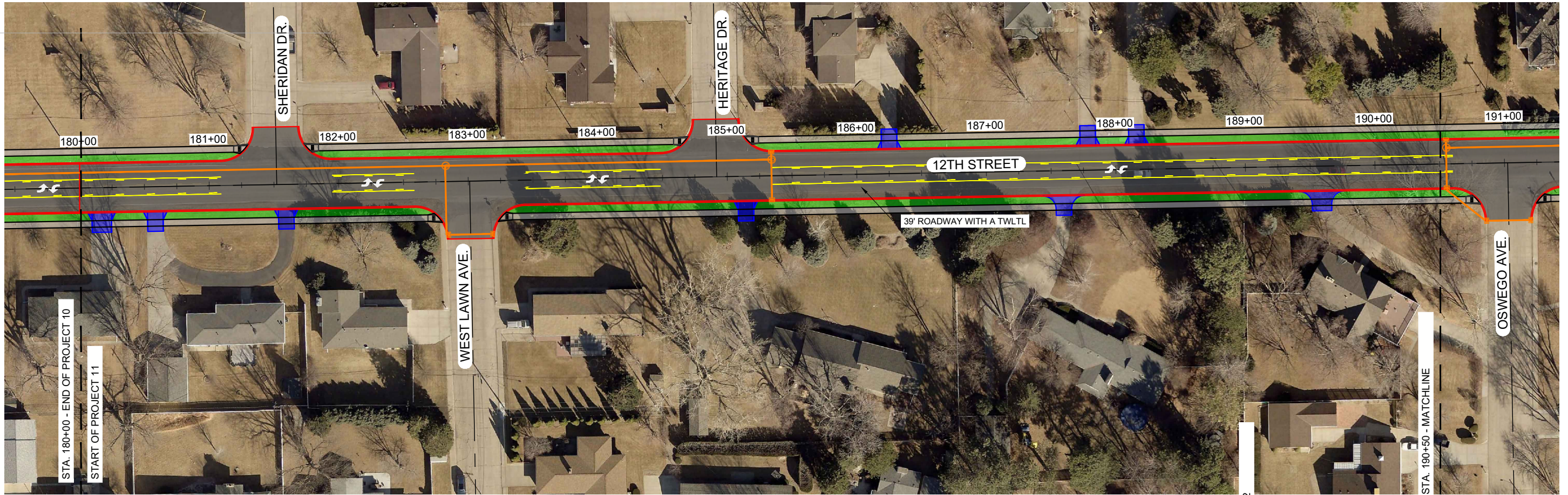
Scale: 1"=40'



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Date: 11/2/2023

Project No. 220983.00



LEGEND:

	CONCRETE PAVEMENT
	CONCRETE CURB AND GUTTER
	CONCRETE DRIVEWAY
	5' CONCRETE SIDEWALK
	10' CONCRETE BIKE TRAIL
	FUTURE 5' CONCRETE SIDEWALK
	FUTURE 10' CONCRETE BIKE TRAIL
	PROJECT 17: 10' CONCRETE BIKE TRAIL
	CONCRETE TRUCK APRON
	RAISED MEDIAN
	SEEDING, FERTILIZER, AND MULCH
	DETECTABLE WARNING PANEL
	RECTANGULAR RAPID FLASHING BEACON
	EXISTING STORM SEWER
	PROPOSED AREA INLET
	PROPOSED STORM SEWER MANHOLE
	PROPOSED CURB INLET
	PROPOSED FLARED END SECTION
	PROPOSED CONCRETE COLLAR

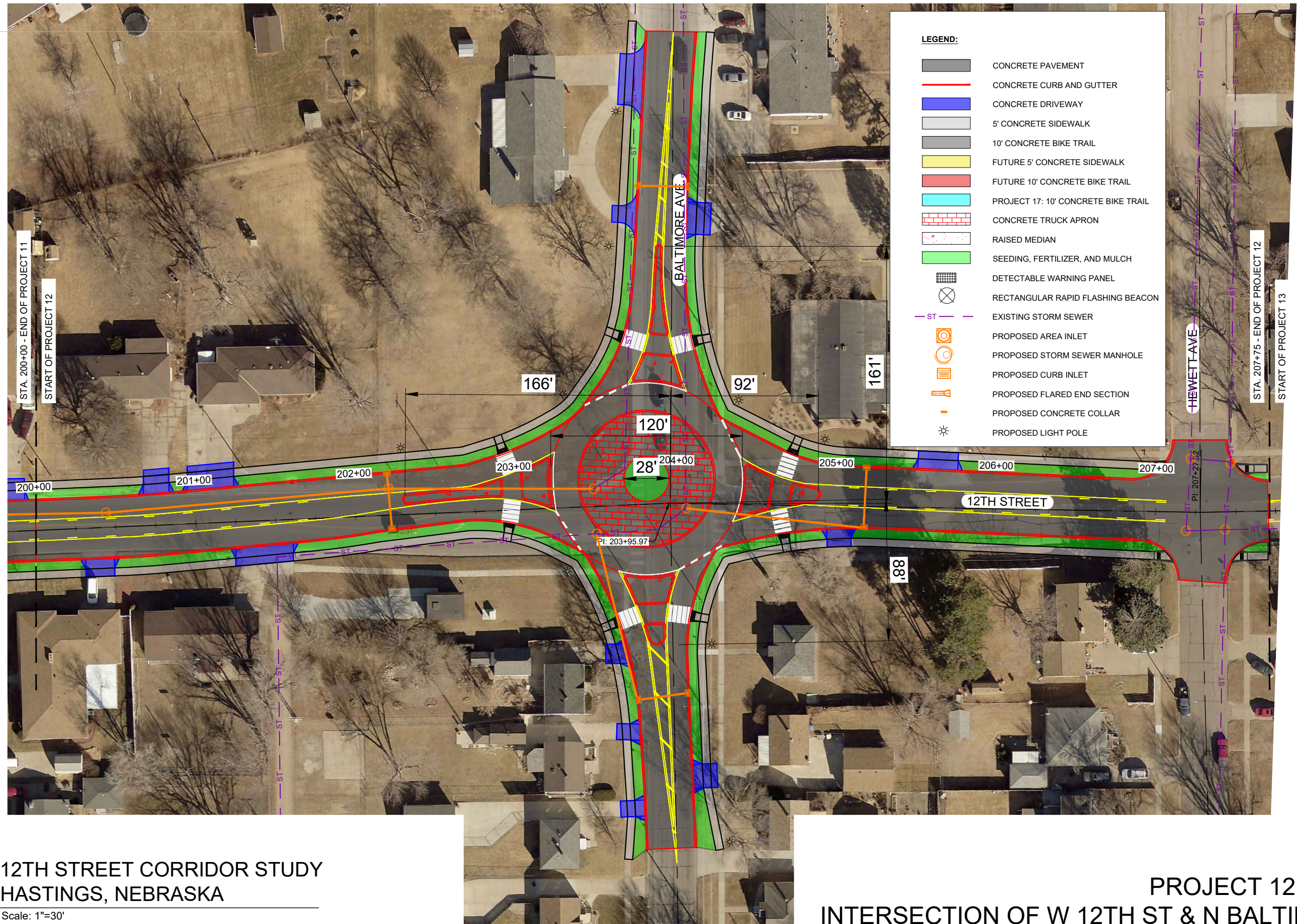
12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=40'

PROJECT 11 CONCEPT W 12TH ST, CRANE AVE TO BALTIMORE AVE.

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=30'

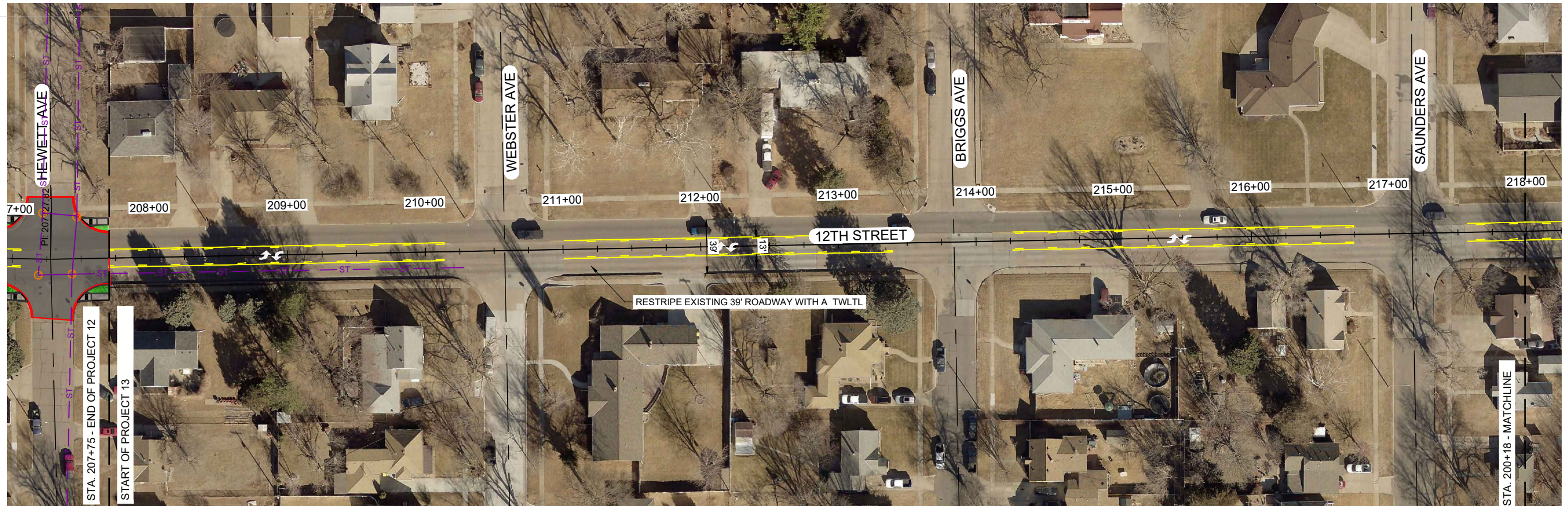


PROJECT 12 CONCEPT INTERSECTION OF W 12TH ST & N BALTIMORE AVE

Date: 11/1/2023

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

Scale: 1"=40'



LEGEND:

- CONCRETE PAVEMENT
- CONCRETE CURB AND GUTTER
- CONCRETE DRIVEWAY
- 5' CONCRETE SIDEWALK
- 10' CONCRETE BIKE TRAIL
- FUTURE 5' CONCRETE SIDEWALK
- FUTURE 10' CONCRETE BIKE TRAIL
- PROJECT 17: 10' CONCRETE BIKE TRAIL
- CONCRETE TRUCK APRON
- RAISED MEDIAN
- SEEDING, FERTILIZER, AND MULCH
- DETECTABLE WARNING PANEL
- RECTANGULAR RAPID FLASHING BEACON
- EXISTING STORM SEWER
- PROPOSED AREA INLET
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CURB INLET
- PROPOSED FLARED END SECTION
- PROPOSED CONCRETE COLLAR

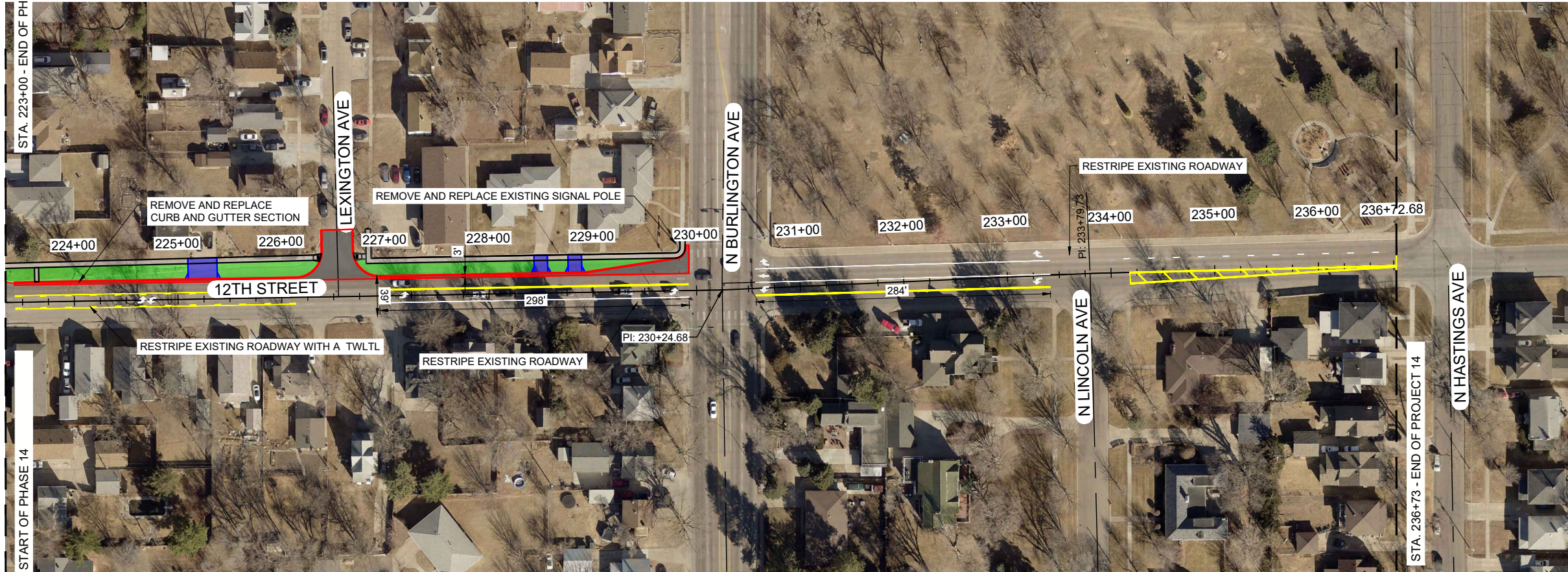
PROJECT 13 CONCEPT W 12TH ST, N BALTIMORE AVE TO BELLEVUE AVE

Date: 11/1/2023
Project No. 220893.00



12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA
Scale: 1"=60'

START OF PHASE 14
STA. 223+00 - END OF PHASE 13



LEGEND:

- CONCRETE PAVEMENT
- CONCRETE CURB AND GUTTER
- CONCRETE DRIVEWAY
- 5' CONCRETE SIDEWALK
- 10' CONCRETE BIKE TRAIL
- FUTURE 5' CONCRETE SIDEWALK
- FUTURE 10' CONCRETE BIKE TRAIL
- PROJECT 17: 10' CONCRETE BIKE TRAIL
- CONCRETE TRUCK APRON
- RAISED MEDIAN
- SEEDING, FERTILIZER, AND MULCH
- DETECTABLE WARNING PANEL
- RECTANGULAR RAPID FLASHING BEACON
- EXISTING STORM SEWER
- PROPOSED AREA INLET
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CURB INLET
- PROPOSED FLARED END SECTION
- PROPOSED CONCRETE COLLAR

12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=60'

PROJECT 14 CONCEPT
W 12TH STREET,
N BELLEVUE AVENUE TO N HASTINGS AVENUE

Date: 11/1/2023



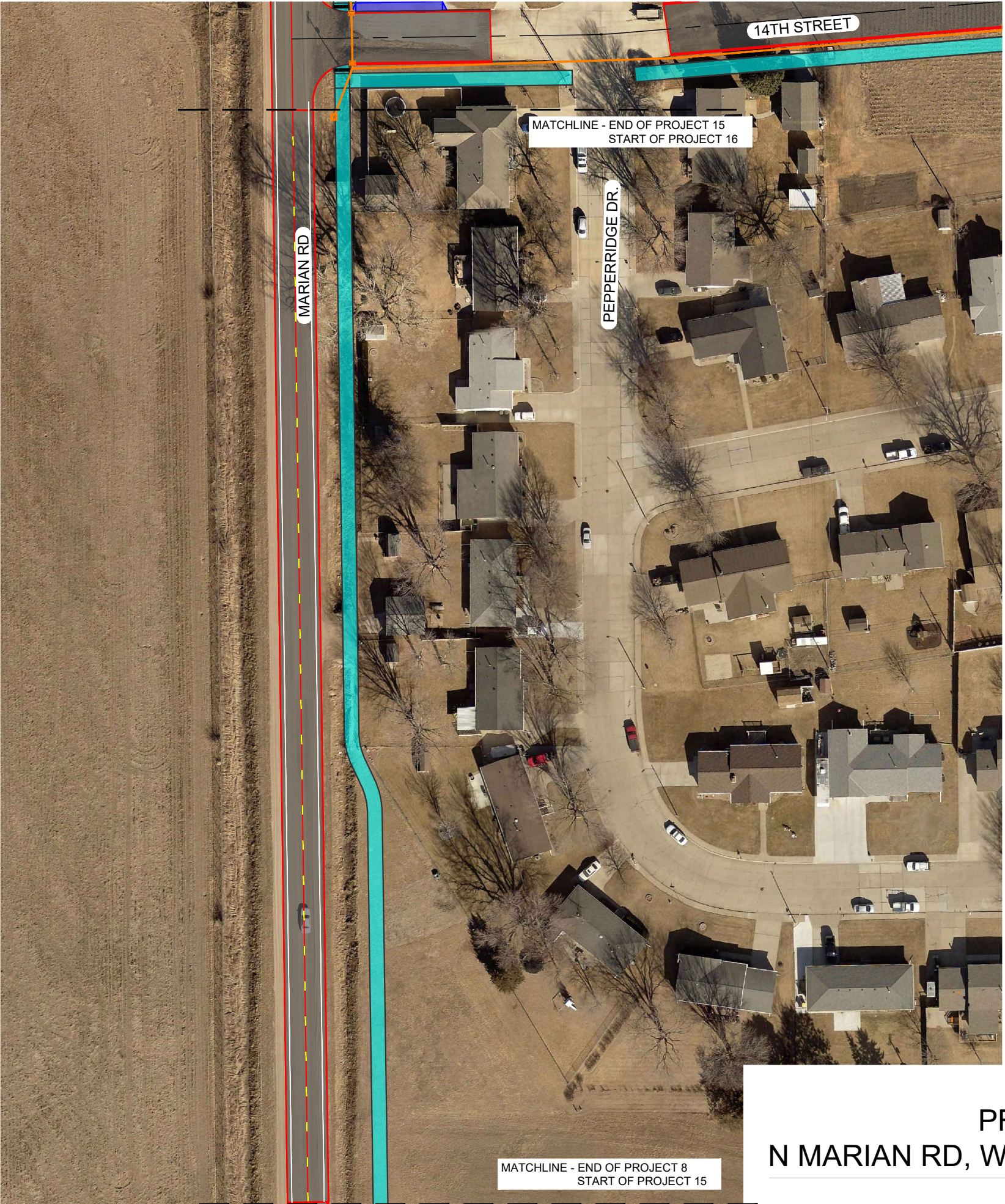
12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=40'



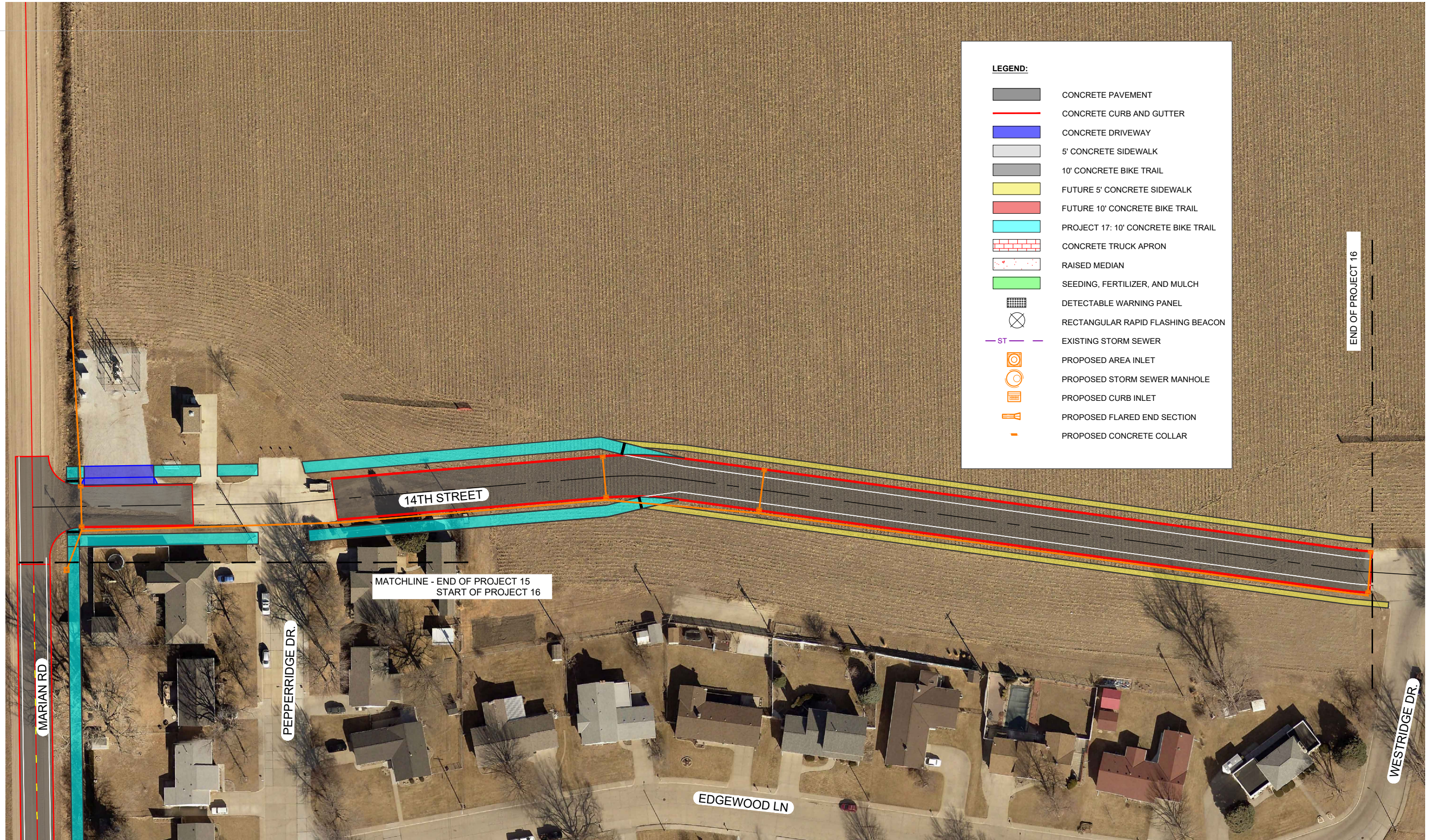
LEGEND:

- CONCRETE PAVEMENT
- CONCRETE CURB AND GUTTER
- CONCRETE DRIVEWAY
- 5' CONCRETE SIDEWALK
- 10' CONCRETE BIKE TRAIL
- FUTURE 5' CONCRETE SIDEWALK
- FUTURE 10' CONCRETE BIKE TRAIL
- PROJECT 17: 10' CONCRETE BIKE TRAIL
- CONCRETE TRUCK APRON
- RAISED MEDIAN
- SEEDING, FERTILIZER, AND MULCH
- DETECTABLE WARNING PANEL
- RECTANGULAR RAPID FLASHING BEACON
- EXISTING STORM SEWER
- PROPOSED AREA INLET
- PROPOSED STORM SEWER MANHOLE
- PROPOSED CURB INLET
- PROPOSED FLARED END SECTION
- PROPOSED CONCRETE COLLAR



PROJECT 15 CONCEPT
N MARIAN RD, W 12TH ST TO 14TH ST

Date:11/1/2023
Project No. 220893.00



12TH STREET CORRIDOR STUDY
HASTINGS, NEBRASKA

Scale: 1"=40'

PROJECT 16 CONCEPT
14TH ST, MARIAN RD TO WESTRIDGE DRIVE

Date: 11/1/2023

APPENDIX C

Corridor-wide drainage memorandum

DRAINAGE MEMO

The following is a brief summary of the drainage improvements needed along the project corridor. In general it is recommended that the drainage design follow the City of Hastings Drainage Design manual and the NDOT Drainage Design manual. Storm sewer systems are to be designed to a 10-year design storm. Roadway culverts are to be designed to a 50-year design storm. Roadway ditches are to be designed to a 50-year design storm.

There is flood zone within the corridor, specifically between Highland Road and Sycamore Avenue. It is possible this flood zone may change as the City is considering flood control improvements in the vicinity. This flood zone shall comply with the City and FEMA regulations for both drainage design and likely fill needed to accommodate the proposed paving and trail improvements.

PROJECT 1: W 12TH STREET, CITY LIMITS TO N ADAMS CENTRAL AVENUE

The existing roadway is paralleled by open ditches along both the north and south sides. Additionally, two culverts cross W 12th Street, east of Westbrook Drive (east of Sta. 33+00); one is a 36" steel pipe and the other is a 30" CMP culvert pipe. During the design of this project, the condition of these culverts should be evaluated as both will likely need to be extended if used in place. Furthermore, the existing culverts under side streets and driveways will likely be impacted by anticipated grading activity and will likely need to be replaced.

PROJECT 2: INTERSECTION W 12TH STREET AND N ADAMS CENTRAL AVENUE

The 12th Street corridor is presently paralleled by open ditches along both the north and south sides of the roadway. It is recommended that drainage be maintained as open ditches with grading outside of the limits of the proposed intersection pavement and trail. During the design of this project, the condition of existing driveway culverts and their compatibility with the proposed grading shall be evaluated.

PROJECT 3: W 12TH STREET, N ADAMS CENTRAL AVENUE TO HIGHLAND ROAD

Drainage of the existing cross-section is provided via open ditches. Drainage of the proposed cross-section will be accommodated with open ditches on both sides of W 12th Street, except for the following segments along the north side of W 12th Street:

- From approximately Sta. 72+00 to approximately Sta. 76+50
 - From approximately Sta. 90+00 to the Highland Road intersection
- For these two segments, it is recommended to drain the roadway and adjacent residential properties using underground storm sewer pipe with area inlets located between driveways.

During the design of this project, the condition of the existing culvert crossing between approximately Sta. 78+25 to Sta. 79+75 should be evaluated as it will likely need to be extended to the north, if used in place.

PROJECT 4: INTERSECTION W 12TH STREET AND HIGHLAND ROAD

The existing 12th Street corridor is paralleled by open ditches on both the north and south sides of the street. It is recommended that drainage be maintained through existing or regraded ditches in the northeast, southeast and southwest quadrants of the intersection. Furthermore, in the northwest quadrant, along the north side of W 12th Street, it is recommended to drain the roadway and adjacent residential properties using underground storm sewer pipe with area inlets located between driveways.

During the design of this project, the condition of the existing culverts crossing on the west side of Highland Road should be evaluated as they are proposed to be extended to connect to the aforementioned storm sewer pipe and accommodate the widening of the roadway for the turning lanes. The three pipes are a 24" arch CMP and 2-36" arch CMPs.

PROJECT 5: W 12TH STREET, HIGHLAND ROAD TO SYCAMORE AVENUE

The existing 12th Street corridor is paralleled by open ditches on both the north and south sides of the street. It is recommended that drainage be maintained through existing or regraded ditches.

During the design of this project, the condition of existing twin 48" arch CMP culverts at approximately Sta. 110+25 should be evaluated as they will likely need to be extended. Also, the existing flood zone/floodway will require evaluation during design for impacts and permitting.

PROJECT 6: INTERSECTION OF W 12TH STREET AND SYCAMORE AVENUE

Storm sewer drainage at this intersection is proposed via curb and gutter and an underground storm sewer system. Details of this storm sewer system include the following:

- A storm sewer outlet is proposed into the south ditch of W 12th Street west of Sycamore Avenue
- The sizing of curb inlets and storm sewer pipe shall be determined in final design and shall consider the storm sewer system constructed with Project 7.
- Due to existing water mains and other known utilities, it is anticipated that the storm sewer trunk line will be constructed south of the south curb line.

PROJECT 7: W 12TH STREET, SYCAMORE AVENUE TO N MARIAN ROAD

Though the existing street is drained via open ditches, a new underground storm sewer system is proposed to be constructed with the new street. Details of this storm sewer system include the following:

- The sizing and location of curb inlets and storm sewer pipe shall be determined during final design.
- For that portion of the segment west of approximately Sta. 136+00, storm water from the street will drain to the west. For this section, the storm sewer trunk line is anticipated to be along the south curb line due to existing utilities along the north side.
- For the portion of the segment east of approximately Sta. 136+00, storm water from the street will drain to the east toward the Marian Road intersection. The storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

PROJECT 8: INTERSECTION OF W 12TH STREET AND N MARIAN ROAD

To drain storm water from the proposed intersection, it is recommended that the existing open ditches be maintained where possible and regraded where necessary. Where curb inlets are constructed, they should outlet to these open ditches. The existing curb inlets along N Marian Road, between Theatre Drive and W 12th Street, should be reconstructed or adjusted as necessary to accommodate the proposed paving improvements. The general locations of the curb inlets and proposed storm sewer pipe are to be similar as existing. The existing 3' x 8' reinforced concrete box culverts on the east and west sides of N Marian Road, at W 12th Street, will need to be either reconstructed or extended to accommodate the proposed roundabout pavement.

PROJECT 9: W 12TH ST, N MARIAN ROAD TO N LAIRD AVENUE

Though the existing street is drained using open ditches, a new underground storm sewer system is proposed to be constructed with the widened street. It is anticipated that this storm sewer system will drain towards and outlet to the open ditches near the Marian Road intersection. Furthermore, the storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

PROJECT 10: W 12TH STREET, N LAIRD AVENUE TO CRANE AVENUE

The existing street is drained using open ditches with a portion of the ditch along the south side of W 12th Street possessing a concrete liner. A new underground storm sewer system is proposed to be constructed with the widened street. It is anticipated that this storm sewer system will drain towards and connect to the existing storm sewer system extending to the north at Crane Avenue. Furthermore, the storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities. With the area south of W 12th Street being significantly lower than the existing roadway and properties north of the street, area inlets or other storm drainage collection features may be needed on the south side.

PROJECT 11: W 12TH STREET, CRANE AVENUE TO N BALTIMORE AVENUE

The existing street is drained using open ditches with drainage swales located west of approximately Oswego Avenue. East of this location, the curb and gutter is connected to an existing underground storm sewer system. L

For the entirety of this proposed project, it is recommended that all street drainage be provided via an underground storm sewer system. West of approximately Heritage Drive, storm water will drain west to the existing storm sewer system at Crane Avenue. East of Oswego Avenue, storm water will drain east to the existing storm sewer system at the N Baltimore Avenue intersection. The storm sewer trunk line is anticipated to be under the westbound through lane due to the presence of underground utilities.

As with all projects, the location and sizes of storm sewer inlets and pipes are to be determined during the design of the project.

PROJECT 12: INTERSECTION OF W 12TH STREET AND N BALTIMORE AVENUE

Existing storm water in the area drains north along N Baltimore Avenue through two large conduits: a 5-ft x 8-ft reinforced box culvert and a 48-in storm sewer pipe. This infrastructure will be reconstructed, as necessary, to accommodate the new intersection geometry. Additionally, it is anticipated that the existing storm sewer infrastructure in the W 12th Street & Hewett Avenue intersection will need to be adjusted to match the proposed grade of W 12th Street.

All existing storm sewer infrastructure should be further evaluated during the design of the project to determine if the condition of these components is sufficient without major maintenance or reconstruction.

PROJECT 13: W 12TH STREET, N BALTIMORE AVENUE TO N BELLEVUE AVENUE

With the proposed concept summarized in Section 4.13.2, no storm sewer construction activity is proposed with this project.

PROJECT 14: W 12TH STREET, N BELLEVUE AVENUE TO N HASTINGS AVENUE

No impacts to drainage are anticipated.

PROJECT 15: N MARIAN ROAD, W 12TH STREET TO W 14TH STREET

The existing N Marian Road corridor is paralleled by open ditches on both the east and west sides of the street. It is recommended that drainage be maintained through existing or regraded ditches.

PROJECT 16: W 14TH STREET, N MARIAN ROAD TO WESTRIDGE DRIVE

Construction of this street will also require a new underground storm sewer system, which will drain west to the ditch along the east side of N Marian Road. Additionally, a culvert (size to be determined during design) will likely be necessary under N 14th Street, along N Marian Road, extending north past the existing electrical transformer station in the northeast quadrant of the N Marian Road & W 14th Street intersection.

PROJECT 17: Bike Trail

Drainage improvements are discussed with the respective adjoining roadway paving projects. If the trail occurs prior to the proposed roadway paving projects, then some of the proposed storm sewer improvements may need to be addressed with this project. Roadside and ditch grading also will need to be coordinated between the roadway and trail projects. Each roadway segment should give consideration to the ultimate grading that may be needed for the bike trail, and if the trail is constructed prior to any of the roadway segments, it's final grading and alignment should be based on the ultimate paving planned based on this study. Drainage improvements are not included in the cost opinion of the trail.

APPENDIX D

Corridor-wide status of utilities

STATUS OF UTILITIES

PROJECT 1: W 12TH STREET, CITY LIMITS TO N ADAMS CENTRAL AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Streetlights Nalan Dr. – Final
- Transformer at Sta. 31+50 on the north side.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- 3 Telecommunication pedestals at Sta. 21+50 on the north side.
- 1 Telecommunication pedestal at Sta. 22+50 on the south side.
- 1 Telecommunication pedestal at Sta. 26+25 on the north side.
- 3 Telecommunication pedestals at Sta. 29+00 on the north side.
- 1 Telecommunication pedestal at Sta. 31+50 on the north side.

STATUS OF UTILITIES

PROJECT 2: INTERSECTION W 12TH STREET AND N ADAMS CENTRAL AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust/Relocate fire hydrant at Sta. 45+00 on the southwest corner of the intersection.
- Relocate irrigation well on the southeast side of N Adams Central Ave - Private

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Relocate 1 power pole at Sta. 47+00 on the north side.
- Relocate 1 power pole at Sta. 48+75 on the north side.
- 1 Power pole at Sta. 350 on the eastside

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- 1 Gas pipe network at Sta. 46+00. Black Hills Gas + HY on the northeast corner of the intersection.

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- 1 Telecommunication pedestal at Sta. 45+00 on the northwest corner of the intersection.

STATUS OF UTILITIES

PROJECT 3: W 12TH STREET, N ADAMS CENTRAL AVENUE TO HIGHLAND ROAD

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Relocate 1 water system at Sta. 64+25 on the north side.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- Relocate telecommunication pedestal at Sta. 63+00 on the north side.
- Relocate telecommunication pedestal at Sta. 65+00 on the north side.

STATUS OF UTILITIES

PROJECT 4: INTERSECTION W 12TH STREET AND HIGHLAND ROAD

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust/relocate 1 fire hydrant at Sta. 98+25 on the northwest corner of the intersection.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 98+00 on the southwest corner of the intersection.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Relocate 1 light pole on the northeastern side of the intersection.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- Relocate 2 gas pipe networks at Sta. 101+00 on the north side.

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- Relocate telecommunication pedestal at Sta. 97+75 on the north side.
- Relocate telecommunication pedestal at Sta. 98+75 on the north side.
- Relocate telecommunication pedestal at Sta. 99+00.

STATUS OF UTILITIES

PROJECT 5: W 12TH STREET, HIGHLAND ROAD TO SYCAMORE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust MH's to Grade +/- #

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Underground

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 6: INTERSECTION OF W 12TH STREET AND SYCAMORE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 117+75 in the middle of Sycamore Ave.
- Adjust 1 manhole to grade at Sta. 118+00 on the southeast corner of the intersection.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 7: W 12TH STREET, SYCAMORE AVENUE TO N MARIAN ROAD

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust/Relocate 1 fire hydrant at Sta. 127+00 on the north side.
- Adjust/Relocate 1 fire hydrant at Sta. 131+50 on the south side.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 137+00 on the north side.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Relocate various electric boxes between Sta. 134+50 – Sta. 138+00 on the north side.
- Relocate 4 power poles between Sta. 136+00 – 142+00 on the north side.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- 1 Telecommunication pedestal at Sta. 137+00 on the north side.
- 1 Telecommunication pedestal on Sta. 141+00 on the north side.

STATUS OF UTILITIES

PROJECT 8: INTERSECTION OF W 12TH STREET AND N MARIAN ROAD

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Relocate 2 fire hydrants at Sta. 152+00 on the southeast corner of the intersection.
- Adjust 1 water valve to grade at Sta. 152+25 on the southeast corner of the intersection.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 151+00 on the northeast corner of the intersection.
- 2 Curb inlet on the west side of Marian Rd.
- 2 Curb inlet on the east side of Marian Rd.
- Adjust 2 manholes to grade on the east side of Marian Rd.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- Adjust 1 gas valve to grade at Sta. 151+25 on the south side.

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 9: W 12TH ST, N MARIAN ROAD TO N LAIRD AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust/Relocate 1 fire hydrant on Sta. 164+00 on the south side.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 157+90 in the middle of the street.
- Adjust 1 manhole to grade at Sta. 158+45 in the middle of Tilden Ave.
- Adjust 1 manhole to grade at Sta. 160+00 in the middle of the street.
- Adjust 1 manhole to grade at Sta. 161+75 in the middle of the street.
- Adjust 1 manhole to grade at Sta. 165+00 in the middle of the street.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Relocate 1 power pole at Sta. 159+50 on the north side.
- Relocate 1 power pole at Sta. 160+50 on the north side.
- Relocate 1 power pole at Sta. 162+00 on the north side.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 10: W 12TH STREET, N LAIRD AVENUE TO CRANE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust 1 water valve to grade at Sta. 178+25 on the south side.
- Adjust 1 water valve to grade at Sta. 178+50 on the south side.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- Adjust 1 manhole to grade at Sta. 168+00 in the middle of the intersection.
- Adjust 1 manhole to grade at Sta. 171+60 in the middle of the street.
- Adjust 1 manhole to grade at Sta 173+30 in the middle of the street.
- Adjust 1 manhole to grade at Sta. 175+00 in the middle of the street.
- Adjust 3 manholes to grade at Sta. 178+00 in the middle of the street.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- Relocate all power poles on the north side of W 12th St.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- Relocate 2 telecommunication pedestals on Sta. 167+75 on the north side.
- 1 Underground telecommunication box at Sta 178+50 on the northeast corner of W 12th St. and Crane Ave.

STATUS OF UTILITIES

PROJECT 11: W 12TH STREET, CRANE AVENUE TO NBALTIMORE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- Adjust/Relocate 1 fire hydrant on Sta. 185+25 on the south side of the road.
- Relocate 1 fire hydrant at Sta. 191+25 on the south side of the road.
- Adjust 1 water valve to grade at Sta. 199+25 on the southeast side of the intersection between W 12th St. and N Washington Ave.

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- 1 Curb inlet at Sta. 193+25 on the northwest corner of the intersection.
- 1 Curb inlet at Sta. 193+75 on the northeast corner of the intersection.
- Adjust 1 Curb/Area Inlet to grade at 194+60 on the southwest corner of the intersection between W 12th St. and N Jefferson Ave.
- 1 Curb inlet at Sta. 197+00 on the northeast corner of the intersection.
- 1 Curb inlet at Sta. 197+50 on the northwest corner of the intersection.
- Adjust 1 manhole to grade at Sta. 197+25 in the middle of Westwood Terrace.
- Relocate 1 area inlet at Sta. 182+75 on the southeast corner of the intersection between W 12th St. and West Lawn Ave.
- Adjust 1 manhole to grade at Sta. 191+00 in the middle of N Oswego Ave.
- Adjust 1 manhole to grade at 193+50 in the middle of Pershing Rd.
- Adjust 1 area inlet to grade at Sta 193+40 on the northwest corner of the intersection between W 12th St. and Pershing Rd.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- 3 Electric boxes on Sta. 183+00 on the north side of the street.

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 12: INTERSECTION OF W 12TH STREET AND N BALTIMORE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- 1 Area inlet at Sta. 201+25 on the south side of the street.
- 1 Area inlet on Sta. 201+50 on the north side of the street.
- 2 Curb/Area inlets at Sta. 203+00 on the north side.
- 2 Curb/Area inlets at Sta. 203+00 on the south side.
- 1 Curb inlet on the southeast corner of the intersection.
- 2 Curb inlets on the north side of the intersection between N Hewett Ave and W 12th Street.
- 1 Curb inlet on the northeast corner of the intersection.
- 1 Curb inlet on the west side of N Baltimore Ave. (Top)
- 1 Curb inlet on the east side of N Baltimore Ave. (Top)
- Adjust 1 manhole to grade at Sta. 203+25 on the northwest corner of the intersection.
- Adjust 1 manhole to grade at Sta 204+00 in the middle of N Baltimore Ave.
- Adjust 1 manhole to grade at Sta. 204+25 on the east side of Baltimore Ave.

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 13: W 12TH STREET, N BALTIMORE AVENUE TO N BELLEVUE AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 14: W 12TH STREET, N BELLEVUE AVENUE TO N HASTINGS AVENUE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 15: N MARIAN ROAD, W 12TH STREET TO W 14TH STREET

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

STATUS OF UTILITIES

PROJECT 16: W 14TH STREET, N MARIAN ROAD TO WESTRIDGE DRIVE

WATER

There are multiple water main lines throughout the project limits.

The following conflicts have been identified:

- None

SEWER

There are multiple underground sewer pipes throughout the project limits.

The following conflicts have been identified:

- None

ELECTRIC

There are multiple power lines throughout the project limits.

The following conflicts have been identified:

- None

GAS

There are multiple underground gas lines throughout the project limits.

The following conflicts have been identified:

- None

TELECOMMUNICATIONS

There are multiple underground telecommunications lines throughout the project limits.

- None

APPENDIX E

Design criteria

Hastings 12th Street Corridor, West City Limit (Nalan Dr.) to Hastings Avenue

Design Criteria Summary

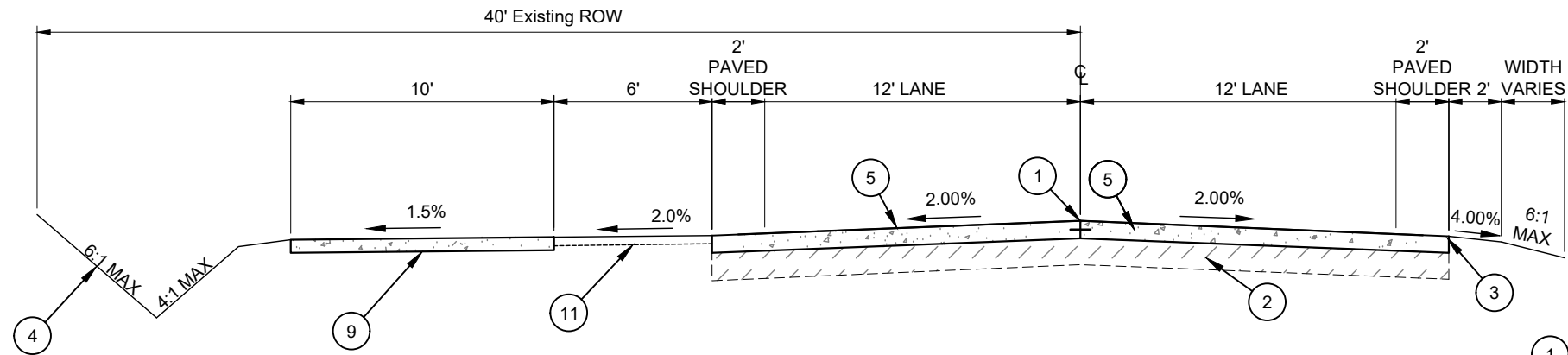
Friday, September 1, 2023

Design Criteria	2-Lane Rural Section	2-Lane Rural Section	3-Lane Urban Section
Roadway Design Speed	40 MPH	55 MPH	35 MPH
Roundabout Approaches Design Speed	Proposed posted speed limit	Currently posted speed limit	35 MPH
Design Vehicle	WB-67	WB-67	School Bus*
Roundabout Inscribed Circle	140-Feet	140-Feet	**140-Feet, 120-Feet
Lane Widths	11-Feet Wide Lane	12-Feet Wide Lane	13-Feet Wide Lane
Curb/Shoulder	No Curb, 3-feet wide paved shoulder, 5' earth shoulder	No Curb, 2-feet wide paved shoulder, 6' earth shoulder	Curb and Gutter
Pavement	**Concrete	**Concrete	**Concrete
Sidewalk	N/A	N/A	5' Min. @ 1.8% max cross slope
Bike Trail	10' @ 1.8% max cross slope	10' @ 1.8% max cross slope	10' @ 1.8% max cross slope
Drainage Design Year			
Culverts	25-year	25-year	25-year
Storm Sewer	10-year	10-year	10-year

Notes:

* Roundabout at Marian designed to accommodate WB-67

** Pavement thickness and Subgrade Preparation to be determined with Geotechnical Investigation at time of final design.



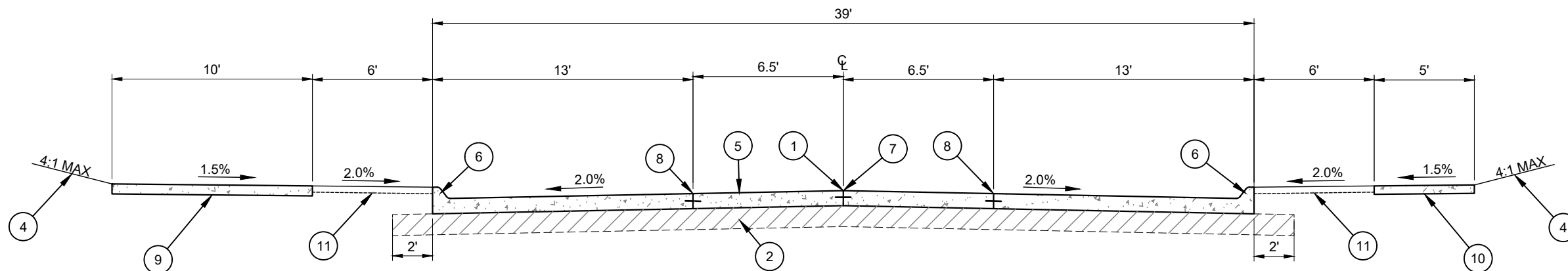
W 12TH STREET - TYPICAL SECTION A

- * PROJECT 1
- * PROJECT 2
- * PROJECT 3
- * PROJECT 4
- * PROJECT 5

NOTE:
PAVEMENT THICKNESS IS BASED ON FREQUENTLY USED PAVEMENT IN HASTINGS, NE AND SHOULD BE EVALUATED BASED ON A GEOTECHNICAL INVESTIGATION AND ANTICIPATED TRAFFIC VOLUMES FOR EACH RESPECTIVE SEGMENT.

LEGEND

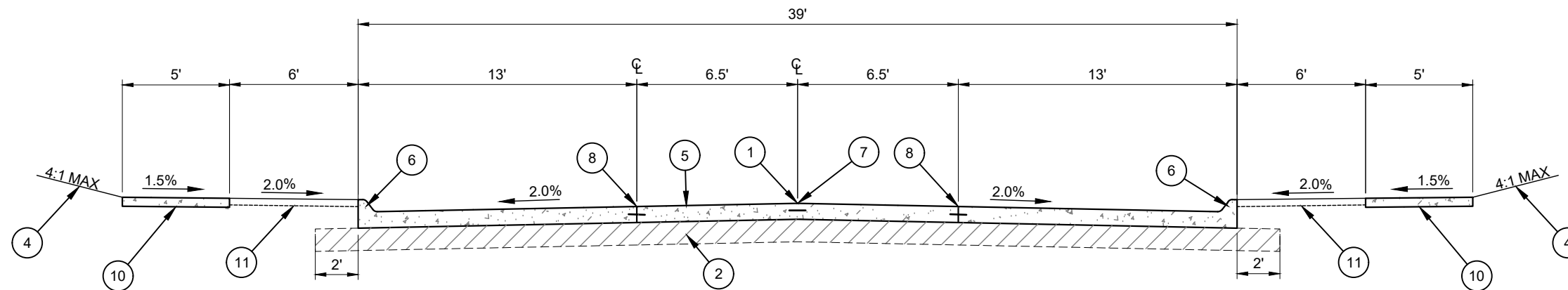
- ① PROFILE GRADE LINE
- ② 12" SUBGRADE PREPARATION
- ③ 3 EARTH SHOULDER
- ④ GRADE TO EXISTING
- ⑤ 9" CONCRETE PAVEMENT *VERIFY DURING FINAL DESIGN
- ⑥ 6" CONCRETE INTEGRAL CURB & GUTTER PAVEMENT
- ⑦ LONGITUDINAL JOINT
- ⑧ CONTRACTION JOINT
- ⑨ 6" CONCRETE BIKE TRAIL (FUTURE)
- ⑩ 5" CONCRETE SIDEWALK
- ⑪ 4" TOPSOIL



12TH STREET - TYPICAL SECTION B

- * PROJECT 6

NOTE:
PAVEMENT THICKNESS IS BASED ON FREQUENTLY
USED PAVEMENT IN HASTINGS, NE AND SHOULD BE
EVALUATED BASED ON A GEOTECHNICAL
INVESTIGATION AND ANTICIPATED TRAFFIC
VOLUMES FOR EACH RESPECTIVE SEGMENT.

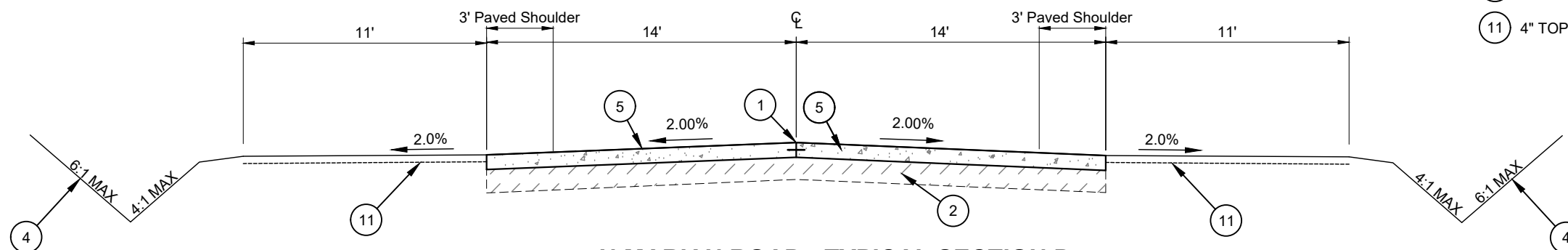


W 12TH STREET - TYPICAL SECTION C

- * PROJECT 7
- * PROJECT 8
- * PROJECT 9
- * PROJECT 10
- * PROJECT 11
- * PROJECT 12

LEGEND

- (1) PROFILE GRADE LINE
- (2) 12" SUBGRADE PREPARATION
- (3) 3' EARTH SHOULDER
- (4) GRADE TO EXISTING
- (5) 9" CONCRETE PAVEMENT *VERIFY DURING FINAL DESIGN
- (6) 6" CONCRETE INTEGRAL CURB & GUTTER PAVEMENT
- (7) LONGITUDINAL JOINT
- (8) CONTRACTION JOINT
- (9) 6" CONCRETE BIKE TRAIL (FUTURE)
- (10) 5" CONCRETE SIDEWALK
- (11) 4" TOPSOIL



N MARIAN ROAD - TYPICAL SECTION D

- * PROJECT 15

12TH STREET CORRIDOR STUDY HASTINGS, NEBRASKA

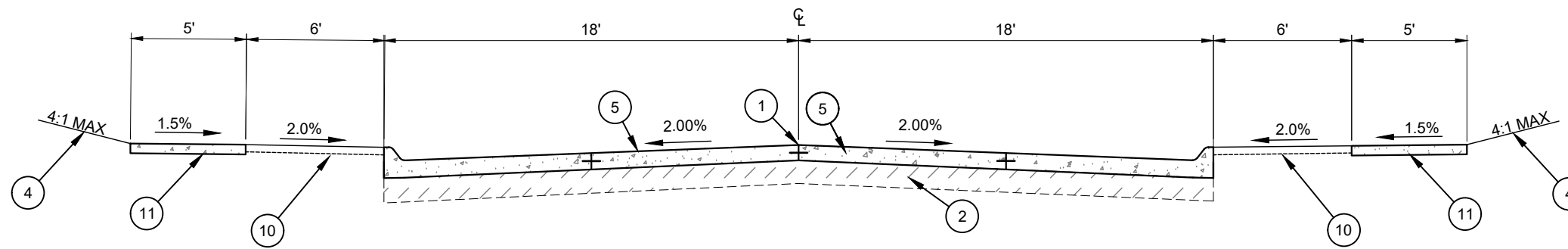
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© JEO Consulting Group

TYPICAL SECTIONS

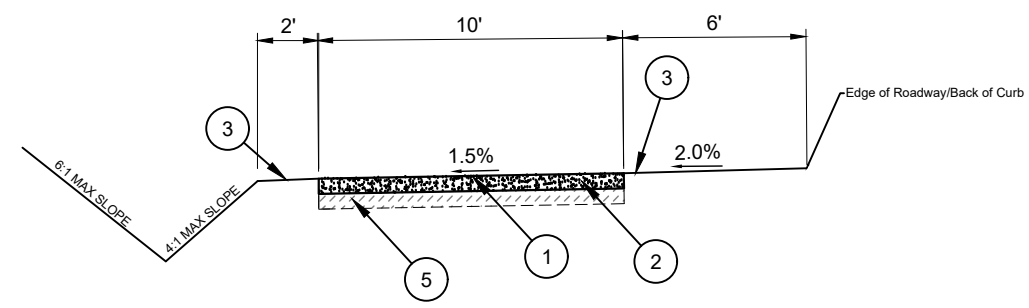
Date: 11/2/2023

Project No. 220983.00



W 14TH STREET - TYPICAL SECTION E

*** PROJECT 16**



BIKE TRAIL - TYPICAL SECTION F

*** PROJECT 17**

NOTE:
PAVEMENT THICKNESS IS BASED ON FREQUENTLY USED PAVEMENT IN HASTINGS, NE AND SHOULD BE EVALUATED BASED ON A GEOTECHNICAL INVESTIGATION AND ANTICIPATED TRAFFIC VOLUMES FOR EACH RESPECTIVE SEGMENT.

LEGEND

- (1) PROFILE GRADE LINE
- (2) 12" SUBGRADE PREPARATION
- (3) 3' EARTH SHOULDER
- (4) GRADE TO EXISTING
- (5) 9" CONCRETE PAVEMENT *VERIFY DURING FINAL DESIGN
- (6) 6" CONCRETE INTEGRAL CURB & GUTTER PAVEMENT
- (7) LONGITUDINAL JOINT
- (8) CONTRACTION JOINT
- (9) 6" CONCRETE BIKE TRAIL (FUTURE)
- (10) 5" CONCRETE SIDEWALK
- (11) 4" TOPSOIL

APPENDIX F

**Engineer's opinion of probable cost (per
project)**

ENGINEER'S CONCEPTUAL OPINION OF PROBABLE COST

Hastings 12th Street

Hastings, Nebraska

JEO Project No. 220893.00

Date Prepared:
November 14, 2023**ESTIMATE OF QUANTITIES**

Item #	Description	Unit	Quantity	Unit Price	Total
PROJECT 1: W 12TH STREET, CITY LIMITS TO N ADAMS CENTRAL AVENUE					
1.	Mobilization	LS	1	\$70,000.00	\$70,000
2.	Bonding and Insurance	LS	1	\$25,000.00	\$25,000
3.	Remove driveway	SY	400	\$15.00	\$6,000
4.	Remove Pavement	SY	6,900	\$15.00	\$103,500
5.	6" Concrete Driveway	SY	400	\$25.00	\$10,000
6.	9" Concrete Pavement	SY	7,000	\$85.00	\$595,000
7.	4" Yellow Permanent Pavement Marking Paint	LF	3,100	\$3.00	\$9,300
8.	4" White Permanent Pavement Marking Paint	LF	5,000	\$3.00	\$15,000
9.	Seeding, Fertilizer and Mulch	ACRE	2.50	\$5,000.00	\$12,500
10.	Detectable Warning Panels	SF	80	\$40.00	\$3,200
11.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	100	\$30.00	\$3,000
12.	24" RCP, Class III	LF	250	\$100.00	\$25,000
13.	Concrete Collar	EA	4	\$750.00	\$3,000
Construction Subtotal Project 1					\$880,500
Contingency & Engineering 35%					\$308,180
Total Opinion of Construction Cost - Project 1					\$1,190,000
PROJECT 2: INTERSECTION OF W 12TH STREET & N ADAMS CENTRAL AVENUE					
1.	Mobilization	LS	1	\$85,000.00	\$85,000
2.	Bonding and Insurance	LS	1	\$30,000.00	\$30,000
3.	Remove driveway	SY	35	\$15.00	\$525
4.	Remove Pavement	SY	5,600	\$15.00	\$84,000
5.	6" Concrete Driveway	SY	35	\$25.00	\$875
6.	9" Concrete Pavement	SY	6,450	\$85.00	\$548,250
7.	4" Yellow Permanent Pavement Marking Paint	LF	1,100	\$3.00	\$3,300
8.	4" White Permanent Pavement Marking Paint	LF	3,500	\$3.00	\$10,500
9.	4" Colored Imprinted Concrete	SY	2,200	\$125.00	\$275,000
10.	9" Colored Imprinted Concrete	SY	600	\$150.00	\$90,000
11.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
12.	Detectable Warning Panels	SF	40	\$40.00	\$1,600
13.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	60	\$30.00	\$1,800
14.	Install Street Lighting	EA	17	\$6,000.00	\$102,000
15.	Remove Traffic Signal	EA	1	\$10,000.00	\$10,000
16.	24" RCP, Class III	LF	75	\$100.00	\$7,500
17.	Concrete Collar	EA	2	\$750.00	\$1,500
Construction Subtotal Project 2					\$1,256,850
Contingency & Engineering 35%					\$439,900
Total Opinion of Construction Cost - Project 2					\$1,700,000

PROJECT 3: W 12TH STREET, N ADAMS CENTRAL AVENUE TO HIGHLAND ROAD

1.	Mobilization	LS	1	\$130,000.00	\$130,000
2.	Bonding and Insurance	LS	1	\$45,000.00	\$45,000
3.	Remove driveway	SY	500	\$15.00	\$7,500
4.	Remove Pavement	SY	12,700	\$15.00	\$190,500
5.	6" Concrete Driveway	SY	600	\$25.00	\$15,000
6.	9" Concrete Pavement	SY	13,000	\$85.00	\$1,105,000
7.	4" Yellow Permanent Pavement Marking Paint	LF	4,000	\$3.00	\$12,000
8.	4" White Permanent Pavement Marking Paint	LF	8,000	\$3.00	\$24,000
9.	Seeding, Fertilizer and Mulch	ACRE	4.00	\$5,000.00	\$20,000
10.	24" RCP Flared End Section	EA	4	\$1,500.00	\$6,000
11.	24" RCP, Class III	LF	650	\$100.00	\$65,000
12.	Concrete Collar	EA	1	\$750.00	\$750
13.	48" Dia. Storm Sewer Manhole	EA	1	\$5,000.00	\$5,000
14.	Area Inlet	EA	5	\$3,500.00	\$17,500

Construction Subtotal	Project 3	\$1,643,250
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Contingency & Engineering	35%	\$575,140
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Total Opinion of Construction Cost - Project 3		\$2,220,000
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PROJECT 4: INTERSECTION OF W 12TH STREET & HIGHLAND ROAD

1.	Mobilization	LS	1	\$50,000.00	\$50,000
2.	Bonding and Insurance	LS	1	\$20,000.00	\$20,000
3.	Remove driveway	SY	100	\$15.00	\$1,500
4.	Remove Pavement	SY	2,200	\$15.00	\$33,000
5.	6" Concrete Driveway	SY	100	\$25.00	\$2,500
6.	9" Concrete Pavement	SY	4,200	\$85.00	\$357,000
7.	4" Yellow Permanent Pavement Marking Paint	LF	2,500	\$3.00	\$7,500
8.	4" White Permanent Pavement Marking Paint	LF	4,500	\$3.00	\$13,500
9.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	4	\$500.00	\$2,000
10.	Seeding, Fertilizer and Mulch	ACRE	0.50	\$5,000.00	\$2,500
11.	Detectable Warning Panels	SF	40	\$40.00	\$1,600
12.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	40	\$30.00	\$1,200
13.	Relocate Fire Hydrant	EA	1	\$7,500.00	\$7,500
14.	Relocate Light Pole	EA	1	\$6,000.00	\$6,000
15.	24" RCP Flared End Section	EA	3	\$1,500.00	\$4,500
16.	24" RCP, Class III	LF	1,500	\$100.00	\$150,000
17.	Concrete Collar	EA	3	\$750.00	\$2,250
18.	48" Dia. Storm Sewer Manhole	EA	4	\$5,000.00	\$20,000
19.	Area Inlet	EA	6	\$3,500.00	\$21,000

Construction Subtotal	Project 4	\$703,550
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Contingency & Engineering	35%	\$246,250
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Total Opinion of Construction Cost - Project 4		\$950,000
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PROJECT 5: W 12TH STREET, HIGHLAND ROAD TO SYCAMORE AVENUE

1.	Mobilization	LS	1	\$35,000.00	\$35,000
2.	Bonding and Insurance	LS	1	\$15,000.00	\$15,000
3.	Remove Pavement	SY	3,050	\$15.00	\$45,750
4.	9" Concrete Pavement	SY	3,050	\$85.00	\$259,250
5.	4" Yellow Permanent Pavement Marking Paint	LF	1,200	\$3.00	\$3,600
6.	4" White Permanent Pavement Marking Paint	LF	1,200	\$3.00	\$3,600
7.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
8.	24" RCP, Class III	LF	25	\$100.00	\$2,500
9.	Concrete Collar	EA	2	\$750.00	\$1,500
Construction Subtotal Project 5					\$371,200
Contingency & Engineering 35%					\$129,920
Total Opinion of Construction Cost - Project 5					\$510,000

PROJECT 6: INTERSECTION OF W 12TH STREET & SYCAMORE AVENUE

1.	Mobilization	LS	1	\$25,000.00	\$25,000
2.	Bonding and Insurance	LS	1	\$10,000.00	\$10,000
3.	Remove Pavement	SY	1,300	\$15.00	\$19,500
4.	9" Concrete Pavement	SY	2,200	\$85.00	\$187,000
5.	4" Yellow Permanent Pavement Marking Paint	LF	1,700	\$3.00	\$5,100
6.	4" White Permanent Pavement Marking Paint	LF	750	\$3.00	\$2,250
7.	5" Concrete Sidewalk	SF	1,050	\$10.00	\$10,500
8.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	2	\$500.00	\$1,000
9.	Seeding, Fertilizer and Mulch	ACRE	0.50	\$5,000.00	\$2,500
10.	24" RCP Flared End Section	EA	1	\$1,500.00	\$1,500
11.	24" RCP, Class III	LF	300	\$100.00	\$30,000
12.	Curb Inlet	EA	2	\$4,000.00	\$8,000
Construction Subtotal Project 6					\$302,350
Contingency & Engineering 35%					\$105,830
Total Opinion of Construction Cost - Project 6					\$410,000

PROJECT 7: W 12TH STREET, SYCAMORE AVENUE TO N MARIAN ROAD

1.	Mobilization	LS	1	\$125,000.00	\$125,000
2.	Bonding and Insurance	LS	1	\$45,000.00	\$45,000
3.	Remove driveway	SY	700	\$15.00	\$10,500
4.	Remove Pavement	SY	8,500	\$15.00	\$127,500
5.	6" Concrete Driveway	SY	700	\$25.00	\$17,500
6.	9" Concrete Pavement	SY	12,300	\$85.00	\$1,045,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	6,500	\$3.00	\$19,500
8.	4" Colored Imprinted Concrete	SY	60	\$125.00	\$7,500
9.	5" Concrete Sidewalk	SF	13,500	\$10.00	\$135,000
10.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	10	\$500.00	\$5,000
11.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
12.	Rectangular Rapid Flashing Beacons	EA	1	\$20,000.00	\$20,000
13.	Detectable Warning Panels	SF	80	\$40.00	\$3,200
14.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	50	\$30.00	\$1,500
15.	Relocate Fire Hydrant	EA	4	\$7,500.00	\$30,000
16.	24" RCP Flared End Section	EA	2	\$1,500.00	\$3,000
17.	24" RCP, Class III	LF	3,350	\$100.00	\$335,000
18.	48" Dia. Storm Sewer Manhole	EA	4	\$5,000.00	\$20,000
19.	Curb Inlet	EA	14	\$4,000.00	\$56,000
20.	Area Inlet	EA	4	\$3,500.00	\$14,000
Construction Subtotal				Project 7	\$2,025,700
Contingency & Engineering				35%	\$709,000
Total Opinion of Construction Cost - Project 7					\$2,740,000

PROJECT 8: INTERSECTION W 12TH STREET & N MARIAN ROAD

1.	Mobilization	LS	1	\$90,000.00	\$90,000
2.	Bonding and Insurance	LS	1	\$30,000.00	\$30,000
3.	Remove Pavement	SY	4,300	\$15.00	\$64,500
4.	9" Concrete Pavement	SY	6,400	\$85.00	\$544,000
5.	4" Yellow Permanent Pavement Marking Paint	LF	5,000	\$3.00	\$15,000
6.	4" White Permanent Pavement Marking Paint	LF	500	\$3.00	\$1,500
7.	4" Colored Imprinted Concrete	SY	800	\$125.00	\$100,000
8.	9" Colored Imprinted Concrete	SY	600	\$150.00	\$90,000
9.	5" Concrete Sidewalk	SF	8,700	\$10.00	\$87,000
10.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	2	\$500.00	\$1,000
11.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
12.	Detectable Warning Panels	SF	80	\$40.00	\$3,200
13.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	170	\$30.00	\$5,100
14.	Relocate Fire Hydrant	EA	2	\$7,500.00	\$15,000
15.	Install Street Lighting	EA	10	\$7,500.00	\$75,000
16.	24" RCP Flared End Section	EA	7	\$1,500.00	\$10,500
17.	24" RCP, Class III	LF	1,100	\$100.00	\$110,000
18.	Reinforced Box Culvert Extension	LF	140	\$500.00	\$70,000
19.	Concrete Collar	EA	4	\$750.00	\$3,000
20.	48" Dia. Storm Sewer Manhole	EA	3	\$5,000.00	\$15,000
21.	Curb Inlet	EA	12	\$4,000.00	\$48,000
Construction Subtotal				Project 8	\$1,382,800
Contingency & Engineering				35%	\$483,980
Total Opinion of Construction Cost - Project 8					\$1,870,000

PROJECT 9: W 12TH STREET, N MARIAN ROAD TO N LAIRD AVENUE

1.	Mobilization	LS	1	\$50,000.00	\$50,000
2.	Bonding and Insurance	LS	1	\$20,000.00	\$20,000
3.	Remove driveway	SY	150	\$15.00	\$2,250
4.	Remove Pavement	SY	3,400	\$15.00	\$51,000
5.	6" Concrete Driveway	SY	170	\$25.00	\$4,250
6.	9" Concrete Pavement	SY	4,700	\$85.00	\$399,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	2,100	\$3.00	\$6,300
8.	4" Colored Imprinted Concrete	SY	60	\$125.00	\$7,500
9.	6" Concrete Trail	SF	2,600	\$12.00	\$31,200
10.	5" Concrete Sidewalk	SF	9,500	\$10.00	\$95,000
11.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	8	\$500.00	\$4,000
12.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
13.	Rectangular Rapid Flashing Beacons	EA	1	\$20,000.00	\$20,000
14.	Detectable Warning Panels	SF	40	\$40.00	\$1,600
15.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	50	\$30.00	\$1,500
16.	Relocate Fire Hydrant	EA	1	\$7,500.00	\$7,500
17.	Adjust Sanitary Manhole to Grade	EA	4	\$3,500.00	\$14,000
18.	24" RCP, Class III	LF	850	\$100.00	\$85,000
19.	48" Dia. Storm Sewer Manhole	EA	2	\$5,000.00	\$10,000
20.	Curb Inlet	EA	4	\$4,000.00	\$16,000

Construction Subtotal Project 9 \$831,600

Contingency & Engineering 35% \$291,060

Total Opinion of Construction Cost - Project 9 \$1,130,000**PROJECT 10: W 12TH STREET, N LAIRD AVENUE TO CRANE AVENUE**

1.	Mobilization	LS	1	\$90,000.00	\$90,000
2.	Bonding and Insurance	LS	1	\$30,000.00	\$30,000
3.	Remove driveway	SY	350	\$15.00	\$5,250
4.	Remove Pavement	SY	6,200	\$15.00	\$93,000
5.	6" Concrete Driveway	SY	350	\$25.00	\$8,750
6.	9" Concrete Pavement	SY	6,700	\$85.00	\$569,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	3,000	\$3.00	\$9,000
8.	5" Concrete Sidewalk	SF	12,000	\$10.00	\$120,000
9.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	8	\$500.00	\$4,000
10.	Seeding, Fertilizer and Mulch	ACRE	1.50	\$5,000.00	\$7,500
11.	Rectangular Rapid Flashing Beacons	EA	1	\$20,000.00	\$20,000
12.	Detectable Warning Panels	SF	120	\$40.00	\$4,800
13.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	50	\$30.00	\$1,500
14.	Relocate Fire Hydrant	EA	2	\$7,500.00	\$15,000
15.	Adjust Storm Manhole to Grade	EA	3	\$3,500.00	\$10,500
16.	24" RCP, Class III	LF	2,050	\$100.00	\$205,000
17.	48" Dia. Storm Sewer Manhole	EA	5	\$5,000.00	\$25,000
18.	Curb Inlet	EA	8	\$4,000.00	\$32,000
19.	Area Inlet	EA	2	\$3,500.00	\$7,000

Construction Subtotal Project 10 \$1,257,800

Contingency & Engineering 35% \$440,230

Total Opinion of Construction Cost - Project 10 \$1,700,000

PROJECT 11: W 12TH STREET, CRANE AVENUE TO N BALTIMORE AVENUE

1.	Mobilization	LS	1	\$115,000.00	\$115,000
2.	Bonding and Insurance	LS	1	\$40,000.00	\$40,000
3.	Remove driveway	SY	500	\$15.00	\$7,500
4.	Remove Pavement	SY	4,900	\$15.00	\$73,500
5.	6" Concrete Driveway	SY	500	\$25.00	\$12,500
6.	9" Concrete Pavement	SY	9,700	\$85.00	\$824,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	7,000	\$3.00	\$21,000
8.	5" Concrete Sidewalk	SF	17,000	\$10.00	\$170,000
9.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	14	\$500.00	\$7,000
10.	Seeding, Fertilizer and Mulch	ACRE	2.00	\$5,000.00	\$10,000
11.	Detectable Warning Panels	SF	160	\$40.00	\$6,400
12.	Relocate Fire Hydrant	EA	1	\$7,500.00	\$7,500
13.	Reconstruct Curb Inlet	EA	4	\$5,000.00	\$20,000
14.	Reconstruct Area Inlet	EA	3	\$5,000.00	\$15,000
15.	24" RCP, Class III	LF	2,100	\$100.00	\$210,000
16.	Concrete Collar	EA	1	\$750.00	\$750
17.	48" Dia. Storm Sewer Manhole	EA	8	\$5,000.00	\$40,000
18.	Curb Inlet	EA	22	\$4,000.00	\$88,000
Construction Subtotal				Project 11	\$1,668,650
Contingency & Engineering				35%	\$584,030
Total Opinion of Construction Cost - Project 11					\$2,260,000

PROJECT 12: INTERSECTION OF W 12TH STREET & N BALTIMORE AVENUE

1.	Mobilization	LS	1	\$115,000.00	\$115,000
2.	Bonding and Insurance	LS	1	\$40,000.00	\$40,000
3.	Remove driveway	SY	200	\$15.00	\$3,000
4.	Remove Pavement	SY	3,000	\$15.00	\$45,000
5.	6" Concrete Driveway	SY	200	\$25.00	\$5,000
6.	9" Concrete Pavement	SY	5,700	\$85.00	\$484,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	400	\$3.00	\$1,200
8.	4" Colored Imprinted Concrete	SY	400	\$125.00	\$50,000
9.	9" Colored Imprinted Concrete	SY	600	\$150.00	\$90,000
10.	5" Concrete Sidewalk	SF	7,200	\$95.00	\$684,000
11.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
12.	Detectable Warning Panels	SF	120	\$40.00	\$4,800
13.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	168	\$30.00	\$5,040
14.	Relocate Fire Hydrant	EA	2	\$7,500.00	\$15,000
15.	Adjust Water Valve Box to Grade	EA	1	\$1,000.00	\$1,000
16.	Adjust Sanitary Manhole to Grade	EA	5	\$3,500.00	\$17,500
17.	Adjust Storm Manhole to Grade	EA	2	\$3,500.00	\$7,000
18.	Relocate Power Poles	EA	4	\$4,000.00	\$16,000
19.	Remove Traffic Signal	LS	1	\$50,000.00	\$50,000
20.	Install Street Lighting	EA	8	\$6,000.00	\$48,000
21.	Reconstruct Curb Inlet	EA	11	\$5,000.00	\$55,000
22.	24" RCP, Class III	LF	750	\$100.00	\$75,000
23.	48" Dia. Storm Sewer Manhole	EA	8	\$5,000.00	\$40,000
24.	Curb Inlet	EA	8	\$4,000.00	\$32,000

Construction Subtotal	Project 12	\$1,889,040
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Contingency & Engineering	35%	\$661,170
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Total Opinion of Construction Cost - Project 12	\$2,560,000
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PROJECT 13: W 12TH STREET, N BALTIMORE AVENUE TO N BELLEVUE AVENUE

1.	Mobilization	LS	1	\$4,000.00	\$4,000
2.	Bonding and Insurance	LS	1	\$1,500.00	\$1,500
3.	5" Concrete Sidewalk	SF	2,000	\$15.00	\$30,000
4.	Detectable Warning Panels	SF	200	\$40.00	\$8,000
5.	4" Yellow Permanent Pavement Marking Paint	LF	3,000	\$3.00	\$9,000
6.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	10	\$500.00	\$5,000

Construction Subtotal	Project 13	\$57,500
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Contingency & Engineering	35%	\$20,130
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Total Opinion of Construction Cost - Project 13	\$80,000
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PROJECT 14: W 12TH STREET, N BELLEVUE AVENUE TO N HASTINGS AVENUE

1.	Mobilization	LS	1	\$20,000.00	\$20,000
2.	Bonding and Insurance	LS	1	\$7,500.00	\$7,500
3.	Remove driveway	SY	150	\$15.00	\$2,250
4.	Remove Pavement	SY	1,000	\$15.00	\$15,000
5.	6" Concrete Driveway	SY	150	\$25.00	\$3,750
6.	9" Concrete Pavement	SY	500	\$85.00	\$42,500
7.	4" Yellow Permanent Pavement Marking Paint	LF	3,500	\$3.00	\$10,500
8.	4" White Permanent Pavement Marking Paint	LF	1,000	\$3.00	\$3,000
9.	5" Concrete Sidewalk	SF	4,500	\$10.00	\$45,000
10.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	9	\$500.00	\$4,500
11.	Street Light Pole Relocation	EA	5	\$5,000.00	\$25,000
12.	Traffic Signal Relocation	EA	1	\$100,000.00	\$100,000
13.	Seeding, Fertilizer and Mulch	ACRE	1.00	\$5,000.00	\$5,000
14.	Detectable Warning Panels	SF	20	\$40.00	\$800
15.	Relocate Fire Hydrant	EA	1	\$7,500.00	\$7,500
16.	Adjust Water Valve to Box to Grade	EA	1	\$1,000.00	\$1,000

Construction Subtotal	Project 14	\$293,300
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Contingency & Engineering	35%	\$102,660
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Total Opinion of Construction Cost - Project 14	\$400,000
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PROJECT 15: N MARIAN ROAD, W 12TH STREET TO W 14TH STREET

1.	Mobilization	LS	1	\$15,000.00	\$15,000
2.	Bonding and Insurance	LS	1	\$5,000.00	\$5,000
5.	9" Concrete Pavement	SY	2,200	\$85.00	\$187,000
6.	4" Yellow Permanent Pavement Marking Paint	LF	200	\$3.00	\$600

Construction Subtotal	Project 15	\$207,600
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Contingency & Engineering	35%	\$72,660
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Total Opinion of Construction Cost - Project 15	\$290,000
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PROJECT 16: W 14TH STREET, N MARIAN ROAD TO WESTRIDGE DRIVE

1.	Mobilization	LS	1	\$40,000.00	\$40,000
2.	Bonding and Insurance	LS	1	\$15,000.00	\$15,000
3.	Remove Pavement	SY	100	\$15.00	\$1,500
4.	Remove driveway	SY	80	\$15.00	\$1,200
5.	8" Concrete Pavement	SY	5,000	\$70.00	\$350,000
6.	4" Yellow Permanent Pavement Marking Paint	LF	1,000	\$3.00	\$3,000
7.	24" RCP Flared End Section	EA	1	\$1,500.00	\$1,500
8.	24" RCP, Class III	LF	1,400	\$100.00	\$140,000
9.	Curb Inlet	EA	8	\$4,000.00	\$32,000
31.	Area Inlet	EA	1	\$3,500.00	\$3,500

Construction Subtotal				Project 16	\$587,700
Contingency & Engineering				35%	\$205,700
Total Opinion of Construction Cost - Project 16					\$800,000

PROJECT 17: FUTURE BIKE TRAIL

1.	Mobilization	LS	1	\$105,000.00	\$105,000
2.	Bonding and Insurance	LS	1	\$35,000.00	\$35,000
3.	6" Concrete Trail	SF	150,000	\$9.00	\$1,350,000
3.	Earthwork Measured in Embankment (Established Quantity)	CY	10,000	\$20.00	\$200,000

Construction Subtotal				Project 16	\$1,690,000
Contingency & Engineering				35%	\$591,500
Total Opinion of Construction Cost - Project 17					\$2,290,000

Construction Subtotal - All Projects					\$17,049,390
Contingency					\$5,967,340
Total Opinion of Construction Cost - All Projects					\$23,020,000

Project Alternative 1 - Projects 1-6

1.	Mobilization	LS	1	\$120,000.00	\$120,000
2.	Bonding and Insurance	LS	1	\$40,000.00	\$40,000
3.	Cold Milling	SY	26,667	\$15.00	\$400,000
4.	Asphalt Concrete	TONS	6,907	\$125.00	\$863,333
5.	4" Yellow Permanent Pavement Marking Paint	LF	20,000	\$3.00	\$60,000
6.	4" White Permanent Pavement Marking Paint	LF	8,000	\$3.00	\$24,000
7.	24" RCP, Class III	LF	200	\$125.00	\$25,000
8.	24" Round Equivalent (RE) RCP, Class III	LF	20	\$1,500.00	\$30,000
Construction Subtotal				Project 10.1	\$1,562,340
Contingency & Engineering				35%	\$546,820
Total Opinion of Construction Cost - Project 10.1					\$2,110,000

Project Alternative - Project 10

1.	Mobilization	LS	1	\$50,000.00	\$50,000
2.	Bonding and Insurance	LS	1	\$15,000.00	\$15,000
3.	Remove driveway	SY	350	\$15.00	\$5,250
4.	Remove Pavement	SY	4,500	\$15.00	\$67,500
5.	6" Concrete Driveway	SY	350	\$25.00	\$8,750
6.	9" Concrete Pavement	SY	5,400	\$85.00	\$459,000
7.	4" Yellow Permanent Pavement Marking Paint	LF	3,700	\$3.00	\$11,100
8.	4" White Permanent Pavement Marking Paint	LF	200	\$3.00	\$600
9.	5" Concrete Sidewalk	SF	1,200	\$10.00	\$12,000
10.	White Preformed Pavement Marking Paint, Symbols and Arrows	EA	4	\$500.00	\$2,000
11.	Rectangular Rapid Flashing Beacons	EA	1	\$20,000.00	\$20,000
12.	Detectable Warning Panels	SF	100	\$40.00	\$4,000
13.	24" White Preformed Pavement Marking, Type 4, Grooved	LF	50	\$30.00	\$1,500
14.	36" RCP, Class III	LF	100	\$150.00	\$15,000
15.	36" RCP Flared End Section	EA	1	\$1,800.00	\$1,800
16.	Manhole	EA	1	\$4,500.00	\$4,500
17.	Relocate Fire Hydrant	EA	2	\$7,500.00	\$15,000
19.	Adjust Storm Manhole to Grade	EA	1	\$1,000.00	\$1,000
20.	24" RCP Flared End Section	EA	1	\$1,500.00	\$1,500
21.	24" RCP, Class III	LF	110	\$100.00	\$11,000
23.	48" Dia. Storm Sewer Manhole	EA	1	\$5,000.00	\$5,000
Construction Subtotal				Project 10.1	\$711,500
Contingency & Engineering				35%	\$249,030
Total Opinion of Construction Cost - Project 10.1					\$970,000



City Council Character Standards

Respect, responsibility, compassion, and honesty

City Council Norms

1. We will work collaboratively to achieve consensus while valuing differences of opinion both within our Council and when considering the input of others.
2. We will conduct meetings and business in a manner that is solution-oriented, fair, and respectful.
3. We will strive to ensure our decisions are congruent with the strategic plan of the City.
4. We will be committed to the City Council process by attending meetings, being on time, coming prepared, adhering to the agenda, referencing Robert's Rules of Order, and participating to our full potential.
5. We will gather the necessary data; seek expertise from city staff; provide questions to staff prior to meetings and hear from citizens to make wise decisions that achieve the greatest good for the greatest number of citizens.
6. We will rely on facts and learn all sides of an issue before forming an opinion.
7. We will regularly and intentionally communicate with one another, staff, and the community, to ensure information is shared openly and in a relevant, timely and appropriate manner.
8. We will focus on policy issues, "what" & "why", and leave day-to-day administrative functions, "how" & "who", to staff.
9. We will maintain confidentiality when necessary.
10. We will each individually support the collective decisions of Council.

*The Council Character Standards and Norms will be included on every City Council agenda and may be discussed at any council meeting. At a minimum, they will be reviewed every 6 months.

DRAFT

**City Hall Tentative Schedule
November 14, 2023**

- Asbestos removal/mold remediation complete – February 2024
- Issue bid package for interior demolition – February 2024
- Renderings of Council Chambers complete – January 31, 2024
 - Send options to council for review
- Renderings of building exterior complete – January 31, 2024
 - Send options to council for review
- Council work session - February 19, 2024
 - discuss renderings of Council Chambers and building exterior
- 50% design plans ready for City staff review – February 20, 2024
- Council meeting to decide on renderings February 26, 2024
 - Decide on which Council Chambers option to go with
 - Decide on which exterior building option to go with
- City staff review of 50% design plans complete - March 5, 2024
- 95% plans ready for City staff review – April 2, 2024
- City staff review of 95% design plans complete - April 16, 2024
- Interior demolition complete – May 2024
- Design, drawings and specifications complete and ready to bid project – May 3, 2024
 - Send out bid package to include all construction work including the roof and foundation.
- Project bid opening – June 11, 2024
- Project Award – June 24, 2024
- Start of construction – August 2024
- Construction complete – March of 2026

Highlighted items require council input/action