Alpine Township, Kent County, MI

GRACEWIL COUNTRY CLUB RESIDENTIAL DEVELOPMENT TRAFFIC IMPACT STUDY

January 28, 2022

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TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

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EXECUTIVE SUMMARY

JTB Homes is proposing to construct a new single- and multi-family residential development located at the existing Gracewil Country Club in Alpine Township. The proposed development is expected to consist of 590 units of single- and multi-family development and be fully constructed and occupied by the year 2042. At the request of the Kent County Road Commission, this study examines the site in three phases: Phase 1 in 2023, the approximate mid-point of development in 2032, and full build out of the development in 2042.

Access to the development is proposed to be served via three full movement access points, with one access point each on 4 Mile Road, Walker Avenue, and Peach Ridge Avenue. The access point on 4 Mile Road will be constructed during Phase 1 of development, while the access point on Walker Avenue will be constructed by the mid-point of development in 2032, and the access point on Peach Ridge Avenue will be constructed by full development build out in 2042.

The report analyzes and presents the traffic impacts that the proposed residential development will have on the following intersections in the project study area:

- Peach Ridge Avenue and 4 Mile Road
- Walker Avenue and 4 Mile Road
- Proposed Site Driveway and 4 Mile Road
- Proposed Site Driveway and Walker Avenue
- Proposed Site Driveway and Peach Ridge Avenue

The above-mentioned intersections were analyzed for the morning and afternoon peak hours for the following conditions:

- Existing 2021 Conditions
- Future 2023 No-Build Conditions
- Future 2032 No-Build Conditions
- Future 2042 No-Build Conditions
- Projected 2023 Build Conditions
- Projected 2032 Build Conditions
- Projected 2042 Build Conditions

The elements to be covered in the traffic study were discussed with the Kent County Road Commission and Alpine Township prior to the study commencing.

Existing Conditions

Based on the intersection counts, the overall morning peak hour was found to occur between the hour of 7:15 a.m. and 8:15 a.m. while the afternoon peak hour was found to occur between the hour

of 4:45 p.m. and 5:45 p.m. These time periods were selected for analysis of existing and future year conditions.

The capacity analyses for existing conditions revealed that the study area intersections and all individual movements currently operate at an acceptable level of service, with the exception of the eastbound shared through/right-turn movement and overall eastbound approach of 4 Mile Road to Walker Avenue during the weekday morning peak hour. These both operate acceptably during the weekday afternoon peak hour. Field visits during the weekday morning and afternoon peak hours confirmed lengthy vehicle delay and queuing for the eastbound 4 Mile Road approach to Walker Avenue. During the capacity analysis, the addition of an eastbound right turn lane was found to mitigate delay and provide an acceptable level of service.

Future No-Build Conditions

An evaluation of traffic impacts associated with the proposed residential development relies on an understanding of the future traffic conditions in the study area without the proposed development. Traffic volumes for the future no build 2023, 2032, and 2042 conditions were estimated by applying traffic growth rates to the existing traffic volumes to develop the future 2023, 2032, and 2042 traffic volumes and adding traffic from approved developments in the area. Per growth projections provided by Grand Valley Metro Council, a 2.07% per year growth rate was utilized between 2021 to 2025, while a 0.72% per year growth rate was utilized between 2025 to 2042. Based on discussions with Alpine Township and the City of Walker, three approved developments were identified in or near the project area that were to be considered in the study: the English Hills multi-family housing development, the Northridge East IPUD development, and the remainder of the Walkerview development.

Future 2023 No-Build Conditions

The future 2023 no build conditions revealed that the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at level of service E during the weekday morning peak hour. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. The southbound queues are expected to be minimal under the future no build 2023 conditions and the volume to capacity ratio is under 1.0, therefore no further mitigation should be required under the future 2023 no build conditions.

Improvements are needed at the intersection of Walker Avenue and 4 Mile Road in order to mitigate the future no build conditions. The existing mitigation recommendation of an eastbound right turn lane was first examined and found to not provide enough capacity to improve the level of service to an acceptable level under the future 2023 no build conditions. Installation of a traffic signal was evaluated and found to result in an acceptable level of service for all intersection movements/approaches. It should be noted that given the misalignment of the Walker Avenue

approaches to the intersection, the northbound and southbound approaches were examined with a split-phase traffic signal operation.

Future 2032 No-Build Conditions

Since no improvement strategies discussed under existing or future no build 2023 conditions were assumed to be in place for the future 2032 no build conditions analyses, the two study area intersections will continue to have the same movements operate with unacceptable levels of service (with greater delays) during the weekday morning and weekday afternoon peak hours. Additional movements at the Walker Avenue and 4 Mile Road intersection will also begin to operate at unacceptable levels of service by the year 2032.

Similar to the future no build 2023 conditions, the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at a poor level of service during the weekday morning peak hour under future no build 2032 conditions. The addition of a 100' auxiliary left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road was investigated as a remedial measure in order to improve the delays and level of service for this approach. It was found that implementing a 100' southbound left turn lane on the Peach Ridge Avenue approach to 4 Mile Road would reduce delay and queuing on the approach. Although the southbound left turn movement and overall approach will still operate at a level of service F, no further mitigation should be required at this intersection for the future 2032 no build conditions.

At the intersection of Walker Avenue at 4 Mile Road, converting the intersection to traffic signal control would continue to provide acceptable levels of service for all intersection movements. No further mitigation is required at this intersection for the future no build 2032 conditions.

Future 2042 No-Build Conditions

Since none of the improvement strategies discussed under existing, future no build 2023 conditions, or future no build 2032 conditions were assumed to be in place for the future 2042 no build conditions analyses, the two study area intersections will continue to have the same operational issues during the weekday morning and weekday afternoon peak hours with significant delays. In addition, other movements at the Walker Avenue and 4 Mile Road intersection will also begin to operate at unacceptable levels of service by the year 2042.

Similar to 2023 and 2032 no build conditions, it was found that implementing a southbound left turn lane on the Peach Ridge Avenue approach to 4 Mile Road would reduce delay and queuing on the approach and result in a volume to capacity ratio below 1.0. However, the southbound left turn movement and overall approach will still operate at a level of service F. As the traffic volumes remain relatively low on this approach and the volume to capacity ratio remains less than 1.0, no further mitigation should be required for the future 2042 no build conditions.

At the intersection of Walker Avenue at 4 Mile Road, it was found that additional mitigation would need to be required under traffic signal control in order to provide acceptable levels of service for all movements and approaches. During the analysis, it was determined that an auxiliary right-turn lane on the eastbound approach would need to be added to provide acceptable levels of service for each movement and approach at the intersection. Installing a traffic signal at the intersection and adding an eastbound right turn lane will result in acceptable levels of service for all movements/approaches under the future 2042 no build conditions. It should be noted that the traffic signal control continued to be examined with a split-phase for the northbound/southbound approaches due to their existing misalignment at the intersection.

Projected Build Conditions

The projected build out years examined include the following:

- The year 2023 when Phase 1 of the proposed residential development (91 units) is expected to be complete with construction of the site access to 4 Mile Road also completed. The dwelling units are split among 13 houses, 26 villas, and 13 townhomes with 4 units per building.
- The year 2032 at an approximate mid-point of the residential development (322 units) with construction of the second site access to Walker Avenue also completed. The dwelling units are split among 138 houses, 48 villas, 26 duplexes, and 21 townhomes with 4 units per building.
- The year 2042 when the proposed residential development is expected to be fully built out (590 units) and construction of the third site access to Peach Ridge Avenue is completed. The dwelling units are split among 307 houses, 105 villas, 47 duplexes, and 21 townhomes with 4 units per building.

The study area intersections were evaluated with the future build traffic volumes to determine the future intersection operations with the proposed residential development project. Traffic volumes for the projected 2023 build, 2032 build, and 2042 build conditions were derived from developing the trip generation, distribution, and assignment for the proposed residential development and adding these trips to the no build traffic volumes projected for 2023, 2032, and 2042 without the proposed project.

New trips to be generated by the proposed residential development were estimated based on information and procedures contained in the Institute of Transportation Engineer's (ITE) report Trip Generation Manual, Eleventh Edition, September 2021. Single Family Detached Housing, Land Use Code 210, was utilized to estimate the morning and afternoon trip generation for the dwelling units in the houses and villas, while Single-Family Attached Housing, Land Use Code 215, was utilized for the morning and afternoon trip generation for the dwelling units in the duplexes and townhomes. By Phase 1 in 2023, the proposed development is projected to generate a total of 53 weekday morning

peak hour trips and 68 weekday afternoon peak hour trips. At the approximate mid-point of development in 2032, the development is projected to generate a total of 196 weekday morning peak hour trips and 256 weekday afternoon peak hour trips. And by full project build out in 2042, a total of 358 weekday morning peak hour trips and 479 weekday afternoon peak hour trips are projected to be generated by the development. The estimated number of weekday morning and weekday afternoon peak hour trips was distributed to the surrounding roadway network using traffic volume distributions approved by the Kent County Road Commission.

Projected 2023 Build Conditions

The capacity analysis for the projected 2023 build conditions under Phase 1 of development revealed that the same improvements identified under the no build 2023 conditions would be required under the projected build conditions. No further mitigation would be needed at the primary study intersections, beyond the mitigation recommended under the future no build 2023 conditions, to accommodate the traffic generated by the proposed residential development in the year 2023.

Turn lane warrants were examined to determine if a right or left turn lane would be needed along 4 Mile Road at the proposed site access with Phase 1 of development. Based on the volume warrants, a westbound right turn taper only is recommended at the proposed site access on 4 Mile Road and has been included in the proposed site plan. A left-turn lane on 4 Mile Road is not warranted at the proposed site access with Phase 1 of development. The capacity analyses for the proposed site access revealed that all movements at its intersection with 4 Mile Road are expected to operate acceptably during the morning and afternoon peak hours.

Projected 2032 Build Conditions

The study area intersections were again evaluated with the future 2032 build traffic volumes to determine the intersection operations at the approximate mid-point of the residential development. The capacity analysis for the projected 2032 build conditions revealed that additional improvements beyond those identified under the no build 2032 conditions would be required at the intersection of Walker Avenue and 4 Mile Road due to the traffic generated by the proposed residential development.

The construction of a left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to improve the weekday morning peak hour approach delay, but the approach is still expected to operate at level of service F, as is the southbound left-turn movement. The expected volume to capacity ratio is expected to remain below 1.0 and queues are expected to be minimal for this approach. The 100’ auxiliary left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road that was recommended under the future 2032 no-build conditions will continue to accommodate the queuing expected for this movement. No further mitigation should be required at this intersection for future 2032 build conditions.

The analysis for the intersection of Walker Avenue at 4 Mile Road determined that signalizing the intersection alone would not provide acceptable levels of service under 2032 build conditions as it did under the 2032 no build conditions. An auxiliary eastbound right turn lane would also need to be constructed along 4 Mile Road at Walker Avenue to provide acceptable levels of service at the study area intersection.

Turn lane warrants were again examined to determine if a right or left turn lane would be needed along 4 Mile Road at the proposed site access as well as along Walker Avenue at the second proposed site access. Based on the volume warrants, right and left turn lanes are warranted along 4 Mile Road at the site access to the development, while neither a right nor left turn lane are warranted along Walker Avenue at the second site access to the development. The capacity analyses for the proposed site accesses revealed that all movements at the intersections are expected to operate acceptably, with the exception of the southbound left turn movement and overall southbound approach from the site access to 4 Mile Road during the weekday morning peak hour. It is common for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. The southbound left-turn queues exiting the development are expected to be minimal, with the signalization at the Walker Avenue and 4 Mile Road intersection, therefore no further mitigation should be required.

Projected 2042 Build Conditions

The study area intersections were finally evaluated with the future 2042 build traffic volumes to determine the future intersection operations at full build out of the proposed residential development. The capacity analysis for the projected 2042 build conditions revealed that additional improvements beyond those identified under the no build 2042 conditions would be required at the Peach Ridge Avenue and 4 Mile Road intersection due to the traffic generated by the proposed residential development.

The installation of a left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to improve weekday morning peak hour approach delay, but the approach is still expected to operate at level of service F. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. While a volume to capacity ratio above 1.0 is expected for the southbound left turn lane, a southbound left-turn lane providing 150 feet of storage will accommodate the anticipated queuing during the weekday morning and afternoon peak hours. This is an additional 50 feet in length from the 2042 no build conditions due to the development traffic. Signalizing the intersection of Walker Avenue at 4 Mile Road will provide the necessary gaps for traffic to enter 4 Mile Road from Peach Ridge Avenue. Additionally, signalizing the intersection of 4 Mile Road at Walker Avenue provides a more efficient intersection for southbound study area traffic to utilize, therefore it is reasonable to assume that vehicles heading south from 6 Mile Road to 4 Mile Road may instead use Walker Avenue rather than Peach Ridge Avenue.

At the intersection of Walker Avenue at 4 Mile Road, the movements/approaches that were found to operate poorly due to the proposed development traffic were already deficient movements for the other scenarios examined and were already identified as requiring mitigation. No additional movements were identified as requiring improvements due to the proposed development traffic. The traffic signal control mitigation was again investigated under a split-phase signal operation for the northbound and southbound approaches as well as the addition of an auxiliary eastbound right turn lane. This mitigation scenario that was recommended under the projected build 2032 conditions will continue to provide acceptable levels of service under the projected build 2042 conditions. No further mitigation is required for this scenario.

Turn lane warrants were again examined to determine if a right or left turn lane would be needed along Walker Avenue at the second proposed site access and along Peach Ridge Avenue at the third proposed site access. Right and left turn lanes were warranted along 4 Mile Road at the first site access to the development under projected 2032 build conditions. A right turn lane or taper is not required on Walker Avenue at the second site access nor on Peach Ridge Avenue at the third site access. A left turn lane is warranted along Walker Avenue at the second site access, while a left turn lane is not warranted at the Peach Ridge Avenue site access. The capacity analyses for the proposed site accesses revealed that all movements at the intersections are expected to operate acceptably, with the exception of the southbound left turn movement and overall approach from the site access to 4 Mile Road. The volume to capacity ratio is expected to remain less than 1.0 and queuing is minimal, thus no improvements are typically necessary to mitigate these side-street movements. In the analysis of mitigation strategies, it was found that converting the intersection of Walker Avenue at 4 Mile Road to traffic signal control will result in an expected 95th percentile queue length less than 100’ on the site access approach to 4 Mile Road during the morning peak hour. In addition, drivers from the development can choose to access Walker Avenue and utilize the improved Walker Avenue and 4 Mile Road intersection instead of attempting to turn left onto 4 Mile Road during the peak hours. No further mitigation should be required for this site access.

Summary

Improvements that are needed in order to mitigate the future 2023, 2032, and 2042 no build conditions include:

- By 2023, installation of a traffic signal with split phase operation at the intersection of Walker Avenue at 4 Mile Road.
- By 2032, addition of a 100’ southbound left-turn lane on the southbound Peach Ridge Avenue approach to the intersection with 4 Mile Road.
- By 2042, an eastbound right turn lane along 4 Mile Road at Walker Avenue would be required with the earlier traffic signal mitigation.

The same mitigation strategies are needed to provide acceptable levels of service under projected 2023, 2032 and 2042 build conditions except for the following alterations:

- Under traffic signal control for the Walker Avenue and 4 Mile Road intersection, the eastbound auxiliary right-turn lane would need to be constructed by 2032.
- The southbound left-turn lane on the southbound Peach Ridge Avenue approach will need to be extended to 150' by 2042 to accommodate the expected queue lengths with the project traffic.

At the proposed site accesses, a westbound right turn taper along 4 Mile Road is required for the initial phase of development in 2023. By 2032, a full-width right turn lane and left-turn lane are warranted along 4 Mile Road at the site access. Neither a left or right turn lane is warranted at the Peach Ridge Avenue driveway under any future year scenario. Neither a left or right turn lane is warranted at the Walker Avenue driveway under 2023 or 2032 conditions, however, a full northbound left turn lane is warranted along Walker Avenue at the site access for the full build out conditions in 2042.

1.0 INTRODUCTION

JTB Homes is proposing a new residential development located at the existing Gracewil Country Club in Alpine Township as shown in Figures 1-1 and 1-2. The proposed development is expected to consist of 590 units of single- and multi-family development. This study will be examined in three phases: Phase 1 in 2023, the approximate mid-point of development in 2032, and full build out of the development in 2042.

Access to the development is proposed to be served via three full movement access points, with one access each on 4 Mile Road, Walker Avenue, and Peach Ridge Avenue. The access point on 4 Mile Road will be constructed during Phase 1 of development, while the access point on Walker Avenue will be constructed by the mid-point of development in 2032, and the access point on Peach Ridge Avenue will be constructed by full development build out in 2042.

This report describes the data collection, analyses, and the traffic impacts due to the proposed residential development.

Figure 1-1 Location Map

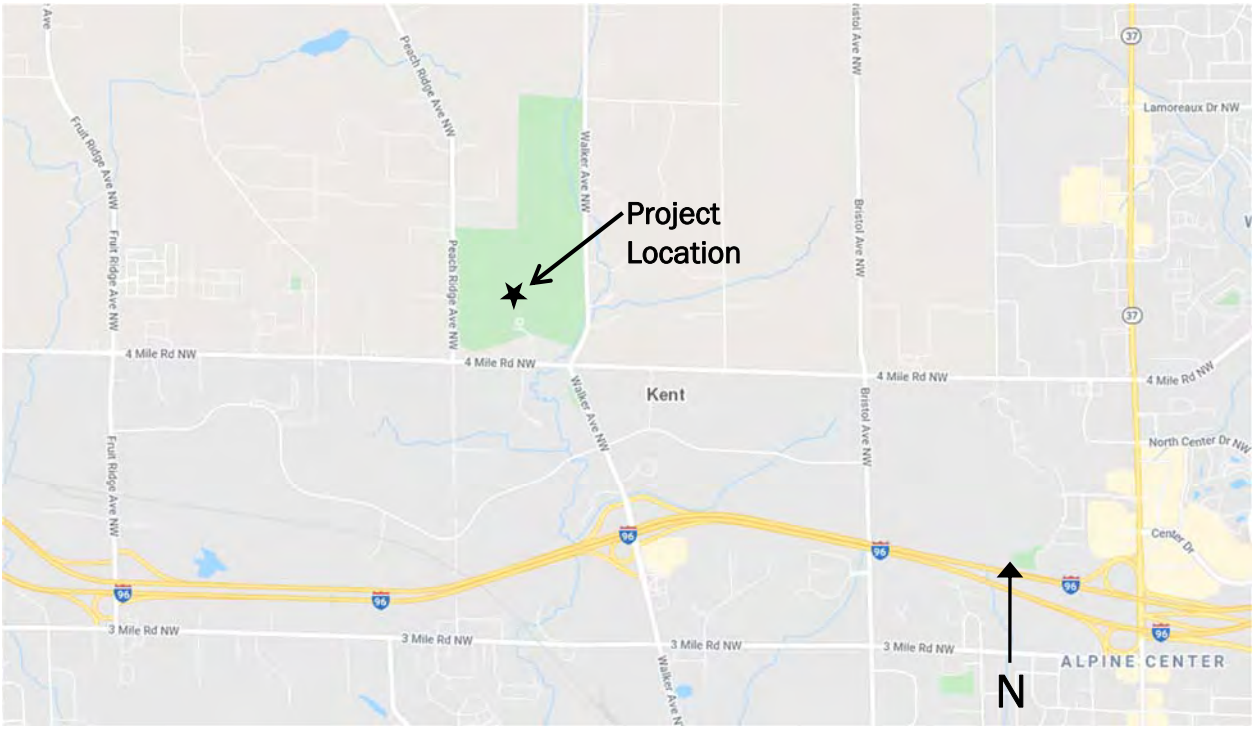


Figure 1-2 Approximate Site Area

1.1 Purpose and Scope

The purpose of this report is to document the assessment of the traffic impacts that the proposed residential development is expected to have on the adjacent roadways and study area intersections. The traffic impacts and mitigation measures described in this report are based on existing, future no build traffic volumes for years 2023, 2032, and 2042 and anticipated future traffic generated at partial build out of the site in the years 2023 and 2032 and full build out of the site in the year 2042.

The assessment included a review of existing roadway and intersection geometry, traffic control devices, and traffic volumes. The study also included trip generation, distribution, and traffic assignment. The analysis examined the following conditions:

- Existing Conditions: 2021 traffic volumes and operations.
- Future 2023 No Build Conditions: future no build traffic conditions that are anticipated in 2023 without the proposed development.
- Future 2032 No Build Conditions: future no build traffic conditions that are anticipated in 2032 without the proposed development.
- Future 2042 No Build Conditions: future no build traffic conditions that would be anticipated in 2042 without the proposed development.
- Projected 2023 Build Conditions: future build traffic conditions that are anticipated in 2023 upon Phase 1 development and occupancy of the property with access to 4 Mile Road.
- Projected 2032 Build Conditions: future build traffic conditions that are anticipated in 2032 when approximately half of the property is developed and occupied with access to 4 Mile Road and Walker Avenue.
- Projected 2042 Build Conditions: future build traffic conditions that are anticipated in 2042 at full build out of the property with access to 4 Mile Road, Walker Avenue, and Peach Ridge Avenue.

A comparison of future no build conditions to projected build conditions was used to determine the traffic impacts of the proposed residential development upon the adjacent street system.

2.0 METHODOLOGY

The study involved the collection and review of geometric, traffic control, and traffic volume data for roadways and intersections potentially impacted by the proposed residential development. This data served as input for the highway capacity analyses that were conducted to estimate the traffic impacts of the proposed development. The information collected, and the evaluation procedures used to conduct the analyses, are described in this section.

2.1 Traffic Impact Study Area

Based on a review of the road network adjacent to the proposed site and conversations with Alpine Township and the Kent County Road Commission (KCRC), the impact area for this study was identified. It was agreed upon that the analysis study area would include the following intersections:

- 4 Mile Road and Peach Ridge Avenue
- 4 Mile Road and Walker Avenue
- Proposed Site Driveways to 4 Mile Road, Peach Ridge Avenue, and Walker Avenue

2.2 Data Collection

Data collection consisted of obtaining roadway and intersection geometry, existing traffic control devices, and traffic volumes.

Traffic volume collection included obtaining directional vehicle turning movement counts for the weekday morning and weekday afternoon peak periods. These data were collected by Quality Counts, LLC for Wade Trim. Directional turning movements were derived from video taken during the weekday morning peak from 7:00 a.m. to 9:00 a.m. and weekday afternoon peak from 4:00 p.m. to 6:00 p.m.at the study area intersections.

The weekday counts for the 4 Mile Road intersections were collected on Wednesday, October 27, 2021. All possible vehicle turning movements at these intersection approaches were recorded in 15-minute intervals. During collection of the turning movement data, truck volumes were taken and the number of pedestrians/bicycles crossing the roadway were also recorded for each 15-minute time period. All existing turning movement data that were collected are summarized in Appendix A.

A field review of the intersections and surrounding area were made by Wade Trim personnel to obtain other data needed for the study. For example, traffic control regulations at the intersections, pedestrian accommodations, speed limits, roadway cross-sections, etc. were verified during the field observations.

2.3 Volume Balancing

When the traffic data was collected, only negligible volume differences were observed between study area intersections, and thus it was not necessary to balance the volumes throughout the network.

2.4 Operational Analysis

The traffic impact analysis includes methodology for trip generation, distribution, and traffic assignment based on the Institute of Transportation Engineers (ITE) standard practices. The guidelines suggested in the document ***Evaluating Traffic Impact Studies – A Recommended Practice for Michigan Communities, 1994 Edition*** were used in the preparation of the impact study. Applicable technical standards such as the ***6th Edition Highway Capacity Manual***, ***MDOT Geometric Design Guide***, and the ***2011 Michigan Manual on Uniform Traffic Control Devices (MMUTCD)*** were also used.

2.4.1 Highway Capacity Analysis

Highway capacity analyses were conducted to determine the existing level of service of the study area intersections, the level of service expected in the years 2023, 2032, and 2042 when background traffic is added, the level of service expected in the year 2023 when trips generated by Phase 1 of the proposed development are added to future 2023 no build volumes, the level of service in the year 2032 at the approximate midpoint of the development, and the level of service expected in 2042 when the development is fully built-out. *Synchro 11.1* was used to conduct the analyses.

Synchro 11.1 is a software package used for modeling and optimizing traffic signal timing at intersections. The program utilizes the methods of the ***6th Edition Highway Capacity Manual*** to calculate capacity. The capacity worksheets for existing year conditions are provided in Appendix B, while the future no build 2023, 2032, and 2042 conditions are given in Appendix E, Appendix F, and Appendix G, respectively. The worksheets for the projected build conditions in 2023, 2032, and 2042 are provided in Appendix H, Appendix I, and Appendix J, respectively.

Capacity analyses were conducted to measure the performance of the intersections in terms of level of service. Level of service ranges from level of service A, which represents the best traffic conditions, to level of service F, which is the worst condition. Operations at level of service A through D are generally considered acceptable. Quantitative measures of level of service are given in the following paragraphs.

The level of service measurement for both signalized and stop controlled intersections is average control delay, which is also quantified in terms of seconds of delay per vehicle. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and acceleration delay. The level of service criteria for unsignalized and signalized intersections, taken from the ***6th Edition Highway Capacity Manual,*** is shown in Table 2-1.

Table 2-1 Level of Service Criteria for Intersections			
Level of Service	Description	Unsignalized Intersections Average Control Delay, Seconds per vehicle	Signalized Intersections Average Control Delay, Seconds per vehicle
A	Little or no delay.	<10.0	<10.0
B	Short traffic delays.	Between 10 and 15	Between 10 and 20
C	Average traffic delays.	Between 15 and 25	Between 20 and 35
D	Long traffic delays.	Between 25 and 35	Between 35 and 55
E	Very long traffic delays.	Between 35 and 50	Between 55 and 80
F	Demand exceeds capacity.	>50	>80

One important factor used in calculating capacity at intersections is the peak-hour factor. The peak hour factor is found by dividing the total hourly volume observed on a road or intersection by four times the highest 15-minute volume. Because manual traffic counts based on 15-minute data were collected for the area intersections, the peak-hour factors used in the existing conditions analyses are based on actual count data. The peak hour factors are applied by intersection approach. The peak hour factors were kept the same for the future no build and projected build analyses. However, as the traffic volumes through this area increase over time and with the proposed development, the peak hour factors may also increase.

3.0 ANALYSIS

The traffic impact study included a review of the study area, an estimation of the amount of peak-period traffic generated by the proposed development, distribution of the site traffic onto the local streets, assignment of traffic volumes to the study area intersections, and capacity analyses to determine the impact of the proposed development on the level of service and operations. Traffic projections were made to estimate future traffic volumes on the area roads in 2023, 2032, and 2042 with and without the proposed residential development in place.

3.1 Existing 2021 Conditions

The existing transportation network in the vicinity of the project site is comprised of the road system. There are no pedestrian or transit facilities currently located in the study area transportation network. A summary of the existing network is described below.

3.1.1 Road System

4 Mile Road is a county local roadway running east/west through the study area. East of Walker Avenue, 4 Mile Road has a three-lane cross section with one through lane in each direction and a center two-way left-turn lane. West of Walker Avenue, 4 Mile Road has a two-lane cross section. 4

Mile Road has left-turn lanes at its intersection with Walker Avenue. The posted speed limit on 4 Mile Road is 55 mph west of Peach Ridge Avenue and 45 mph east of Peach Ridge Avenue.

Walker Avenue is a county local roadway running north/south along the east side of the study area. Walker Avenue has a two-lane cross section with left-turn lanes at its intersection with 4 Mile Road. The posted speed limit on Walker Avenue south of 4 Mile Road is 45 mph, while the speed limit north of 4 Mile Road is unposted but assumed to be 55 mph.

Peach Ridge Avenue is a county local roadway running north/south along the west side of the study area. Peach Ridge Avenue has a two-lane cross section. The speed limit is unposted but assumed to be 25 mph south of 4 Mile Road and assumed to be 55 mph north of 4 Mile Road.

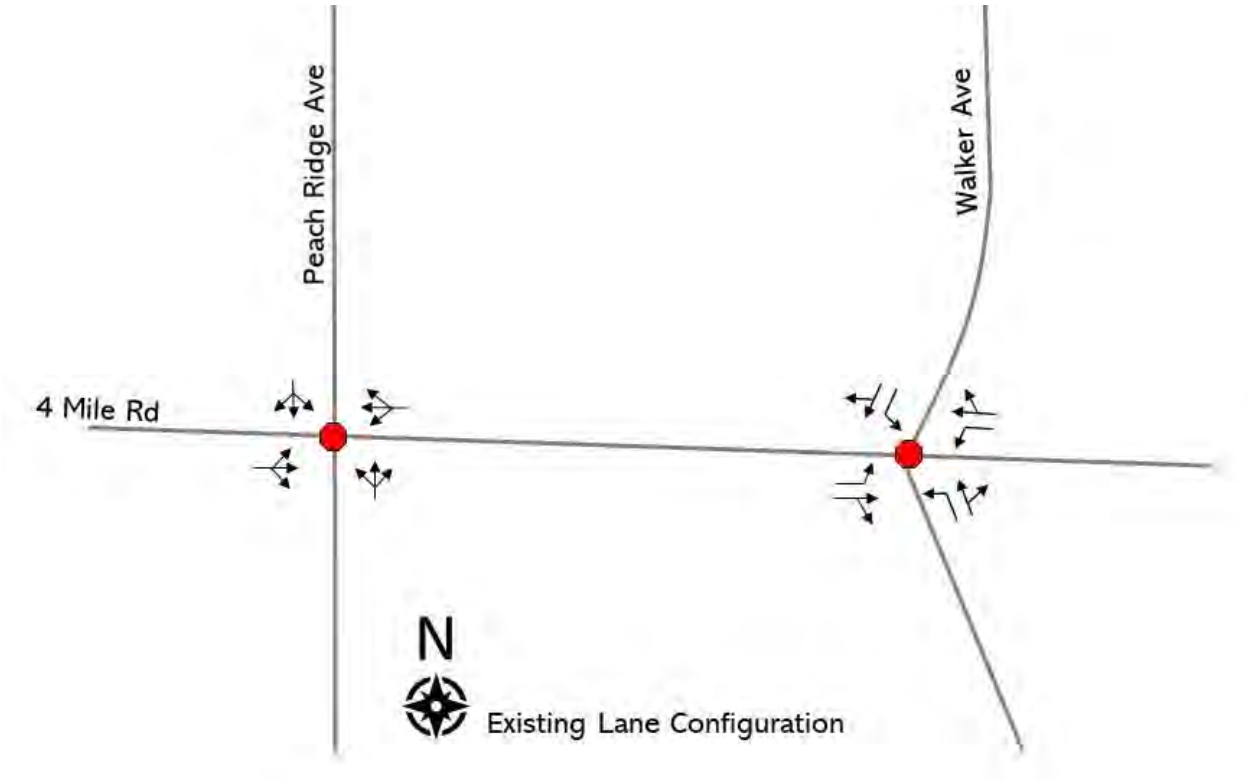
3.1.2 Intersection Geometry and Traffic Control

There are two primary intersections in the study area; 4 Mile Road with Walker Avenue and 4 Mile Road with Peach Ridge Avenue. The existing lane configuration for the study area intersections is depicted in Figure 3-1.

The intersection of 4 Mile Road and Walker Avenue has four approach legs and is stop-controlled on each approach. There are no pedestrian facilities at the intersection. Each approach has one left turn lane and one shared through/right-turn lane.

The intersection of 4 Mile Road and Peach Ridge Avenue has four approach legs and is stop-controlled on the northbound and southbound Peach Ridge Avenue approaches. There are no pedestrian facilities at the intersection. Each approach has one lane serving all movements. Right-turn tapers are present on the eastbound and westbound 4 Mile Road approaches to the intersection. The tapers and approach lanes together provide approximately 25 feet of approach width. While right-turn lanes are not delineated via pavement markings, there is enough room to allow eastbound or westbound vehicles to shift outside of the primary travel lanes to perform a right-turn to Peach Ridge Avenue, and was modeled as such in Synchro.

Figure 3-1 Existing Lane Configuration



3.1.3 Pedestrian and Bicycle Facilities

No pedestrian or bicycle facilities are present in the study area.

3.1.4 Transit Facilities

No transit facilities are present in the study area.

3.1.5 Traffic Volumes

The traffic impact analysis began with an examination of the weekday morning and weekday afternoon peak hours. The peak hour consists of the four highest consecutive 15-minute intervals within the peak time periods. Based on the intersection counts, the overall morning system peak hour was found to occur between the hour of 7:15 a.m. and 8:15 a.m. for the study area intersections while the afternoon system peak hour was found to occur between the hour of 4:45 p.m. and 5:45 p.m. for the overall study area intersections. Figures 3-2 and 3-3 illustrate the existing traffic volumes for the weekday morning and weekday afternoon peak hours.

During the collection of the manual intersection turning movement counts, pedestrian data, bicyclists, passenger car and light truck, and large truck data were recorded. The pedestrian, bicyclist, and truck data are also shown in Appendix A. The truck percentages and any pedestrian crossings were used in the traffic capacity analyses.

Figure 3-2 Existing AM Peak Hour Traffic Volumes

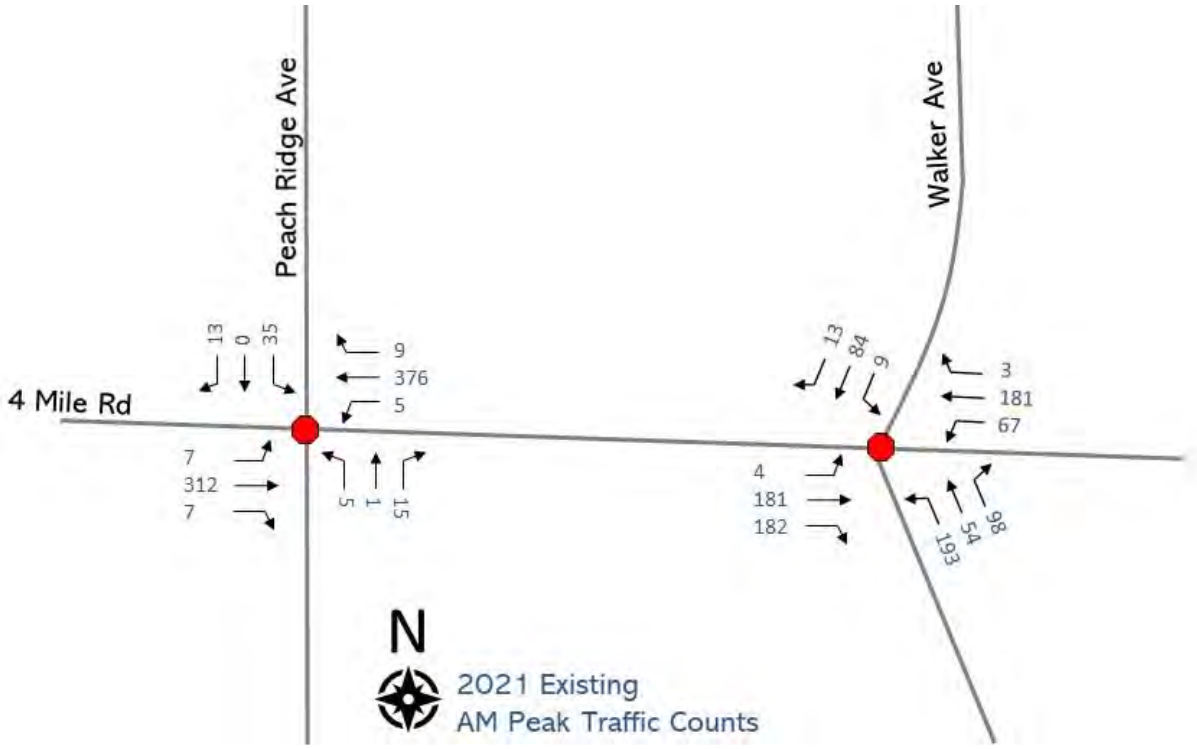
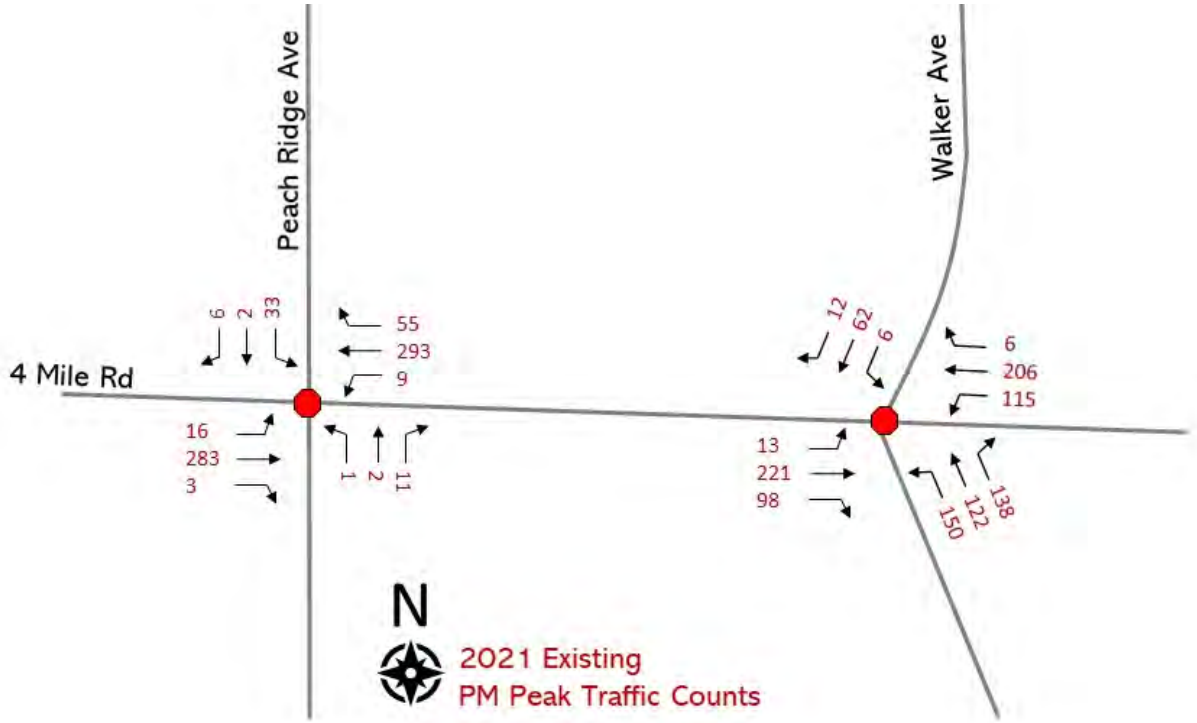


Figure 3-3 Existing PM Peak Hour Traffic Volumes



3.1.6 Operational Analysis

The analysis of existing operations was initiated with the preparation of existing condition models using Synchro 11 and the aerial and field obtained geometric data. The collected 2021 traffic volumes were input into the existing conditions model.

Highway capacity analyses were conducted for existing geometric conditions and traffic control. The capacity analysis included an examination of the weekday morning and weekday afternoon peak hours. The results of the capacity analyses for existing year 2021 conditions are summarized in Table 3-1. Table 3-1 provides the level of service, delay values, and volume to capacity ratios at each intersection for each movement and approach that currently exist throughout the study area. Unsignalized intersections do not have an overall intersection level of service, delay value, or volume to capacity ratio based on the HCM methodology and are therefore notated with a N/A (Not Applicable) in the table.

The capacity analyses for existing conditions revealed that all study area intersection approaches and movements operate at an acceptable level of service during both the weekday morning and weekday afternoon peak hours, with the exception of the following:

- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue operates at a level of service F during the weekday morning peak hour.
- The overall eastbound approach from 4 Mile Road to Walker Avenue operates at a level of service F during the weekday morning peak hour.

Lengthy vehicle delays and queuing for the eastbound 4 Mile Road approach to Walker Avenue were also observed on field visits to the intersection during the weekday morning and afternoon peak hours.

It was determined that construction of an auxiliary right-turn lane on the eastbound approach to Walker Avenue would provide enough capacity to improve the approach level of service to an acceptable level under existing traffic conditions during the weekday morning peak hour. The average vehicle delay for the eastbound shared through/right-turn movement would decrease to 21.9 seconds per vehicle (LOS C) and eastbound approach delay would decrease to 20.2 seconds per vehicle (LOS C).

3.1.7 SimTraffic Model Calibration and Validation

After completing the Synchro analysis for existing conditions, the SimTraffic models were calibrated and validated to ensure that they reflected actual field operations. This is an essential step in Synchro modeling and was conducted prior to the analysis and simulation of any future conditions.

The SimTraffic results for existing conditions were calibrated and validated for weekday morning and weekday afternoon peak hour conditions. The process involved comparing the actual traffic volumes collected at each intersection with the SimTraffic Volume Exited report. The models were considered validated when the field counts and model results were within the greater of ±10 percent or ±20 vehicles.

In order to meet the calibration targets, adjustments can be made to a number of simulation parameters including headway factors, actual link speeds, vehicle and driver options, mandatory lane change distances, and lost time values. When there are differences, changing one or more of these parameters often will bring the model values within the acceptable range of the vehicle counts.

Ten simulations of each peak period were performed and the average of the volumes for each turning movement was reported in a SimTraffic Performance Report. During both peak periods for each turning movement, the differences between the actual field counts and the average values from 10 simulation runs were within the acceptable range. Accordingly, no adjustments to the simulation parameters for these periods were made. The SimTraffic Performance Reports for the peak periods are provided in Appendix C.

Table 3-1 Existing 2021 Synchro Analyses Results

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	8.8	0.011	A	8.2	0.015
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.4**	**N/A**
	NB Approach	**C**	**16.7**	**0.084**	**B**	**11.5**	**0.04**
	WB Left	A	8.3	0.007	A	7.9	0.009
	WB Approach	**A**	**0.1**	**N/A**	**B**	**11.5**	**N/A**
	SB Approach	**D**	**28.9**	**0.312**	**C**	**17.4**	**0.162**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	10.9	0.011	B	10.4	0.031
	EB Thru/Right	F	64.5	0.99	C	22.2	0.665
	EB Approach	**F**	**63.9**	**N/A**	**C**	**21.7**	**N/A**
	NB Left	C	24.1	0.62	B	14.2	0.341
	NB Thru/Right	C	15.7	0.434	C	16.5	0.521
	NB Approach	**C**	**20.4**	**N/A**	**C**	**15.7**	**N/A**
	WB Left	B	13.4	0.204	B	12.8	0.255
	WB Thru/Right	C	19.2	0.523	B	15.0	0.438
	WB Approach	**C**	**17.7**	**N/A**	**B**	**14.2**	**N/A**
	SB Left	B	12.3	0.031	B	11.2	0.016
	SB Thru/Right	C	15.3	0.313	B	12.2	0.183
	SB Approach	**B**	**15.0**	**N/A**	**B**	**12.1**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

3.2 Future No Build Conditions

An evaluation of traffic impacts associated with the proposed residential development relies on an understanding of the future traffic conditions in the study area without development of the proposed site. Since traffic volumes in the study area would likely continue to increase with or without the traffic impacts generated by the project, it is necessary to understand the future conditions without the proposed development in order to compare the project impacts against baseline conditions. The future years examined include 2023 when Phase 1 of the proposed development would be expected to be constructed and occupied, 2032 when approximately half of the property would be expected to be developed and occupied, and 2042, which is when the entire development would be expected to be completed. The following sections describe the study area future no build 2023, 2032, and 2042 traffic impacts without the proposed residential project.

The traffic impact analysis for future no build 2023, 2032, and 2042 conditions began with the projection of turning movement volumes for the weekday morning and weekday afternoon peak hours. This process was accomplished by applying a traffic growth rate to the current traffic volumes to develop the future 2023, 2032, and 2042 traffic volumes and adding any traffic from approved developments in the area.

3.2.1 Background Traffic Growth

Traffic volumes on a roadway change over time depending upon shifts in population density, economic fluctuations, and a host of other factors. These changes occur independently of any proposed development in the area and must be considered in an impact analysis of future conditions. This change is usually known as background traffic growth, which can represent an increase or decrease in existing volumes over time. The Grand Valley Metro Council (GVMC) was contacted to obtain their growth rate projections for the study area. The GVMC Travel Demand Model shows an annual growth rate of 2.07% from 2021 to 2025 and an annual growth rate of 0.72% from 2025 to 2045 for the study area. These growth rates were utilized to project existing traffic volumes through the analysis years of 2023, 2032, and 2042.

3.2.2 Committed Developments

In addition to background traffic growth, it is important to account for traffic associated with specific developments in the vicinity of the study area that have been approved by the local jurisdiction. Committed developments are developments that have received site approval and are under construction, or will be under construction in the near future, and will impact the study area. Based on our discussions with Alpine Township and the City of Walker, the approved or committed projects that would impact the study area include; the English Hills multi-family housing development, the Northridge East IPUD development, and the remainder of the Walkerview development.

The English Hills multi-family housing development is located along the south side of 4 Mile Road, east of Bristol Avenue. English Hills is a multi-family development that will include 524 apartments.

Site access is provided via two driveways onto 4 Mile Road. Projected site generated traffic volumes for English Hills were taken from the *English Hills Multi-Family Housing Development Traffic Impact Study* conducted by RS Engineering, LLC. Refer to Appendix D for the English Hills trip generation and distribution data. Not all of the site generated traffic for English Hills is expected to impact the study area intersections for this project. Only the indicated percentage heading to/from the west on 4 Mile Road, west of Bristol, would potentially reach the study area.

The Northridge East IPUD development is an industrial planned unit development that consists of approximately 1.24 million square feet of industrial type development situated along Northridge Drive. The existing Amazon facility is part of this IPUD. All access for the future industrial uses will be provided via Northridge Drive, with connections to 4 Mile Road, Walker Avenue, and Fruit Ridge Avenue. The development area remaining for this IPUD area includes roughly 679,600 square feet of industrial use. Projected site generated traffic volumes for this IPUD were taken from the *Northridge East PUD Traffic Assessment* conducted by Wade Trim. Refer to Appendix D for the trip generation and distribution data. Not all of the site generated traffic for the Northridge East IPUD is expected to impact the study area for this project. Direct access to Walker Avenue and Fruit Ridge Avenue will limit the site generated trips along 4 Mile Road through the study area.

The last committed development to be included in the study area is the Walkerview development. Walkerview is an industrial development situated east of Walker Avenue and south of 4 Mile Road. The Walkerview site area includes approximately 243 acres that will be developed with light and heavy industrial uses as well as commercial parcels along the Walker Avenue frontage. Access to this overall development is provided via Northridge Drive to Bristol Avenue and Walker Avenue as well as Shippers Drive to 4 Mile Road. Several large parcels have already been developed. We contacted Moore & Bruggink to determine the remaining parcels yet to be developed and/or parcels that are under construction but not occupied yet. The development area remaining within Walkerview includes approximately 63 acres of general light industrial, 35 acres of general heavy industrial, and all of the commercial parcels except a hotel parcel. The *Walkerview Traffic Impact Study* conducted by Wade Trim was utilized to obtain the trip generation for the remaining undeveloped parcels and the trip distribution. Refer to Appendix D for the trip generation and distribution data taken from that report. Not all of the site generated traffic for Walkerview is expected to impact the study area for this project. The majority of trips are headed to/from the south on Walker Avenue and Bristol Avenue and do not go through a study area intersection.

Table 3-2 illustrates the overall trip generation summary for the approved background developments. It should be noted again that not all of the committed development site traffic provided in the table below is expected to impact the study area for this project. The actual committed development site generated traffic volumes through the study area are shown in Figures 3-4 and 3-5.

Table 3-2 Committed Development Trip Generation Summary						
	AM Peak Hour			PM Peak Hour		
Approved Development	Total	In	Out	Total	In	Out
English Hills	209	48	161	235	148	87
Northridge East	272	220	52	272	57	215
Walkerview	1053	812	242	1093	315	778

Figure 3-4 Committed Development AM Peak Hour Study Area Trips

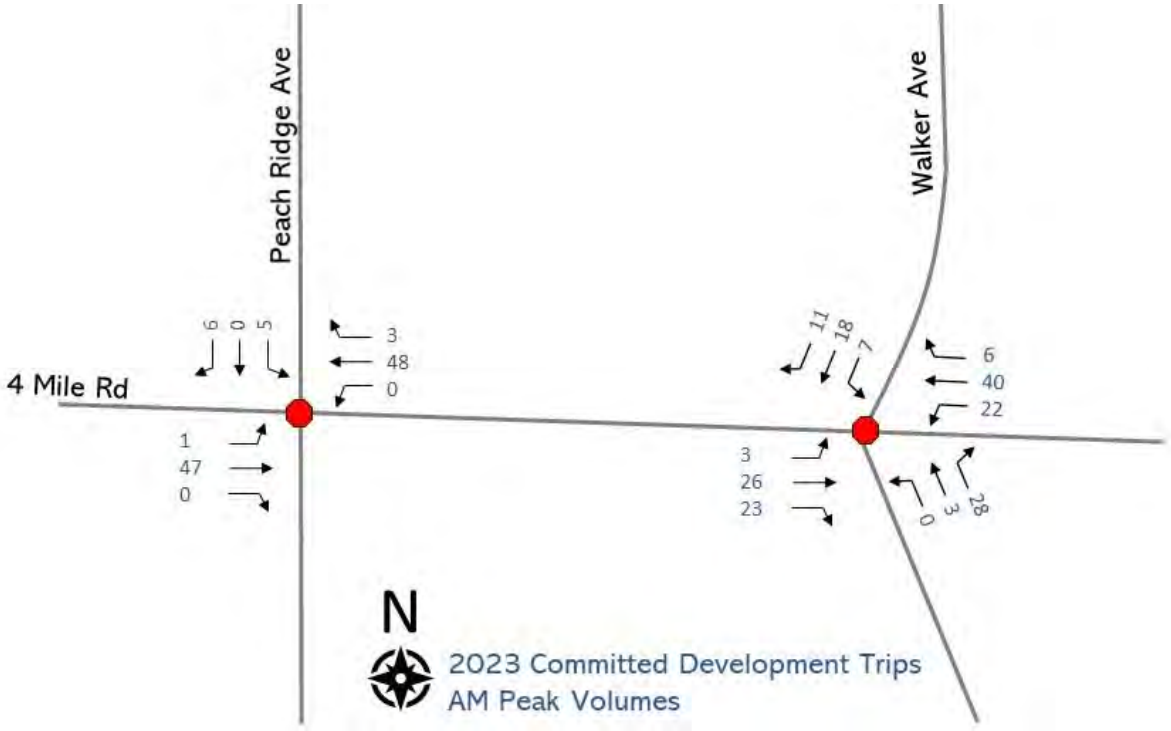
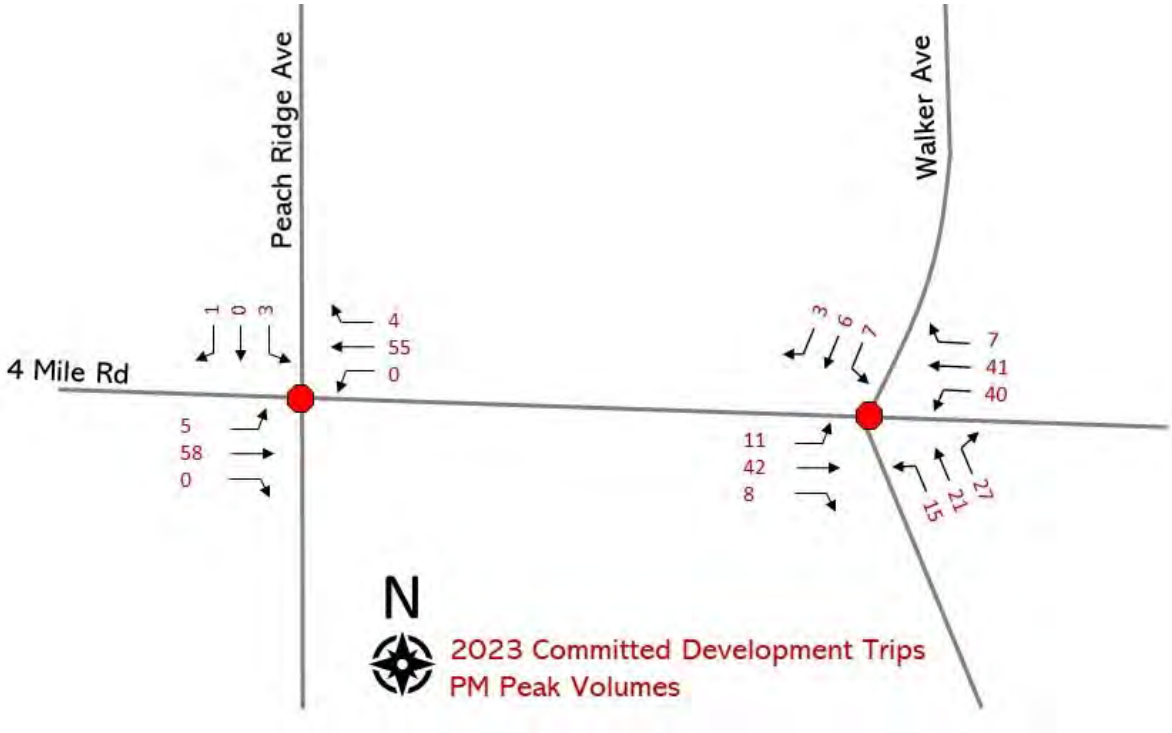


Figure 3-5 Committed Development PM Peak Hour Study Area Trips



3.2.3 Future No Build 2023 Traffic Volumes

Future traffic volumes were developed for the future 2023 no build scenario based on the background traffic growth and trips generated from the committed developments. The growth rate was applied to the existing 2021 traffic volumes to project the future 2023 no build volumes during the morning and afternoon peak hours. Trips at the study area intersections from the committed developments were then added to the future 2023 no build volumes. The future year 2023 weekday morning and weekday afternoon peak hour traffic volumes (including committed development trips) without the proposed project are shown in Figures 3-6 and 3-7.

Figure 3-6 Future No Build 2023 AM Peak Hour Traffic Volumes

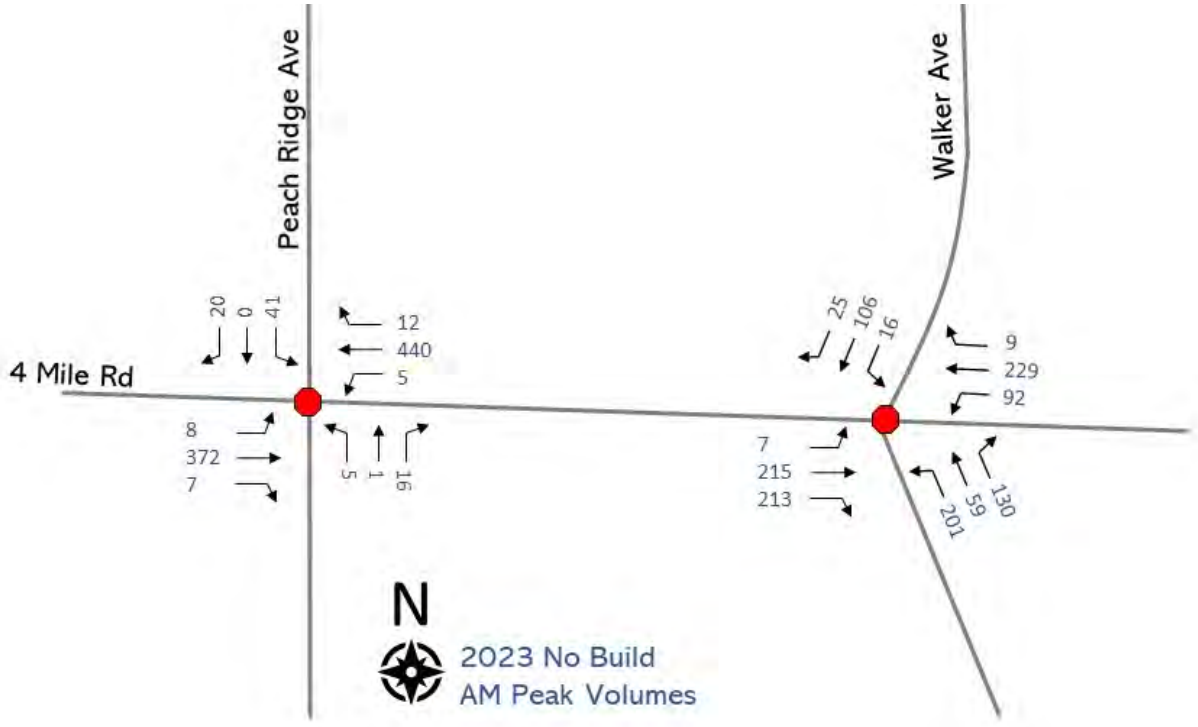
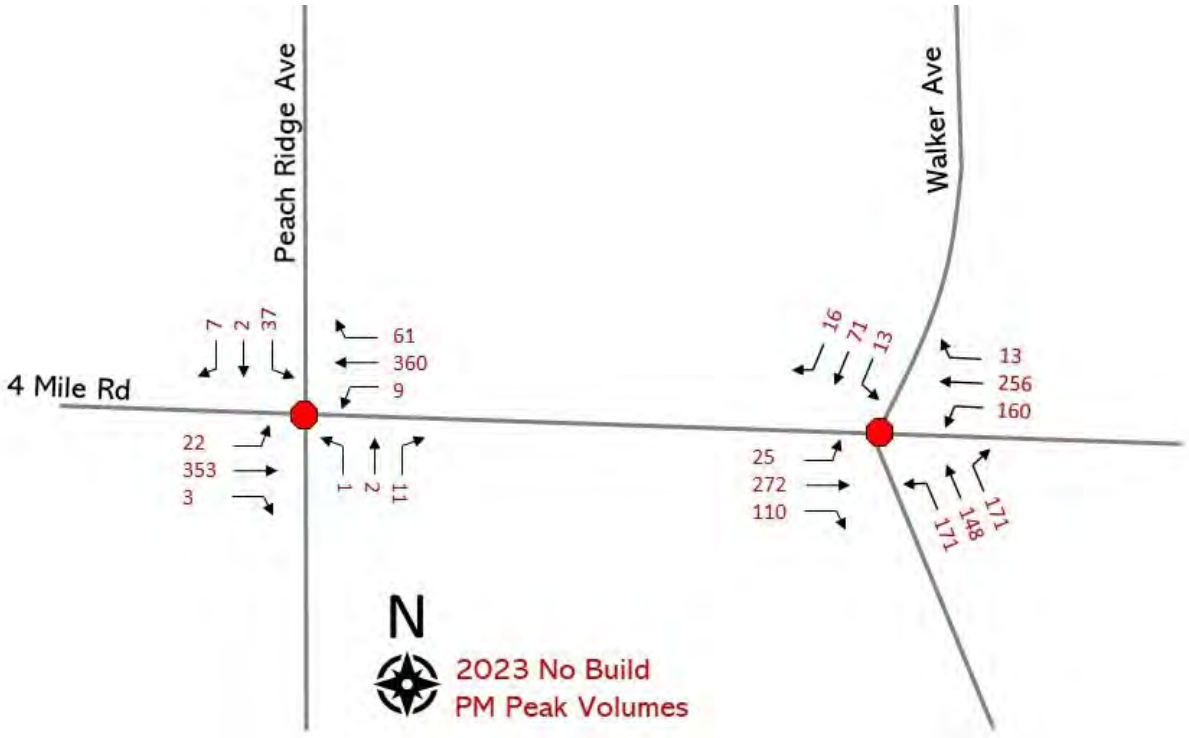


Figure 3-7 Future No Build 2023 PM Peak Hour Traffic Volumes



3.2.4 Future No Build 2023 Operational Analysis

The study area intersections were evaluated with the future 2023 no build traffic volumes to determine the future intersection operations without the proposed development project. Highway capacity analyses were conducted for existing geometric conditions and traffic control, and future 2023 no build traffic volumes (without the proposed development) and are summarized in Table 3-3. The existing mitigation of constructing an eastbound right-turn lane along 4 Mile Road at Walker Avenue was not included in the future 2023 no build conditions analysis.

Table 3-3 Future No Build 2023 Synchro Analyses Results

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	9.2	0.013	A	8.5	0.022
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**C**	**20.3**	**0.111**	**B**	**12.7**	**0.048**
	WB Left	A	8.6	0.008	A	8.1	0.009
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**E**	**46.5**	**0.508**	**C**	**22.7**	**0.237**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	11.8	0.025	B	11.6	0.065
	EB Thru/Right	F	173.4	1.282	E	48.2	0.901
	EB Approach	**F**	**170.8**	**N/A**	**E**	**46.0**	**N/A**
	NB Left	D	30.0	0.73	C	17.4	0.434
	NB Thru/Right	C	21.7	0.612	D	27.3	0.720
	NB Approach	**D**	**26.0**	**N/A**	**C**	**23.8**	**N/A**
	WB Left	C	16.0	0.311	C	16.5	0.394
	WB Thru/Right	D	30.2	0.751	C	22.5	0.620
	WB Approach	**D**	**26.2**	**N/A**	**C**	**20.3**	**N/A**
	SB Left	B	13.7	0.063	B	12.7	0.04
	SB Thru/Right	C	19.8	0.473	B	14.5	0.247
	SB Approach	**C**	**19.1**	**N/A**	**B**	**14.3**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The capacity analyses for the future 2023 no build conditions revealed that the study area intersection approaches and movements operate at an acceptable level of service during the weekday morning and weekday afternoon peak hours, with the exception of the following:

- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service E during the weekday morning peak hour.

- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning peak hour and a level of service E during the weekday afternoon peak hour.
- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning peak hour and a level of service E during the weekday afternoon peak hour.

Addition of an auxiliary right turn lane on the eastbound approach to Walker Avenue was again examined to mitigate the poor level of service for the eastbound shared through/right-turn movement. This improvement was recommended to mitigate the existing conditions. It was determined that the addition of a right-turn lane would not provide enough capacity to improve the eastbound through movement and overall approach level of service to an acceptable level during the weekday morning peak hour. Thus, other potential improvement options were examined in an effort to mitigate the poor level of service which included:

1. Removing the stop-control on the eastbound/westbound 4 Mile Road approaches and converting the intersection to two-way stop control. In addition, constructing auxiliary right turn lanes on the northbound and southbound Walker Avenue approaches.
2. Converting the intersection to pretimed traffic signal control under the existing lane configuration with a 60 second cycle length. Given the misalignment of the Walker Avenue approaches to the intersection, the northbound and southbound approaches were split-phased. No exclusive left-turn phasing was included.

The southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at level of service E during the weekday morning peak hour. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are necessary to mitigate these movements. The southbound queues are expected to be minimal under the future no build 2023 conditions and the volume to capacity ratio is 0.508, therefore no further mitigation should be required under the future 2023 no build conditions.

Highway capacity analyses were conducted for the two mitigation options presented for the Walker Avenue and 4 Mile Road intersection and future 2023 no build traffic volumes (without the proposed development) and are summarized in Table 3-4.

Mitigation option one included removing the stop-control on the 4 Mile Road approaches to Walker Avenue and converting the intersection to a two-way stop-controlled intersection. This option is expected to significantly improve delay for the eastbound/westbound directions, but this measure results in extreme delay for the northbound/southbound Walker Avenue approaches. The addition of auxiliary right turn lanes was investigated as a potential solution to improve delay on the

northbound/southbound Walker Avenue approaches, but the additional turn lanes did not provide enough capacity to result in an acceptable level of service for the approaches. Thus, the option to implement two-way stop-control at the intersection of Walker Avenue and 4 Mile Road was not considered for further analysis.

Table 3-4 Future No Build 2023 Synchro Analysis Results with Mitigation

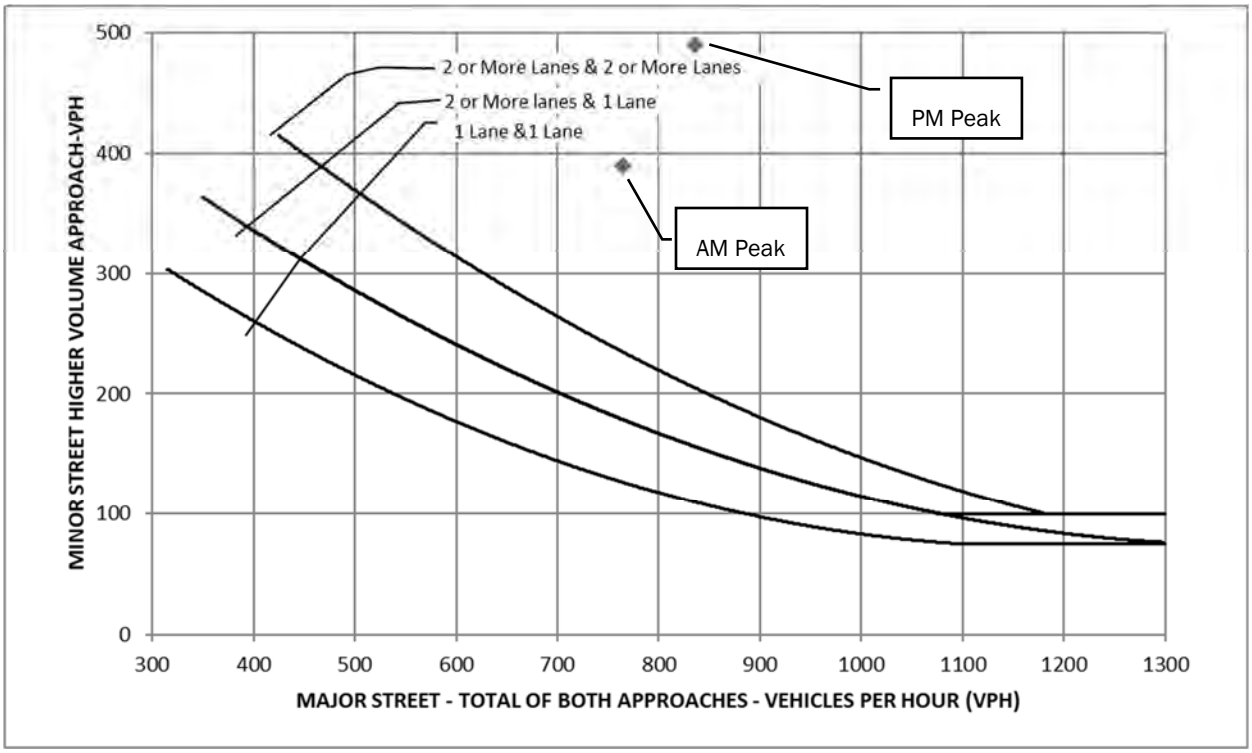
Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Walker Avenue NW & 4 Mile Road NW (TWSC)	EB Left	A	7.9	0.008	A	7.9	0.022
	EB Approach	**A**	**0.1**	**N/A**	**A**	**0.5**	**N/A**
	NB Left	F	2073.7	5.267	F	460.1	1.787
	NB Thru	D	32.9	0.392	F	82.3	0.851
	NB Right	B	13.3	0.295	B	12.3	0.275
	NB Approach	**F**	**1078.2**	**N/A**	**F**	**189.7**	**N/A**
	WB Left	A	9.2	0.122	A	8.7	0.15
	WB Approach	**A**	**2.6**	**N/A**	**A**	**3.3**	**N/A**
	SB Left	F	64.9	0.267	F	221.8	0.515
	SB Thru	F	82.1	0.823	E	42.4	0.466
	SB Right	B	10.1	0.046	A	9.9	0.024
	SB Approach	**F**	**68.0**	**N/A**	**F**	**60.5**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW (Signal)	EB Left	B	15.5	0.02	B	17.1	0.07
	EB Thru/Right	C	29.3	0.86	C	20.2	0.64
	EB Approach	**C**	**29.1**	**N/A**	**C**	**20.0**	**N/A**
	NB Left	C	28.3	0.66	B	19.8	0.38
	NB Thru/Right	C	29.1	0.66	C	29.9	0.74
	NB Approach	**C**	**28.7**	**N/A**	**C**	**26.4**	**N/A**
	WB Left	D	42.3	0.62	C	33.2	0.59
	WB Thru/Right	B	14.4	0.42	B	15.6	0.41
	WB Approach	**C**	**22.2**	**N/A**	**C**	**22.2**	**N/A**
	SB Left	C	24.1	0.10	C	23.8	0.07
	SB Thru/Right	D	48.7	0.78	C	30.6	0.45
	SB Approach	**D**	**46.0**	**N/A**	**C**	**29.7**	**N/A**
	Overall	**C**	**29.2**	**N/A**	**C**	**23.5**	**N/A**

Mitigation option two included installation of a three-phase traffic signal with split-phasing for the north/south approaches. The weekday morning and afternoon peak hour volumes were measured against the peak hour warrant thresholds for consideration of intersection traffic signal control as described in Section 4C.04 of the latest revision of the *Michigan Manual on Uniform Traffic Control Devices* (MMUTCD). Given that the posted speed limit on 4 Mile Road is above 40 mph, the 70% traffic volume thresholds may be used as shown in Figure 4C-4 of the MMUTCD. A plot of the

weekday morning and afternoon peak hour volumes against the warrant criteria is depicted in Figure 3-8 for the Walker Avenue and 4 Mile Road intersection.

As shown in Figure 3-8 for the Walker Avenue at 4 Mile Road intersection, the 2023 no build peak hour vehicle traffic volumes fall above the warrant threshold curve for two lane approaches on both the minor and major streets. The peak hour warrant requires that just one hour be met, thus a traffic signal may be considered based on peak hour traffic volumes at the intersection. Table 3-4 illustrates that a traffic signal would provide acceptable level of service at the intersection for all movements during the weekday morning and afternoon peak hours.

Figure 3-8 Peak Hour Signal Warrant Analysis – Walker Avenue at 4 Mile Road – 2023 No Build



3.2.5 Future No Build 2032 Traffic Volumes

Per the request of the Kent County Road Commission to analyze an approximate half-way point in the proposed development's construction timeline, future traffic volumes were developed for the future 2032 no build scenario based on the background traffic growth between 2023 and 2032. The background traffic growth over the nine-year period was added to the future 2023 no build traffic volumes to develop the future year 2032 no build traffic volumes. The future year 2032 weekday morning and weekday afternoon peak hour traffic volumes without the proposed project are shown in Figures 3-9 and 3-10. Developing the future year no build conditions allows an understanding of what improvements would be needed at the study area intersections in the future regardless of the proposed development.

Figure 3-9 Future No Build 2032 AM Peak Hour Traffic Volumes

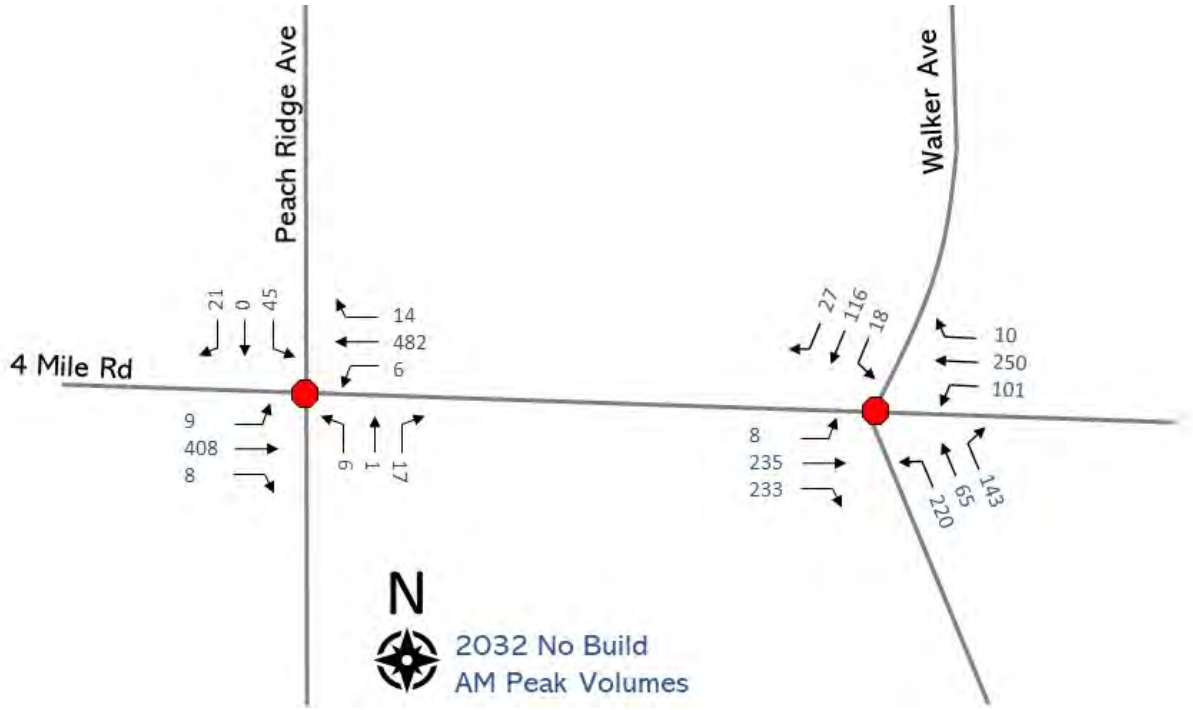
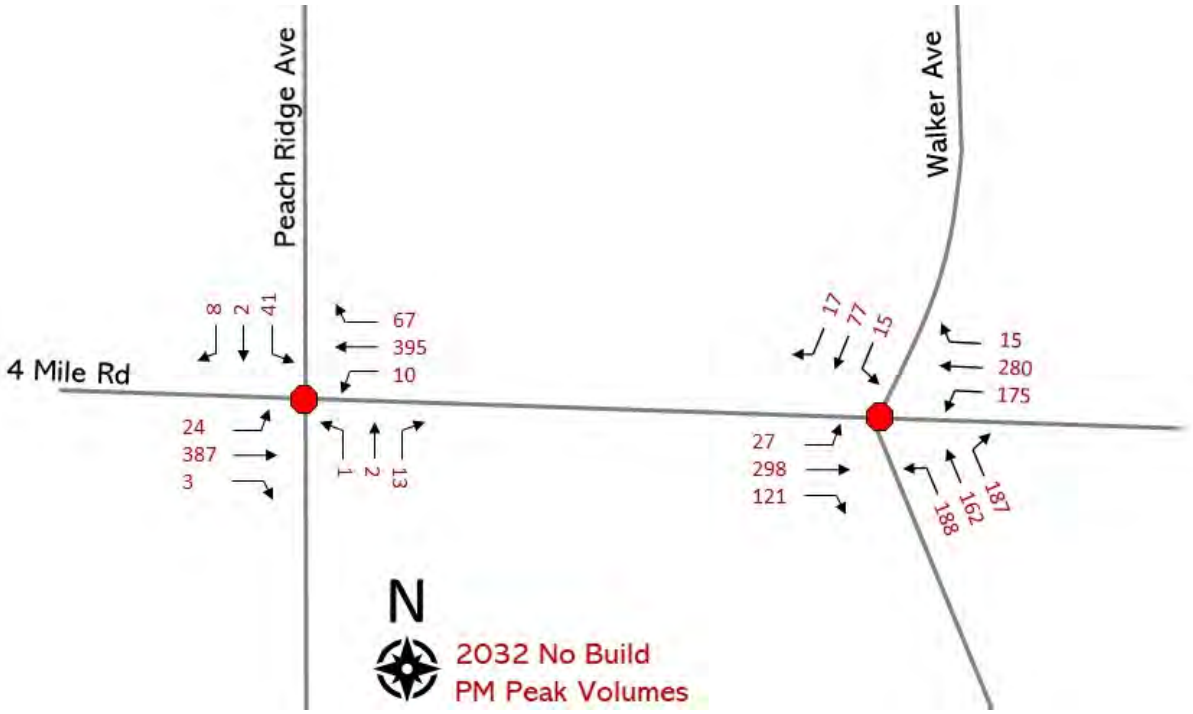


Figure 3-10 Future No Build 2032 PM Peak Hour Traffic Volumes



3.2.6 Future No Build 2032 Operational Analysis

The study area intersections were evaluated with the future 2032 no build traffic volumes to determine the future intersection operations for an approximate midway point without the proposed development project. Highway capacity analyses were conducted for existing geometric conditions and traffic control, and future 2032 no build traffic volumes (without the proposed development) and are summarized in Table 3-5. No improvement strategies discussed under existing or future no build 2023 conditions were assumed to be in place for the future no build 2032 conditions analyses.

Table 3-5 Future No Build 2032 Synchro Analyses Results

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	9.4	0.016	A	8.7	0.026
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**C**	**24.4**	**0.147**	**B**	**13.2**	**0.057**
	WB Left	A	8.8	0.01	A	8.2	0.011
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**F**	**73.0**	**0.674**	**D**	**27.1**	**0.301**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	12.2	0.028	B	12.1	0.072
	EB Thru/Right	F	253.4	1.47	F	82.3	1.031
	EB Approach	**F**	**249.3**	**N/A**	**F**	**78.1**	**N/A**
	NB Left	E	39.3	0.848	C	19.6	0.496
	NB Thru/Right	D	26.9	0.719	E	36.1	0.826
	NB Approach	**D**	**33.3**	**N/A**	**D**	**30.3**	**N/A**
	WB Left	C	17.7	0.359	C	18.3	0.454
	WB Thru/Right	E	40.9	0.869	D	27.9	0.715
	WB Approach	**D**	**34.4**	**N/A**	**C**	**24.3**	**N/A**
	SB Left	B	14.5	0.073	B	13.3	0.048
	SB Thru/Right	C	22.7	0.548	C	15.7	0.283
	SB Approach	**C**	**21.8**	**N/A**	**C**	**15.4**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The capacity analyses for the future 2032 no build conditions revealed that the study area intersection approaches and movements operate at an acceptable level of service during the weekday morning and weekday afternoon peak hours, with the exception of the following:

- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.

- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The northbound left-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday morning peak hour.
- The northbound shared through/right-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday afternoon peak hour.
- The westbound shared through/right-turn movement along 4 Mile Road to Walker Avenue will operate at a level of service E during the weekday morning peak hour.

Similar to the future no build 2023 conditions, the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at a poor level of service (LOS F with 73.0 seconds of average vehicle delay) during the weekday morning peak hour. As stated previously, it is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these movements. The expected V/C ratio of 0.674 is still well under 1.0 and queues are expected to be minimal for this approach with a 95th percentile queue length of 68 feet expected. The addition of an auxiliary left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road was investigated as a remedial measure in order to improve the delays and level of service for this approach.

An auxiliary left turn lane with 100 feet of storage on the southbound approach was investigated with the capacity results under future 2032 no build conditions shown in Table 3-6. As shown, the addition of the southbound left turn lane on Peach Ridge Avenue is expected to reduce average vehicle delay on the approach by 12.8 seconds during the weekday morning peak hour. However, the southbound left turn movement and overall approach will still operate at a level of service F. The results of the SimTraffic analysis indicate that a 95th percentile queue length of 54 feet may be expected during the weekday morning peak hour for the southbound left-turn movement. No further mitigation should be required at this intersection for future 2032 no build conditions.

At the intersection of Walker Avenue and 4 Mile Road, the mitigation measure of converting the intersection to traffic signal control was once again investigated for capacity under 2032 no build conditions (without the proposed development) with the results shown in Table 3-6. Similar to 2023 no build conditions, the traffic signal was analyzed as pretimed with a 60 second cycle length, and with the Walker Avenue approaches split-phased. Implementing traffic signal control at the intersection is expected to continue to result in acceptable levels of service for all movements under 2032 no build traffic volumes.

Table 3-6 Future No Build 2032 Synchro Analyses Results with Mitigation

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW (SB Left-turn Lane)	EB Left	A	9.4	0.016	A	8.7	0.026
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**C**	**24.4**	**0.147**	**B**	**13.2**	**0.057**
	WB Left	A	8.8	0.01	A	8.2	0.011
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Left	F	81.5	0.604	D	28.7	0.271
	SB Thru/Right	B	14.5	0.072	B	13.2	0.03
	SB Approach	**F**	**60.2**	**N/A**	**D**	**25.7**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW (Signal)	EB Left	B	15.2	0.03	B	15.9	0.07
	EB Thru/Right	C	32.7	0.9	B	18.7	0.65
	EB Approach	**C**	**32.4**	**N/A**	**B**	**18.6**	**N/A**
	NB Left	D	42.8	0.84	C	23.2	0.47
	NB Thru/Right	D	44.9	0.85	D	50.4	0.92
	NB Approach	**D**	**43.8**	**N/A**	**D**	**40.9**	**N/A**
	WB Left	D	54.5	0.75	C	33.4	0.62
	WB Thru/Right	B	14.0	0.44	B	14.3	0.41
	WB Approach	**C**	**25.3**	**N/A**	**C**	**21.4**	**N/A**
	SB Left	C	23.2	0.10	C	23.9	0.08
	SB Thru/Right	D	43.1	0.75	C	31.8	0.49
	SB Approach	**D**	**40.9**	**N/A**	**C**	**30.7**	**N/A**
	Overall	**D**	**35.2**	**N/A**	**C**	**27.9**	**N/A**

3.2.7 Future No Build 2042 Traffic Volumes

As the estimated build out year of the development project is 2042, future traffic volumes were developed for the future 2042 no build scenario in order to have an understanding of what improvements would be needed at the study area intersections without the proposed residential development. The future 2042 no build conditions were based on the additional background traffic growth between 2032 and 2042. The background traffic growth over the ten-year period was added to the future 2032 no build traffic volumes to develop the future year 2042 no build traffic volumes. The expected future year 2042 weekday morning and weekday afternoon peak hour traffic volumes without the proposed project are shown in Figures 3-11 and 3-12.

Figure 3-11 Future No Build 2042 AM Peak Hour Traffic Volumes

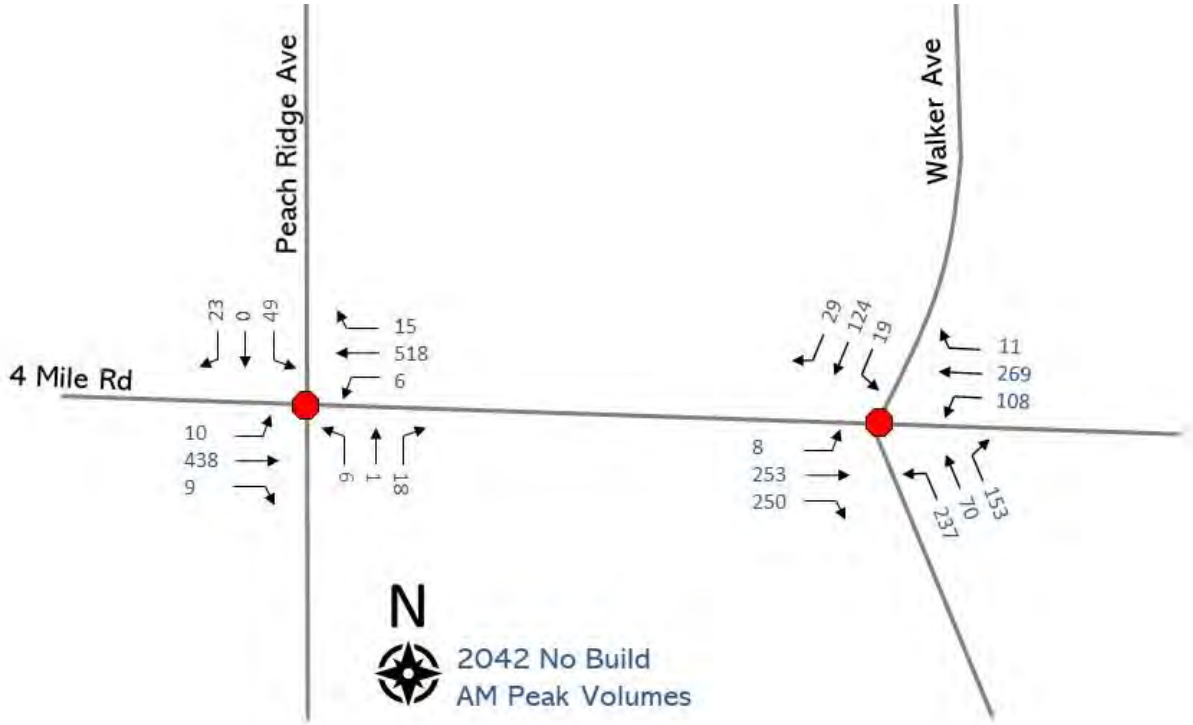
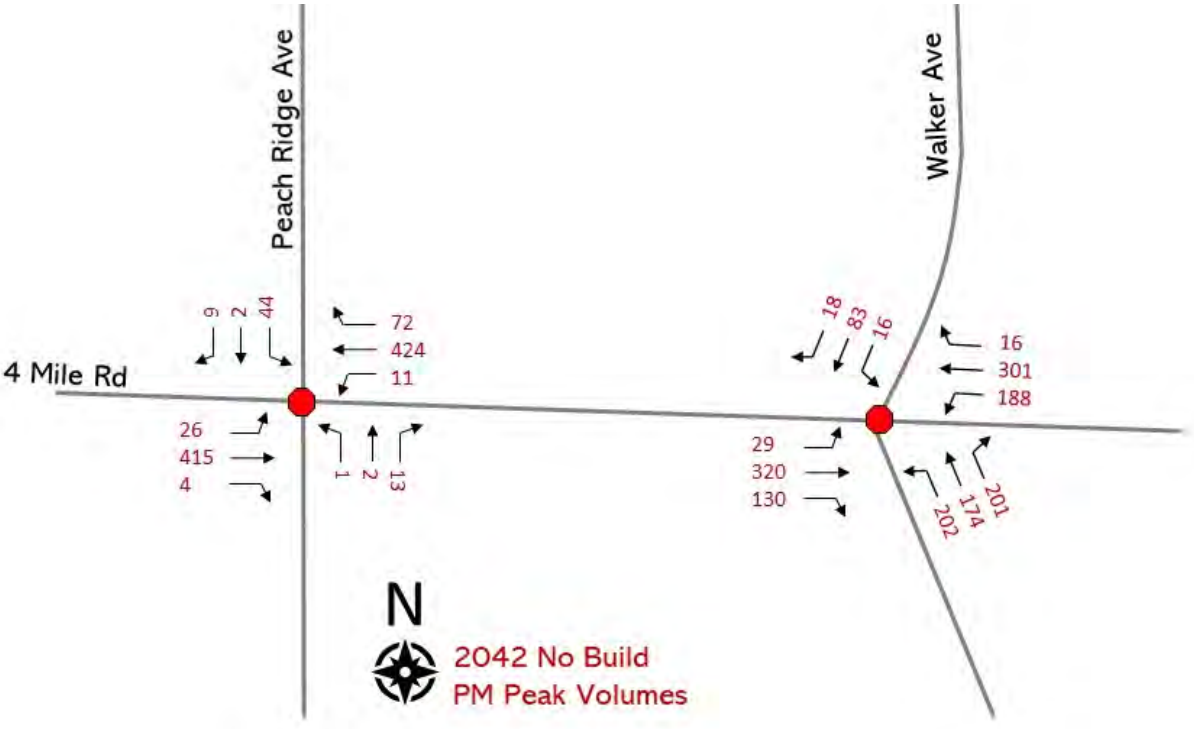


Figure 3-12 Future No Build 2042 PM Peak Hour Traffic Volumes



3.2.8 Future No Build 2042 Operational Analysis

The study area intersections were evaluated with the future 2042 no build traffic volumes to determine the future intersection operations that would be expected at the same time as full build out of the proposed development project. Highway capacity analyses were conducted for existing geometric conditions and traffic control, and future 2042 no build traffic volumes (without the proposed development) and are summarized in Table 3-7. No improvement strategies discussed under existing, future no build 2023 conditions, or future no build 2032 conditions were assumed to be in place for the future 2042 no build conditions analyses.

Table 3-7 Future No Build 2042 Synchro Analyses Results

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	9.7	0.019	A	8.8	0.029
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**D**	**27.8**	**0.175**	**B**	**13.8**	**0.061**
	WB Left	A	8.9	0.01	A	8.3	0.012
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**F**	**124.3**	**0.882**	**D**	**32.0**	**0.364**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	12.6	0.029	B	12.5	0.083
	EB Thru/Right	F	328.0	1.614	F	120.5	1.137
	EB Approach	**F**	**323.1**	**N/A**	**F**	**114.0**	**N/A**
	NB Left	F	50.6	0.951	C	21.8	0.554
	NB Thru/Right	D	32.5	0.814	E	48.6	0.919
	NB Approach	**E**	**41.8**	**N/A**	**E**	**39.2**	**N/A**
	WB Left	C	19.1	0.404	C	20.3	0.508
	WB Thru/Right	F	54.1	0.981	E	35.1	0.799
	WB Approach	**E**	**44.4**	**N/A**	**D**	**29.6**	**N/A**
	SB Left	C	15.1	0.083	B	13.8	0.053
	SB Thru/Right	D	25.5	0.618	C	16.8	0.317
	SB Approach	**C**	**24.4**	**N/A**	**C**	**16.4**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The capacity analyses for the future 2042 no build conditions revealed that several of the study area movements and approaches will operate at an unacceptable level of service during the weekday morning and weekday afternoon peak hours, which include:

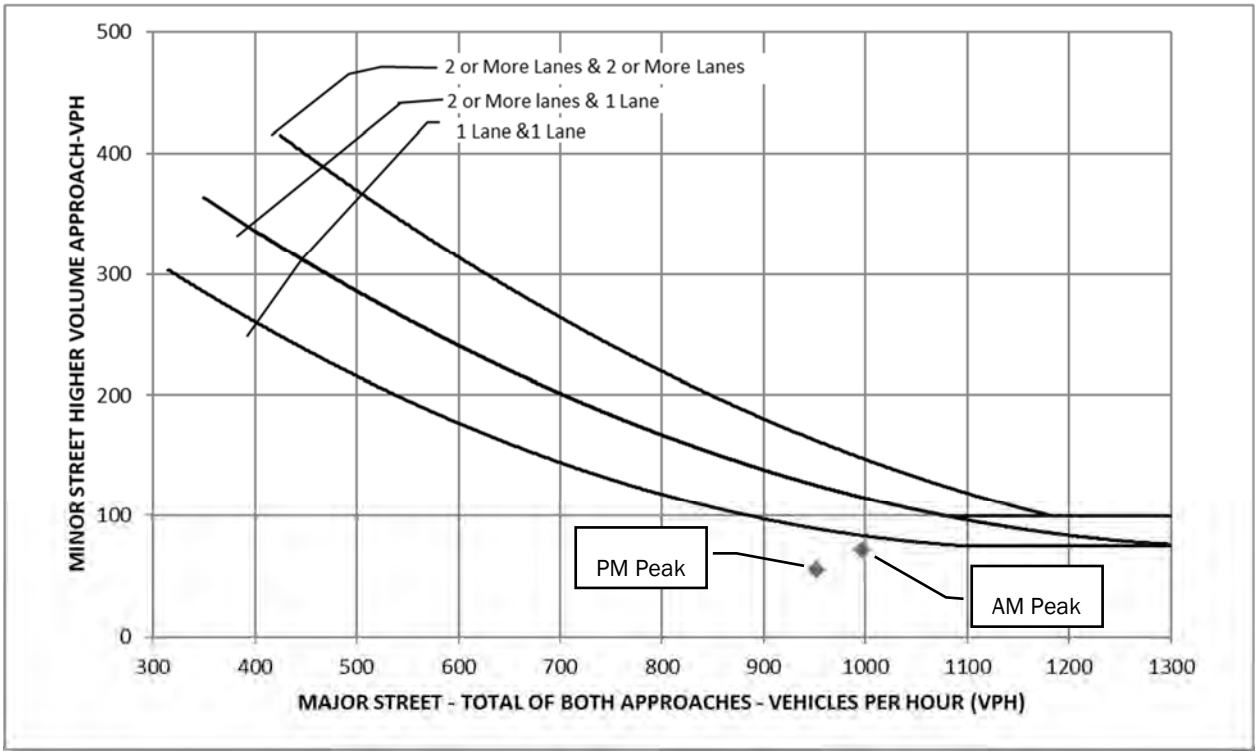
- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.

- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The northbound left-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The northbound shared through/right-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday afternoon peak hour.
- The overall northbound Walker Avenue approach to 4 Mile Road will operate at level of service E during both the weekday morning and afternoon peak hours.
- The westbound shared through/right-turn movement along 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning peak hour and a level of service E during the weekday afternoon peak hour.
- The overall westbound 4 Mile Road approach will operate at a level of service E during the weekday morning peak hour.

Similar to no build 2023 and no build 2032 conditions, the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at a poor level of service (LOS F with 124.3 seconds of average vehicle delay) during the weekday morning peak hour. The weekday morning and afternoon peak hour volumes were measured against the peak hour warrant thresholds for consideration of intersection traffic signal control. It was found that the intersection will fail to meet the peak hour signal warrant under the future 2042 no build peak hour volumes as indicated in Figure 3-13. Thus, as a secondary mitigation measure, installation of an auxiliary left turn lane with 100 feet of storage on the southbound approach was investigated with capacity results shown in Table 3-8.

The addition of the southbound left turn only lane on Peach Ridge Avenue is expected to reduce average vehicle delay on the overall approach by 30.9 seconds during the weekday morning peak hour. However, the southbound left turn movement and overall approach will still operate at a level of service F. The results of the SimTraffic analysis indicate that a 95th percentile queue length of 64 feet may be expected during the weekday morning peak hour for the southbound left-turn movement. As the traffic volumes remain relatively low on this approach, queuing minimal, and the volume to capacity ratio remains less than 1.0, no further mitigation should be required for the future 2042 no build conditions.

Figure 3-13 Peak Hour Traffic Signal Warrant –Peach Ridge Avenue at 4 Mile Road – 2042 No Build



At the intersection of Walker Avenue and 4 Mile Road, the mitigation measure of converting the intersection to traffic signal control was once again investigated for capacity under 2042 no build conditions (without the proposed development) with the results shown in Table 3-8. Similar to 2023 and 2032 no build conditions, the traffic signal was analyzed as pretimed with a 60 second cycle length, and with the Walker Avenue approaches split-phased. During the signalized analysis, it was also determined that an auxiliary right-turn lane on the eastbound approach would need to be added to provide acceptable levels of service for each movement and approach at the intersection. Installing a traffic signal at the intersection and adding an eastbound right turn lane will result in acceptable levels of service for all movements under the future 2042 no build conditions.

Table 3-8 Future No Build 2042 Synchro Analyses Results with Mitigation

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW (SB Left-turn Lane)	EB Left	A	9.7	0.019	A	8.8	0.029
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**D**	**27.8**	**0.175**	**B**	**13.8**	**0.061**
	WB Left	A	8.9	0.01	A	8.3	0.012
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Left	F	130.0	0.793	D	34.0	0.329
	SB Thru/Right	C	15.4	0.085	B	13.6	0.035
	SB Approach	**F**	**93.4**	**N/A**	**D**	**29.9**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW (Signal & EB Right-turn Lane)	EB Left	B	19.7	0.03	B	18.5	0.09
	EB Thru	B	18.3	0.53	B	17.2	0.51
	EB Right	C	20.9	0.62	B	13.9	0.25
	EB Approach	**B**	**19.6**	**N/A**	**B**	**16.4**	**N/A**
	NB Left	C	30.1	0.73	C	21.0	0.45
	NB Thru/Right	C	30.9	0.73	D	39.9	0.87
	NB Approach	**C**	**30.5**	**N/A**	**C**	**33.2**	**N/A**
	WB Left	C	29.9	0.51	C	31.7	0.62
	WB Thru/Right	B	18.9	0.56	B	16.7	0.48
	WB Approach	**C**	**21.9**	**N/A**	**C**	**22.3**	**N/A**
	SB Left	C	22.2	0.09	C	23.9	0.08
	SB Thru/Right	D	38.7	0.72	C	32.8	0.52
	SB Approach	**D**	**36.8**	**N/A**	**C**	**31.6**	**N/A**
	Overall	**C**	**25.5**	**N/A**	**C**	**25.0**	**N/A**

3.3 Projected Build Conditions

The traffic impact analysis for projected year build conditions with traffic from the proposed residential development began with the development of turning movement volumes for the weekday morning and weekday afternoon peak hours. These future traffic volumes were derived from developing the trip generation, distribution, and assignment for the proposed residential development and adding them to traffic volumes projected for build out years 2023, 2032, and 2042 without the proposed development. The proposed residential development is located at the existing Gracewil Country Club on 4 Mile Road between Walker Avenue and Peach Ridge Avenue in Alpine Township. The proposed development is expected to consist of 590 units of single and multi-family development and be fully constructed and occupied by 2042. This study examines the development in three phases: Phase 1 in 2023 as the opening year, the approximate mid-point of development in 2032, and full build out of the development in 2042.

In Phase 1, the proposed residential development is expected to have 91 units of single- and multi-family development. The dwelling units are split among three different building types as described below:

- 1 or 2-story houses, containing 1 dwelling unit per building;
  Count = 13 buildings (13 units)
- 1 or 2-story villas, containing 1 dwelling unit per building;
  Count = 26 buildings (26 units)
- 2-story townhomes, containing 4 dwelling units per building;
  Count = 13 buildings (52 units)

At the approximate mid-point of development in 2032, the proposed residential development is expected to have at total of 322 units of single- and multi-family development. The dwelling units are split among four different building types as described below:

- 1 or 2-story houses, containing 1 dwelling unit per building;
  Count = 138 buildings (138 units)
- 1 or 2-story villas, containing 1 dwelling unit per building;
  Count = 48 buildings (48 units)
- 1 or 2-story duplexes, containing 2 dwelling unit per building;
  Count = 26 buildings (52 units)
- 2-story townhomes, containing 4 dwelling units per building;
  Count = 21 buildings (84 units)

At full buildout in 2042, the proposed residential development is expected to have a total of 590 units of single- and multi-family development. The dwelling units are split among four different building types as described below:

- 1 or 2-story houses, containing 1 dwelling unit per building; Count = 307 buildings (307 units)
- 1 or 2-story villas, containing 1 dwelling unit per building; Count = 105 buildings (105 units)
- 1 story duplexes, containing 2 dwelling units per building; Count = 47 buildings (94 units)
- 2-story townhomes, containing 4 dwelling units per building; Count = 21 buildings (84 units)

3.3.1 Site Access

Access to the development is proposed to be served via three full movement access points, with one access point each on 4 Mile Road, Walker Avenue, and Peach Ridge Avenue. The access point on 4 Mile Road will be constructed during Phase 1 of development, while the access point on Walker Avenue will be constructed by the mid-point of development in 2032, and the access point on Peach Ridge Avenue will be constructed for full development build out in 2042.

3.3.2 Trip Generation

New trips to be generated by the proposed residential development were estimated based on information and procedures contained in the Institute of Transportation Engineer's (ITE) report *Trip Generation Manual, Eleventh Edition*, September 2021. Single Family Detached Housing, Land Use Code 210, was utilized to estimate the morning and afternoon trip generation for the dwelling units in the houses and villas, while Single-Family Attached Housing, Land Use Code 215, was utilized for the morning and afternoon trip generation for the dwelling units in the duplexes and townhomes. Tables 3-9 through 3-11 provides the morning and afternoon peak hour trip generation summaries for each phase under investigation.

Table 3-9 Gracewil Residential Trip Generation – Phase 1 2023

Land Use	Size	AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out
Single Family Detached Housing	39 units	32	8	24	41	26	15
Single Family Attached Housing	52 units	21	6	15	27	15	12
Total	**91 units**	**53**	**14**	**39**	**68**	**41**	**27**

Table 3-10 Gracewil Residential Trip Generation – Mid-Point 2032							
		AM Peak Hour			PM Peak Hour		
Land Use	Size	Total	In	Out	Total	In	Out
Single Family Detached Housing	186 units	131	34	97	178	112	66
Single Family Attached Housing	136 units	65	20	45	78	44	34
Total	**322 units**	**196**	**54**	**142**	**256**	**156**	**100**

Table 3-11 Gracewil Residential Trip Generation – Full Buildout 2042							
		AM Peak Hour			PM Peak Hour		
Land Use	Size	Total	In	Out	Total	In	Out
Single Family Detached Housing	412 units	271	70	201	376	237	139
Single Family Attached Housing	178 units	87	27	60	103	59	44
Total	**590 units**	**358**	**97**	**261**	**479**	**296**	**183**

3.3.3 Directional Distribution

Trip distribution for the site traffic was determined based on existing peak hour traffic volumes on the study area roadways. The resultant trip distribution pattern for the proposed development as approved by the KCRC is as follows:

- To/from the west on 4 Mile Road 31%
- To/from the east on 4 Mile Road 27%
- To/from the north on Peach Ridge Avenue 3%
- To/from the north on Walker Avenue 6%
- To/from the south on Walker Avenue 33%.

3.4 Projected 2023 Build Conditions

The opening year of the development in 2023 was examined first. It is expected that a total of 91-units would be constructed and occupied for the future build 2023 conditions analysis. The examination of the future build 2023 conditions began with the projection of turning movement volumes for the weekday morning and weekday afternoon peak hours. This process was accomplished by adding the estimated number of weekday morning and afternoon peak hour trips from Phase 1 of the proposed development to the future 2023 no build traffic volumes.

3.4.1 Projected 2023 Build Traffic Volumes

The estimated number of weekday morning and afternoon peak hour trips was distributed to the surrounding roadway network using the distributions discussed in the previous section. Figures 3-14 and 3-15 show the corresponding site generated traffic volumes distributed on the study area network for Phase 1 of the development.

Projected site generated trips were added to the future no build 2023 traffic volumes to yield the Projected 2023 Build Conditions. These traffic volumes represent the 2.07% per year growth rate over existing traffic volumes, estimated traffic from committed developments, and the estimated site traffic from Phase 1 of the development. Figures 3-16 and 3-17 illustrate the weekday morning and weekday afternoon peak hour traffic volumes for the projected 2023 build conditions.

Access Configuration

Michigan Department of Transportation (MDOT) turn lane warrants were examined with the site generated traffic to determine if a right or left turn lane would be needed along 4 Mile Road at the proposed site access. Based on the volume warrants, a right turn taper only is recommended at the proposed site access on 4 Mile Road. Also, based on the volume warrants, a left-turn lane on 4 Mile Road is not warranted at the proposed site access.

The proposed driveway approach to 4 Mile Road was examined with one exiting right-turn lane, one exiting left-turn lane, and one inbound lane given that the proposed approach width is approximately 38 feet. The site plan indicates that the proposed access will have a right-turn taper that will provide approximately 20 feet of additional width on the westbound approach to the site driveway. This will allow enough room for vehicles to shift outside of the primary travel lane to perform a right turn to the site and was modeled as such in Synchro.

Figure 3-14 Projected 2023 Build AM Peak Hour Site Generated Trips

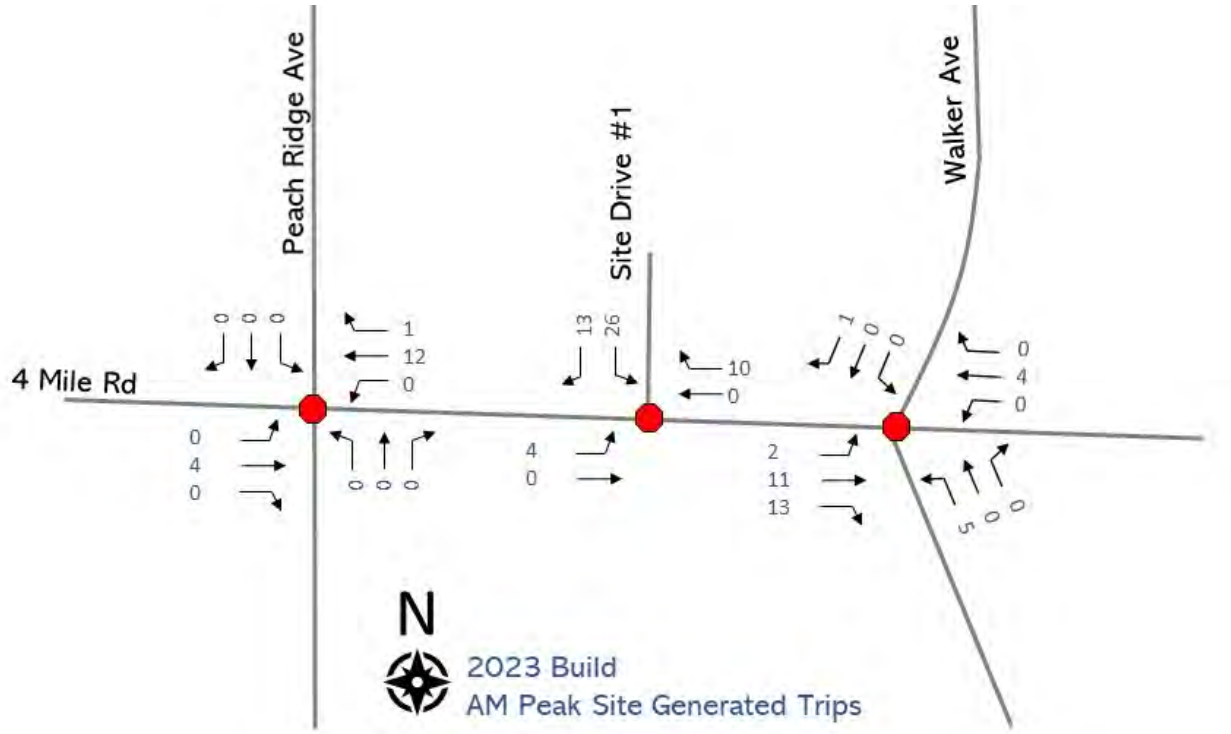


Figure 3-15 Projected 2023 Build PM Peak Hour Site Generated Trips

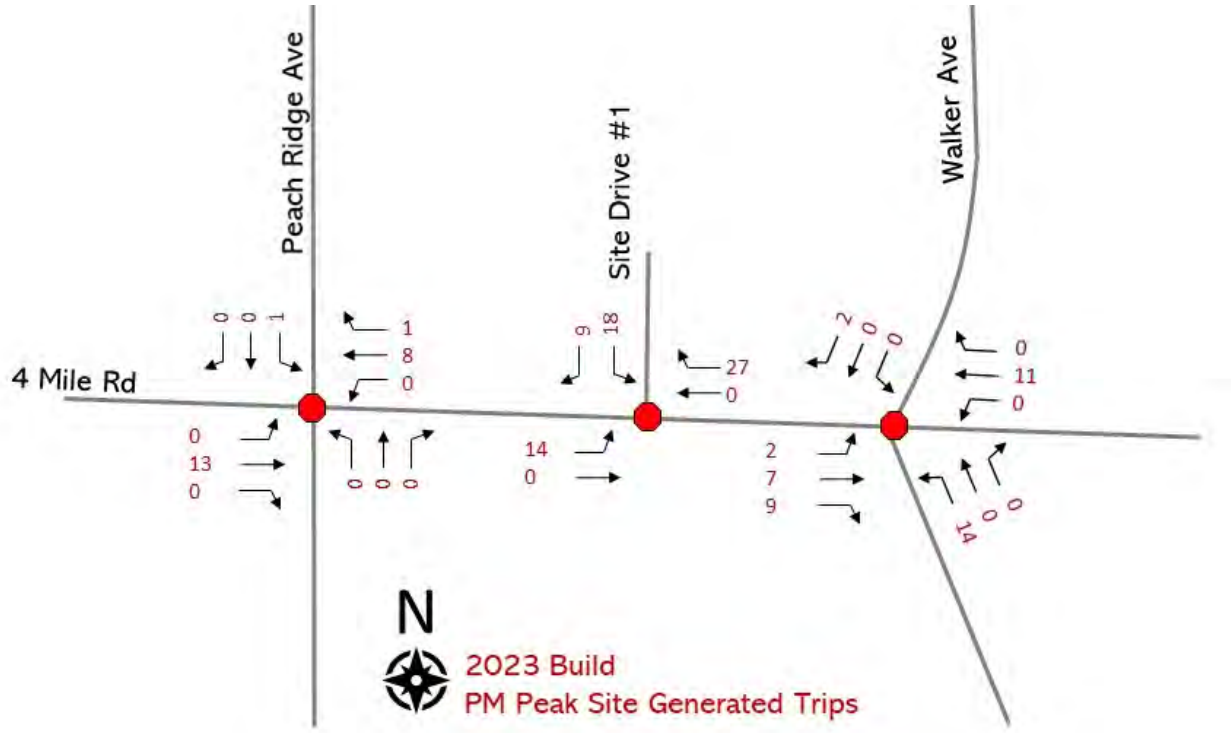


Figure 3-16 Projected 2023 Build AM Peak Hour Traffic Volumes

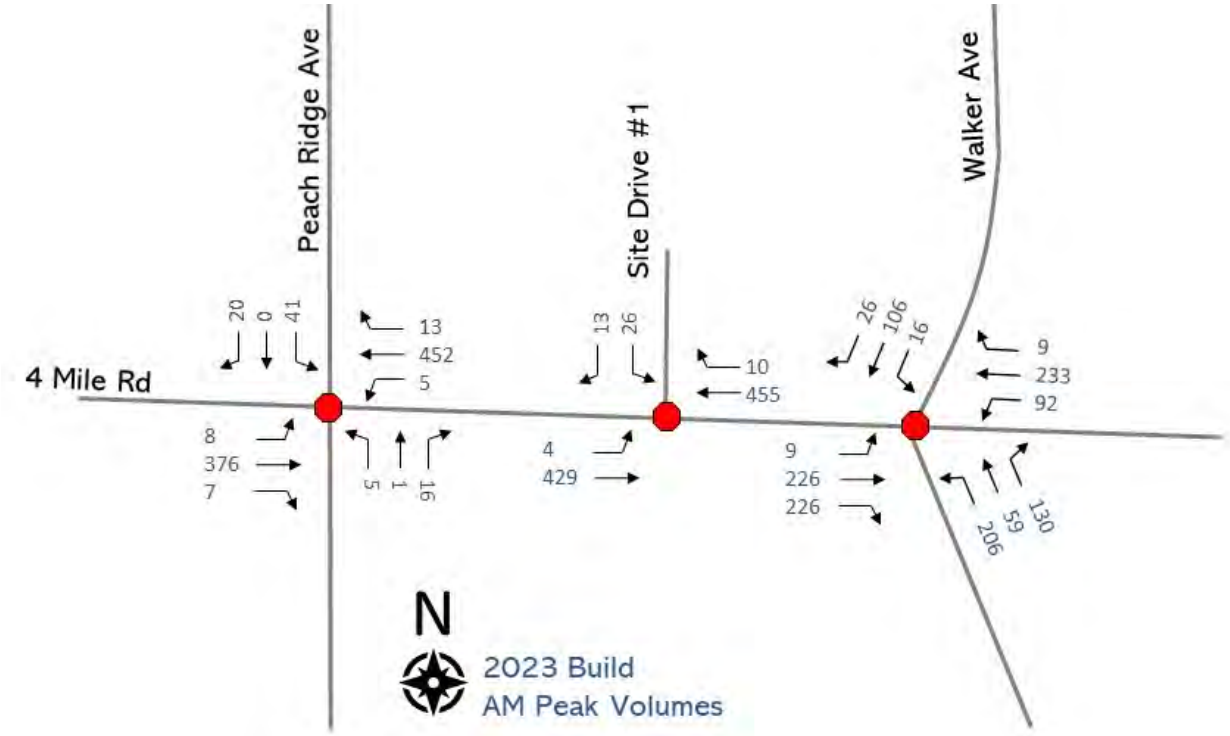
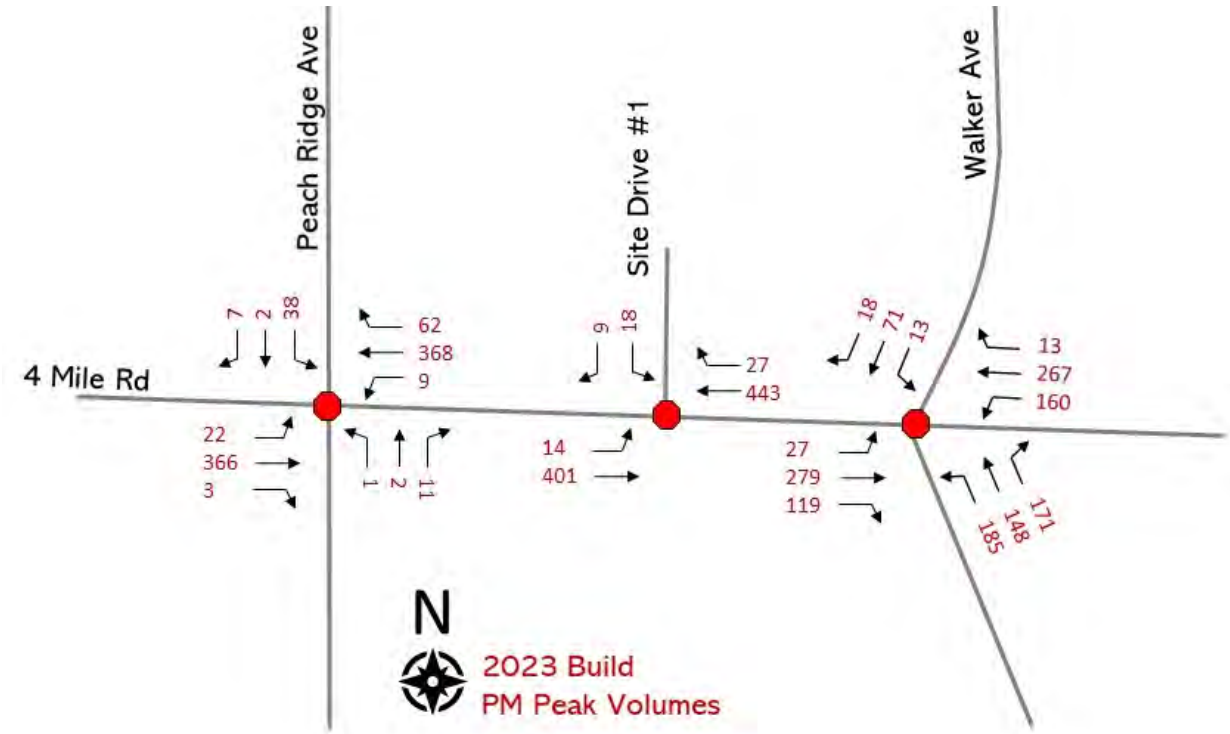


Figure 3-17 Projected 2023 Build PM Peak Hour Traffic Volumes



3.4.2 Projected 2023 Build Operational Analysis

The study area intersections were evaluated with the future 2023 build traffic volumes to determine the future intersection operations with the proposed residential development project. Highway capacity analyses were conducted for the existing geometric conditions and traffic control, and 2023 projected build traffic volumes, and are summarized in Table 3-12. None of the mitigation options discussed under future no build conditions were assumed to be in place for the projected 2023 build conditions analyses as to provide a future comparison with and without the proposed development traffic.

The capacity analysis for the projected 2023 build conditions revealed that the following approaches/ movements will operate with unacceptable levels of service:

- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service E during the weekday morning peak hour.
- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning and afternoon peak hours.
- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning and afternoon peak hours.

These are the same capacity issues that were identified under the future 2023 no build conditions as requiring potential improvements in the future without the proposed development. Comparing the projected build results to the future no build results (without any mitigation) show that the impact from the additional residential traffic is minimal with very small increases in overall delays, except for the eastbound shared through/right turn movement and overall eastbound approach from 4 Mile Road to Walker Avenue during the morning peak hour, where an increase in average vehicle delay of 34.1 seconds and 32.9 seconds is expected, respectively.

The capacity analyses for the proposed site driveway access to 4 Mile Road revealed that all movements are expected to operate acceptably for Phase 1 of the development in 2023.

Table 3-12 Projected 2023 Build Synchro Analyses Results							
Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	9.2	0.014	A	8.5	0.023
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**C**	**20.8**	**0.114**	**B**	**13.0**	**0.049**
	WB Left	A	8.6	0.008	A	8.1	0.009
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**E**	**49.4**	**0.527**	**C**	**23.6**	**0.251**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	11.9	0.03	B	11.8	0.071
	EB Thru/Right	F	207.5	1.352	F	58.5	0.951
	EB Approach	**F**	**203.7**	**N/A**	**F**	**55.5**	**N/A**
	NB Left	D	31.9	0.763	C	18.8	0.476
	NB Thru/Right	C	22.2	0.624	D	28.7	0.735
	NB Approach	**D**	**27.3**	**N/A**	**D**	**25.1**	**N/A**
	WB Left	C	16.3	0.316	C	16.9	0.403
	WB Thru/Right	D	32.0	0.775	C	24.7	0.658
	WB Approach	**D**	**27.7**	**N/A**	**C**	**21.9**	**N/A**
	SB Left	B	13.9	0.065	B	12.9	0.041
	SB Thru/Right	C	20.2	0.486	B	15.0	0.257
	SB Approach	**C**	**19.5**	**N/A**	**B**	**14.7**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #1 & 4 Mile Road NW	EB Left	A	8.8	0.006	A	8.5	0.015
	EB Approach	**A**	**0.1**	**N/A**	**A**	**0.3**	**N/A**
	SB Left	D	27.1	0.148	C	18.8	0.07
	SB Right	B	12.5	0.028	B	11.2	0.017
	SB Approach	**C**	**22.2**	**N/A**	**C**	**16.3**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The southbound approach from Peach Ridge Avenue to 4 Mile Road will begin to operate unacceptably under 2023 traffic volumes during the morning peak hour with or without the proposed development. When comparing the future build conditions to the future no build conditions, the increase in delay is very minor (2.9 seconds). It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal (a 95th percentile queue length of 62 feet is expected), no improvements are necessary to mitigate these movements. The southbound queues are expected to be minimal under the projected build 2023 conditions and the volume to capacity ratio is 0.527, therefore no mitigation should be required under the projected 2023 build conditions at this intersection.

The eastbound 4 Mile Road through/right turn movement at Walker Avenue, as well as the overall eastbound approach, will also begin to operate unacceptably under 2023 traffic volumes during the morning and afternoon peak hours with or without the proposed development. When comparing the future build conditions to the future no build conditions, the increase in delay is very minor except for the overall eastbound approach from 4 Mile Road to Walker Avenue during the morning peak hour, where an increase in average vehicle delay of 32.9 seconds is expected for the overall approach and a vehicle delay of 34.1 seconds is expected for the shared through/right turn movement. Converting the intersection to traffic signal control was again examined to mitigate the eastbound approach delay that is expected to occur during the morning peak hour. The results of the capacity analyses for the future build 2023 conditions under traffic signal control, as recommended under the no build conditions, are summarized in Table 3-13.

Table 3-13 Projected 2023 Build Synchro Analyses Results with Mitigation

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Walker Avenue NW & 4 Mile Road NW (Signal)	EB Left	B	14.8	0.03	B	16.5	0.07
	EB Thru/Right	C	29.5	0.87	B	19.4	0.64
	EB Approach	**C**	**29.2**	**N/A**	**B**	**19.2**	**N/A**
	NB Left	C	32.6	0.73	C	21.6	0.44
	NB Thru/Right	C	32.7	0.71	C	34.1	0.79
	NB Approach	**C**	**32.6**	**N/A**	**C**	**29.5**	**N/A**
	WB Left	D	43.4	0.63	C	31.9	0.57
	WB Thru/Right	B	13.6	0.41	B	14.9	0.41
	WB Approach	**C**	**21.8**	**N/A**	**C**	**21.1**	**N/A**
	SB Left	C	24.1	0.10	C	23.8	0.07
	SB Thru/Right	D	49.2	0.79	C	31.1	0.46
	SB Approach	**D**	**46.5**	**N/A**	**C**	**30.1**	**N/A**
	Overall	**C**	**30.4**	**N/A**	**C**	**24.0**	**N/A**

As shown in Table 3-13, signalizing the intersection of Walker Avenue and 4 Mile Road, which is also needed for the 2023 no build condition, would provide acceptable levels of service to all movements at the intersection with the proposed residential development.

3.5 Projected 2032 Build Conditions

An evaluation of the study area at an approximate mid-point of development was requested by the Kent County Road Commission. It is approximated that a total of 322-units would be constructed and occupied for the mid-point analysis in 2032. The mid-point of the development also coincides with the construction of the Walker Avenue driveway resulting in two full access driveways for the

development; one to 4 Mile Road and one to Walker Avenue. The following sections describe future 2032 traffic impacts on the study area at the mid-point of the proposed residential development.

The examination of the future build 2032 conditions began with the projection of turning movement volumes for the weekday morning and weekday afternoon peak hours. This process was accomplished by adding the estimated number of weekday morning and afternoon peak hour trips from the proposed development to the future 2032 no build traffic volumes.

3.5.1 Projected Build 2032 Traffic Volumes

Future traffic volumes were developed for the projected 2032 build scenario based on the background traffic growth (including committed developments) and estimated trips generated from the proposed residential development. The expected trips generated by the proposed residential development as shown in Table 3-10 were distributed to the surrounding roadway network using the distributions indicated in Section 3.3.3. Figures 3-18 and 3-19 show the corresponding site generated traffic volumes distributed on the study area network at the approximate mid-point of the development.

Projected site generated trips were added to the future no build 2032 traffic volumes to yield the projected 2032 build conditions. These traffic volumes represent the 2.07% per year growth rate between 2023 to 2025 and the 0.72% growth rate between 2025 to 2032, estimated traffic from committed developments, and the estimated site traffic at the approximate mid-point of the development. Figures 3-20 and 3-21 illustrate the weekday morning and weekday afternoon peak hour traffic volumes for the projected 2032 build conditions.

Figure 3-18 Projected 2032 Build AM Peak Hour Site Generated Trips

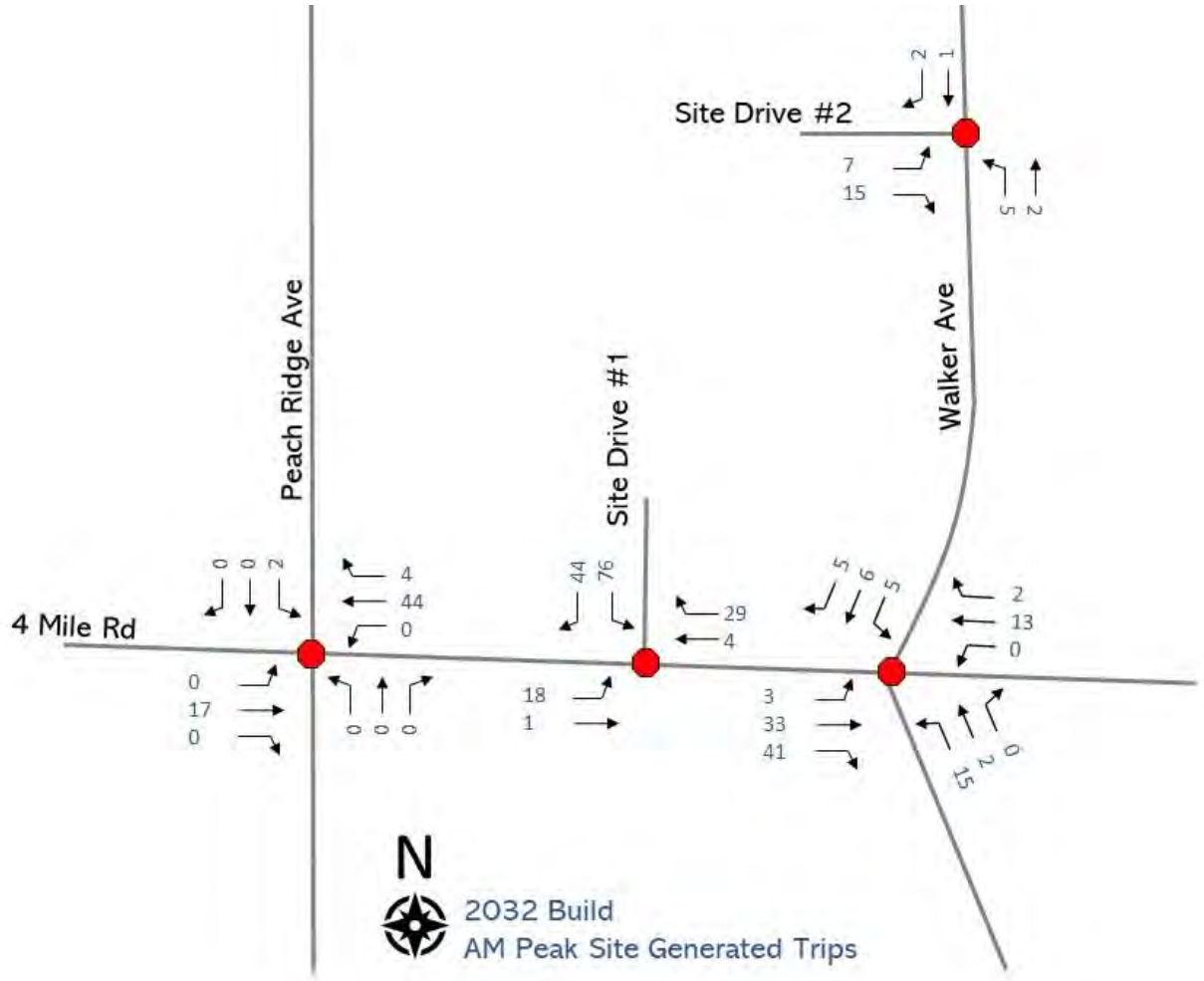


Figure 3-19 Projected 2032 Build PM Peak Hour Site Generated Trips

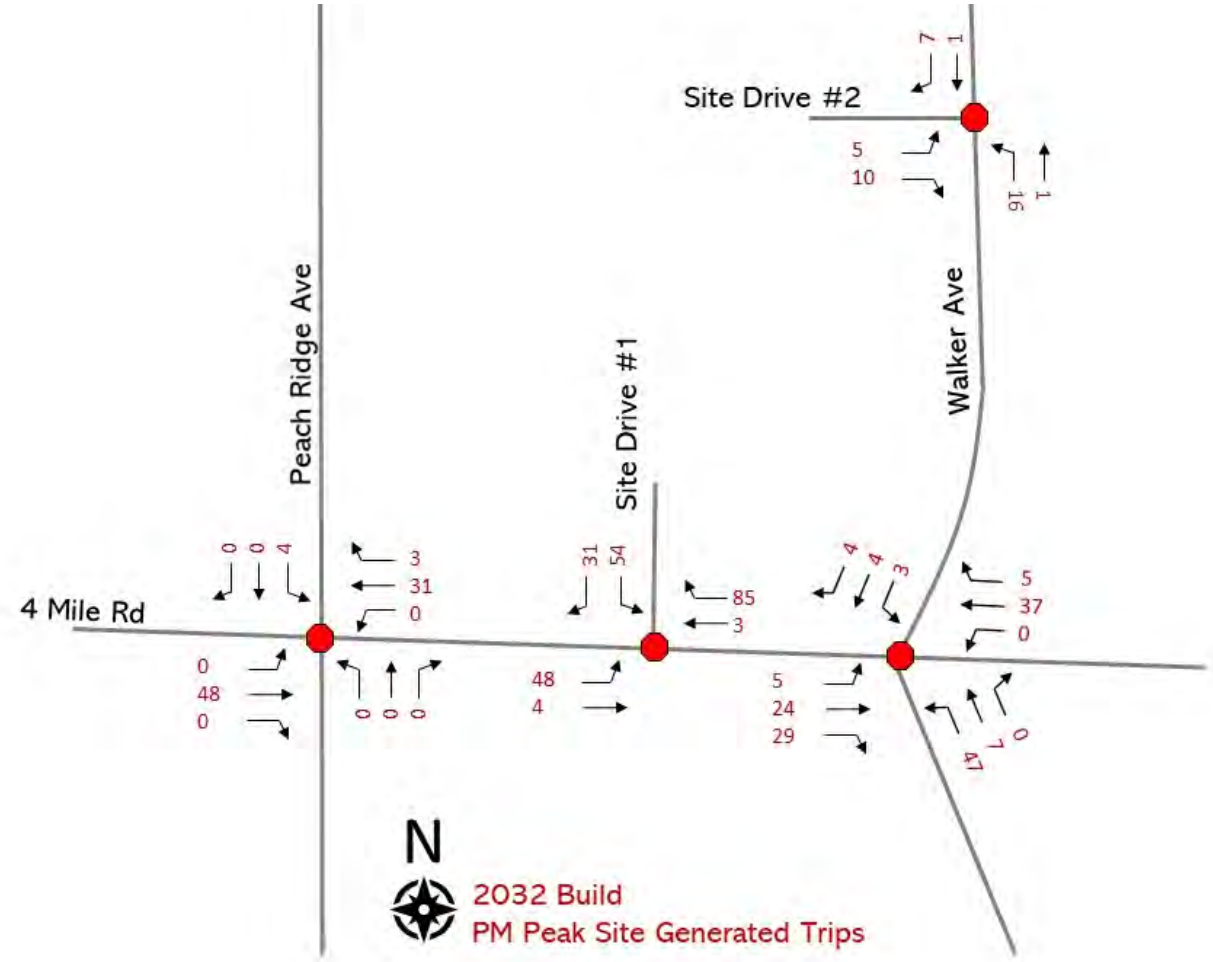


Figure 3-20 Projected 2032 Build AM Peak Hour Traffic Volumes

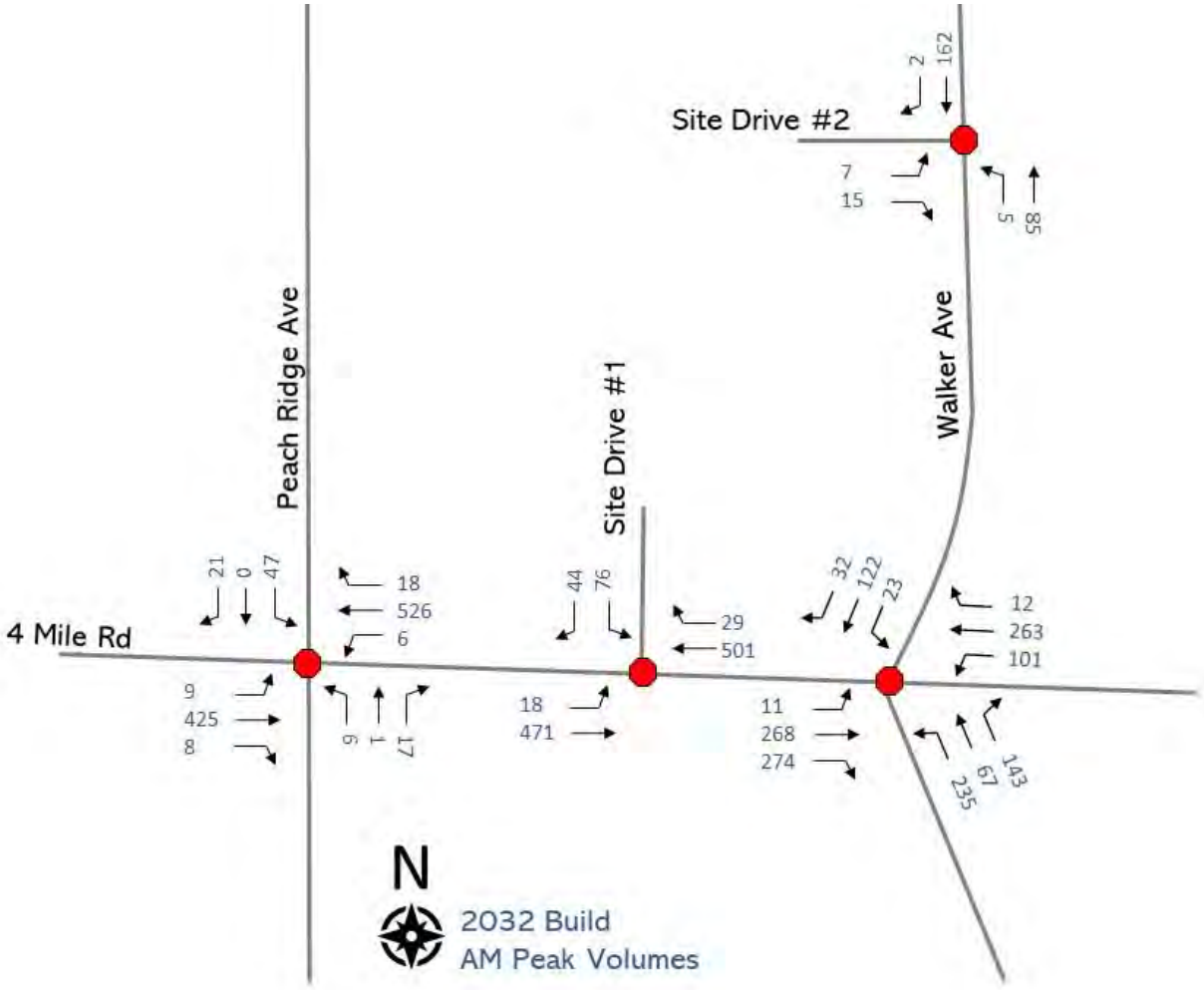
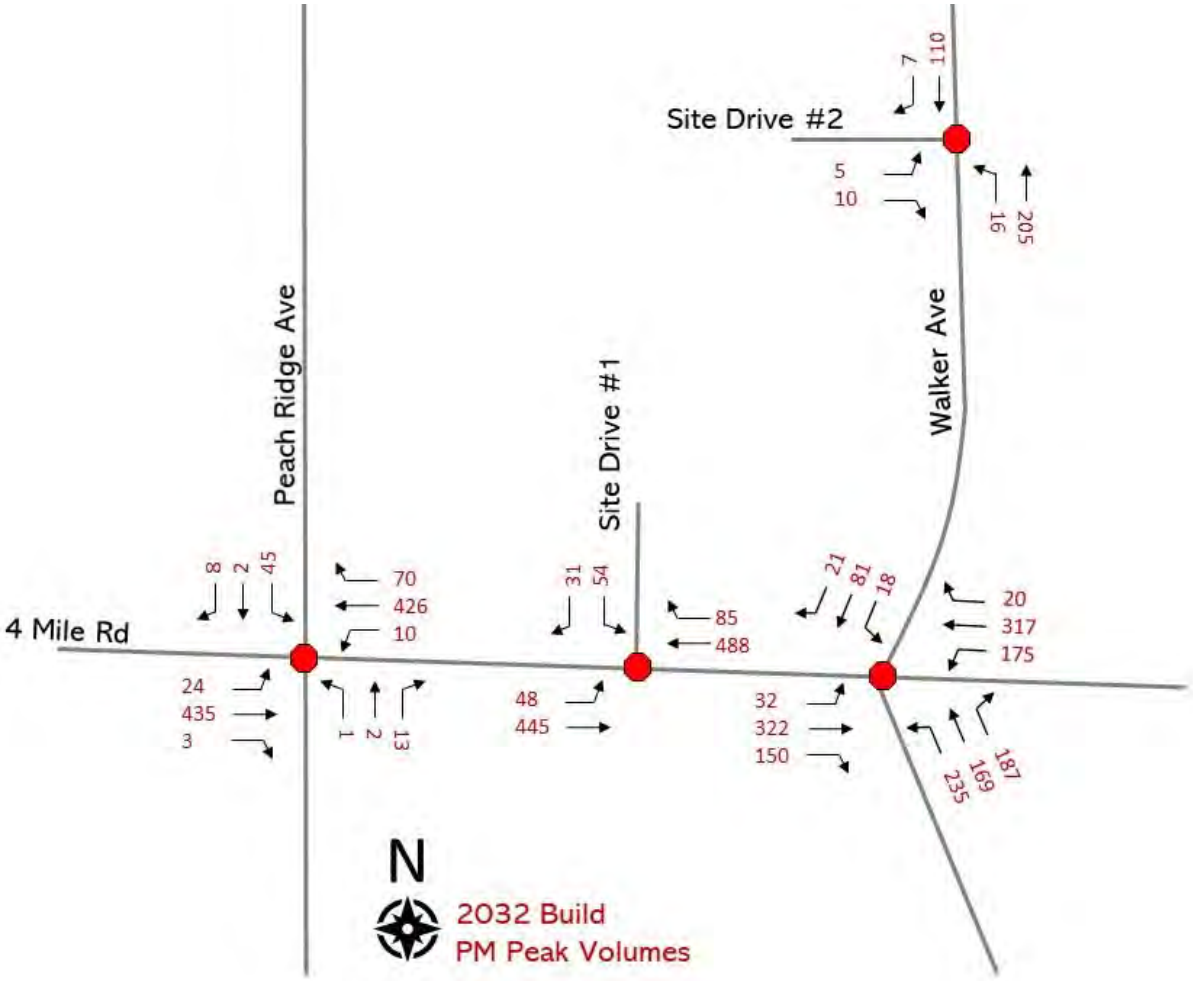


Figure 3-21 Projected 2032 Build PM Peak Hour Traffic Volumes



Access Configuration

Michigan Department of Transportation (MDOT) turn lane warrants were again examined with the additional site generated traffic to determine if right or left turn lanes would be needed at either proposed site access on 4 Mile Road or Walker Avenue. Based on the volume warrants, a full-width right turn lane as well as a left-turn lane is recommended along 4 Mile Road at the proposed site access. Also, based on the volume warrants, right and left turn lanes along Walker Avenue are not warranted at that proposed site access.

The proposed driveway approach to 4 Mile Road was again examined with one exiting right-turn lane, one exiting left-turn lane, and one inbound lane. The proposed driveway approach on Walker Avenue was examined with one approach lane serving all movements and one inbound lane.

3.5.2 Projected 2032 Build Operational Analysis

The study area intersections were evaluated with the projected 2032 build traffic volumes to determine the future intersection operations at approximately the mid-point of the proposed residential development. Highway capacity analyses were conducted for the projected 2032 build conditions and are summarized in Table 3-14. None of the mitigation improvements identified under previous sections were assumed to be in place for the projected 2032 build conditions analyses as to provide a future comparison with and without the proposed development traffic.

The capacity analyses for the future 2032 build conditions revealed that the study area intersection approaches and movements operate at an acceptable level of service during the weekday morning and weekday afternoon peak hours, with the exception of the following same movements and approaches that were also projected to operate poorly without the proposed development:

- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The northbound left-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The northbound shared through/right-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday afternoon peak hour.
- The westbound shared through/right-turn movement along 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday morning peak hour.

The following movements and approaches were expected to operate at an acceptable level of service under 2032 no build conditions, but will operate poorly under 2032 build conditions:

- The overall northbound approach from Walker Avenue to 4 Mile Road will operate at a level of service E during both the weekday morning and afternoon peak hours.
- The westbound shared through/right-turn movement along 4 Mile Road to Walker Avenue will operate at a level of service E during the weekday afternoon peak hour.
- The overall westbound approach from 4 Mile Road to Walker Avenue will operate at a level of service E during the weekday morning peak hour.

Table 3-14 Projected 2032 Build Synchro Analyses Results

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	A	9.8	0.017	A	8.7	0.026
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**D**	**27.6**	**0.168**	**B**	**14.0**	**0.062**
	WB Left	A	8.9	0.01	A	8.4	0.011
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**F**	**106.9**	**0.812**	**D**	**32.2**	**0.366**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	12.6	0.04	B	12.6	0.09
	EB Thru/Right	F	378.9	1.722	F	143.8	1.205
	EB Approach	**F**	**371.6**	**N/A**	**F**	**135.5**	**N/A**
	NB Left	F	50.1	0.962	D	25.7	0.652
	NB Thru/Right	D	30.0	0.783	E	41.8	0.894
	NB Approach	**E**	**40.6**	**N/A**	**E**	**35.4**	**N/A**
	WB Left	C	18.8	0.383	C	19.5	0.476
	WB Thru/Right	F	52.0	0.981	E	40.9	0.857
	WB Approach	**E**	**43.1**	**N/A**	**D**	**33.6**	**N/A**
	SB Left	C	15.5	0.101	B	14.0	0.062
	SB Thru/Right	D	25.8	0.628	C	17.0	0.323
	SB Approach	**C**	**24.5**	**N/A**	**C**	**16.6**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #1 & 4 Mile Road NW	EB Left	A	9.3	0.03	A	9.0	0.056
	EB Approach	**A**	**0.3**	**N/A**	**A**	**0.9**	**N/A**
	SB Left	F	55.7	0.554	D	27.9	0.273
	SB Right	B	13.8	0.104	B	11.9	0.061
	SB Approach	**E**	**40.3**	**N/A**	**C**	**22.1**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #2 & Walker Avenue NW	**EB Approach**	**A**	**9.9**	**0.032**	**A**	**9.7**	**0.021**
	NB Left	A	7.7	0.005	A	7.5	0.012
	NB Approach	**A**	**0.4**	**N/A**	**A**	**0.5**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The southbound approach from Peach Ridge Avenue to 4 Mile Road will continue to operate unacceptably under 2032 build traffic volume conditions during the morning peak hour with or without the proposed development. When comparing the future build conditions to the future no build conditions (without mitigation), the increase in delay is 33.9 seconds during the morning peak hour and 5.1 seconds during the afternoon peak hour. Constructing a southbound auxiliary left-turn lane along Peach Ridge Avenue was again examined to mitigate the approach delay that is expected to occur during the morning peak hour. The results of the capacity analyses for the future build 2032 conditions with the southbound left-turn lane on Peach Ridge Avenue (same mitigation as under no build 2032 conditions) are displayed in Table 3-15.

At the intersection of Walker Avenue at 4 Mile Road, numerous movements and approaches will begin to operate unacceptably under 2032 traffic volumes during the morning and afternoon peak hours with or without the proposed development. The movements/approaches that were found to operate poorly due to the proposed development traffic were already identified as deficient movements during the opposite time period examined for the 2032 no build conditions and thus were already identified as requiring mitigation. Therefore, no additional movements were identified as requiring improvements due to the development. When comparing the future build conditions to the future no build conditions, the increase in delays are fairly minor except for the overall eastbound approach from 4 Mile Road to Walker Avenue, where an increase in average vehicle delay of 122.3 seconds is expected during the morning peak hour and an increase in average vehicle delay of 57.4 seconds is expected during the afternoon peak hour. In addition, the eastbound shared through/right turn movement will experience an increase in delay of 125.5 seconds during the morning peak hour and 61.5 seconds during the afternoon peak hour. Converting the intersection to traffic signal control was again examined to mitigate the unacceptable levels of service at this intersection.

The initial analysis at the intersection of Walker Avenue at 4 Mile Road determined that signalization alone would not provide acceptable levels of service under 2032 build conditions as it did under the 2032 no build conditions. In addition, an auxiliary eastbound right turn lane would also need to be constructed along 4 Mile Road at Walker Avenue to provide acceptable levels of service at the study area intersection. The results of the capacity analyses for the future build 2032 conditions with signalization and the eastbound right turn lane are summarized in Table 3-15.

Table 3-15 Projected 2032 Build Synchro Analyses Results with Mitigation

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW (SB Left-turn Lane)	EB Left	A	9.8	0.017	A	8.7	0.026
	EB Approach	**A**	**0.2**	**N/A**	**A**	**0.5**	**N/A**
	NB Approach	**D**	**27.6**	**0.168**	**B**	**14.0**	**0.062**
	WB Left	A	8.9	0.01	A	8.4	0.011
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Left	F	115.0	0.736	D	33.9	0.333
	SB Thru/Right	C	15.5	0.079	B	13.7	0.032
	SB Approach	**F**	**84.3**	**N/A**	**D**	**30.2**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW (Signal & EB Right-turn Lane)	EB Left	B	18.6	0.04	B	19.2	0.1
	EB Thru	B	17.7	0.54	B	17.2	0.52
	EB Right	C	20.9	0.65	B	14.3	0.28
	EB Approach	**B**	**19.3**	**N/A**	**B**	**16.5**	**N/A**
	NB Left	C	33.8	0.77	C	22.3	0.52
	NB Thru/Right	C	32.6	0.74	D	35.5	0.82
	NB Approach	**C**	**33.2**	**N/A**	**C**	**30.3**	**N/A**
	WB Left	C	28.4	0.48	C	30.5	0.59
	WB Thru/Right	B	17.5	0.52	B	17.2	0.51
	WB Approach	**C**	**20.4**	**N/A**	**C**	**21.7**	**N/A**
	SB Left	C	22.4	0.11	C	24.1	0.10
	SB Thru/Right	D	39.1	0.73	C	33.1	0.52
	SB Approach	**D**	**36.9**	**N/A**	**C**	**31.7**	**N/A**
	Overall	**C**	**25.7**	**N/A**	**C**	**23.8**	**N/A**

As shown in Table 3-15, the installation of a left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to improve the weekday morning peak hour approach delay by 22.6 seconds, but the approach is still expected to operate at LOS F as is the southbound left-turn movement. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these movements. The expected V/C ratio of 0.736 is still below 1.0 and queues are expected to be minimal for this approach. The results of the SimTraffic analysis indicate that a 95th percentile queue length of 95 feet can be expected during the weekday morning peak hour for the southbound left-turn movement. No further mitigation should be required at this intersection for future 2032 build conditions.

As shown in Table 3-15, signalizing the intersection of Walker Avenue and 4 Mile Road with additional construction of an eastbound right turn only lane would provide acceptable operations. Installing a traffic signal was found to be needed under the no build 2023 and no-build 2032

conditions as well. The addition of project traffic to the intersection will additionally require the construction of an eastbound right turn lane along 4 Mile Road at Walker Avenue.

The capacity analyses for the site driveway accesses to 4 Mile Road and Walker Avenue revealed that all movements at the intersections are expected to operate acceptably, with the exception of the southbound left turn movement and overall southbound approach to 4 Mile Road from the proposed site which will operate unacceptably during the weekday morning peak hour. The southbound left turn movement is expected to operate at a level of service F and the overall approach is expected to operate at a level of service E. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these side-street movements. While the southbound left turn movement from the site access to 4 Mile Road is expected to operate at a poor level of service (LOS F with 55.7 seconds of average vehicle delay) during the weekday morning peak hour, the expected V/C ratio of 0.554 is still well under 1.0. The results of the SimTraffic analysis indicate that a 95th percentile queue length exceeding 500 feet may be expected on the site access approach during the weekday morning peak hour, as a result of queues on the eastbound 4 Mile Road approach to Walker Avenue extending past the site access during this time period. However, it was found that converting the intersection of Walker Avenue at 4 Mile Road to traffic signal control will reduce the expected 95th percentile queue length for the exiting left turn movement from the site to 4 Mile Road to 72 feet during the morning peak hour since eastbound queues along 4 Mile Road at Walker Avenue are not expected to impact the exiting movements from the site driveway.

3.6 Projected 2042 Build Conditions

An evaluation of the study area under 2042 traffic volumes is required to understand the future conditions at full build out of the proposed residential development. A total of 590-units would be constructed and occupied at full build out in 2042. The proposed development would be served via three full movement access points upon full build out of the development; one to 4 Mile Road, one to Walker Avenue, and one to Peach Ridge Avenue. The following sections describe future 2042 traffic impacts on the study area with the proposed residential development.

The examination of the future build 2042 conditions began with the projection of turning movement volumes for the weekday morning and weekday afternoon peak hours. This process was accomplished by adding the estimated number of weekday morning and afternoon peak hour trips from the proposed development to the future 2042 no build traffic volumes.

3.6.1 Projected Build 2042 Traffic Volumes

Future traffic volumes were developed for the projected 2042 build scenario based on the background traffic growth (including committed developments) and estimated trips generated from the proposed residential development. The expected trips generated by the proposed residential development shown in Table 3-11 were distributed to the surrounding roadway network using the distributions indicated in Section 3.3.3. Figures 3-22 and 3-23 show the corresponding site generated traffic volumes distributed on the study area network at full build out of the development.

Projected site generated trips were added to the future no build 2042 traffic volumes to yield the projected 2042 build conditions. These traffic volumes represent the 2.07% per year growth rate between 2023 to 2025 and the 0.72% growth rate between 2025 to 2042, estimated traffic from committed developments, and the estimated site traffic upon full build out of the development. Figures 3-24 and 3-25 illustrate the weekday morning and weekday afternoon peak hour traffic volumes for the projected 2042 build conditions.

Figure 3-22 Projected 2042 Build AM Peak Hour Site Generated Trips

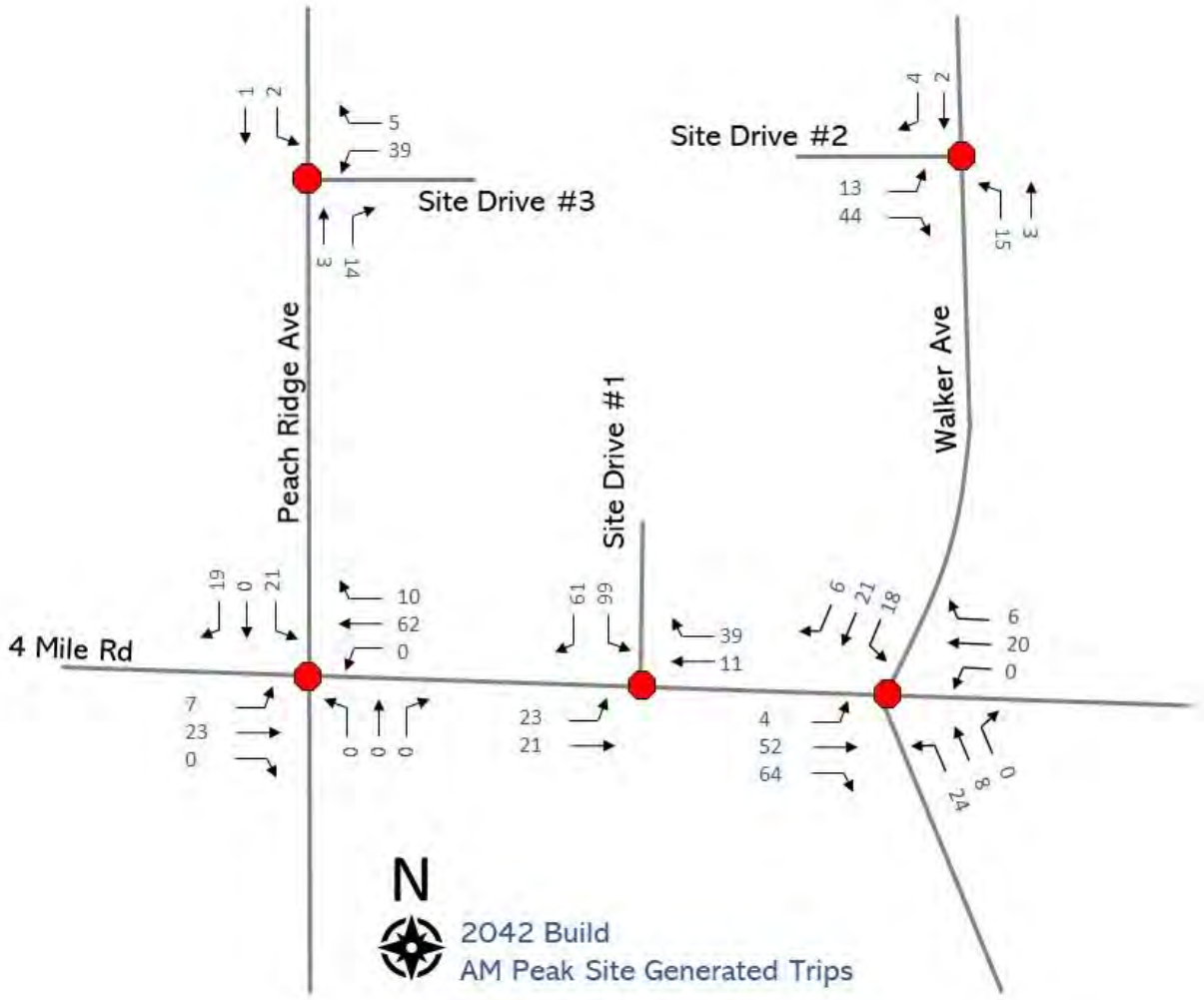


Figure 3-23 Projected 2042 Build PM Peak Hour Site Generated Trips

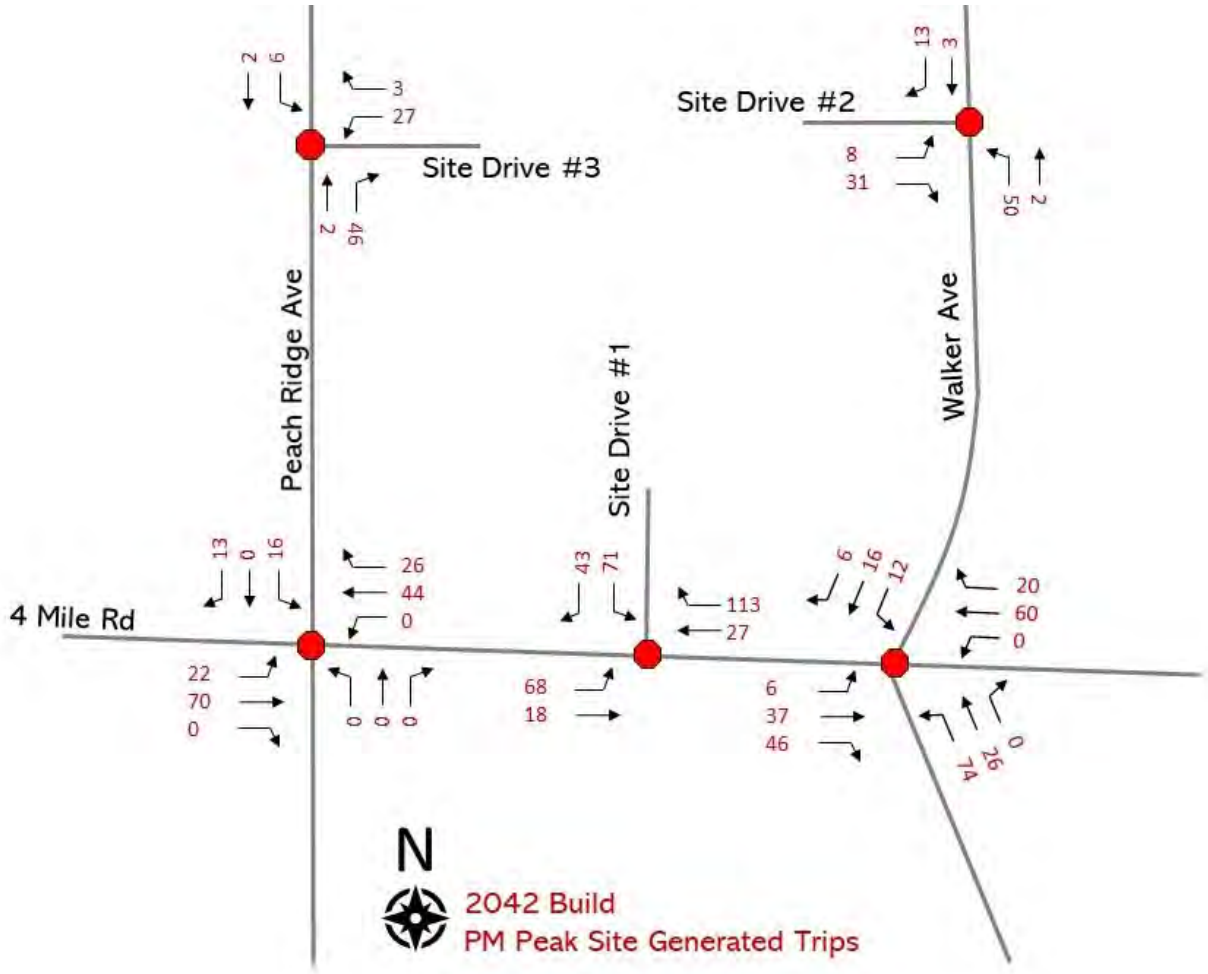


Figure 3-24 Projected 2042 Build AM Peak Hour Traffic Volumes

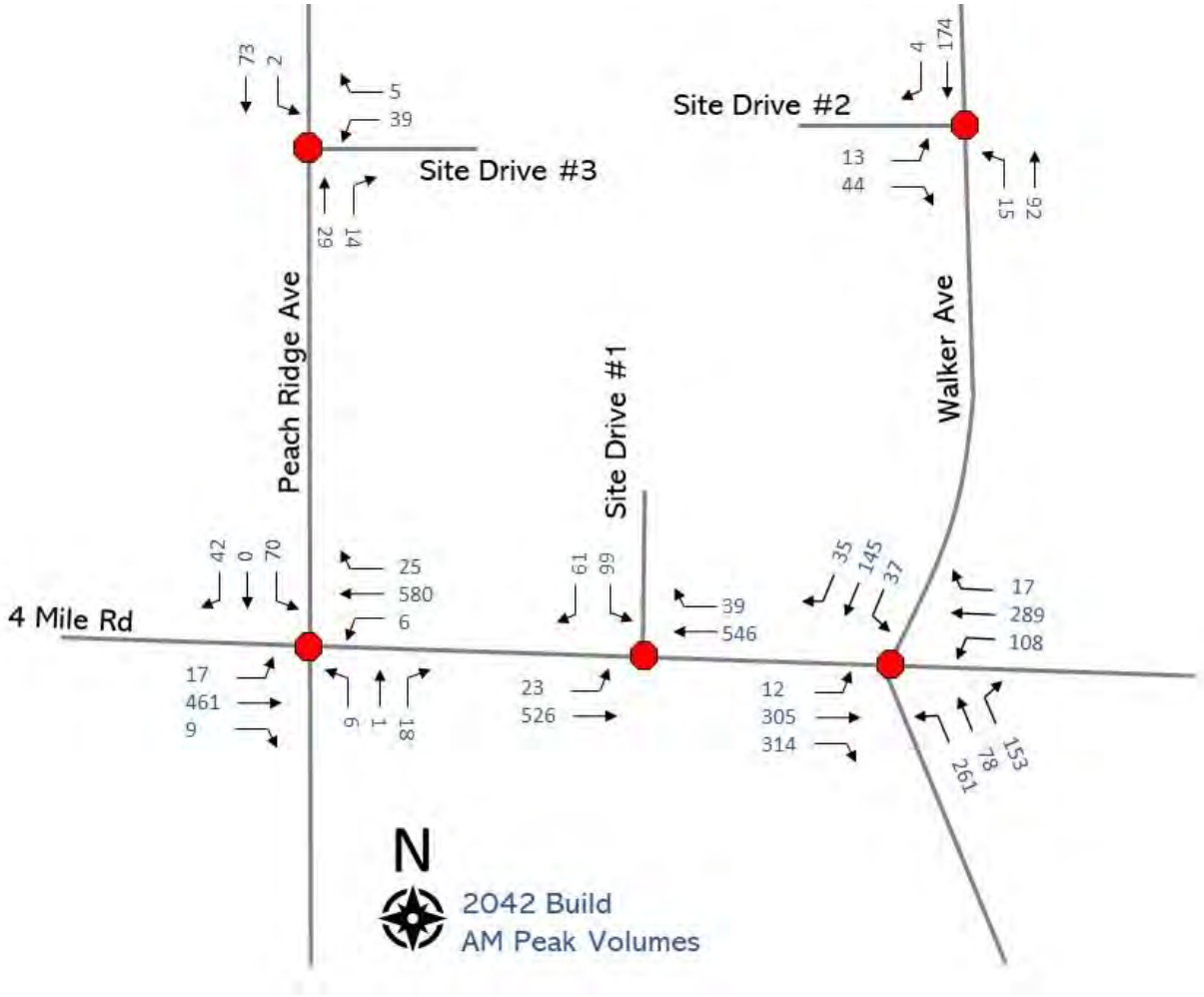
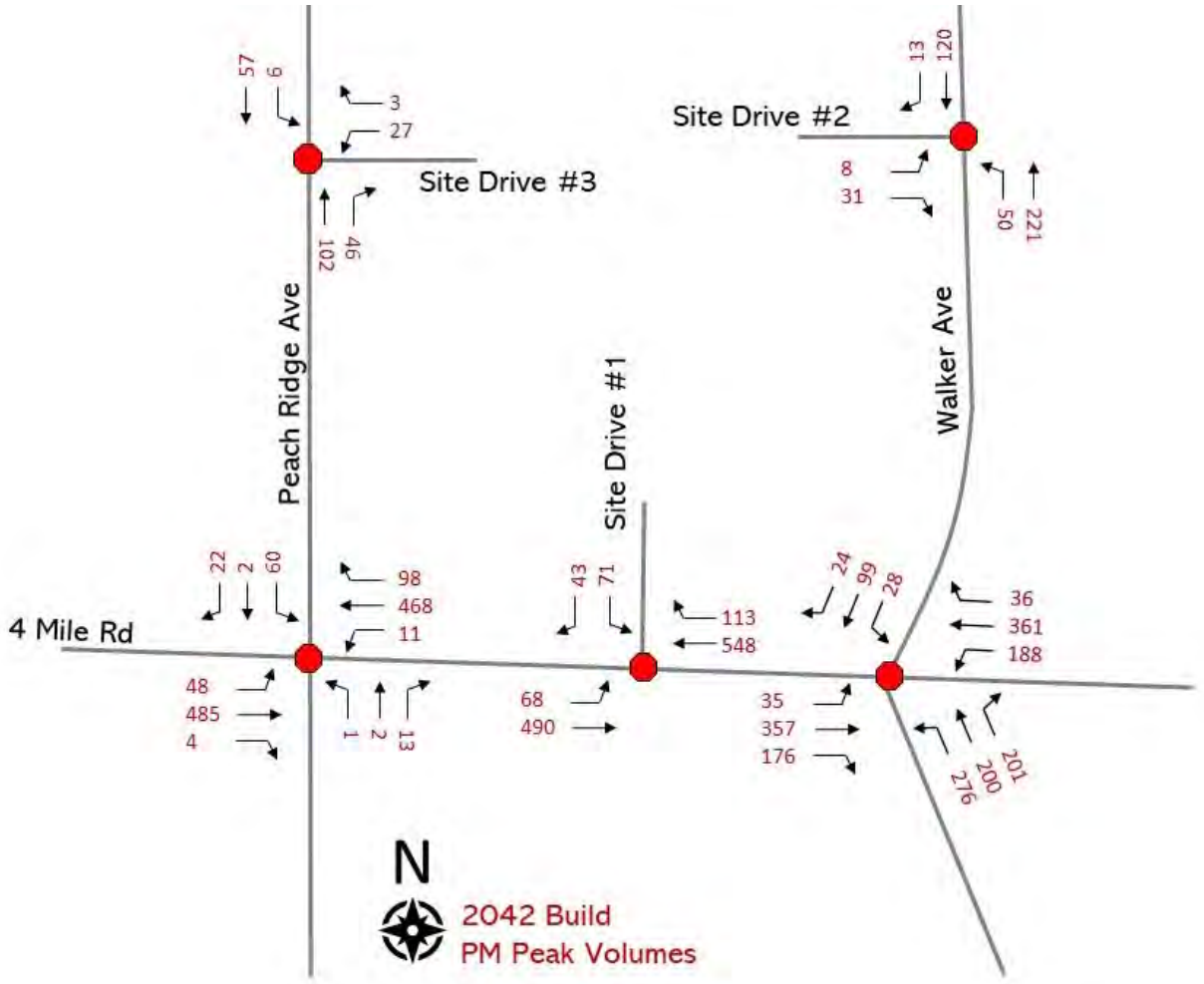


Figure 3-25 Projected 2042 Build PM Peak Hour Traffic Volumes



Access Configuration

Michigan Department of Transportation (MDOT) turn lane warrants were again examined with the additional site generated traffic to determine if right or left turn lanes would be needed at either proposed site access on Walker Avenue or Peach Ridge Avenue. The turn lane warrant analysis under 2032 build conditions previously determined that a full-width right turn lane and a left turn lane would be required along 4 Mile Road at that site access. Based on the volume warrants, a left-turn lane along Walker Avenue at the site access is recommended; however a right turn lane/taper is not needed. At the Peach Ridge Avenue site access, it was found that neither a left nor right turn lane is warranted.

The proposed access to 4 Mile Road was examined with one exiting right-turn lane, one exiting left-turn lane, and one inbound lane. The proposed accesses to Walker Avenue and Peach Ridge Avenue were both examined with one approach lane serving all movements and one inbound lane.

3.6.2 Projected 2042 Build Operational Analysis

The study area intersections were evaluated with the projected 2042 build traffic volumes to determine the future intersection operations upon full build out of the proposed residential development. Highway capacity analyses were conducted for the projected 2042 build conditions and are summarized in Table 3-16. None of the mitigation improvements under previous sections were assumed to be in place for the projected 2042 build conditions analyses as to provide a future comparison with and without the proposed development traffic.

The capacity analyses for the future 2042 build conditions revealed that numerous study area intersection approaches and movements operate at an unacceptable level of service during the weekday morning and weekday afternoon peak hours. The majority of the capacity issues found included the same movements and approaches that were also projected to operate poorly without the proposed development. These include the following:

- The southbound Peach Ridge Avenue approach to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The eastbound shared through/right-turn movement from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The overall eastbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The northbound left-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service F during the weekday morning peak hour.
- The northbound shared through/right-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service F during the weekday afternoon peak hour.
- The overall northbound approach from Walker Avenue to 4 Mile Road will operate at a level of service F during both the weekday morning and afternoon peak hours.

- The westbound shared through/right-turn movement along 4 Mile Road to Walker Avenue will operate at a level of service F during both the weekday morning and afternoon peak hours.
- The overall westbound 4 Mile Road approach will operate at a level of service F during the weekday morning peak hour.

The following movements and approaches were expected to operate at an acceptable level of service under 2042 no build conditions, but will operate poorly under 2042 build conditions:

- The overall northbound approach from Peach Ridge Avenue to 4 Mile Road will operate at a level of service E during the weekday morning peak hour.
- The overall southbound approach from Peach Ridge Avenue to 4 Mile Road will operate at a level of service F during the weekday afternoon peak hour.
- The northbound left-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday afternoon peak hour.
- The northbound shared through/right-turn movement from Walker Avenue to 4 Mile Road will operate at a level of service E during the weekday morning peak hour.
- The overall westbound approach from 4 Mile Road to Walker Avenue will operate at a level of service F during the weekday afternoon peak hour.

Table 3-16 Projected 2042 Build Synchro Analyses Results

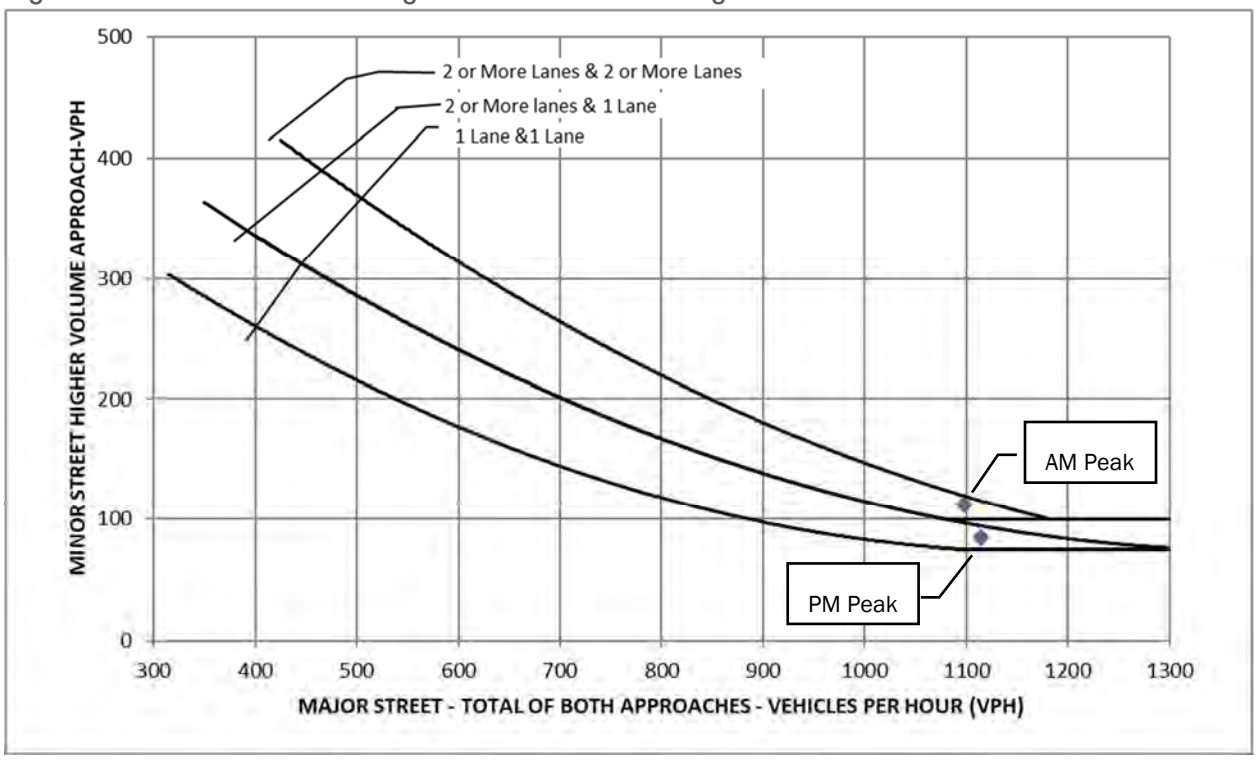
Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW	EB Left	B	10.3	0.035	A	9.1	0.056
	EB Approach	**A**	**0.4**	**N/A**	**A**	**0.8**	**N/A**
	NB Approach	**E**	**38.0**	**0.235**	**C**	**16.0**	**0.075**
	WB Left	A	9.0	0.01	A	8.5	0.012
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Approach	**F**	**407.8**	**1.643**	**F**	**61.0**	**0.673**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW	EB Left	B	13.3	0.045	B	13.5	0.105
	EB Thru/Right	F	538.2	2.125	F	241.8	1.45
	EB Approach	**F**	**528.2**	**N/A**	**F**	**227.7**	**N/A**
	NB Left	F	80.2	1.175	E	38.6	0.826
	NB Thru/Right	E	42.4	0.953	F	77.1	1.087
	NB Approach	**F**	**62.5**	**N/A**	**F**	**61.4**	**N/A**
	WB Left	C	21.4	0.45	C	22.5	0.549
	WB Thru/Right	F	85.2	1.202	F	77.4	1.085
	WB Approach	**F**	**68.6**	**N/A**	**F**	**59.8**	**N/A**
	SB Left	C	17.4	0.174	C	15.3	0.102
	SB Thru/Right	D	34.4	0.794	C	20.0	0.42
	SB Approach	**D**	**31.5**	**N/A**	**C**	**19.1**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #1 & 4 Mile Road NW	EB Left	A	9.6	0.041	A	9.5	0.085
	EB Approach	**A**	**0.4**	**N/A**	**A**	**1.2**	**N/A**
	SB Left	F	126.7	0.904	E	44.2	0.465
	SB Right	C	15.1	0.157	B	12.8	0.092
	SB Approach	**F**	**84.2**	**N/A**	**D**	**32.4**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #2 & Walker Avenue NW	**EB Approach**	**B**	**10.3**	**0.084**	**A**	**9.9**	**0.054**
	NB Left	A	7.8	0.016	A	7.6	0.038
	NB Approach	**A**	**1.1**	**N/A**	**A**	**9.9**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Site Drive #3 & Peach Ridge Avenue NW	**WB Approach**	**A**	**9.5**	**0.057**	**A**	**9.9**	**0.043**
	SB Left	A	7.3	0.002	A	7.6	0.006
	SB Approach	**A**	**0.2**	**N/A**	**A**	**0.7**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

The southbound approach from Peach Ridge Avenue to 4 Mile Road will operate unacceptably under 2042 traffic volumes during the morning peak hour with or without the proposed development and will begin to operate unacceptably during the afternoon peak hour due to the addition of project traffic. When comparing the future build conditions to the future no build conditions, there is a substantial increase in delay (283.5 seconds) during the morning peak hour and the volume to

capacity ratio is well over 1.0 at 1.643. The weekday morning and afternoon peak hour volumes were measured against the peak hour warrant thresholds for consideration of traffic signal control at the intersection as described in Section 4C.04 of the latest revision of the *Michigan Manual on Uniform Traffic Control Device*s (MMUTCD). A plot of the weekday morning and afternoon peak hour volumes against the warrant criteria is depicted in Figure 3-26 for the Peach Ridge Avenue and 4 Mile Road intersection. As shown in Figure 3-26, the intersection would meet the peak hour traffic signal warrant under 2042 build conditions if the approaches are considered as the existing single lane approaches. However, two lane approaches would typically be required for consideration of intersection signalization, and the traffic volumes under 2042 build conditions fall underneath the peak hour warrant volume thresholds with two lane approaches.

A preliminary analysis was performed at the intersection of Peach Ridge Avenue at 4 Mile Road to include a westbound right turn lane and left turn lanes along 4 Mile Road, in addition to construction of a southbound left turn lane on Peach Ridge Avenue, in an effort to determine the impact on the southbound approach delay at the intersection. The capacity analysis determined that the additional turn lanes on 4 Mile Road would only provide a negligible delay reduction for the southbound approach. Thus, only implementing a southbound auxiliary left-turn lane was again examined in detail in an effort to mitigate the approach delay that is expected to occur during the morning and afternoon peak hours. The results of the capacity analyses for the future build 2042 conditions with the southbound left-turn lane on Peach Ridge Avenue, which is the same mitigation as all previous scenarios, are displayed in Table 3-17.

Figure 3-26 Peak Hour Traffic Signal Warrant –Peach Ridge Avenue at 4 Mile Road – 2042 Build



At the intersection of Walker Avenue at 4 Mile Road, numerous movements and approaches will begin to operate unacceptably under 2042 traffic volumes during the morning and afternoon peak hours with or without the proposed development. The movements/approaches that were found to operate poorly due to the proposed development traffic were already deficient movements for the other peak hour examined and were already identified as requiring mitigation. When comparing the future build conditions to the future no build conditions, the increase in delay is fairly substantial for the eastbound approach from 4 Mile Road to Walker Avenue, where an increase in average vehicle delay of 283.5 seconds is expected during the morning peak hour and an increase in average vehicle delay of 113.7 seconds is expected during the afternoon peak hour. Converting the intersection to traffic signal control and constructing an eastbound right turn lane was again examined to mitigate the approach and movement delays that are expected to occur.

Similar to 2032 build conditions, the traffic signal control was investigated under three-phase, split-phase signal operation as well as the auxiliary eastbound right turn lane. The results of the capacity analyses for the future build 2042 conditions with proposed signalization and intersection geometry as described above are summarized in Table 3-17.

As shown in Table 3-17, the installation of a southbound left turn only lane along the Peach Ridge Avenue approach to 4 Mile Road is expected to improve the weekday morning peak hour approach delay by 120.7 seconds, but the approach is still expected to operate at level of service F. It is not

uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. While a volume to capacity ratio of 1.472 is expected for the southbound left turn lane, the anticipated 95th percentile queue length is minimal at 143 feet with the conversion of the intersection of Walker Avenue at 4 Mile Road to traffic signal control. Thus, a southbound left-turn lane providing 150 feet of storage is recommended. This is an additional 50 feet in length from the 2042 no build conditions due to the project traffic. Signalizing the intersection of Walker Avenue at 4 Mile Road will provide the necessary gaps for traffic to enter 4 Mile Road from Peach Ridge Avenue compared to the queuing expected under the existing all-way stop traffic control at the intersection. Additionally, signalizing the intersection of 4 Mile Road at Walker Avenue provides a more efficient intersection for southbound study area traffic to utilize, therefore it is reasonable to assume that vehicles heading south from 6 Mile Road to 4 Mile Road may instead use Walker Avenue rather than Peach Ridge Avenue.

As shown in Table 3-17, signalizing the intersection of 4 Mile Road at Walker Avenue would provide acceptable operations for all movements and approaches. This mitigation also includes constructing an eastbound right turn lane along 4 Mile Road at Walker Avenue, which would be needed under the no build 2042 conditions and 2032 build conditions as well.

The capacity analyses for the three site driveway accesses to 4 Mile Road, Walker Avenue, and Peach Ridge Avenue revealed that all movements at the intersections are expected to operate acceptably, with the exception of the southbound left turn movement and overall southbound approach to 4 Mile Road from the proposed site which will operate unacceptably during the weekday morning and afternoon peak hours. The southbound left turn movement is expected to operate at a level of service F during the weekday morning peak hour and level of service E during the weekday afternoon peak hour and the overall approach is expected to operate at a level of service F during the weekday morning peak hour. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these side-street movements. While the southbound left turn movement from the site access to 4 Mile Road is expected to operate at a poor level of service (LOS F with 84.2 seconds of average vehicle delay) during the weekday morning peak hour, the expected V/C ratio of 0.904 is still under 1.0. In the analysis of mitigation strategies, it was found that converting the intersection of Walker Avenue and 4 Mile Road to traffic signal control will result in an expected 95th percentile queue length for the left turn movement of 90 feet during the morning peak hour. In addition, drivers from the development can choose to access Walker Avenue and utilize the improved Walker Avenue and 4 Mile Road intersection instead of attempting to turn left onto 4 Mile Road during the peak hours.

Table 3-17 Projected 2042 Build Synchro Analyses Results with Mitigation

Intersection	Lane Movement / Approach	AM Peak Hour			PM Peak Hour		
		LOS	Delay (sec)	V/C Ratio	LOS	Delay (sec)	V/C Ratio
Peach Ridge Avenue NW & 4 Mile Road NW (SB Left-turn Lane)	EB Left	B	10.3	0.035	A	9.1	0.056
	EB Approach	**A**	**0.4**	**N/A**	**A**	**0.8**	**N/A**
	NB Approach	**E**	**38.0**	**0.235**	**C**	**16.0**	**0.075**
	WB Left	A	9.0	0.01	A	8.5	0.012
	WB Approach	**A**	**0.1**	**N/A**	**A**	**0.2**	**N/A**
	SB Left	F	381.2	1.472	F	64.5	0.60
	SB Thru/Right	C	18.1	0.177	B	13.7	0.073
	SB Approach	**F**	**245.0**	**N/A**	**F**	**50.0**	**N/A**
	Overall	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Walker Avenue NW & 4 Mile Road NW (Signal & EB Right-turn Lane)	EB Left	B	19.9	0.05	C	21.3	0.13
	EB Thru	B	19.2	0.61	B	18.3	0.57
	EB Right	C	24.5	0.74	B	14.9	0.33
	EB Approach	**C**	**21.9**	**N/A**	**B**	**17.4**	**N/A**
	NB Left	D	41.0	0.85	C	24.6	0.61
	NB Thru/Right	D	37.3	0.81	D	47.2	0.92
	NB Approach	**D**	**39.3**	**N/A**	**D**	**38.0**	**N/A**
	WB Left	C	34.9	0.58	D	37.7	0.69
	WB Thru/Right	B	18.7	0.58	B	19.1	0.61
	WB Approach	**C**	**22.9**	**N/A**	**C**	**25.0**	**N/A**
	SB Left	C	23.2	0.18	C	24.8	0.14
	SB Thru/Right	D	50.2	0.85	D	37.9	0.63
	SB Approach	**D**	**45.6**	**N/A**	**D**	**35.5**	**N/A**
	Overall	**C**	**30.0**	**N/A**	**C**	**28.0**	**N/A**

4.0 CONCLUSIONS

This report assessed the traffic impacts that the new Gracewil residential development is expected to have on the adjacent roadways and study area intersections. The traffic impacts and mitigation described in this report are based on existing and future no build traffic volumes and anticipated projected traffic generated at Phase 1 of the proposed development in the year 2023, the approximate mid-point of development in the year 2032, and at full build out in the year 2042. A comparison of future no build conditions to the projected build conditions for each of these future years was used to determine the traffic impacts of the proposed development upon the adjacent street system.

4.1 Existing Conditions

The existing conditions analyses revealed that the study area intersection approaches and all individual movements operate at an acceptable level of service during the weekday morning and afternoon peak hours, with the exception of the eastbound shared through/right-turn movement and the overall eastbound approach at the 4 Mile Road and Walker Avenue intersection. During the

weekday morning peak hour, the shared through/right-turn movement as well as the overall eastbound approach operates at a level of service F. These both operate acceptably during the weekday afternoon peak hour. Field visits during the weekday morning and afternoon peak hours confirmed lengthy vehicle delay and queuing for the eastbound 4 Mile Road approach to Walker Avenue. During the capacity analysis, the addition of an eastbound right turn lane was found to mitigate delay and provide acceptable levels of service.

4.2 Future No Build Conditions

Traffic volumes for the future no build 2023, 2032, and 2042 conditions were estimated by applying traffic growth rates to the existing traffic volumes to develop the future 2023, 2032, and 2042 traffic volumes and adding traffic from approved developments in the area which included English Hills, Walkerview, and the Northridge East IPUD.

4.2.1 Future 2023 No Build Conditions

The future 2023 no build conditions revealed that both study area intersections will have movements that operate at an unacceptable level of service during the weekday morning and weekday afternoon peak hours.

The southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at level of service E during the weekday morning peak hour. It is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. The southbound queues are expected to be minimal under the future no build 2023 conditions and the volume to capacity ratio is 0.508, therefore no further mitigation would be required under the future 2023 no build conditions.

Improvements are needed at the intersection of Walker Avenue and 4 Mile Road in order to mitigate the existing conditions and future no build conditions. The existing conditions recommendation of an eastbound right turn lane was first examined and found to not provide enough capacity to improve the level of service to an acceptable level under the future 2023 no build conditions. The mitigation strategy to install a traffic signal (the peak hour signal warrant is met under 2023 no build volumes) was investigated. Signalization would result in acceptable levels of service for all intersection movements. It should be noted that given the misalignment of the Walker Avenue approaches to the intersection, the northbound and southbound approaches were examined with a split-phase traffic signal operation.

4.2.2 Future 2032 No Build Conditions

Since no improvement strategies discussed under existing or future no build 2023 conditions were assumed to be in place for the future 2032 no build conditions analyses, the two study area intersections will continue to have the same movements operate with unacceptable levels of service (with greater delays) during the weekday morning and weekday afternoon peak hours. Additional

movements at the Walker Avenue and 4 Mile Road intersection will also begin to operate at unacceptable levels of service by the year 2032.

Similar to the future no build 2023 conditions, the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to operate at a poor level of service during the weekday morning peak hour. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these movements. The expected V/C ratio of 0.674 is still well under 1.0 and queues are expected to be minimal for this approach with a 95th percentile queue length of 68 feet expected. The addition of an auxiliary left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road was investigated as a remedial measure in order to improve the delays and level of service for this approach. It was found that implementing a 100' southbound left turn lane on the Peach Ridge Avenue approach to 4 Mile Road would reduce delay and queuing on the approach. Although the southbound left-turn lane is still expected to operate at a level of service F, no further mitigation should be required at this intersection for the future 2032 no build conditions.

At the intersection of Walker Avenue at 4 Mile Road, converting the intersection to traffic signal control would continue to provide acceptable levels of service for all intersection movements. No further mitigation is required at this intersection for the future no build 2032 conditions.

4.2.3 Future 2042 No Build Conditions

Since none of the improvement strategies discussed under existing, future no build 2023 conditions, or future no build 2032 conditions were assumed to be in place for the future 2042 no build conditions analyses, the two study area intersections will continue to have the same operational issues during the weekday morning and weekday afternoon peak hours with significant delays. In addition, other movements at the Walker Avenue and 4 Mile Road intersection will also begin to operate at unacceptable levels of service by the year 2042.

Similar to 2023 and 2032 no build conditions, it was found that implementing a southbound left turn lane on the Peach Ridge Avenue approach to 4 Mile Road would reduce delay and queuing on the approach and result in a V/C ratio below 1.0 However, the southbound left turn movement and overall approach will still operate at a level of service F. As the traffic volumes remain relatively low on this approach and the V/C ratio remains less than 1.0, no further mitigation should be required for the future 2042 no build conditions.

At the intersection of Walker Avenue at 4 Mile Road, additional mitigation was found to be required beyond installing a traffic signal. During the signalized analysis, it was determined that an auxiliary right-turn lane on the eastbound approach would need to be added to provide acceptable levels of service for each movement and approach at the intersection. Installing a traffic signal at the intersection and adding an eastbound right turn lane will result in acceptable levels of service for all

movements under the future 2042 no build conditions. It should be noted that the traffic signal control continued to be examined with a split-phase for the northbound/southbound approaches due to the existing misalignment for the north/south approaches at the intersection.

4.3 Projected Build Conditions

The projected build out years examined included the following:

- The year 2023 when Phase 1 of the proposed residential development (91 units) is expected to be complete with construction of the site access to 4 Mile Road also completed.
- The year 2032 at an approximate mid-point of the residential development (322 units) with construction of the second site access to Walker Avenue also completed.
- The year 2042 when the proposed residential development is expected to be fully built out (590 units) and construction of the third site access to Peach Ridge Avenue is completed.

The study area intersections were evaluated with the future build traffic volumes to determine the future intersection operations with the proposed residential development project. Traffic volumes for the projected 2023 build, 2032 build, and 2042 build conditions were derived from developing the trip generation, distribution, and assignment for the proposed residential development and adding these trips to the no build traffic volumes projected for 2023, 2032, and 2042 without the proposed project.

4.3.1 Projected 2023 Build Conditions

The capacity analysis for the projected 2023 build conditions under Phase 1 of development revealed that the same improvements identified under the no build 2023 conditions would be required under the projected build conditions. No further mitigation would be needed at the primary study intersections, beyond the mitigation recommended under the future no build 2023 conditions, to accommodate the traffic generated by the proposed residential development in the year 2023.

Turn lane warrants were examined to determine if a right or left turn lane would be needed along 4 Mile Road at the proposed site access with Phase 1 of development. Based on the volume warrants, a right turn taper only is recommended at the proposed site access on 4 Mile Road and has been included in the proposed site plan. A left-turn lane on 4 Mile Road is not warranted at the proposed site access with Phase 1 of development. The capacity analyses for the proposed site access revealed that all movements at its intersection with 4 Mile Road are expected to operate acceptably with levels of service D or better during the morning and afternoon peak hours.

4.3.2 Projected 2032 Build Conditions

The study area intersections were again evaluated with the future 2032 build traffic volumes to determine the intersection operations at the approximate mid-point of the residential development. The capacity analysis for the projected 2032 build conditions revealed that additional improvements beyond those identified under the no build 2032 conditions would be required at the Walker Avenue and 4 Mile Road intersection due to the traffic generated by the proposed residential development.

The construction of a left turn lane on the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to improve the weekday morning peak hour approach delay by 22.6 seconds, but the approach is still expected to operate at level of service F, as is the southbound left-turn movement. The expected volume to capacity ratio of 0.736 is still below 1.0 and queues are expected to be minimal for this approach. The results of the SimTraffic analysis indicate that a 95th percentile queue length of 95 feet can be expected during the weekday morning peak hour for the southbound left-turn movement. No further mitigation should be required at this intersection for future 2032 build conditions.

The initial analysis at the intersection of Walker Avenue at 4 Mile Road determined that signalization alone would not provide acceptable levels of service under the 2032 build conditions as it did under the 2032 no build conditions. It was found that an auxiliary eastbound right turn lane would also need to be constructed along 4 Mile Road at Walker Avenue to provide acceptable levels of service at the intersection.

Turn lane warrants were again examined to determine if a right or left turn lane would be needed along 4 Mile Road at the proposed site access as well as along Walker Avenue at the second proposed site access. Based on the volume warrants, right and left turn lanes are warranted along 4 Mile Road at the site access to the development, while neither a right nor left turn lane are warranted along Walker Avenue at the second site access to the development. The capacity analyses for the proposed site accesses revealed that all movements at the intersections are expected to operate acceptably, with the exception of the southbound left turn movement from the site access to 4 Mile Road. This movement will operate at a level of service F during the weekday morning peak hour and the overall southbound approach from the site access to 4 Mile Road will operate at a level of service E during the weekday morning peak hour. It is common for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. The southbound left-turn queues are expected to be minimal, with mitigation at the Walker Avenue and 4 Mile Road intersection, and the volume to capacity ratio is 0.554, therefore no further mitigation should be required at this site access.

4.3.3 Projected 2042 Build Conditions

The study area intersections were finally evaluated with the future 2042 build traffic volumes to determine the future intersection operations at full build out of the proposed residential

development. The capacity analysis for the projected 2042 build conditions revealed that additional improvements beyond those identified under the no build 2042 conditions would be required at the 4 Mile Road and Peach Ridge Avenue intersection due to the traffic generated by the proposed residential development.

The installation of a left turn only lane on the southbound Peach Ridge Avenue approach to 4 Mile Road is expected to improve weekday morning peak hour approach delay by 120.7 seconds, but the approach is still expected to operate at level of service F. However, it is not uncommon for unsignalized side-street approaches onto major roadways to operate poorly during peak hours. While a volume to capacity ratio above 1.0 is expected for the southbound left turn lane, the anticipated 95th percentile queue length is minimal at 143 feet. Thus, a southbound left-turn lane providing 150 feet of storage is recommended. This is an additional 50 feet in length from the 2042 no build conditions due to the project traffic. Signalizing the intersection of Walker Avenue and 4 Mile Road will provide the necessary gaps for traffic to enter 4 Mile Road from Peach Ridge Avenue. Additionally, signalizing the intersection of 4 Mile Road at Walker Avenue provides a more efficient intersection for southbound study area traffic to utilize, therefore it is reasonable to assume that vehicles heading south from 6 Mile Road to 4 Mile Road may instead use Walker Avenue rather than Peach Ridge Avenue. In addition, traffic from the proposed development heading east on 4 Mile Road may utilize the Walker Avenue access instead of the Peach Ridge Avenue access if the delay for the southbound left-turn movement onto 4 Mile Road becomes lengthy. Improvements at the 4 Mile Road and Walker Avenue intersection may encourage site traffic to utilize the Walker Avenue access.

At the intersection of Walker Avenue at 4 Mile Road, the movements/approaches that were found to operate poorly due to the proposed development traffic were already deficient movements for the other scenarios examined and were already identified as requiring mitigation. The traffic signal control mitigation scenario was investigated under a three-phase signal operation with the north/south approaches split-phased, as well as an auxiliary eastbound right turn lane. This mitigation scenario that was recommended under the projected build 2032 conditions will continue to provide acceptable levels of service under the projected build 2042 conditions. No further improvements are required for this mitigation scenario.

Turn lane warrants were again examined to determine if a right or left turn lanes would be needed along Walker Avenue at the second proposed site access and along Peach Ridge Avenue at the third proposed site access. Right and left turn lanes were warranted along 4 Mile Road at the first site access to the development under projected 2032 build conditions. A right turn lane or taper is not required on Walker Avenue at the second site access nor on Peach Ridge Avenue at the third site access. A left turn lane is warranted along Walker Avenue at the second site access, while a left turn lane is not warranted at the Peach Ridge Avenue site access. The capacity analyses for the proposed site accesses revealed that all movements at the intersections are expected to operate acceptably,

with the exception of the southbound left turn movement from the site access to 4 Mile Road which will operate at a level of service F during the weekday morning peak hour and level of service E during the weekday afternoon peak hour, and the overall southbound approach which will operate at a level of service F during the weekday morning peak hour. As long as the volume to capacity ratio remains less than 1.0 and queuing is minimal, no improvements are typically necessary to mitigate these side-street movements from driveways. While the southbound left turn movement from the site access to 4 Mile Road is expected to operate at a poor level of service during the weekday morning peak hour, the expected V/C ratio of 0.904 for the left turn movement is still under 1.0. In the analysis of mitigation strategies, it was found that converting the intersection of Walker Avenue at 4 Mile Road to traffic signal control will result in an expected 95th percentile queue length on the site access approach to 4 Mile Road of 90 feet during the morning peak hour. In addition, drivers from the development can choose to access Walker Avenue and utilize the improved Walker Avenue and 4 Mile Road intersection instead of attempting to turn left onto 4 Mile Road during the peak hours. No further mitigation should be required at the site access to 4 Mile Road.

4.4 Summary

Improvements that are needed in order to mitigate the future 2023, 2032, and 2042 no build conditions are as follows:

4.4.1 Future 2023 No Build Conditions

- Installation of a traffic signal at Walker Avenue and 4 Mile Road. Due to the existing misalignment of the intersection, the traffic signal operation would require a split-phase operation.

4.4.2 Future 2032 No Build Conditions

The following additional improvements will be needed under future 2032 no build conditions:

- A 100’ southbound left-turn lane along Peach Ridge Avenue at 4 Mile Road.

4.4.3 Future 2042 No Build Conditions

The following additional improvements will be needed under future 2042 no build conditions:

- Construction of an eastbound right-turn lane along 4 Mile Road at Walker Avenue.

Additional improvements that are needed in order to mitigate the projected 2023 Phase 1 build conditions, projected 2032 mid-point build conditions, and projected 2042 full build out stages of the development due to the addition of project traffic are as follows:

4.4.4 Projected 2023 Build Conditions

- Westbound right turn taper along 4 Mile Road at the proposed site access.

4.4.5 Projected 2032 Build Conditions

- Construction of an eastbound right-turn lane along 4 Mile Road at Walker Avenue.
- Construction of a westbound right turn lane along 4 Mile Road at the proposed site access.
- Construction of an eastbound left-turn lane along 4 Mile Road at the proposed site access.

4.4.6 Projected 2042 Build Conditions

- A 150' southbound left-turn lane along Peach Ridge Avenue at 4 Mile Road (additional 50 feet of turn lane storage compared to no build conditions).
- Construction of a northbound left-turn lane along Walker Avenue at the proposed site access.

Appendix A.
Existing Traffic Data

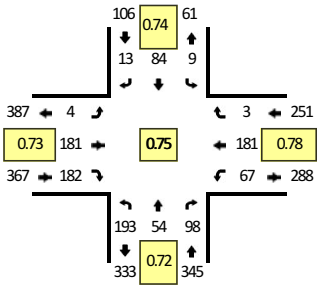
Type of peak hour being reported: Intersection Peak

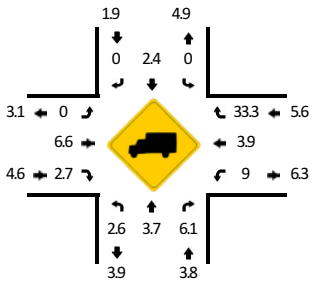
Method for determining peak hour: Total Entering Volume

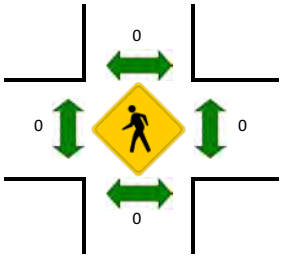
LOCATION: Walker Ave NW -- 4 Mile Rd NW
CITY/STATE: Walker, MI

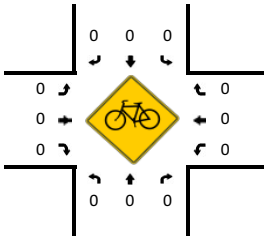
QC JOB #: 15575401
DATE: Wed, Oct 27 2021

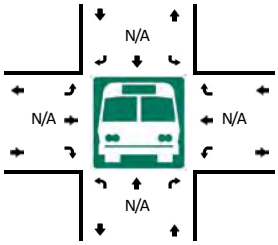
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

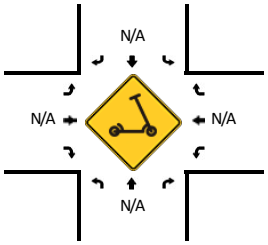












15-Min Count Period Beginning At	Walker Ave NW (Northbound)				Walker Ave NW (Southbound)				4 Mile Rd NW (Eastbound)				4 Mile Rd NW (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	39	6	6	0	0	18	2	0	0	17	20	0	12	29	0	0	149	
7:15 AM	77	13	17	0	1	19	2	0	0	27	50	0	21	59	0	0	286	
7:30 AM	82	12	26	0	3	27	6	0	1	51	73	0	13	62	1	0	357	
7:45 AM	20	19	28	0	1	23	2	0	2	59	37	0	15	25	1	0	232	1024
8:00 AM	14	10	27	0	4	15	3	0	1	44	22	0	18	35	1	0	194	1069
8:15 AM	10	10	21	0	1	18	2	0	6	34	23	0	19	24	0	0	168	951
8:30 AM	14	9	22	0	1	13	5	0	0	22	21	0	30	39	2	0	178	772
8:45 AM	17	10	15	0	0	15	2	0	0	19	21	0	16	26	2	0	143	683

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	328	48	104	0	12	108	24	0	4	204	292	0	52	248	4	0	1428
Heavy Trucks	0	0	8		0	4	0		0	28	8		0	8	4		60
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

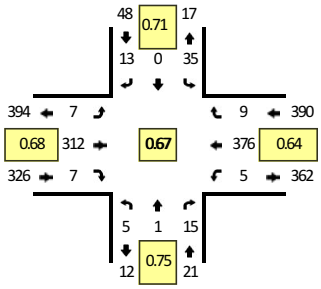
Report generated on 11/5/2021 10:17 AM

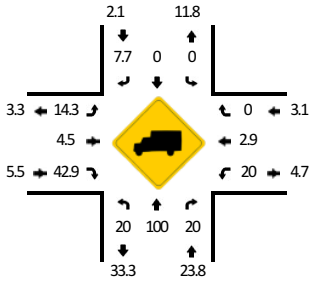
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

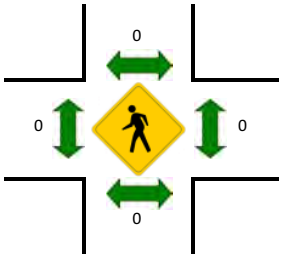
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

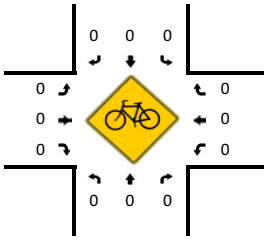
LOCATION: Peach Ridge Ave NW -- 4 Mile Rd NW | **QC JOB #:** 15575403
CITY/STATE: Walker, MI | **DATE:** Wed, Oct 27 2021

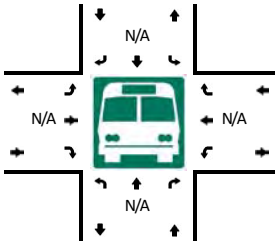
Peak-Hour: 7:15 AM -- 8:15 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

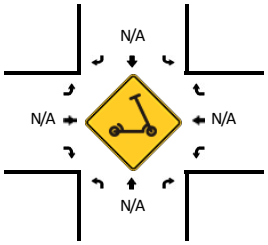












15-Min Count Period Beginning At	Peach Ridge Ave NW (Northbound)				Peach Ridge Ave NW (Southbound)				4 Mile Rd NW (Eastbound)				4 Mile Rd NW (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	2	0	0	0	11	0	1	0	0	24	0	0	1	67	1	0	107	
7:15 AM	2	0	3	0	10	0	5	0	1	69	3	0	1	133	1	0	228	
7:30 AM	1	0	4	0	13	0	4	0	2	115	2	0	2	147	4	0	294	
7:45 AM	1	0	3	0	9	0	2	0	2	66	1	0	0	50	2	0	136	765
8:00 AM	1	1	5	0	3	0	2	0	2	62	1	0	2	46	2	0	127	785
8:15 AM	2	0	1	0	8	0	4	0	1	48	0	0	1	33	4	0	102	659
8:30 AM	0	0	3	0	5	0	1	0	1	40	0	0	1	54	2	0	107	472
8:45 AM	1	0	2	0	3	0	3	0	2	32	0	0	1	42	3	0	89	425

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	16	0	52	0	16	0	8	460	8	0	8	588	16	0	1176
Heavy Trucks	0	0	4		0	0	0		0	32	0		0	8	0		44
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

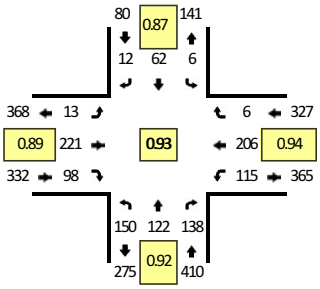
Comments:

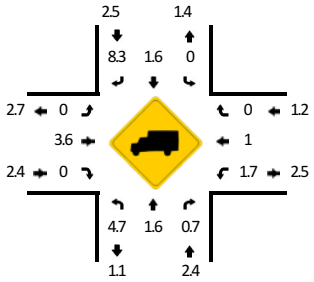
Report generated on 11/5/2021 10:17 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

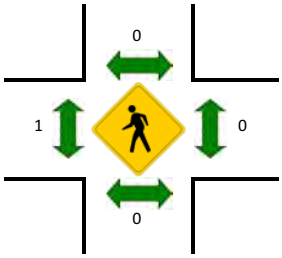
Type of peak hour being reported: System-wide Peak | Method for determining peak hour: Total Entering Volume

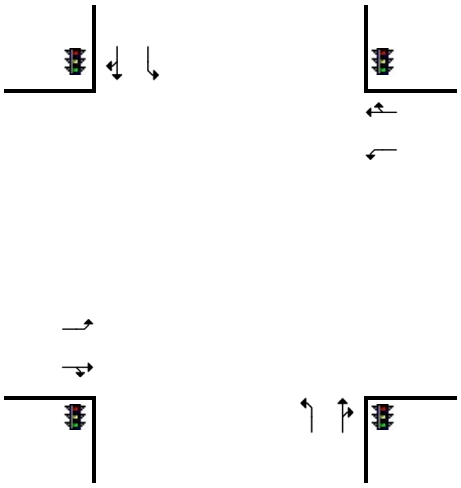
LOCATION: Walker Ave NW -- 4 Mile Rd NW | **QC JOB #:** 15575402
CITY/STATE: Walker, MI | **DATE:** Wed, Oct 27 2021

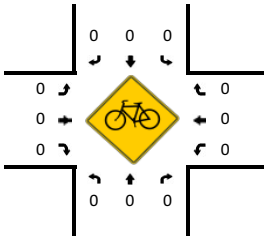
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

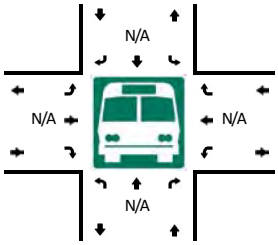


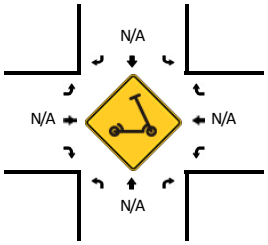












15-Min Count Period Beginning At	Walker Ave NW (Northbound)				Walker Ave NW (Southbound)				4 Mile Rd NW (Eastbound)				4 Mile Rd NW (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	34	25	39	0	2	12	3	0	2	60	28	0	29	40	1	0	275	
4:15 PM	27	32	27	0	0	14	7	0	3	53	14	0	35	58	3	0	273	
4:30 PM	27	34	20	0	0	17	5	0	2	46	26	0	35	52	1	0	265	
4:45 PM	37	30	34	0	1	15	2	0	3	45	20	0	28	53	1	0	269	1082
5:00 PM	39	29	44	0	1	20	1	0	4	65	19	0	36	49	2	0	309	1116
5:15 PM	28	31	32	0	2	17	4	0	3	57	33	0	31	51	2	0	291	1134
5:30 PM	46	32	28	0	2	10	5	0	3	54	26	0	20	53	1	0	280	1149
5:45 PM	44	20	22	0	2	17	1	0	1	39	22	0	22	65	0	0	255	1135

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	156	116	176	0	4	80	4	0	16	260	76	0	144	196	8	0	1236
Heavy Trucks	12	0	0		0	4	0		0	4	0		4	0	0		24
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

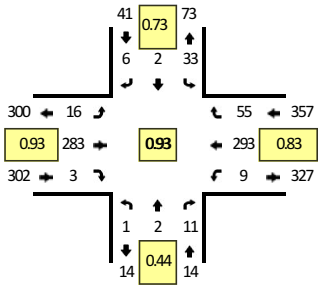
Comments:

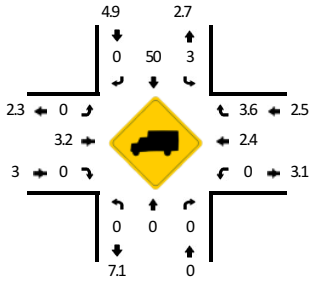
Report generated on 11/5/2021 10:16 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

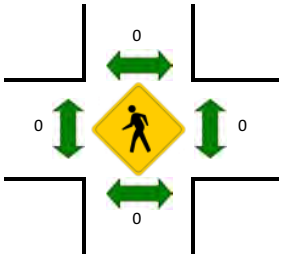
Type of peak hour being reported: System-wide Peak | Method for determining peak hour: Total Entering Volume

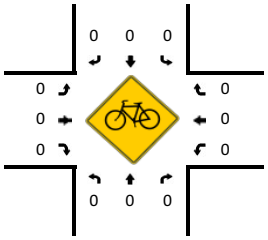
LOCATION: Peach Ridge Ave NW -- 4 Mile Rd NW | **QC JOB #:** 15575404
CITY/STATE: Walker, MI | **DATE:** Wed, Oct 27 2021

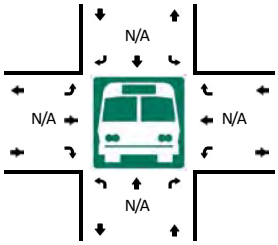
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

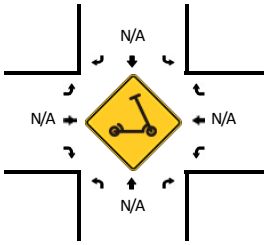












15-Min Count Period Beginning At	Peach Ridge Ave NW (Northbound)				Peach Ridge Ave NW (Southbound)				4 Mile Rd NW (Eastbound)				4 Mile Rd NW (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	2	0	10	1	1	0	1	78	2	0	4	61	12	0	172	
4:15 PM	0	1	4	0	4	0	5	0	2	62	0	0	4	75	10	0	167	
4:30 PM	1	0	1	0	8	0	0	0	3	62	0	0	3	70	10	0	158	
4:45 PM	0	0	1	0	3	1	1	0	4	69	0	0	2	71	14	0	166	663
5:00 PM	0	1	1	0	11	0	3	0	5	74	2	0	4	62	17	0	180	671
5:15 PM	1	0	7	0	12	0	1	0	4	72	0	0	0	68	11	0	176	680
5:30 PM	0	1	2	0	7	1	1	0	3	68	1	0	3	92	13	0	192	714
5:45 PM	0	0	0	0	7	0	4	0	0	55	0	0	3	94	9	0	172	720

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	4	8	0	28	4	4	0	12	272	4	0	12	368	52	0	768
Heavy Trucks	0	0	0		4	0	0		0	4	0		0	4	0		12
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/5/2021 10:16 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix B.
Existing 2021 Synchro Results

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		↕			↕	
Traffic Vol, veh/h	7	312	7	5	376	9	5	1	15	35	0	13
Future Vol, veh/h	7	312	7	5	376	9	5	1	15	35	0	13
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	10	459	10	8	588	14	7	1	20	49	0	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	602	0	0	469	0	0	1099	1097	459	1099	1093	588
Stage 1	-	-	-	-	-	-	479	479	-	604	604	-
Stage 2	-	-	-	-	-	-	620	618	-	495	489	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	956	-	-	1087	-	-	172	195	559	190	214	509
Stage 1	-	-	-	-	-	-	528	520	-	485	488	-
Stage 2	-	-	-	-	-	-	440	448	-	556	549	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	956	-	-	1087	-	-	163	190	559	179	209	509
Mov Cap-2 Maneuver	-	-	-	-	-	-	163	190	-	179	209	-
Stage 1	-	-	-	-	-	-	521	513	-	478	483	-
Stage 2	-	-	-	-	-	-	420	443	-	527	541	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	16.7	28.9
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	335	956	-	-	1087	-	-	217
HCM Lane V/C Ratio	0.084	0.011	-	-	0.007	-	-	0.312
HCM Control Delay (s)	16.7	8.8	0	-	8.3	0	-	28.9
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	1.3

Intersection	
Intersection Delay, s/veh	34.4
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	181	182	67	181	3	193	54	98	9	84	13
Future Vol, veh/h	4	181	182	67	181	3	193	54	98	9	84	13
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	5	248	249	86	232	4	268	75	136	12	114	18
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	63.9	17.7	20.4	15
HCM LOS	F	C	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	36%	0%	50%	0%	98%	0%	87%
Vol Right, %	0%	64%	0%	50%	0%	2%	0%	13%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	193	152	4	363	67	184	9	97
LT Vol	193	0	4	0	67	0	9	0
Through Vol	0	54	0	181	0	181	0	84
RT Vol	0	98	0	182	0	3	0	13
Lane Flow Rate	268	211	5	497	86	236	12	131
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.622	0.432	0.012	0.99	0.202	0.521	0.031	0.315
Departure Headway (Hd)	8.352	7.372	8.039	7.166	8.479	7.951	9.268	8.65
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	432	486	444	502	421	451	389	418
Service Time	6.144	5.163	5.818	4.944	6.277	5.748	6.968	6.35
HCM Lane V/C Ratio	0.62	0.434	0.011	0.99	0.204	0.523	0.031	0.313
HCM Control Delay	24.1	15.7	10.9	64.5	13.4	19.2	12.3	15.3
HCM Lane LOS	C	C	B	F	B	C	B	C
HCM 95th-tile Q	4.1	2.1	0	13.3	0.7	2.9	0.1	1.3

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	16	283	3	9	293	55	1	2	11	33	2	6
Future Vol, veh/h	16	283	3	9	293	55	1	2	11	33	2	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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	17	304	3	11	353	66	2	3	18	45	3	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	419	0	0	307	0	0	752	779	304	725	716	353
Stage 1	-	-	-	-	-	-	338	338	-	375	375	-
Stage 2	-	-	-	-	-	-	414	441	-	350	341	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	1135	-	-	1248	-	-	329	330	740	337	352	684
Stage 1	-	-	-	-	-	-	681	644	-	640	612	-
Stage 2	-	-	-	-	-	-	620	580	-	660	633	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1135	-	-	1248	-	-	316	320	740	319	341	684
Mov Cap-2 Maneuver	-	-	-	-	-	-	316	320	-	319	341	-
Stage 1	-	-	-	-	-	-	669	632	-	628	605	-
Stage 2	-	-	-	-	-	-	602	573	-	629	622	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.2	11.5	17.4
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	577	1135	-	-	1248	-	-	347
HCM Lane V/C Ratio	0.04	0.015	-	-	0.009	-	-	0.162
HCM Control Delay (s)	11.5	8.2	0	-	7.9	0	-	17.4
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.6

Intersection	
Intersection Delay, s/veh	16.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	13	221	98	115	206	6	150	122	138	6	62	12
Future Vol, veh/h	13	221	98	115	206	6	150	122	138	6	62	12
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	15	248	110	122	219	6	163	133	150	7	71	14
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	21.7	14.2	15.7	12.1
HCM LOS	C	B	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	47%	0%	69%	0%	97%	0%	84%
Vol Right, %	0%	53%	0%	31%	0%	3%	0%	16%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	260	13	319	115	212	6	74
LT Vol	150	0	13	0	115	0	6	0
Through Vol	0	122	0	221	0	206	0	62
RT Vol	0	138	0	98	0	6	0	12
Lane Flow Rate	163	283	15	358	122	226	7	85
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.342	0.522	0.03	0.671	0.255	0.437	0.016	0.182
Departure Headway (Hd)	7.542	6.652	7.467	6.737	7.508	6.976	8.349	7.716
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	478	543	480	538	478	516	429	464
Service Time	5.278	4.388	5.202	4.472	5.246	4.714	6.1	5.467
HCM Lane V/C Ratio	0.341	0.521	0.031	0.665	0.255	0.438	0.016	0.183
HCM Control Delay	14.2	16.5	10.4	22.2	12.8	15	11.2	12.2
HCM Lane LOS	B	C	B	C	B	B	B	B
HCM 95th-tile Q	1.5	3	0.1	5	1	2.2	0	0.7

Appendix C.
SimTraffic Performance Report (Validation Logs)

9001: Peach Ridge Ave NW & 4 Mile Rd NW Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Vehicles Entered	5	319	7	4	402	9	4	0	13	35	14	812
Vehicles Exited	5	318	8	4	402	9	4	0	13	35	14	812
Hourly Exit Rate	5	318	8	4	402	9	4	0	13	35	14	812
Input Volume	7	312	7	5	398	9	5	1	15	35	13	806
% of Volume	71	102	114	80	101	103	84	0	88	101	110	101

9002: Walker Ave NW & 4 Mile Rd NW Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Entered	3	194	184	66	187	4	192	55	97	10	85	12
Vehicles Exited	3	194	184	67	187	4	192	54	98	10	86	12
Hourly Exit Rate	3	194	184	67	187	4	192	54	98	10	86	12
Input Volume	4	191	182	67	181	3	193	54	98	9	84	13
% of Volume	71	102	101	100	103	123	99	100	100	111	102	94

9002: Walker Ave NW & 4 Mile Rd NW Performance by movement

Movement	All
Vehicles Entered	1089
Vehicles Exited	1091
Hourly Exit Rate	1091
Input Volume	1079
% of Volume	101

Total Network Performance

Vehicles Entered	1142
Vehicles Exited	1147
Hourly Exit Rate	1147
Input Volume	4138
% of Volume	28

9001: Peach Ridge Ave NW & 4 Mile Rd NW Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Entered	16	282	2	8	314	53	0	2	10	31	2	6
Vehicles Exited	16	280	2	8	314	53	0	2	10	32	2	6
Hourly Exit Rate	16	280	2	8	314	53	0	2	10	32	2	6
Input Volume	16	283	3	9	317	55	1	2	11	33	2	6
% of Volume	98	99	67	91	99	97	0	89	89	97	89	104

9001: Peach Ridge Ave NW & 4 Mile Rd NW Performance by movement

Movement	All
Vehicles Entered	726
Vehicles Exited	725
Hourly Exit Rate	725
Input Volume	738
% of Volume	98

9002: Walker Ave NW & 4 Mile Rd NW Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Entered	12	224	93	116	208	8	142	122	130	6	62	11
Vehicles Exited	12	224	93	116	208	8	142	122	129	6	62	10
Hourly Exit Rate	12	224	93	116	208	8	142	122	129	6	62	10
Input Volume	13	224	98	115	206	6	150	122	138	6	62	12
% of Volume	94	100	95	101	101	133	95	100	93	96	100	85

9002: Walker Ave NW & 4 Mile Rd NW Performance by movement

Movement	All
Vehicles Entered	1134
Vehicles Exited	1132
Hourly Exit Rate	1132
Input Volume	1152
% of Volume	98

Total Network Performance

Vehicles Entered	1177
Vehicles Exited	1173
Hourly Exit Rate	1173
Input Volume	4310
% of Volume	27

Appendix D.
Committed Development Trip Information

TRAFFIC IMPACT STUDY

DECEMBER 23, 2020

ENGLISH HILLS
MULTI-FAMILY HOUSING DEVELOPMENT
CITY OF WALKER, MICHIGAN

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3 Site Analysis

3.1 Trip Generation

The *ITE Trip Generation Manual, 10th Edition* (Institute of Transportation Engineers, 2017) provides equations and rates to calculate the estimated traffic from over 170 different land uses. The proposed site plan is to develop 23 low-rise apartment buildings, 17 mid-rise apartment buildings, a clubhouse, pool and some recreational green space on an existing golf course. The following ITE Trip Generation Land Uses were identified in the site development plan and used in the analysis:

- Land Use 220 – Multi-family Housing (Low-Rise)
- Land Use 221 – Multi-family Housing (Mid-Rise)

Trips generated by the housing development are captured using both Land Use 220 and 221, Multi-Family Housing (Low-Rise) and (Mid-Rise) respectively. These land uses were chosen due to similar size and occupancy of the development. There are two type of buildings being developed, a 20-units and 8-units per building. Based on the proposed site map the 20-unit buildings are only slightly larger than the 8-unit buildings. The additional capacity indicates multiple stories so those were assumed to be mid-rise and the 8-units being low-rise. The 20-unit buildings are located at the southernmost of the development and the 8-unit buildings are located at the northernmost of the development. The ITE land uses and estimated trip generation for the Future Build-Out during the weekday AM and PM peak hours are summarized in Table 5 and Appendix C.

TABLE 5: FUTURE TRIP GENERATION

English Hills Trip Generation (Trip Generation Manual 10th Edition)										
Land Use Code	Land Use	Proposed Site Description	AM Peak				PM Peak			
			# of Dwelling Units	Enter	Exit	Total	# of Dwelling Units	Enter	Exit	Total
220	Multifamily Housing (LOW - RISE)	23 Buildings (8-units each)	184	20	66	86	184	54	31	85
221	Multifamily Housing (MID - RISE)	17 Buildings (20-units each)	340	28	95	123	340	95	56	150
Total				**48**	**161**	**209**		**148**	**87**	**235**

3.2 Internal Trip Capture

The ITE Trip Generation Manual does not account for a development with two or more complementary land uses or a mixed-use development. At a mixed-use development, there is potential for interaction among those land uses; this is referred to as *Internal Capture*. As a result, the total generation of external trips (trips entering and exiting the overall site) may be less than the simple sum of the trips generated by each individual land use. The methodology to correct this error is presented in the *NCHRP Report 684: Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*.

Based on the proposed development's land uses and site layout, internal trip capture was not included during the AM or PM peak hours. Internal trips are not expected for this development and the land uses were not listed on the *NCHRP Report 684*.

The *NCHRP 684* report incorporates non-motorized trips. A non-motorized trip is defined as a person trip that is part of either a walk trip or bicycle trip. The greater the percentage of non-motorized trips the lower the number of vehicles trips. Non-motorized trips are more typical in urban core locations and areas with

pedestrian/bike trails. Without any existing pedestrian or non-motorized facilities along 4 Mile Rd, the proposed housing developments will not incorporate a percentage of non-motorized trips. This will ensure that a more conservative representation of traffic generated by the development into the roadway network.

3.3 Trip Distribution

Trips generated by the proposed development must be distributed to the site access points so that the impacts on the existing roadway system and intersections can be evaluated. The proposed site plan shows two site access points. The main access point is located along 4 Mile Rd at the English Hills Dr/Cordes Ave signalized intersection. It will be using the same curb cut that is being used for the existing Golf Course. The second access point (New Proposed Driveway) is also located along 4 Mile Rd, and it is approximately 1,850 ft west of the English Hills Dr/4 Mile Rd intersection. The proposed driveway will be an entirely new access point on to 4 Mile Rd.

The total trips generated for the Future Build-Out were distributed to the site access points and adjacent roadway network. The trip distribution is based on the following factors:

- Existing peak hour traffic distribution at the 4 Mile Rd / M-37 (Alpine Ave) intersection
  - AM
    - WB approach: 48%
    - EB approach: 52%
  - PM
    - WB approach: 43%
    - EB approach: 57%
- Development site layout. Building locations and signalized intersection at English Hills Dr
  - 80% of new trips will use the proposed East Driveway
  - 20% of new trips will use the proposed West Driveway
- Peak hour/Time-of-day

Based on the three factors above, the peak hour trip distribution percentages were developed. The trip distribution percentages and the subsequent results for the trips generated by the proposed site are shown on Tables 6 and 7.

TABLE 6: FUTURE BUILD-OUT AM PEAK HOUR TRIP DISTRIBUTION

ITE Trip Generation	AM Peak Hour Distribution							
Enter/Exit	Entering				Exiting			
Site Driveways	English Hills Driveway		New Proposed Driveway		English Hills Driveway		New Proposed Driveway	
Direction	Right	Left	Right	Left	Right	Left	Right	Left
Land Use	Multifamily Housing (TOTAL)							
Total Enter/Exit	76				256			
Internal Distribution % *	80%		20%		80%		20%	
Access Point Distribution % **	48%	52%	48%	52%	48%	52%	48%	52%
Access Point Volumes	30	32	8	8	99	107	25	27
All Land Uses Total	**30**	**32**	**8**	**8**	**99**	**107**	**25**	**27**

TABLE 7: FUTURE BUILD-OUT PM PEAK HOUR TRIP DISTRIBUTION

ITE Trip Generation	PM Peak Hour Distribution							
Enter/Exit	Entering				Exiting			
Site Driveways	English Hills Driveway		New Proposed Driveway		English Hills Driveway		New Proposed Driveway	
Direction	Right	Left	Right	Left	Right	Left	Right	Left
Land Use	Multifamily Housing (TOTAL)							
Total Enter/Exit	243				142			
Internal Distribution % *	80%		20%		80%		20%	
Access Point Distribution % **	57%	43%	57%	43%	57%	43%	57%	43%
Access Point Volumes	110	85	28	22	65	50	17	13
All Land Uses Total	**110**	**85**	**28**	**22**	**65**	**50**	**17**	**13**

3.4 Pass-By Trips

Pass-by trips are trips generated by the development from the adjacent street traffic. The pass-by trips do not decrease the total trips generated by the development; however, the total *new* trips generated by the development are decreased. A percentage of the trips generated by the site are taken from the existing traffic on the adjacent street. The *ITE Trip Generation Handbook, 3nd Edition (2018)* provides guidance for calculating the pass-by trips for applicable developments. Typically, retail establishments, banks, and fast-food restaurants are specifically located on or adjacent to busy streets to attract motorists already on the roadway. It is expected that the proposed site would generate a portion of its trips from pass-by traffic.

Based on the proposed development's land uses, pass-by trips were not considered during the AM or PM peak hours because pass-by trips are generally not considered for residential developments. In addition, the proposed land uses are not listed in ITE Trip Generation Handbook.

3.5 Traffic Volumes

The trips generated by the proposed site for the AM and PM peaks are added to the 2023 No-Build traffic Volumes. The 2020 Existing, 2023 No-Build, Trip Distribution, Trip Generation, and 2023 Build-Out traffic volumes for the AM and PM peaks are shown on Exhibit 4 to Exhibit 11.

Since we don't have the separated number of traffic for the golf course and existing residences along English Hills Dr and with the insignificant number of traffic using the vacant golf course, we should note that the existing traffic accessing the golf course only was not removed from the existing traffic volumes. There was no reduction to the existing traffic volumes due to the minimal and lack of consistent trips at the current vacant site. This will be more a more conservative approach to this for the purpose of the analysis.

EXHIBIT 8: TRIP DISTRIBUTION DIAGRAM

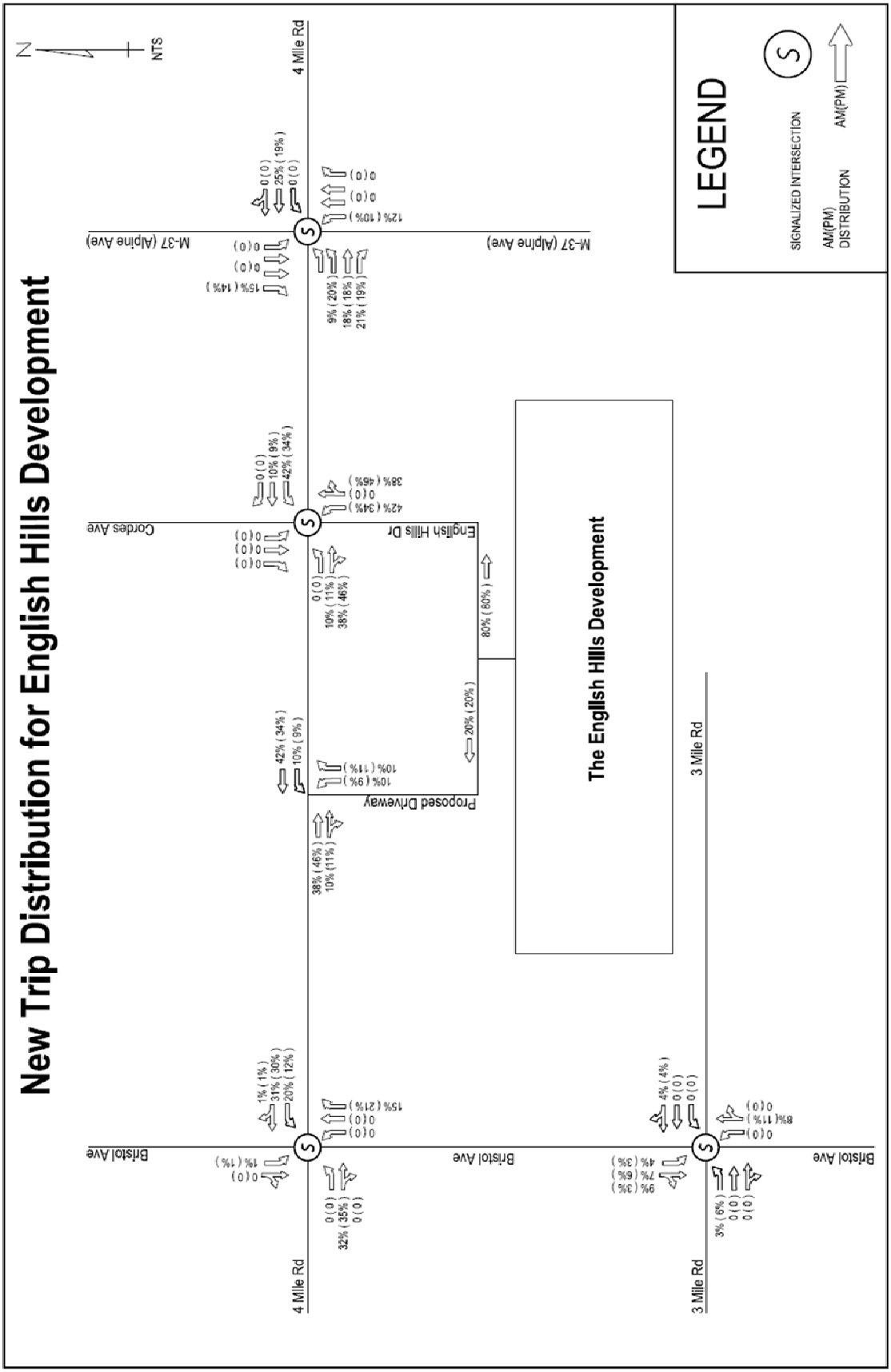
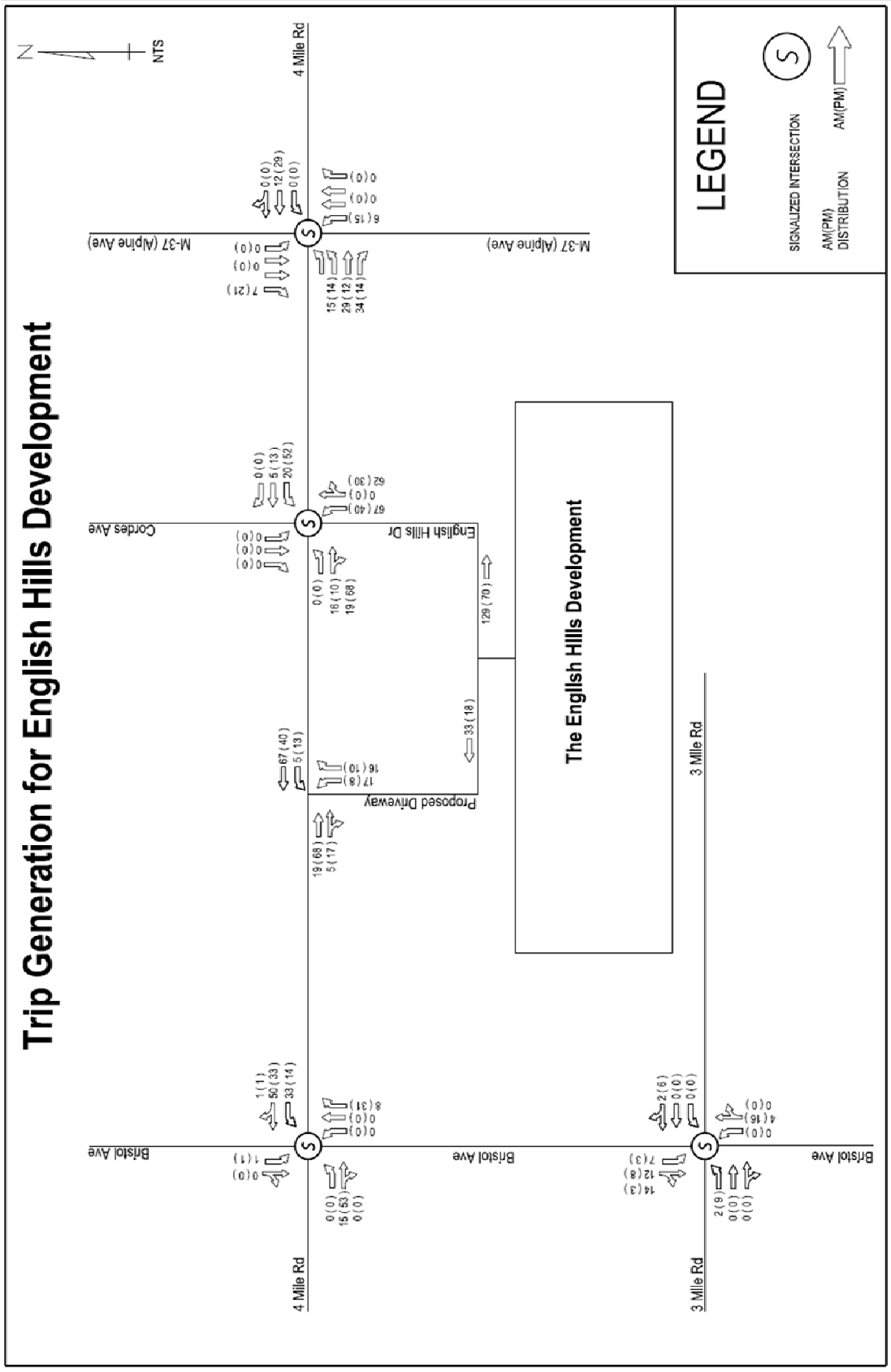


EXHIBIT 9: TRIP GENERATION DIAGRAM



2.0 PROJECTED BUILD CONDITIONS

The assessment with traffic from the proposed development began with the development of turning movement volumes for the weekday morning and afternoon peak hours for each phase of development. These projected traffic volumes were derived from developing the trip generation, distribution, and assignment for the proposed development by phase and adding them to the existing traffic volumes that were adjusted by the growth rate to project future development years.

The overall proposed industrial development will consist of approximately 1.24 million square feet of industrial type space. The timeline for construction of this development is not well defined nor are the exact industrial uses. The development will be constructed in three phases with an assumed build out year of 2029. It was estimated that Phase 1 would be fully constructed in 2025 and would consist of approximately 787,000 square feet of industrial space. Phase 2 would be fully constructed in 2026 would consist of approximately 313,000 square feet of industrial space. Phase 3 would be fully constructed in 2029 and would consist of an additional 144,00 square feet of industrial. The exact sizes and timeframes are not yet known and were estimated for analysis purposes.

2.1 TRIP GENERATION

New trips to be generated by the proposed development were estimated based on information and procedures contained in the Institute of Transportation Engineer's (ITE) report *Trip Generation, Tenth Edition, September 2017.* Land Use Code 130 – Industrial Park was used to estimate trips for each phase of development. An industrial park contains a number of industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Table 2-1 summarizes the expected morning and afternoon peak hour trip generation by phase.

Table 2-1 Trip Generation

Land Use	Phase & Size	AM Peak Hour			PM Peak Hour		
		Total	In	Out	Total	In	Out
Industrial Park (LUC 130)	Phase 1 - 787,000 Sft	315	255	60	315	66	249
	Phase 2 - 313,000 Sft	125	101	24	125	26	99
	Phase 3 - 144,000 Sft	58	47	11	58	12	46
	Total at Full Build-out	**498**	**403**	**95**	**498**	**104**	**394**

2.2 DIRECTIONAL DISTRIBUTION

Trip distribution for the site traffic was determined based on existing peak hour traffic volumes on the study area roadways. The most recent traffic count information provided by GVMC was utilized to examine traffic volumes to roadways to the north of Four Mile Road, to the south on Walker Avenue, to the south on Fruitridge Avenue, and to the east and west on I-96. The resultant trip distribution pattern for the proposed development is as follows:

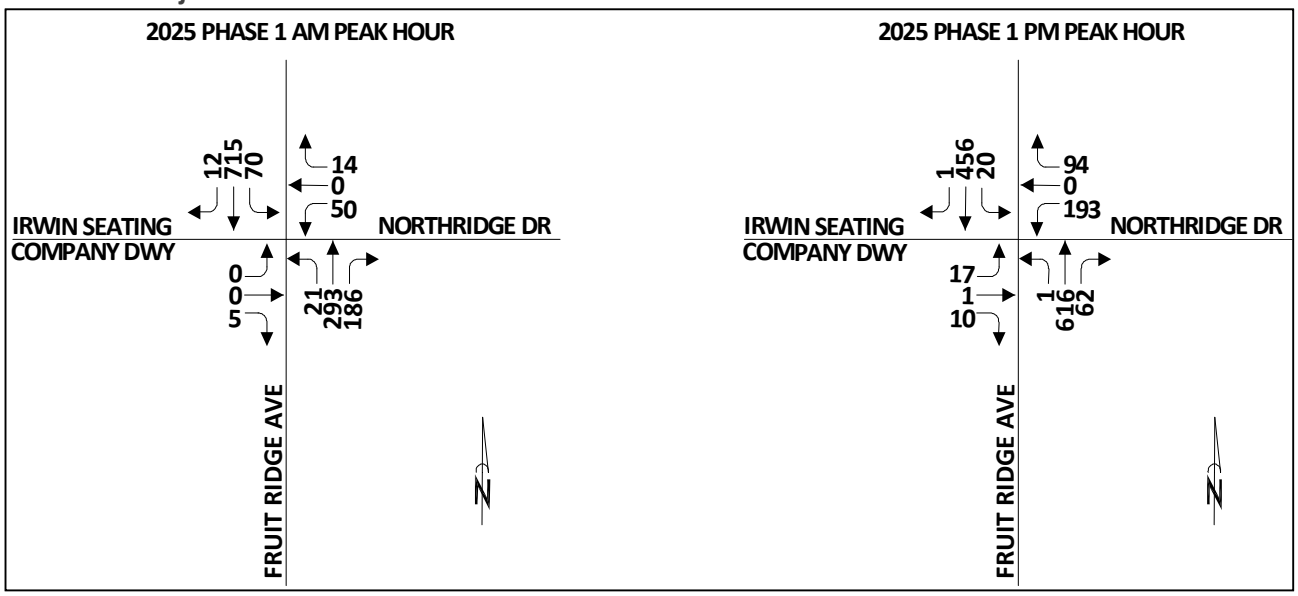
- To/from the north on Fruitridge Avenue 18%
- To/from the south on Fruitridge Avenue 57%
- To/from the east on Northridge Drive 25%.

As this analysis focuses only on the Fruitridge Avenue and Northridge Drive intersection, the 25% of traffic to/from the east on the new Northridge Drive connection to Walker Avenue is not included in the analyses.

2.3 PROJECTED 2025 PHASE 1 TRAFFIC VOLUMES

The estimated number of weekday morning and afternoon peak hour trips for projected 2025 phase 1 conditions was determined by applying the 1.42% per year growth rate to the existing 2019 traffic volumes to obtain estimated 2025 traffic volumes at the intersection, and then adding the estimated site generated traffic for phase 1. The new site generated traffic was distributed to the intersection using the directional distribution provided in the previous section. Exhibit 2-1 illustrates the weekday morning and afternoon peak hour traffic volumes for projected 2025 phase 1 conditions.

Exhibit 2-1 Projected 2025 Phase 1 Traffic Volumes



2.4 PROJECTED 2025 PHASE 1 OPERATIONAL ANALYSIS

Highway capacity analyses for projected 2025 phase 1 conditions revealed that the westbound left-turn movement is expected to operate at a level of service F during both the morning and afternoon peak hours, with significant delays during the afternoon peak hour. The remaining movements are expected to operate at a level of service C or better during both peak hours. Table 2-2 illustrates the projected 2025 phase 1 levels of service at Fruitridge Avenue and Northridge Drive during both the morning and afternoon peak hours.

Walkerview
Traffic Impact Study

City of Walker, Michigan

Final Report

May 2015

Prepared for

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WT Project #MOB2014.01N

Trip Generation

New trips expected to be generated by the industrial project for the initial move-in year of 2017, and the final phase in 2020 were estimated based on information and procedures contained in the Institute of Transportation Engineer's (ITE) report *Trip Generation, Ninth Edition, 2012*. A user has been identified for phase one and has provided their expected hourly arrival and departure traffic flows for use in the analysis. The traffic flows provided were compared to ITE Land Use Code 110 – General Light Industrial and were found to be comparable. The user provided traffic flows resulted in greater morning and afternoon peak hour trips than ITE identified.

The preliminary area site plan (PASP) developed by Moore & Bruggink was used to examine the remainder of the project. The project consists of a mixture of light industrial lots, heavy industrial lots, and commercial development. For the industrial uses, ITE Land Use Code 110 – General Light Industrial and ITE Land Use Code 120- General Heavy Industrial were used along with the overall acreage for each lot. Table 6 provides the trip generation summary for the industrial components of the overall site by lot.

The Walkerview commercial area is proposed to consist of four lots for office use and eight lots for retail uses consistent with zone district C-3 Highway Commercial. The retail portion of the site will consist of a mix of uses that have not been committed to at this time. For the purposes of this analysis, assumptions were made by the developer as to the type of uses that could potentially be developed. The assumed uses include a pharmacy/drug-store with drive-through, two sit down restaurants, two hotels, a fast-food restaurant with drive-through, a bread, donut, bagel shop with drive-through, and specialty retail type uses in a strip-commercial setting. The PASP defined maximum building footprints for each of the commercial lots. These maximum building footprints were used to examine the office and specialty retail uses. These footprints were assumed to directly correspond to the gross floor area of the office and specialty retail uses but not the restaurants, hotels, or pharmacy. The maximum building footprints for the restaurant, hotel, and pharmacy lots are much larger than average sizes for these uses. ITE *Trip Generation* provides average sizes by gross floor area for each type of use. For instance, a high turnover sit-down restaurant has an average size of 6,000 square feet of gross floor area. The lots identified for sit-down restaurants on the preliminary area site plan have maximum building footprints of 45,515 square feet and 26,570 square feet, which are considerably larger than a typical restaurant. Therefore, instead of using the maximum building footprints provided in the preliminary area site plan, the average (or slightly above average) sizes according to ITE *Trip Generation* were used for the proposed restaurants and pharmacy instead. An assumption was made that the hotels would each have 120 rooms. Tables 7 and 8 provide the trip generation summary for the commercial components of the development by lot.

Traffic for the proposed commercial development will consist of new trips, whose sole purpose is the visit to the site, internal trips, and pass-by trips. New Trips are those that are new to the study area and consist of motorists whose primary destination is the proposed development.

Table 6 Trip Generation Summary for Industrial Tracts

Lot	Acreage	Land Use	AM Peak Hour			PM Peak Hour		
			Inbound	*Outbound*	*Total*	*Inbound*	*Outbound*	*Total*
I1	11.40	General Light Industrial	71	15	86	18	65	83
I2	5.61	General Light Industrial	35	7	42	9	32	41
I3*	59.81	General Light Industrial	254	258	512	342	230	572
I4	4.51	General Light Industrial	28	6	34	7	26	33
I5	15.07	General Light Industrial	94	19	113	24	85	109
I6	6.39	General Light Industrial	40	8	48	10	36	46
I7	7.54	General Light Industrial	47	10	57	12	43	55
I8	5.23	General Heavy Industrial	9	2	10	2	9	11
I9	13.69	General Heavy Industrial	22	5	27	6	23	29
I10	3.79	General Heavy Industrial	6	1	8	2	6	8
I11	3.78	General Heavy Industrial	6	1	8	2	6	8
I12	3.75	General Heavy Industrial	6	1	7	2	6	8
I13	4.29	General Heavy Industrial	7	2	9	2	7	9
I14	10.12	General Light Industrial	63	13	76	16	57	73
I15	4.21	General Light Industrial	26	5	32	7	23	30
I16	4.85	General Light Industrial	30	6	36	8	27	35
I17	4.59	General Heavy Industrial	8	2	9	2	8	10
I18	4.79	General Heavy Industrial	8	2	10	2	8	10
I19	3.67	General Light Industrial	23	5	28	6	21	27
I20	9.07	General Light Industrial	57	12	68	14	51	65
I21	14.55	General Light Industrial	91	19	109	23	82	105
I22	11.90	General Light Industrial	74	15	89	19	67	86
Totals			***1005***	***413***	***1418***	***535***	***918***	***1453***

Table 7 AM Peak Hour Trip Generation Summary for Commercial Area

Lot	Max. Building Footprint (SFT)	Land Use	Estimated Size (SFT)	Total Trips			Internal Trips			Net trips			Pass-By Trips			New Trips		
				In	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*
C1	26,405	Specialty Retail	26,405	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C2	19,000	Pharmacy/Drugstore with Drive-Thru	14,000	25	23	48	4	6	10	21	17	38	10	8	18	11	9	20
C3	45,515	High Turnover Sit-Down Restaurant	7,000	42	34	76	7	10	17	35	24	59	15	11	26	20	13	33
C4	27,315	Fast-food Restaurant with Drive-Thru	4,000	93	89	182	16	25	41	77	64	141	39	32	71	38	32	70
C5	33,130	Hotel	120 rooms	38	26	64	6	7	13	32	19	51	0	0	0	32	19	51
C6	28,575	Hotel	120 rooms	38	26	64	6	7	13	32	19	51	0	0	0	32	19	51
C7	26,570	High Turnover Sit-Down Restaurant	7,000	42	34	76	7	10	17	35	24	59	15	11	26	20	13	33
C8	27,623	Bread, Donut, Bagel Shop with Drive-Thru	4,000	77	77	154	13	22	35	64	55	119	29	25	54	35	30	65
C9	81,565	Office	81,565	143	20	163	24	6	30	119	14	133	0	0	0	119	14	133
C11	17,630	Medical/Dental Office	17,630	33	9	42	6	3	9	27	6	33	0	0	0	27	6	33
C12	19,350	Medical/Dental Office	19,350	36	10	46	6	3	9	30	7	37	0	0	0	30	7	37
C13	15,790	Medical/Dental Office	15,790	30	8	38	5	2	7	25	6	31	0	0	0	25	6	31
				597	***356***	***953***	***100***	***101***	***201***	***497***	***255***	***752***	***108***	***87***	***195***	***389***	***168***	***557***

Table 8 PM Peak Hour Trip Generation Summary for Commercial Area

Lot	Max. Building Footprint (SFT)	Land Use	Estimated Size (SFT)	Total Trips			Internal Trips			Net Trips			Pass-By Trips			New Trips		
				In	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*	*In*	*Out*	*Total*
C1	26,405	Specialty Retail	26,405	37	48	85	11	11	22	26	37	63	9	13	22	17	24	41
C2	19,000	Pharmacy/Drugstore with Drive-Thru	14,000	70	69	139	21	15	36	49	54	103	24	26	50	25	28	53
C3	45,515	High Turnover Sit-Down Restaurant	7,000	41	28	69	12	6	18	29	22	51	12	9	22	17	13	30
C4	27,315	Fast-food Restaurant with Drive-Thru	4,000	68	63	131	20	14	34	48	49	97	24	25	48	24	24	48
C5	33,130	Hotel	120 rooms	37	35	72	11	8	19	26	27	53	0	0	0	26	27	53
C6	28,575	Hotel	120 rooms	37	35	72	11	8	19	26	27	53	0	0	0	26	27	53
C7	26,570	High Turnover Sit-Down Restaurant	7,000	41	28	69	12	6	18	29	22	51	12	9	22	17	13	30
C8	27,623	Bread, Donut, Bagel Shop with Drive-Thru	4,000	37	39	76	11	9	20	26	30	56	12	14	25	14	16	30
C9	81,565	Office	81,565	29	141	170	9	31	40	20	110	130	0	0	0	20	110	130
C11	17,630	Medical/Dental Office	17,630	18	45	63	5	10	15	13	35	48	0	0	0	13	35	48
C12	19,350	Medical/Dental Office	19,350	19	50	69	6	11	17	13	39	52	0	0	0	13	39	52
C13	15,790	Medical/Dental Office	15,790	16	40	56	5	9	14	11	31	42	0	0	0	11	31	42
				450	***621***	***1071***	***134***	***138***	***272***	***316***	***483***	***799***	***93***	***96***	***189***	***223***	***387***	***610***

A development that contains multiple uses, such as this one, can be expected to have some internal trip sharing. A shared trip is one that visits more than one use on the site and thus lessens the overall impact of a multiple use site on the adjacent street system. The National Cooperative Highway Research Program (NCHRP) has published Report 684 – *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. The ITE Trip Generation Handbook, 2nd Edition included three land use categories for trip sharing: office, retail, and residential. The NCHRP 684 added three additional categories: restaurant, cinema, and hotel. These additional three categories and their internal capture rates have since been incorporated into the latest ITE Trip Generation Handbook, 3rd Edition. The resulting methodology has been incorporated into a spreadsheet model which estimates the morning and afternoon internal peak hour trips by arrival and departure. The internal capture estimation tool worksheets for the commercial portion of Walkerview are provided in Appendix F. The industrial portion of the development was not considered in the internal trip sharing, only the commercial lots. It was found that during the morning peak hour, an internal capture percentage of 17% for entering traffic and 28% for exiting traffic were estimated with an average of 21% for the total trips. During the afternoon peak hour, an internal capture percentage of 30% for entering traffic and 22% for exiting traffic were estimated with an average of 25% for the total trips. These factors were applied to the total trips estimated for the commercial area.

Pass-by trips are typically associated with retail uses, as well as gas stations and restaurants. Pass-by trips are comprised of vehicles already traveling on the adjacent roads, which divert from their original path of travel to visit one of the uses. The ultimate destination of a pass-by trip is directed elsewhere. Pass-by trips were applied to the restaurant uses, specialty retail, and the pharmacy/drug-store use. The pass-by rates were based on ITE's *Trip Generation Handbook*. Based on information provided for similar size uses, a pass-by rate of 34 percent was applied to the specialty retail, 43 percent to the sit-down restaurants, 50 percent to the fast-food restaurant with drive-through, 49 percent to the pharmacy/drugstore with drive-through, and 45 percent to the bread, donut, bagel shop with drive-through.

As a result, the proposed overall development at full build out is expected to generate a total of 1,975 new trips during the morning peak hour with 1,394 inbound trips and 581 outbound trips, and 2,063 new trips during the afternoon peak hour with 758 inbound trips and 1,305 outbound trips. Table 9 illustrates the overall trip generation summary for Walkerview.

Table 9 Walkerview Trip Generation Summary at Full Build Out

Land Use		Morning Peak Hour			Afternoon Peak Hour		
		Inbound	*Outbound*	*Total Trips*	*Inbound*	*Outbound*	*Total Trips*
Industrial Area		1005	413	1418	535	918	1453
Commercial Area	*Net Trips*	*497*	*255*	*752*	*316*	*483*	*799*
	-Pass-by Trips	*-108*	*-87*	*-195*	*-93*	*-96*	*-189*
	New Trips	389	168	557	223	387	610
Total Walkerview Trip Generation		**1394**	**581**	**1975**	**758**	**1305**	**2063**

This project is anticipated to be developed in two phases including the 60-acre light industrial parcel (I-3) in phase one and a portion of the commercial and light industrial parcels that front Walker Avenue and the new Northridge Drive along I-3. These parcels include all the commercial parcels as well as I-1, I-2, I-4, I-5, and I-6. For the purposes of this analysis, the

working group decided that 40% of all those frontage parcels would be completed in addition to the 60-acre light industrial parcel for phase one.

The 60-acre phase one light industrial parcel is expected to be constructed by December of 2016. However, the traffic flows provided for this user are not all anticipated in the first year of opening. The traffic generation for this user will increase each year over the five-year period. This user provided anticipated traffic flows for their site from the initial construction to expected flows at full build. The expected traffic flows provided for 2017 were used for the phase one analysis.

The expected traffic generation for phase one of the development is summarized in Table 10. Phase one of the proposed development is expected to generate a total of 613 new trips during the morning peak hour with 389 inbound trips and 224 outbound trips, and 641 new trips during the afternoon peak hour with 282 inbound trips and 359 outbound trips.

Table 10 Walkerview Phase One Trip Generation Summary

Land Use		Morning Peak Hour			Afternoon Peak Hour		
		Inbound	*Outbound*	*Total Trips*	*Inbound*	*Outbound*	*Total Trips*
I-3 Light Industrial (Distribution Center)		**126**	**135**	**261**	**166**	**107**	**273**
Lots C1-C13 & I1, I2, I4, I5, & I6							
40% Build Phase 1	*Net Trips*	*306*	*124*	*430*	*154*	*291*	*445*
	-Pass-by Trips	*43*	*35*	*78*	*37*	*38*	*75*
	New Trips	263	89	352	116	252	368
TOTAL PHASE 1 TRIP GENERATION		**389**	**224**	**613**	**282**	**359**	**641**

The phase one light industrial user provided their expected hourly arrival and departure traffic flows for use in the analysis. The traffic flows provided were broken down by automobile, P&D vans, spot trailers, and linehauls. These numbers were used to examine the commercial truck percentages used in the traffic capacity analyses and increase the percentages where applicable to accommodate for the future industrial uses. It should be noted that during the weekday morning peak hour, the heavy vehicles expected are minimal with 4 total trips during the morning peak hour. During the afternoon peak hour, the expected heavy vehicles identified with the phase one user have minimal outbound movement and a heavier inbound movement of spot trailers. The commercial truck percentages were examined under phase one and at full build and adjusted to accommodate the industrial uses.

Directional Distribution

Trip distribution for the site was determined based on existing peak hour traffic volumes in the study area and discussions with the working group. The working group decided that two different trip distributions patterns should be used between phase one and full build due to the access connection to Bristol Avenue not occurring until full build condition. The resultant site trip distribution patterns that were approved by the working group are provided in Figures 8 and 9.

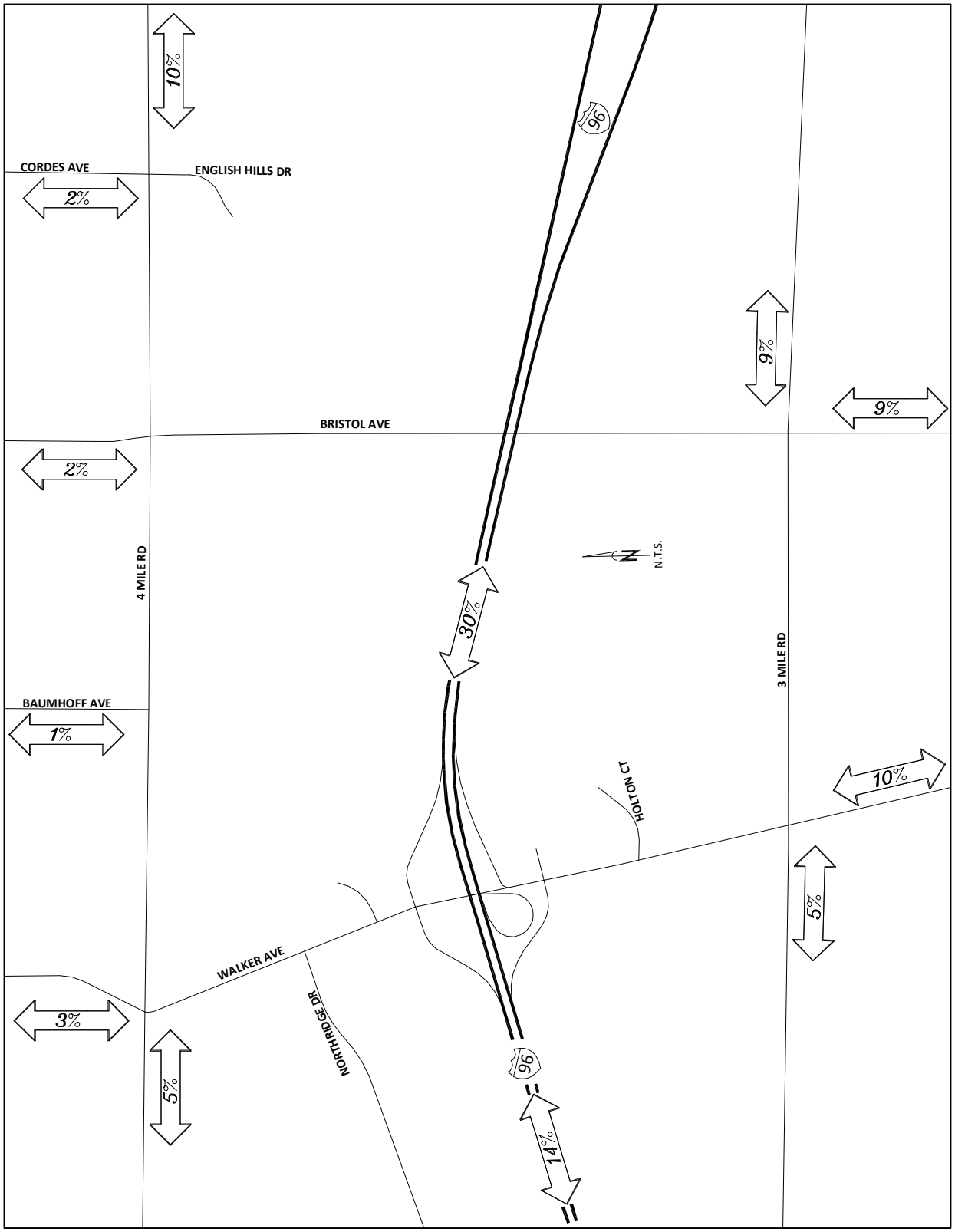


Figure 9 Trip Distribution Pattern at Full Build (Including Bristol Avenue Access)

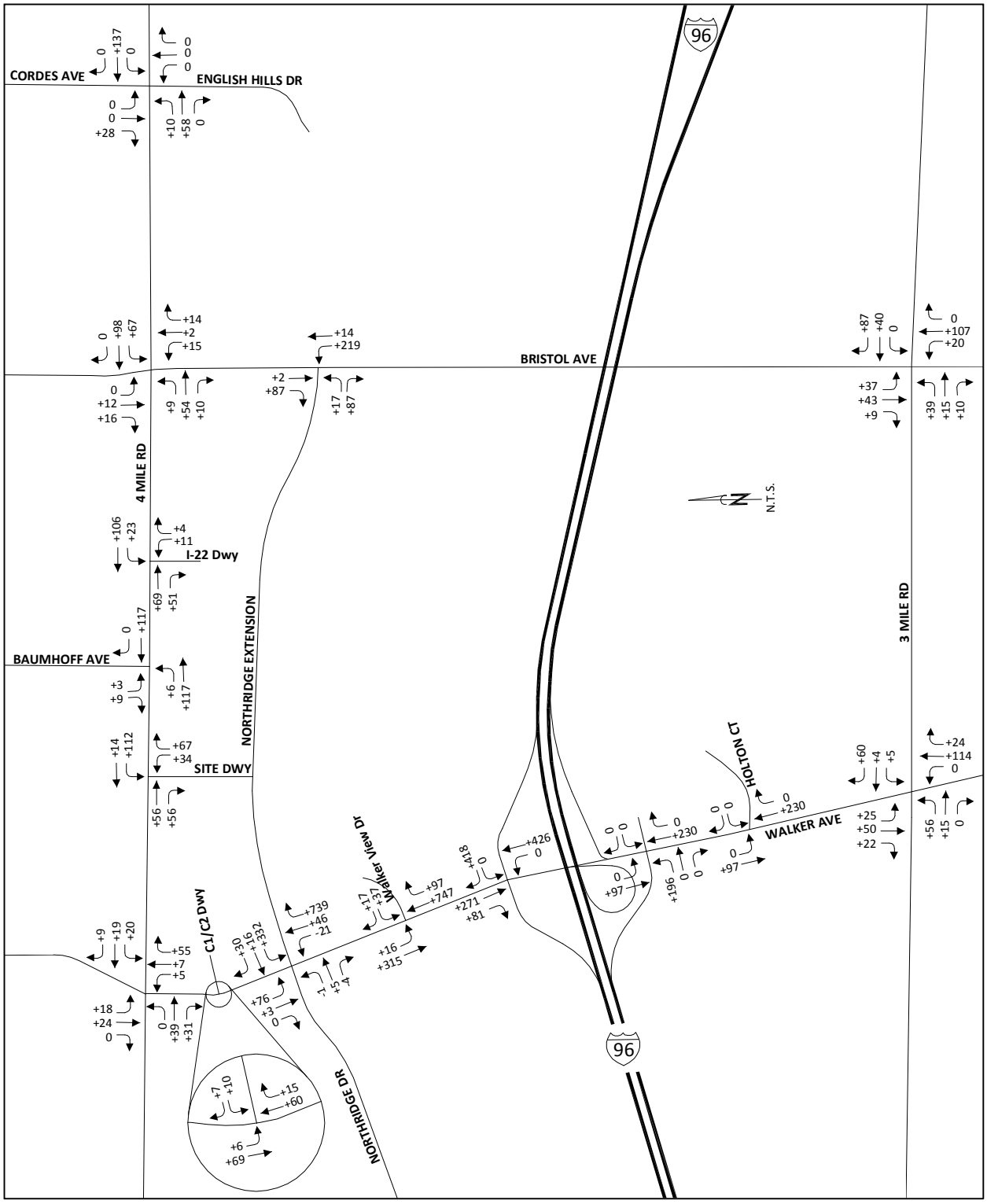


Figure 14 Projected 2020 Build AM Peak Hour Site Generated Trips

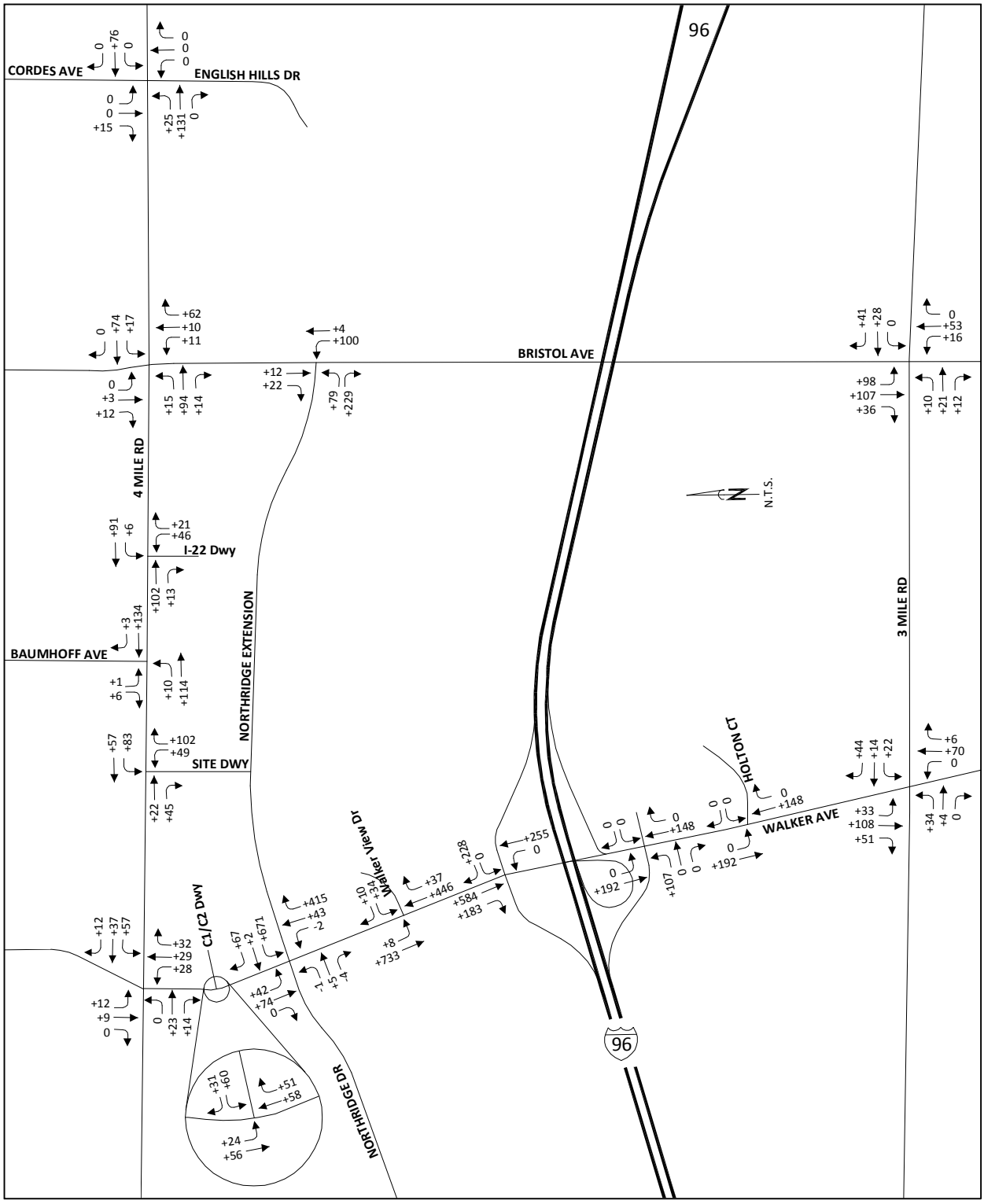


Figure 15 Projected 2020 Build PM Peak Hour Site Generated Trips

Appendix E.
Future 2023 No-Build Synchro Results

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	8	372	7	5	440	12	5	1	16	41	0	20
Future Vol, veh/h	8	372	7	5	440	12	5	1	16	41	0	20
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	12	547	10	8	688	19	7	1	21	58	0	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	707	0	0	557	0	0	1299	1294	547	1291	1285	688
Stage 1	-	-	-	-	-	-	571	571	-	704	704	-
Stage 2	-	-	-	-	-	-	728	723	-	587	581	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	873	-	-	1009	-	-	124	147	497	140	165	446
Stage 1	-	-	-	-	-	-	469	471	-	428	440	-
Stage 2	-	-	-	-	-	-	382	400	-	496	500	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	873	-	-	1009	-	-	113	142	497	130	160	446
Mov Cap-2 Maneuver	-	-	-	-	-	-	113	142	-	130	160	-
Stage 1	-	-	-	-	-	-	460	462	-	419	434	-
Stage 2	-	-	-	-	-	-	353	395	-	464	490	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	20.3	46.5
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	264	873	-	-	1009	-	-	169
HCM Lane V/C Ratio	0.111	0.013	-	-	0.008	-	-	0.508
HCM Control Delay (s)	20.3	9.2	0	-	8.6	0	-	46.5
HCM Lane LOS	C	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	2.5

Intersection	
Intersection Delay, s/veh	74.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	215	213	92	229	9	201	59	130	16	106	25
Future Vol, veh/h	7	215	213	92	229	9	201	59	130	16	106	25
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	10	295	292	118	294	12	279	82	181	22	143	34
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	170.8	26.2	26	19.1
HCM LOS	F	D	D	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	31%	0%	50%	0%	96%	0%	81%
Vol Right, %	0%	69%	0%	50%	0%	4%	0%	19%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	201	189	7	428	92	238	16	131
LT Vol	201	0	7	0	92	0	16	0
Through Vol	0	59	0	215	0	229	0	106
RT Vol	0	130	0	213	0	9	0	25
Lane Flow Rate	279	262	10	586	118	305	22	177
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.676	0.564	0.024	1.298	0.289	0.702	0.057	0.438
Departure Headway (Hd)	9.538	8.513	8.848	7.97	9.524	8.974	10.375	9.707
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	382	428	407	457	380	406	347	374
Service Time	7.238	6.213	6.557	5.678	7.224	6.674	8.075	7.407
HCM Lane V/C Ratio	0.73	0.612	0.025	1.282	0.311	0.751	0.063	0.473
HCM Control Delay	30	21.7	11.8	173.4	16	30.2	13.7	19.8
HCM Lane LOS	D	C	B	F	C	D	B	C
HCM 95th-tile Q	4.8	3.4	0.1	25.4	1.2	5.2	0.2	2.2

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	353	3	9	360	61	1	2	11	37	2	7
Future Vol, veh/h	22	353	3	9	360	61	1	2	11	37	2	7
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	24	380	3	11	434	73	2	3	18	51	3	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	507	0	0	383	0	0	927	957	380	896	887	434
Stage 1	-	-	-	-	-	-	428	428	-	456	456	-
Stage 2	-	-	-	-	-	-	499	529	-	440	431	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	1053	-	-	1170	-	-	251	260	671	258	280	616
Stage 1	-	-	-	-	-	-	609	588	-	578	563	-
Stage 2	-	-	-	-	-	-	557	530	-	590	578	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1053	-	-	1170	-	-	237	249	671	240	268	616
Mov Cap-2 Maneuver	-	-	-	-	-	-	237	249	-	240	268	-
Stage 1	-	-	-	-	-	-	591	571	-	561	556	-
Stage 2	-	-	-	-	-	-	539	523	-	554	561	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	12.7	22.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	489	1053	-	-	1170	-	-	266
HCM Lane V/C Ratio	0.048	0.022	-	-	0.009	-	-	0.237
HCM Control Delay (s)	12.7	8.5	0	-	8.1	0	-	22.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.9

Intersection	
Intersection Delay, s/veh	28.6
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	272	110	160	256	13	171	148	171	13	71	16
Future Vol, veh/h	25	272	110	160	256	13	171	148	171	13	71	16
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	28	306	124	170	272	14	186	161	186	15	82	18
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	46	20.3	23.8	14.3
HCM LOS	E	C	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	46%	0%	71%	0%	95%	0%	82%
Vol Right, %	0%	54%	0%	29%	0%	5%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	171	319	25	382	160	269	13	87
LT Vol	171	0	25	0	160	0	13	0
Through Vol	0	148	0	272	0	256	0	71
RT Vol	0	171	0	110	0	13	0	16
Lane Flow Rate	186	347	28	429	170	286	15	100
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.432	0.72	0.065	0.902	0.394	0.619	0.039	0.245
Departure Headway (Hd)	8.373	7.471	8.285	7.563	8.339	7.788	9.477	8.821
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	429	482	431	476	431	461	376	405
Service Time	6.146	5.244	6.057	5.335	6.119	5.568	7.277	6.62
HCM Lane V/C Ratio	0.434	0.72	0.065	0.901	0.394	0.62	0.04	0.247
HCM Control Delay	17.4	27.3	11.6	48.2	16.5	22.5	12.7	14.5
HCM Lane LOS	C	D	B	E	C	C	B	B
HCM 95th-tile Q	2.1	5.7	0.2	10.1	1.8	4.1	0.1	0.9

Intersection	
Int Delay, s/veh	340.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	215	213	92	229	9	201	59	130	16	106	25
Future Vol, veh/h	7	215	213	92	229	9	201	59	130	16	106	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	120	-	-	180	-	-	130	-	150	80	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	78	78	78	72	72	72	74	74	74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	10	295	292	118	294	12	279	82	181	22	143	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	306	0	0	587	0	0	1086	1003	441	1129	1143	300
Stage 1	-	-	-	-	-	-	461	461	-	536	536	-
Stage 2	-	-	-	-	-	-	625	542	-	593	607	-
Critical Hdwy	4.15	-	-	4.16	-	-	7.14	6.54	6.24	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-	6.12	5.52	-
Follow-up Hdwy	2.245	-	-	2.254	-	-	3.536	4.036	3.336	3.518	4.018	3.318
Pot Cap-1 Maneuver	1238	-	-	969	-	-	~ 192	240	612	181	200	740
Stage 1	-	-	-	-	-	-	577	562	-	529	523	-
Stage 2	-	-	-	-	-	-	469	517	-	492	486	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1238	-	-	969	-	-	~ 53	209	612	81	174	740
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 53	209	-	81	174	-
Stage 1	-	-	-	-	-	-	572	558	-	525	459	-
Stage 2	-	-	-	-	-	-	~ 270	454	-	294	482	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.6	$ 1078.2	68
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	53	209	612	1238	-	-	969	-	-	81	174	740
HCM Lane V/C Ratio	5.267	0.392	0.295	0.008	-	-	0.122	-	-	0.267	0.823	0.046
HCM Control Delay (s)	$ 2073.7	32.9	13.3	7.9	-	-	9.2	-	-	64.9	82.1	10.1
HCM Lane LOS	F	D	B	A	-	-	A	-	-	F	F	B
HCM 95th %tile Q(veh)	31.6	1.7	1.2	0	-	-	0.4	-	-	1	5.7	0.1

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	70.3

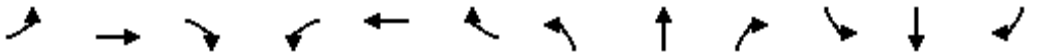
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	272	110	160	256	13	171	148	171	13	71	16
Future Vol, veh/h	25	272	110	160	256	13	171	148	171	13	71	16
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	120	-	-	180	-	-	130	-	150	80	-	150
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	94	94	94	92	92	92	87	87	87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	28	306	124	170	272	14	186	161	186	15	82	18

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	286	0	0	430	0	0	1094	1050	368	1217	1105	280
Stage 1	-	-	-	-	-	-	424	424	-	619	619	-
Stage 2	-	-	-	-	-	-	670	626	-	598	486	-
Critical Hdwy	4.12	-	-	4.11	-	-	7.12	6.52	6.22	7.13	6.53	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.13	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.13	5.53	-
Follow-up Hdwy	2.218	-	-	2.209	-	-	3.518	4.018	3.318	3.527	4.027	3.327
Pot Cap-1 Maneuver	1276	-	-	1135	-	-	191	227	677	157	210	756
Stage 1	-	-	-	-	-	-	608	587	-	474	479	-
Stage 2	-	-	-	-	-	-	446	477	-	487	549	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1276	-	-	1135	-	-	~ 104	189	677	29	175	755
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 104	189	-	29	175	-
Stage 1	-	-	-	-	-	-	595	574	-	464	407	-
Stage 2	-	-	-	-	-	-	295	405	-	249	537	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	3.3	189.7	60.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	SBLn3
Capacity (veh/h)	104	189	677	1276	-	-	1135	-	-	29	175	755
HCM Lane V/C Ratio	1.787	0.851	0.275	0.022	-	-	0.15	-	-	0.515	0.466	0.024
HCM Control Delay (s)	$ 460.1	82.3	12.3	7.9	-	-	8.7	-	-	221.8	42.4	9.9
HCM Lane LOS	F	F	B	A	-	-	A	-	-	F	E	A
HCM 95th %tile Q(veh)	14.9	6.2	1.1	0.1	-	-	0.5	-	-	1.6	2.2	0.1

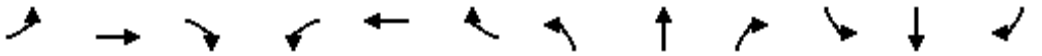
Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	215	213	92	229	9	201	59	130	16	106	25
Future Volume (veh/h)	7	215	213	92	229	9	201	59	130	16	106	25
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	10	295	292	118	294	12	279	82	181	22	143	34
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	421	344	340	192	706	29	424	123	272	223	183	43
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.24	0.24	0.24	0.13	0.13	0.13
Sat Flow, veh/h	1048	842	834	802	1728	71	1753	511	1127	1781	1461	347
Grp Volume(v), veh/h	10	0	587	118	0	306	279	0	263	22	0	177
Grp Sat Flow(s),veh/h/ln	1048	0	1676	802	0	1798	1753	0	1638	1781	0	1808
Q Serve(g_s), s	0.4	0.0	19.1	5.4	0.0	7.3	8.6	0.0	8.7	0.7	0.0	5.7
Cycle Q Clear(g_c), s	7.7	0.0	19.1	24.5	0.0	7.3	8.6	0.0	8.7	0.7	0.0	5.7
Prop In Lane	1.00		0.50	1.00		0.04	1.00		0.69	1.00		0.19
Lane Grp Cap(c), veh/h	421	0	684	192	0	734	424	0	396	223	0	226
V/C Ratio(X)	0.02	0.00	0.86	0.62	0.00	0.42	0.66	0.00	0.66	0.10	0.00	0.78
Avail Cap(c_a), veh/h	421	0	684	192	0	734	424	0	396	223	0	226
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.4	0.0	16.2	28.4	0.0	12.7	20.5	0.0	20.6	23.3	0.0	25.5
Incr Delay (d2), s/veh	0.1	0.0	13.2	13.9	0.0	1.7	7.8	0.0	8.5	0.9	0.0	23.2
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(50%),veh/ln	0.1	0.0	8.2	2.3	0.0	2.7	3.9	0.0	3.8	0.3	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.5	0.0	29.3	42.3	0.0	14.4	28.3	0.0	29.1	24.1	0.0	48.7
LnGrp LOS	B	A	C	D	A	B	C	A	C	C	A	D
Approach Vol, veh/h		597			424			542			199	
Approach Delay, s/veh		29.1			22.2			28.7			46.0	
Approach LOS		C			C			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.0		29.0		12.0		29.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		14.5		24.5		7.5		24.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			29.2									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	272	110	160	256	13	171	148	171	13	71	16
Future Volume (veh/h)	25	272	110	160	256	13	171	148	171	13	71	16
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	28	306	124	170	272	14	186	161	186	15	82	18
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	406	474	192	290	666	34	490	217	251	221	184	40
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.28	0.28	0.28	0.13	0.13	0.13
Sat Flow, veh/h	1093	1265	513	966	1777	91	1781	791	913	1767	1473	323
Grp Volume(v), veh/h	28	0	430	170	0	286	186	0	347	15	0	100
Grp Sat Flow(s),veh/h/ln	1093	0	1778	966	0	1869	1781	0	1704	1767	0	1796
Q Serve(g_s), s	1.2	0.0	12.0	10.5	0.0	6.8	5.1	0.0	11.1	0.4	0.0	3.1
Cycle Q Clear(g_c), s	7.9	0.0	12.0	22.5	0.0	6.8	5.1	0.0	11.1	0.4	0.0	3.1
Prop In Lane	1.00		0.29	1.00		0.05	1.00		0.54	1.00		0.18
Lane Grp Cap(c), veh/h	406	0	667	290	0	701	490	0	469	221	0	224
V/C Ratio(X)	0.07	0.00	0.64	0.59	0.00	0.41	0.38	0.00	0.74	0.07	0.00	0.45
Avail Cap(c_a), veh/h	406	0	667	290	0	701	490	0	469	221	0	224
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.8	0.0	15.5	24.7	0.0	13.8	17.6	0.0	19.8	23.2	0.0	24.3
Incr Delay (d2), s/veh	0.3	0.0	4.8	8.5	0.0	1.8	2.2	0.0	10.1	0.6	0.0	6.3
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(50%),veh/ln	0.3	0.0	4.8	2.8	0.0	2.6	2.1	0.0	5.0	0.2	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.1	0.0	20.2	33.2	0.0	15.6	19.8	0.0	29.9	23.8	0.0	30.6
LnGrp LOS	B	A	C	C	A	B	B	A	C	C	A	C
Approach Vol, veh/h		458			456			533			115	
Approach Delay, s/veh		20.0			22.2			26.4			29.7	
Approach LOS		C			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		27.0		12.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		16.5		22.5		7.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			23.5									
HCM 6th LOS			C									

Appendix F.
Future 2032 No-Build Synchro Results

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	408	8	6	482	14	6	1	17	45	0	21
Future Vol, veh/h	9	408	8	6	482	14	6	1	17	45	0	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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	13	600	12	9	753	22	8	1	23	63	0	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	775	0	0	612	0	0	1423	1419	600	1415	1409	753
Stage 1	-	-	-	-	-	-	626	626	-	771	771	-
Stage 2	-	-	-	-	-	-	797	793	-	644	638	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	823	-	-	962	-	-	102	123	463	115	139	410
Stage 1	-	-	-	-	-	-	437	444	-	393	410	-
Stage 2	-	-	-	-	-	-	349	370	-	461	471	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	823	-	-	962	-	-	92	118	463	105	133	410
Mov Cap-2 Maneuver	-	-	-	-	-	-	92	118	-	105	133	-
Stage 1	-	-	-	-	-	-	427	433	-	384	403	-
Stage 2	-	-	-	-	-	-	319	364	-	427	460	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	24.4	73
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	217	823	-	-	962	-	-	138
HCM Lane V/C Ratio	0.147	0.016	-	-	0.01	-	-	0.674
HCM Control Delay (s)	24.4	9.4	0	-	8.8	0	-	73
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	3.7

Intersection	
Intersection Delay, s/veh	105.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	235	233	101	250	10	220	65	143	18	116	27
Future Vol, veh/h	8	235	233	101	250	10	220	65	143	18	116	27
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	11	322	319	129	321	13	306	90	199	24	157	36
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	249.3	34.4	33.3	21.8
HCM LOS	F	D	D	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	31%	0%	50%	0%	96%	0%	81%
Vol Right, %	0%	69%	0%	50%	0%	4%	0%	19%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	220	208	8	468	101	260	18	143
LT Vol	220	0	8	0	101	0	18	0
Through Vol	0	65	0	235	0	250	0	116
RT Vol	0	143	0	233	0	10	0	27
Lane Flow Rate	306	289	11	641	129	333	24	193
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.766	0.646	0.028	1.487	0.329	0.798	0.066	0.492
Departure Headway (Hd)	10.111	9.079	9.229	8.348	10.103	9.548	11.014	10.343
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	361	402	388	436	359	383	327	352
Service Time	7.811	6.779	6.971	6.089	7.803	7.248	8.714	8.043
HCM Lane V/C Ratio	0.848	0.719	0.028	1.47	0.359	0.869	0.073	0.548
HCM Control Delay	39.3	26.9	12.2	253.4	17.7	40.9	14.5	22.7
HCM Lane LOS	E	D	B	F	C	E	B	C
HCM 95th-tile Q	6.2	4.4	0.1	33.3	1.4	6.9	0.2	2.6

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	387	3	10	395	67	1	2	13	41	2	8
Future Vol, veh/h	24	387	3	10	395	67	1	2	13	41	2	8
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	26	416	3	12	476	81	2	3	22	56	3	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	557	0	0	419	0	0	1016	1049	416	982	971	476
Stage 1	-	-	-	-	-	-	468	468	-	500	500	-
Stage 2	-	-	-	-	-	-	548	581	-	482	471	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	1009	-	-	1135	-	-	218	229	641	225	250	583
Stage 1	-	-	-	-	-	-	579	565	-	547	538	-
Stage 2	-	-	-	-	-	-	524	503	-	560	554	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1009	-	-	1135	-	-	204	218	641	207	238	583
Mov Cap-2 Maneuver	-	-	-	-	-	-	204	218	-	207	238	-
Stage 1	-	-	-	-	-	-	559	546	-	528	529	-
Stage 2	-	-	-	-	-	-	503	495	-	519	535	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	13.2	27.1
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	466	1009	-	-	1135	-	-	232
HCM Lane V/C Ratio	0.057	0.026	-	-	0.011	-	-	0.301
HCM Control Delay (s)	13.2	8.7	0	-	8.2	0	-	27.1
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.2

Intersection	
Intersection Delay, s/veh	41.5
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	298	121	175	280	15	188	162	187	15	77	17
Future Vol, veh/h	27	298	121	175	280	15	188	162	187	15	77	17
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	30	335	136	186	298	16	204	176	203	17	89	20
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	78.1	24.3	30.3	15.4
HCM LOS	F	C	D	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	46%	0%	71%	0%	95%	0%	82%
Vol Right, %	0%	54%	0%	29%	0%	5%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	188	349	27	419	175	295	15	94
LT Vol	188	0	27	0	175	0	15	0
Through Vol	0	162	0	298	0	280	0	77
RT Vol	0	187	0	121	0	15	0	17
Lane Flow Rate	204	379	30	471	186	314	17	108
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.485	0.806	0.073	1.043	0.442	0.696	0.047	0.273
Departure Headway (Hd)	8.832	7.925	8.7	7.974	8.835	8.279	10.105	9.448
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	411	459	414	457	410	439	357	382
Service Time	6.532	5.625	6.4	5.674	6.535	5.979	7.805	7.148
HCM Lane V/C Ratio	0.496	0.826	0.072	1.031	0.454	0.715	0.048	0.283
HCM Control Delay	19.6	36.1	12.1	82.3	18.3	27.9	13.3	15.7
HCM Lane LOS	C	E	B	F	C	D	B	C
HCM 95th-tile Q	2.6	7.4	0.2	14.6	2.2	5.2	0.1	1.1

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	9	408	8	6	482	14	6	1	17	45	0	21
Future Vol, veh/h	9	408	8	6	482	14	6	1	17	45	0	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	-	-	100	-	-	20	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	13	600	12	9	753	22	8	1	23	63	0	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	775	0	0	612	0	0	1423	1419	600	1415	1409	753
Stage 1	-	-	-	-	-	-	626	626	-	771	771	-
Stage 2	-	-	-	-	-	-	797	793	-	644	638	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	823	-	-	962	-	-	102	123	463	115	139	410
Stage 1	-	-	-	-	-	-	437	444	-	393	410	-
Stage 2	-	-	-	-	-	-	349	370	-	461	471	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	823	-	-	962	-	-	92	118	463	105	133	410
Mov Cap-2 Maneuver	-	-	-	-	-	-	92	118	-	105	133	-
Stage 1	-	-	-	-	-	-	427	433	-	384	403	-
Stage 2	-	-	-	-	-	-	319	364	-	427	460	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	24.4	60.2
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	217	823	-	-	962	-	-	105	410
HCM Lane V/C Ratio	0.147	0.016	-	-	0.01	-	-	0.604	0.072
HCM Control Delay (s)	24.4	9.4	0	-	8.8	0	-	81.5	14.5
HCM Lane LOS	C	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	2.9	0.2

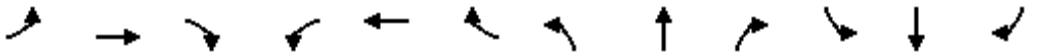
Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	387	3	10	395	67	1	2	13	41	2	8
Future Vol, veh/h	24	387	3	10	395	67	1	2	13	41	2	8
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	-	-	100	-	-	20	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	26	416	3	12	476	81	2	3	22	56	3	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	557	0	0	419	0	0	1016	1049	416	982	971	476
Stage 1	-	-	-	-	-	-	468	468	-	500	500	-
Stage 2	-	-	-	-	-	-	548	581	-	482	471	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	1009	-	-	1135	-	-	218	229	641	225	250	583
Stage 1	-	-	-	-	-	-	579	565	-	547	538	-
Stage 2	-	-	-	-	-	-	524	503	-	560	554	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1009	-	-	1135	-	-	204	218	641	207	238	583
Mov Cap-2 Maneuver	-	-	-	-	-	-	204	218	-	207	238	-
Stage 1	-	-	-	-	-	-	559	546	-	528	529	-
Stage 2	-	-	-	-	-	-	503	495	-	519	535	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	13.2	25.7
HCM LOS			B	D

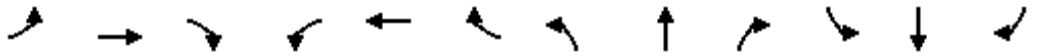
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	466	1009	-	-	1135	-	-	207	452
HCM Lane V/C Ratio	0.057	0.026	-	-	0.011	-	-	0.271	0.03
HCM Control Delay (s)	13.2	8.7	0	-	8.2	0	-	28.7	13.2
HCM Lane LOS	B	A	A	-	A	A	-	D	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.1	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	235	233	101	250	10	220	65	143	18	116	27
Future Volume (veh/h)	8	235	233	101	250	10	220	65	143	18	116	27
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	11	322	319	129	321	13	306	90	199	24	157	36
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	420	358	354	173	735	30	365	106	235	252	209	48
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.21	0.21	0.21	0.14	0.14	0.14
Sat Flow, veh/h	1021	842	834	763	1728	70	1753	510	1128	1781	1472	338
Grp Volume(v), veh/h	11	0	641	129	0	334	306	0	289	24	0	193
Grp Sat Flow(s),veh/h/ln	1021	0	1676	763	0	1798	1753	0	1638	1781	0	1810
Q Serve(g_s), s	0.5	0.0	21.4	4.1	0.0	7.9	10.0	0.0	10.2	0.7	0.0	6.1
Cycle Q Clear(g_c), s	8.3	0.0	21.4	25.5	0.0	7.9	10.0	0.0	10.2	0.7	0.0	6.1
Prop In Lane	1.00		0.50	1.00		0.04	1.00		0.69	1.00		0.19
Lane Grp Cap(c), veh/h	420	0	712	173	0	764	365	0	341	252	0	256
V/C Ratio(X)	0.03	0.00	0.90	0.75	0.00	0.44	0.84	0.00	0.85	0.10	0.00	0.75
Avail Cap(c_a), veh/h	420	0	712	173	0	764	365	0	341	252	0	256
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.1	0.0	16.1	29.2	0.0	12.2	22.8	0.0	22.8	22.4	0.0	24.7
Incr Delay (d2), s/veh	0.1	0.0	16.6	25.3	0.0	1.8	20.0	0.0	22.1	0.7	0.0	18.4
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(50%),veh/ln	0.1	0.0	9.5	2.9	0.0	2.9	5.6	0.0	5.5	0.3	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	0.0	32.7	54.5	0.0	14.0	42.8	0.0	44.9	23.2	0.0	43.1
LnGrp LOS	B	A	C	D	A	B	D	A	D	C	A	D
Approach Vol, veh/h		652			463			595			217	
Approach Delay, s/veh		32.4			25.3			43.8			40.9	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		17.0		30.0		13.0		30.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		12.5		25.5		8.5		25.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			35.2									
HCM 6th LOS			D									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	298	121	175	280	15	188	162	187	15	77	17
Future Volume (veh/h)	27	298	121	175	280	15	188	162	187	15	77	17
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	30	335	136	186	298	16	204	176	203	17	89	20
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	428	516	210	301	724	39	430	191	221	221	183	41
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.24	0.24	0.24	0.13	0.13	0.13
Sat Flow, veh/h	1066	1265	513	930	1773	95	1781	791	913	1767	1465	329
Grp Volume(v), veh/h	30	0	471	186	0	314	204	0	379	17	0	109
Grp Sat Flow(s),veh/h/ln	1066	0	1778	930	0	1868	1781	0	1704	1767	0	1795
Q Serve(g_s), s	1.2	0.0	12.8	11.7	0.0	7.2	5.9	0.0	13.0	0.5	0.0	3.4
Cycle Q Clear(g_c), s	8.4	0.0	12.8	24.5	0.0	7.2	5.9	0.0	13.0	0.5	0.0	3.4
Prop In Lane	1.00		0.29	1.00		0.05	1.00		0.54	1.00		0.18
Lane Grp Cap(c), veh/h	428	0	726	301	0	763	430	0	412	221	0	224
V/C Ratio(X)	0.07	0.00	0.65	0.62	0.00	0.41	0.47	0.00	0.92	0.08	0.00	0.49
Avail Cap(c_a), veh/h	428	0	726	301	0	763	430	0	412	221	0	224
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.6	0.0	14.3	24.3	0.0	12.6	19.5	0.0	22.2	23.2	0.0	24.5
Incr Delay (d2), s/veh	0.3	0.0	4.5	9.1	0.0	1.6	3.7	0.0	28.3	0.7	0.0	7.3
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(50%),veh/ln	0.3	0.0	4.9	3.1	0.0	2.7	2.5	0.0	7.6	0.2	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.9	0.0	18.7	33.4	0.0	14.3	23.2	0.0	50.4	23.9	0.0	31.8
LnGrp LOS	B	A	B	C	A	B	C	A	D	C	A	C
Approach Vol, veh/h		501			500			583			126	
Approach Delay, s/veh		18.6			21.4			40.9			30.7	
Approach LOS		B			C			D			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.0		29.0		12.0		29.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		14.5		24.5		7.5		24.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			27.9									
HCM 6th LOS			C									

Appendix G.
Future 2042 No-Build Synchro Results

Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		↔			↔	
Traffic Vol, veh/h	10	438	9	6	518	15	6	1	18	49	0	23
Future Vol, veh/h	10	438	9	6	518	15	6	1	18	49	0	23
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	15	644	13	9	809	23	8	1	24	69	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	832	0	0	657	0	0	1529	1524	644	1520	1514	809
Stage 1	-	-	-	-	-	-	674	674	-	827	827	-
Stage 2	-	-	-	-	-	-	855	850	-	693	687	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	783	-	-	926	-	-	85	106	436	97	120	380
Stage 1	-	-	-	-	-	-	410	422	-	366	386	-
Stage 2	-	-	-	-	-	-	324	348	-	434	447	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	783	-	-	926	-	-	75	101	436	87	114	380
Mov Cap-2 Maneuver	-	-	-	-	-	-	75	101	-	87	114	-
Stage 1	-	-	-	-	-	-	398	409	-	355	379	-
Stage 2	-	-	-	-	-	-	291	342	-	397	434	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	27.8	124.3
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	191	783	-	-	926	-	-	115
HCM Lane V/C Ratio	0.175	0.019	-	-	0.01	-	-	0.882
HCM Control Delay (s)	27.8	9.7	0	-	8.9	0	-	124.3
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	5.4

Intersection	
Intersection Delay, s/veh	135.7
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	253	250	108	269	11	237	70	153	19	124	29
Future Vol, veh/h	8	253	250	108	269	11	237	70	153	19	124	29
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	11	347	342	138	345	14	329	97	213	26	168	39
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	323.1	44.4	41.8	24.4
HCM LOS	F	E	E	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	31%	0%	50%	0%	96%	0%	81%
Vol Right, %	0%	69%	0%	50%	0%	4%	0%	19%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	237	223	8	503	108	280	19	153
LT Vol	237	0	8	0	108	0	19	0
Through Vol	0	70	0	253	0	269	0	124
RT Vol	0	153	0	250	0	11	0	29
Lane Flow Rate	329	310	11	689	138	359	26	207
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.843	0.709	0.029	1.658	0.359	0.879	0.071	0.538
Departure Headway (Hd)	10.602	9.566	9.547	8.663	10.582	10.024	11.524	10.849
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	346	381	376	427	342	366	313	335
Service Time	8.302	7.266	7.288	6.404	8.282	7.724	9.224	8.549
HCM Lane V/C Ratio	0.951	0.814	0.029	1.614	0.404	0.981	0.083	0.618
HCM Control Delay	50.6	32.5	12.6	328	19.1	54.1	15.1	25.5
HCM Lane LOS	F	D	B	F	C	F	C	D
HCM 95th-tile Q	7.6	5.3	0.1	40.4	1.6	8.5	0.2	3

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	415	4	11	424	72	1	2	13	44	2	9
Future Vol, veh/h	26	415	4	11	424	72	1	2	13	44	2	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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	28	446	4	13	511	87	2	3	22	60	3	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	598	0	0	450	0	0	1090	1126	446	1054	1043	511
Stage 1	-	-	-	-	-	-	502	502	-	537	537	-
Stage 2	-	-	-	-	-	-	588	624	-	517	506	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	974	-	-	1105	-	-	194	207	617	201	227	557
Stage 1	-	-	-	-	-	-	555	545	-	522	518	-
Stage 2	-	-	-	-	-	-	499	481	-	536	535	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	974	-	-	1105	-	-	180	196	617	183	215	557
Mov Cap-2 Maneuver	-	-	-	-	-	-	180	196	-	183	215	-
Stage 1	-	-	-	-	-	-	534	524	-	502	509	-
Stage 2	-	-	-	-	-	-	477	472	-	494	515	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	13.8	32
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	434	974	-	-	1105	-	-	207
HCM Lane V/C Ratio	0.061	0.029	-	-	0.012	-	-	0.364
HCM Control Delay (s)	13.8	8.8	0	-	8.3	0	-	32
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.6

Intersection	
Intersection Delay, s/veh	56.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	320	130	188	301	16	202	174	201	16	83	18
Future Vol, veh/h	29	320	130	188	301	16	202	174	201	16	83	18
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	33	360	146	200	320	17	220	189	218	18	95	21
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	114	29.6	39.2	16.4
HCM LOS	F	D	E	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	46%	0%	71%	0%	95%	0%	82%
Vol Right, %	0%	54%	0%	29%	0%	5%	0%	18%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	202	375	29	450	188	317	16	101
LT Vol	202	0	29	0	188	0	16	0
Through Vol	0	174	0	320	0	301	0	83
RT Vol	0	201	0	130	0	16	0	18
Lane Flow Rate	220	408	33	506	200	337	18	116
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.532	0.889	0.081	1.156	0.487	0.772	0.051	0.301
Departure Headway (Hd)	9.15	8.239	8.961	8.233	9.185	8.627	10.541	9.882
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	397	444	400	445	394	422	342	366
Service Time	6.85	5.939	6.705	5.978	6.885	6.327	8.241	7.582
HCM Lane V/C Ratio	0.554	0.919	0.083	1.137	0.508	0.799	0.053	0.317
HCM Control Delay	21.8	48.6	12.5	120.5	20.3	35.1	13.8	16.8
HCM Lane LOS	C	E	B	F	C	E	B	C
HCM 95th-tile Q	3	9.4	0.3	18.6	2.6	6.6	0.2	1.2

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	10	438	9	6	518	15	6	1	18	49	0	23
Future Vol, veh/h	10	438	9	6	518	15	6	1	18	49	0	23
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	-	-	100	-	-	20	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	15	644	13	9	809	23	8	1	24	69	0	32

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	832	0	0	657	0	0	1529	1524	644	1520	1514	809
Stage 1	-	-	-	-	-	-	674	674	-	827	827	-
Stage 2	-	-	-	-	-	-	855	850	-	693	687	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	783	-	-	926	-	-	85	106	436	97	120	380
Stage 1	-	-	-	-	-	-	410	422	-	366	386	-
Stage 2	-	-	-	-	-	-	324	348	-	434	447	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	783	-	-	926	-	-	75	101	436	87	114	380
Mov Cap-2 Maneuver	-	-	-	-	-	-	75	101	-	87	114	-
Stage 1	-	-	-	-	-	-	398	409	-	355	379	-
Stage 2	-	-	-	-	-	-	291	342	-	397	434	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	27.8	93.4
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	191	783	-	-	926	-	-	87	380
HCM Lane V/C Ratio	0.175	0.019	-	-	0.01	-	-	0.793	0.085
HCM Control Delay (s)	27.8	9.7	0	-	8.9	0	-	130	15.4
HCM Lane LOS	D	A	A	-	A	A	-	F	C
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	4.1	0.3

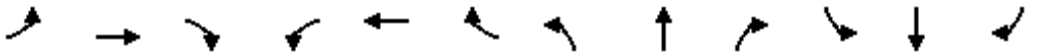
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	415	4	11	424	72	1	2	13	44	2	9
Future Vol, veh/h	26	415	4	11	424	72	1	2	13	44	2	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	-	-	100	-	-	20	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	28	446	4	13	511	87	2	3	22	60	3	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	598	0	0	450	0	0	1090	1126	446	1054	1043	511
Stage 1	-	-	-	-	-	-	502	502	-	537	537	-
Stage 2	-	-	-	-	-	-	588	624	-	517	506	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	974	-	-	1105	-	-	194	207	617	201	227	557
Stage 1	-	-	-	-	-	-	555	545	-	522	518	-
Stage 2	-	-	-	-	-	-	499	481	-	536	535	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	974	-	-	1105	-	-	180	196	617	183	215	557
Mov Cap-2 Maneuver	-	-	-	-	-	-	180	196	-	183	215	-
Stage 1	-	-	-	-	-	-	534	524	-	502	509	-
Stage 2	-	-	-	-	-	-	477	472	-	494	515	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	13.8	29.9
HCM LOS			B	D

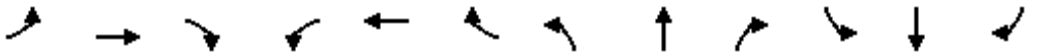
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	434	974	-	-	1105	-	-	183	432
HCM Lane V/C Ratio	0.061	0.029	-	-	0.012	-	-	0.329	0.035
HCM Control Delay (s)	13.8	8.8	0	-	8.3	0	-	34	13.6
HCM Lane LOS	B	A	A	-	A	A	-	D	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.4	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	253	250	108	269	11	237	70	153	19	124	29
Future Volume (veh/h)	8	253	250	108	269	11	237	70	153	19	124	29
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	11	347	342	138	345	14	329	97	212	26	168	39
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	318	654	554	272	619	25	453	133	290	282	232	54
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.26	0.26	0.26	0.16	0.16	0.16
Sat Flow, veh/h	998	1826	1547	730	1728	70	1753	514	1124	1781	1468	341
Grp Volume(v), veh/h	11	347	342	138	0	359	329	0	309	26	0	207
Grp Sat Flow(s),veh/h/ln	998	1826	1547	730	0	1798	1753	0	1638	1781	0	1809
Q Serve(g_s), s	0.5	9.0	10.9	11.1	0.0	9.6	10.3	0.0	10.3	0.7	0.0	6.5
Cycle Q Clear(g_c), s	10.1	9.0	10.9	20.1	0.0	9.6	10.3	0.0	10.3	0.7	0.0	6.5
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.69	1.00		0.19
Lane Grp Cap(c), veh/h	318	654	554	272	0	644	453	0	423	282	0	286
V/C Ratio(X)	0.03	0.53	0.62	0.51	0.00	0.56	0.73	0.00	0.73	0.09	0.00	0.72
Avail Cap(c_a), veh/h	318	654	554	272	0	644	453	0	423	282	0	286
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.5	15.3	15.9	23.2	0.0	15.4	20.3	0.0	20.3	21.6	0.0	24.0
Incr Delay (d2), s/veh	0.2	3.1	5.1	6.6	0.0	3.5	9.8	0.0	10.6	0.6	0.0	14.7
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(50%),veh/ln	0.1	3.6	3.9	2.1	0.0	3.8	4.8	0.0	4.6	0.3	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.7	18.3	20.9	29.9	0.0	18.9	30.1	0.0	30.9	22.2	0.0	38.7
LnGrp LOS	B	B	C	C	A	B	C	A	C	C	A	D
Approach Vol, veh/h		700			497			638			233	
Approach Delay, s/veh		19.6			21.9			30.5			36.8	
Approach LOS		B			C			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.0		26.0		14.0		26.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		15.5		21.5		9.5		21.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			25.5									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	320	130	188	301	16	202	174	201	16	83	18
Future Volume (veh/h)	29	320	130	188	301	16	202	174	201	16	83	18
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	33	360	146	200	320	17	220	189	218	18	95	21
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	368	701	594	323	665	35	490	218	251	221	184	41
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.28	0.28	0.28	0.13	0.13	0.13
Sat Flow, veh/h	1043	1870	1585	900	1774	94	1781	791	913	1767	1470	325
Grp Volume(v), veh/h	33	360	146	200	0	337	220	0	407	18	0	116
Grp Sat Flow(s),veh/h/ln	1043	1870	1585	900	0	1868	1781	0	1704	1767	0	1795
Q Serve(g_s), s	1.5	8.9	3.8	13.3	0.0	8.3	6.1	0.0	13.6	0.5	0.0	3.6
Cycle Q Clear(g_c), s	9.7	8.9	3.8	22.2	0.0	8.3	6.1	0.0	13.6	0.5	0.0	3.6
Prop In Lane	1.00		1.00	1.00		0.05	1.00		0.54	1.00		0.18
Lane Grp Cap(c), veh/h	368	701	594	323	0	701	490	0	469	221	0	224
V/C Ratio(X)	0.09	0.51	0.25	0.62	0.00	0.48	0.45	0.00	0.87	0.08	0.00	0.52
Avail Cap(c_a), veh/h	368	701	594	323	0	701	490	0	469	221	0	224
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.0	14.5	12.9	23.1	0.0	14.3	18.0	0.0	20.7	23.2	0.0	24.6
Incr Delay (d2), s/veh	0.5	2.7	1.0	8.6	0.0	2.4	3.0	0.0	19.2	0.7	0.0	8.3
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(50%),veh/ln	0.4	3.6	1.3	3.2	0.0	3.3	2.5	0.0	7.0	0.2	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	17.2	13.9	31.7	0.0	16.7	21.0	0.0	39.9	23.9	0.0	32.8
LnGrp LOS	B	B	B	C	A	B	C	A	D	C	A	C
Approach Vol, veh/h		539			537			627			134	
Approach Delay, s/veh		16.4			22.3			33.2			31.6	
Approach LOS		B			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		27.0		12.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		16.5		22.5		7.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			25.0									
HCM 6th LOS			C									

Appendix H.
Projected 2023 Build Synchro Results

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	376	7	5	452	13	5	1	16	41	0	20
Future Vol, veh/h	8	376	7	5	452	13	5	1	16	41	0	20
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	12	553	10	8	706	20	7	1	21	58	0	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	726	0	0	563	0	0	1323	1319	553	1315	1309	706
Stage 1	-	-	-	-	-	-	577	577	-	722	722	-
Stage 2	-	-	-	-	-	-	746	742	-	593	587	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	859	-	-	1003	-	-	120	142	493	135	159	436
Stage 1	-	-	-	-	-	-	465	468	-	418	431	-
Stage 2	-	-	-	-	-	-	373	391	-	492	497	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	859	-	-	1003	-	-	109	137	493	125	154	436
Mov Cap-2 Maneuver	-	-	-	-	-	-	109	137	-	125	154	-
Stage 1	-	-	-	-	-	-	456	459	-	410	425	-
Stage 2	-	-	-	-	-	-	344	386	-	460	487	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	20.8	49.4
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	257	859	-	-	1003	-	-	163
HCM Lane V/C Ratio	0.114	0.014	-	-	0.008	-	-	0.527
HCM Control Delay (s)	20.8	9.2	0	-	8.6	0	-	49.4
HCM Lane LOS	C	A	A	-	A	A	-	E
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	2.6

Intersection	
Intersection Delay, s/veh	88.1
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	226	226	92	233	9	206	59	130	16	106	26
Future Vol, veh/h	9	226	226	92	233	9	206	59	130	16	106	26
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	12	310	310	118	299	12	286	82	181	22	143	35
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	203.7	27.7	27.3	19.5
HCM LOS	F	D	D	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	31%	0%	50%	0%	96%	0%	80%
Vol Right, %	0%	69%	0%	50%	0%	4%	0%	20%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	206	189	9	452	92	242	16	132
LT Vol	206	0	9	0	92	0	16	0
Through Vol	0	59	0	226	0	233	0	106
RT Vol	0	130	0	226	0	9	0	26
Lane Flow Rate	286	262	12	619	118	310	22	178
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.697	0.568	0.031	1.381	0.291	0.719	0.057	0.44
Departure Headway (Hd)	9.704	8.677	8.909	8.029	9.677	9.126	10.581	9.907
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	375	420	404	458	374	400	341	366
Service Time	7.404	6.377	6.609	5.729	7.377	6.826	8.281	7.607
HCM Lane V/C Ratio	0.763	0.624	0.03	1.352	0.316	0.775	0.065	0.486
HCM Control Delay	31.9	22.2	11.9	207.5	16.3	32	13.9	20.2
HCM Lane LOS	D	C	B	F	C	D	B	C
HCM 95th-tile Q	5.1	3.4	0.1	29.3	1.2	5.5	0.2	2.2

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	4	429	455	10	26	13
Future Vol, veh/h	4	429	455	10	26	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	-	-	-	35	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	75	75	92	92
Heavy Vehicles, %	6	6	5	5	2	2
Mvmt Flow	6	622	607	13	28	14

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	620	0	-	0	1241	607
Stage 1	-	-	-	-	607	-
Stage 2	-	-	-	-	634	-
Critical Hdwy	4.16	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.254	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	941	-	-	-	193	496
Stage 1	-	-	-	-	544	-
Stage 2	-	-	-	-	529	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	941	-	-	-	191	496
Mov Cap-2 Maneuver	-	-	-	-	191	-
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	529	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	22.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	941	-	-	-	191	496
HCM Lane V/C Ratio	0.006	-	-	-	0.148	0.028
HCM Control Delay (s)	8.8	0	-	-	27.1	12.5
HCM Lane LOS	A	A	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0.1

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	22	366	3	9	368	62	1	2	11	38	2	7
Future Vol, veh/h	22	366	3	9	368	62	1	2	11	38	2	7
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	83	83	83	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	24	394	3	11	443	75	2	3	18	52	3	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	518	0	0	397	0	0	951	982	394	919	910	443
Stage 1	-	-	-	-	-	-	442	442	-	465	465	-
Stage 2	-	-	-	-	-	-	509	540	-	454	445	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	1043	-	-	1156	-	-	242	251	659	249	271	608
Stage 1	-	-	-	-	-	-	598	580	-	572	558	-
Stage 2	-	-	-	-	-	-	550	524	-	580	570	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1043	-	-	1156	-	-	228	240	659	232	259	608
Mov Cap-2 Maneuver	-	-	-	-	-	-	228	240	-	232	259	-
Stage 1	-	-	-	-	-	-	580	563	-	555	550	-
Stage 2	-	-	-	-	-	-	531	517	-	544	553	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	13	23.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	476	1043	-	-	1156	-	-	257
HCM Lane V/C Ratio	0.049	0.023	-	-	0.009	-	-	0.251
HCM Control Delay (s)	13	8.5	0	-	8.1	0	-	23.6
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1

Intersection	
Intersection Delay, s/veh	32.4
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	279	119	160	267	13	185	148	171	13	71	18
Future Vol, veh/h	27	279	119	160	267	13	185	148	171	13	71	18
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	30	313	134	170	284	14	201	161	186	15	82	21
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	55.5	21.9	25.1	14.7
HCM LOS	F	C	D	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	46%	0%	70%	0%	95%	0%	80%
Vol Right, %	0%	54%	0%	30%	0%	5%	0%	20%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	185	319	27	398	160	280	13	89
LT Vol	185	0	27	0	160	0	13	0
Through Vol	0	148	0	279	0	267	0	71
RT Vol	0	171	0	119	0	13	0	18
Lane Flow Rate	201	347	30	447	170	298	15	102
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.475	0.733	0.071	0.953	0.401	0.656	0.041	0.259
Departure Headway (Hd)	8.51	7.606	8.399	7.668	8.477	7.927	9.771	9.1
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	422	472	425	470	422	453	369	397
Service Time	6.298	5.393	6.186	5.455	6.273	5.722	7.471	6.8
HCM Lane V/C Ratio	0.476	0.735	0.071	0.951	0.403	0.658	0.041	0.257
HCM Control Delay	18.8	28.7	11.8	58.5	16.9	24.7	12.9	15
HCM Lane LOS	C	D	B	F	C	C	B	B
HCM 95th-tile Q	2.5	6	0.2	11.6	1.9	4.6	0.1	1

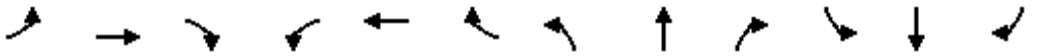
Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	401	443	27	18	9
Future Vol, veh/h	14	401	443	27	18	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	35	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	93	93	92	92
Heavy Vehicles, %	3	3	1	1	2	2
Mvmt Flow	16	446	476	29	20	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	505	0	-	0	954	476
Stage 1	-	-	-	-	476	-
Stage 2	-	-	-	-	478	-
Critical Hdwy	4.13	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1055	-	-	-	287	589
Stage 1	-	-	-	-	625	-
Stage 2	-	-	-	-	624	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1055	-	-	-	281	589
Mov Cap-2 Maneuver	-	-	-	-	281	-
Stage 1	-	-	-	-	613	-
Stage 2	-	-	-	-	624	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	16.3
HCM LOS			C

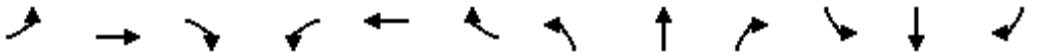
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1055	-	-	-	281	589
HCM Lane V/C Ratio	0.015	-	-	-	0.07	0.017
HCM Control Delay (s)	8.5	0	-	-	18.8	11.2
HCM Lane LOS	A	A	-	-	C	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	226	226	92	233	9	206	59	130	16	106	26
Future Volume (veh/h)	9	226	226	92	233	9	206	59	130	16	106	26
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	12	310	310	118	299	12	286	82	181	22	143	35
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	438	356	356	188	735	29	394	115	254	223	181	44
Arrive On Green	0.43	0.43	0.43	0.43	0.43	0.43	0.22	0.22	0.22	0.13	0.13	0.13
Sat Flow, veh/h	1043	838	838	778	1729	69	1753	511	1127	1781	1451	355
Grp Volume(v), veh/h	12	0	620	118	0	311	286	0	263	22	0	178
Grp Sat Flow(s),veh/h/ln	1043	0	1675	778	0	1799	1753	0	1638	1781	0	1806
Q Serve(g_s), s	0.5	0.0	20.3	5.2	0.0	7.2	9.1	0.0	8.9	0.7	0.0	5.7
Cycle Q Clear(g_c), s	7.7	0.0	20.3	25.5	0.0	7.2	9.1	0.0	8.9	0.7	0.0	5.7
Prop In Lane	1.00		0.50	1.00		0.04	1.00		0.69	1.00		0.20
Lane Grp Cap(c), veh/h	438	0	712	188	0	764	394	0	369	223	0	226
V/C Ratio(X)	0.03	0.00	0.87	0.63	0.00	0.41	0.73	0.00	0.71	0.10	0.00	0.79
Avail Cap(c_a), veh/h	438	0	712	188	0	764	394	0	369	223	0	226
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.7	0.0	15.7	28.5	0.0	12.0	21.5	0.0	21.5	23.3	0.0	25.5
Incr Delay (d2), s/veh	0.1	0.0	13.8	14.9	0.0	1.6	11.0	0.0	11.2	0.9	0.0	23.8
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(50%),veh/ln	0.1	0.0	8.6	2.3	0.0	2.6	4.4	0.0	4.1	0.3	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.8	0.0	29.5	43.4	0.0	13.6	32.6	0.0	32.7	24.1	0.0	49.2
LnGrp LOS	B	A	C	D	A	B	C	A	C	C	A	D
Approach Vol, veh/h		632			429			549			200	
Approach Delay, s/veh		29.2			21.8			32.6			46.5	
Approach LOS		C			C			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.0		30.0		12.0		30.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		13.5		25.5		7.5		25.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			30.4									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	279	119	160	267	13	185	148	171	13	71	18
Future Volume (veh/h)	27	279	119	160	267	13	185	148	171	13	71	18
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	30	313	134	170	284	14	201	161	186	15	82	21
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	419	487	208	298	698	34	460	204	236	221	178	46
Arrive On Green	0.39	0.39	0.39	0.39	0.39	0.39	0.26	0.26	0.26	0.13	0.13	0.13
Sat Flow, veh/h	1081	1243	532	951	1782	88	1781	791	913	1767	1424	365
Grp Volume(v), veh/h	30	0	447	170	0	298	201	0	347	15	0	103
Grp Sat Flow(s),veh/h/ln	1081	0	1775	951	0	1869	1781	0	1704	1767	0	1788
Q Serve(g_s), s	1.2	0.0	12.3	10.6	0.0	6.9	5.7	0.0	11.4	0.4	0.0	3.2
Cycle Q Clear(g_c), s	8.2	0.0	12.3	22.9	0.0	6.9	5.7	0.0	11.4	0.4	0.0	3.2
Prop In Lane	1.00		0.30	1.00		0.05	1.00		0.54	1.00		0.20
Lane Grp Cap(c), veh/h	419	0	695	298	0	732	460	0	440	221	0	224
V/C Ratio(X)	0.07	0.00	0.64	0.57	0.00	0.41	0.44	0.00	0.79	0.07	0.00	0.46
Avail Cap(c_a), veh/h	419	0	695	298	0	732	460	0	440	221	0	224
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.2	0.0	14.8	24.2	0.0	13.2	18.6	0.0	20.7	23.2	0.0	24.4
Incr Delay (d2), s/veh	0.3	0.0	4.5	7.7	0.0	1.7	3.0	0.0	13.4	0.6	0.0	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(50%),veh/ln	0.3	0.0	4.8	2.7	0.0	2.7	2.4	0.0	5.5	0.2	0.0	1.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.5	0.0	19.4	31.9	0.0	14.9	21.6	0.0	34.1	23.8	0.0	31.1
LnGrp LOS	B	A	B	C	A	B	C	A	C	C	A	C
Approach Vol, veh/h		477			468			548			118	
Approach Delay, s/veh		19.2			21.1			29.5			30.1	
Approach LOS		B			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.0		28.0		12.0		28.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		15.5		23.5		7.5		23.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			24.0									
HCM 6th LOS			C									

Appendix I.
Projected 2032 Build Synchro Results

Intersection	
Int Delay, s/veh	6.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	425	8	6	526	18	6	1	17	47	0	21
Future Vol, veh/h	9	425	8	6	526	18	6	1	17	47	0	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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	13	625	12	9	822	28	8	1	23	66	0	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	850	0	0	637	0	0	1520	1519	625	1509	1503	822
Stage 1	-	-	-	-	-	-	651	651	-	840	840	-
Stage 2	-	-	-	-	-	-	869	868	-	669	663	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	771	-	-	942	-	-	87	106	447	99	122	374
Stage 1	-	-	-	-	-	-	423	432	-	360	381	-
Stage 2	-	-	-	-	-	-	318	341	-	447	459	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	771	-	-	942	-	-	77	101	447	90	117	374
Mov Cap-2 Maneuver	-	-	-	-	-	-	77	101	-	90	117	-
Stage 1	-	-	-	-	-	-	412	421	-	351	374	-
Stage 2	-	-	-	-	-	-	288	335	-	412	447	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	27.6	106.9
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	191	771	-	-	942	-	-	118
HCM Lane V/C Ratio	0.168	0.017	-	-	0.01	-	-	0.812
HCM Control Delay (s)	27.6	9.8	0	-	8.9	0	-	106.9
HCM Lane LOS	D	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	4.8

Intersection	
Intersection Delay, s/veh	158.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	11	268	274	101	263	12	235	67	143	23	122	32
Future Vol, veh/h	11	268	274	101	263	12	235	67	143	23	122	32
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	15	367	375	129	337	15	326	93	199	31	165	43
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	371.6	43.1	40.6	24.5
HCM LOS	F	E	E	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	32%	0%	49%	0%	96%	0%	79%
Vol Right, %	0%	68%	0%	51%	0%	4%	0%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	235	210	11	542	101	275	23	154
LT Vol	235	0	11	0	101	0	23	0
Through Vol	0	67	0	268	0	263	0	122
RT Vol	0	143	0	274	0	12	0	32
Lane Flow Rate	326	292	15	742	129	353	31	208
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.835	0.667	0.04	1.775	0.336	0.862	0.086	0.538
Departure Headway (Hd)	10.795	9.76	9.495	8.605	10.753	10.191	11.692	11.002
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	339	373	378	431	337	360	308	331
Service Time	8.495	7.46	7.236	6.346	8.453	7.891	9.392	8.702
HCM Lane V/C Ratio	0.962	0.783	0.04	1.722	0.383	0.981	0.101	0.628
HCM Control Delay	50.1	30	12.6	378.9	18.8	52	15.5	25.8
HCM Lane LOS	F	D	B	F	C	F	C	D
HCM 95th-tile Q	7.3	4.6	0.1	46.3	1.4	8.1	0.3	3

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	471	501	29	76	44
Future Vol, veh/h	18	471	501	29	76	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	75	75	92	92
Heavy Vehicles, %	6	6	5	5	2	2
Mvmt Flow	26	683	668	39	83	48

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	707	0	-	0	1403	668
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	735	-
Critical Hdwy	4.16	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.254	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	873	-	-	-	154	458
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	474	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	873	-	-	-	149	458
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	495	-
Stage 2	-	-	-	-	474	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	40.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	873	-	-	-	149	458
HCM Lane V/C Ratio	0.03	-	-	-	0.554	0.104
HCM Control Delay (s)	9.3	-	-	-	55.7	13.8
HCM Lane LOS	A	-	-	-	F	B
HCM 95th %tile Q(veh)	0.1	-	-	-	2.8	0.3

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	7	15	5	85	162	2
Future Vol, veh/h	7	15	5	85	162	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	73	73	74	74
Heavy Vehicles, %	2	2	4	4	2	2
Mvmt Flow	8	16	7	116	219	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	351	221	222	0	-	0
Stage 1	221	-	-	-	-	-
Stage 2	130	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.14	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.236	-	-	-
Pot Cap-1 Maneuver	646	819	1335	-	-	-
Stage 1	816	-	-	-	-	-
Stage 2	896	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	642	819	1335	-	-	-
Mov Cap-2 Maneuver	642	-	-	-	-	-
Stage 1	811	-	-	-	-	-
Stage 2	896	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1335	-	753	-	-
HCM Lane V/C Ratio	0.005	-	0.032	-	-
HCM Control Delay (s)	7.7	0	9.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

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	24	435	3	10	426	70	1	2	13	45	2	8
Future Vol, veh/h	24	435	3	10	426	70	1	2	13	45	2	8
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	86	86	86	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	26	468	3	12	495	81	2	3	22	62	3	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	576	0	0	471	0	0	1087	1120	468	1053	1042	495
Stage 1	-	-	-	-	-	-	520	520	-	519	519	-
Stage 2	-	-	-	-	-	-	567	600	-	534	523	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	992	-	-	1086	-	-	195	208	599	202	227	569
Stage 1	-	-	-	-	-	-	543	535	-	534	528	-
Stage 2	-	-	-	-	-	-	512	493	-	524	526	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	1086	-	-	182	197	599	185	215	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	182	197	-	185	215	-
Stage 1	-	-	-	-	-	-	523	516	-	515	520	-
Stage 2	-	-	-	-	-	-	492	485	-	484	507	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	14	32.2
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	428	992	-	-	1086	-	-	206
HCM Lane V/C Ratio	0.062	0.026	-	-	0.011	-	-	0.366
HCM Control Delay (s)	14	8.7	0	-	8.4	0	-	32.2
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.6

Intersection	
Intersection Delay, s/veh	63.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	32	322	150	175	317	20	235	169	187	18	81	21
Future Vol, veh/h	32	322	150	175	317	20	235	169	187	18	81	21
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	36	362	169	186	337	21	255	184	203	21	93	24
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	135.5	33.6	35.4	16.6
HCM LOS	F	D	E	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	47%	0%	68%	0%	94%	0%	79%
Vol Right, %	0%	53%	0%	32%	0%	6%	0%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	235	356	32	472	175	337	18	102
LT Vol	235	0	32	0	175	0	18	0
Through Vol	0	169	0	322	0	317	0	81
RT Vol	0	187	0	150	0	20	0	21
Lane Flow Rate	255	387	36	530	186	359	21	117
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.615	0.839	0.09	1.219	0.456	0.823	0.057	0.305
Departure Headway (Hd)	9.289	8.385	9.026	8.277	9.267	8.702	10.678	9.998
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	391	433	398	440	391	419	337	362
Service Time	6.989	6.085	6.747	5.998	6.967	6.402	8.378	7.698
HCM Lane V/C Ratio	0.652	0.894	0.09	1.205	0.476	0.857	0.062	0.323
HCM Control Delay	25.7	41.8	12.6	143.8	19.5	40.9	14	17
HCM Lane LOS	D	E	B	F	C	E	B	C
HCM 95th-tile Q	4	8.1	0.3	21.2	2.3	7.6	0.2	1.3

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	445	488	85	54	31
Future Vol, veh/h	48	445	488	85	54	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	93	93	92	92
Heavy Vehicles, %	3	3	1	1	2	2
Mvmt Flow	53	494	525	91	59	34

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	616	0	-	0	1125	525
Stage 1	-	-	-	-	525	-
Stage 2	-	-	-	-	600	-
Critical Hdwy	4.13	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	959	-	-	-	227	552
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	548	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	959	-	-	-	215	552
Mov Cap-2 Maneuver	-	-	-	-	215	-
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	548	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	22.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	959	-	-	-	215	552
HCM Lane V/C Ratio	0.056	-	-	-	0.273	0.061
HCM Control Delay (s)	9	-	-	-	27.9	11.9
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.2	-	-	-	1.1	0.2

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	10	16	205	110	7
Future Vol, veh/h	5	10	16	205	110	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	87	87
Heavy Vehicles, %	2	2	2	2	3	3
Mvmt Flow	5	11	17	223	126	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	387	130	134	0	-	0
Stage 1	130	-	-	-	-	-
Stage 2	257	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	616	920	1451	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	786	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	608	920	1451	-	-	-
Mov Cap-2 Maneuver	608	-	-	-	-	-
Stage 1	884	-	-	-	-	-
Stage 2	786	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.7	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1451	-	786	-	-
HCM Lane V/C Ratio	0.012	-	0.021	-	-
HCM Control Delay (s)	7.5	0	9.7	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

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	9	425	8	6	526	18	6	1	17	47	0	21
Future Vol, veh/h	9	425	8	6	526	18	6	1	17	47	0	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	-	-	100	-	-	20	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	13	625	12	9	822	28	8	1	23	66	0	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	850	0	0	637	0	0	1520	1519	625	1509	1503	822
Stage 1	-	-	-	-	-	-	651	651	-	840	840	-
Stage 2	-	-	-	-	-	-	869	868	-	669	663	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	771	-	-	942	-	-	87	106	447	99	122	374
Stage 1	-	-	-	-	-	-	423	432	-	360	381	-
Stage 2	-	-	-	-	-	-	318	341	-	447	459	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	771	-	-	942	-	-	77	101	447	90	117	374
Mov Cap-2 Maneuver	-	-	-	-	-	-	77	101	-	90	117	-
Stage 1	-	-	-	-	-	-	412	421	-	351	374	-
Stage 2	-	-	-	-	-	-	288	335	-	412	447	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	27.6	84.3
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	191	771	-	-	942	-	-	90	374
HCM Lane V/C Ratio	0.168	0.017	-	-	0.01	-	-	0.736	0.079
HCM Control Delay (s)	27.6	9.8	0	-	8.9	0	-	115	15.5
HCM Lane LOS	D	A	A	-	A	A	-	F	C
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-	-	3.7	0.3

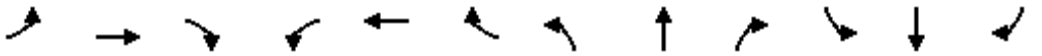
Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	435	3	10	426	70	1	2	13	45	2	8
Future Vol, veh/h	24	435	3	10	426	70	1	2	13	45	2	8
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	-	-	100	-	-	20	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	86	86	86	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	26	468	3	12	495	81	2	3	22	62	3	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	576	0	0	471	0	0	1087	1120	468	1053	1042	495
Stage 1	-	-	-	-	-	-	520	520	-	519	519	-
Stage 2	-	-	-	-	-	-	567	600	-	534	523	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	992	-	-	1086	-	-	195	208	599	202	227	569
Stage 1	-	-	-	-	-	-	543	535	-	534	528	-
Stage 2	-	-	-	-	-	-	512	493	-	524	526	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	992	-	-	1086	-	-	182	197	599	185	215	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	182	197	-	185	215	-
Stage 1	-	-	-	-	-	-	523	516	-	515	520	-
Stage 2	-	-	-	-	-	-	492	485	-	484	507	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	14	30.2
HCM LOS			B	D

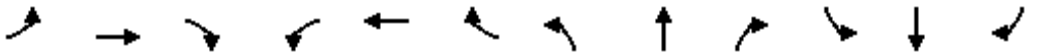
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	428	992	-	-	1086	-	-	185	428
HCM Lane V/C Ratio	0.062	0.026	-	-	0.011	-	-	0.333	0.032
HCM Control Delay (s)	14	8.7	0	-	8.4	0	-	33.9	13.7
HCM Lane LOS	B	A	A	-	A	A	-	D	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.4	0.1



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	268	274	101	263	12	235	67	143	23	122	32
Future Volume (veh/h)	11	268	274	101	263	12	235	67	143	23	122	32
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	15	367	375	129	337	15	326	93	199	31	165	43
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	344	685	580	271	645	29	424	126	270	282	226	59
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.24	0.24	0.24	0.16	0.16	0.16
Sat Flow, veh/h	1005	1826	1547	695	1721	77	1753	522	1117	1781	1430	373
Grp Volume(v), veh/h	15	367	375	129	0	352	326	0	292	31	0	208
Grp Sat Flow(s),veh/h/ln	1005	1826	1547	695	0	1797	1753	0	1640	1781	0	1803
Q Serve(g_s), s	0.7	9.4	12.0	10.7	0.0	9.1	10.4	0.0	9.9	0.9	0.0	6.6
Cycle Q Clear(g_c), s	9.8	9.4	12.0	20.1	0.0	9.1	10.4	0.0	9.9	0.9	0.0	6.6
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.68	1.00		0.21
Lane Grp Cap(c), veh/h	344	685	580	271	0	674	424	0	396	282	0	286
V/C Ratio(X)	0.04	0.54	0.65	0.48	0.00	0.52	0.77	0.00	0.74	0.11	0.00	0.73
Avail Cap(c_a), veh/h	344	685	580	271	0	674	424	0	396	282	0	286
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.4	14.7	15.5	22.5	0.0	14.6	21.2	0.0	21.0	21.6	0.0	24.0
Incr Delay (d2), s/veh	0.2	3.0	5.5	5.9	0.0	2.9	12.6	0.0	11.6	0.8	0.0	15.1
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(50%),veh/ln	0.2	3.7	4.3	1.9	0.0	3.5	5.1	0.0	4.5	0.4	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.6	17.7	20.9	28.4	0.0	17.5	33.8	0.0	32.6	22.4	0.0	39.1
LnGrp LOS	B	B	C	C	A	B	C	A	C	C	A	D
Approach Vol, veh/h		757			481			618			239	
Approach Delay, s/veh		19.3			20.4			33.2			36.9	
Approach LOS		B			C			C			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.0		27.0		14.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		14.5		22.5		9.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			25.7									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	322	150	175	317	20	235	169	187	18	81	21
Future Volume (veh/h)	32	322	150	175	317	20	235	169	187	18	81	21
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	36	362	169	186	337	21	255	184	203	21	93	24
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	352	701	594	318	659	41	490	223	246	221	178	46
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.28	0.28	0.28	0.13	0.13	0.13
Sat Flow, veh/h	1023	1870	1585	880	1756	109	1781	812	896	1767	1421	367
Grp Volume(v), veh/h	36	362	169	186	0	358	255	0	387	21	0	117
Grp Sat Flow(s),veh/h/ln	1023	1870	1585	880	0	1865	1781	0	1707	1767	0	1788
Q Serve(g_s), s	1.7	9.0	4.5	12.5	0.0	8.9	7.3	0.0	12.8	0.6	0.0	3.7
Cycle Q Clear(g_c), s	10.6	9.0	4.5	21.5	0.0	8.9	7.3	0.0	12.8	0.6	0.0	3.7
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.52	1.00		0.21
Lane Grp Cap(c), veh/h	352	701	594	318	0	700	490	0	469	221	0	223
V/C Ratio(X)	0.10	0.52	0.28	0.59	0.00	0.51	0.52	0.00	0.82	0.10	0.00	0.52
Avail Cap(c_a), veh/h	352	701	594	318	0	700	490	0	469	221	0	223
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.6	14.5	13.1	22.9	0.0	14.5	18.4	0.0	20.4	23.2	0.0	24.6
Incr Delay (d2), s/veh	0.6	2.7	1.2	7.7	0.0	2.7	3.9	0.0	15.1	0.9	0.0	8.5
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(50%),veh/ln	0.4	3.6	1.5	2.9	0.0	3.5	3.1	0.0	6.2	0.3	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.2	17.2	14.3	30.5	0.0	17.2	22.3	0.0	35.5	24.1	0.0	33.1
LnGrp LOS	B	B	B	C	A	B	C	A	D	C	A	C
Approach Vol, veh/h		567			544			642			138	
Approach Delay, s/veh		16.5			21.7			30.3			31.7	
Approach LOS		B			C			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		27.0		12.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		16.5		22.5		7.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			23.8									
HCM 6th LOS			C									

Appendix J.
Projected 2042 Build Synchro Results

Intersection	
Int Delay, s/veh	35.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		↕			↕	
Traffic Vol, veh/h	17	461	9	6	580	25	6	1	18	70	0	42
Future Vol, veh/h	17	461	9	6	580	25	6	1	18	70	0	42
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	25	678	13	9	906	39	8	1	24	99	0	59

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	945	0	0	691	0	0	1701	1691	678	1671	1665	906
Stage 1	-	-	-	-	-	-	728	728	-	924	924	-
Stage 2	-	-	-	-	-	-	973	963	-	747	741	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	710	-	-	899	-	-	64	83	416	~ 76	97	334
Stage 1	-	-	-	-	-	-	382	398	-	323	348	-
Stage 2	-	-	-	-	-	-	277	307	-	405	423	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	710	-	-	899	-	-	50	77	416	~ 67	90	334
Mov Cap-2 Maneuver	-	-	-	-	-	-	50	77	-	~ 67	90	-
Stage 1	-	-	-	-	-	-	360	375	-	305	341	-
Stage 2	-	-	-	-	-	-	223	301	-	359	399	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	38	$ 407.8
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	142	710	-	-	899	-	-	96
HCM Lane V/C Ratio	0.235	0.035	-	-	0.01	-	-	1.643
HCM Control Delay (s)	38	10.3	0	-	9	0	-	$ 407.8
HCM Lane LOS	E	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-	-	12.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	229.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	305	314	108	289	17	261	78	153	37	145	35
Future Vol, veh/h	12	305	314	108	289	17	261	78	153	37	145	35
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Heavy Vehicles, %	5	5	5	6	6	6	4	4	4	2	2	2
Mvmt Flow	16	418	430	138	371	22	363	108	213	50	196	47
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	528.2	68.6	62.5	31.5
HCM LOS	F	F	F	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	34%	0%	49%	0%	94%	0%	81%
Vol Right, %	0%	66%	0%	51%	0%	6%	0%	19%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	261	231	12	619	108	306	37	180
LT Vol	261	0	12	0	108	0	37	0
Through Vol	0	78	0	305	0	289	0	145
RT Vol	0	153	0	314	0	17	0	35
Lane Flow Rate	362	321	16	848	138	392	50	243
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.97	0.773	0.045	2.132	0.374	1.001	0.143	0.652
Departure Headway (Hd)	11.881	10.847	10.146	9.25	11.792	11.214	12.585	11.898
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	308	337	355	399	307	326	287	306
Service Time	9.581	8.547	7.846	6.95	9.492	8.914	10.285	9.598
HCM Lane V/C Ratio	1.175	0.953	0.045	2.125	0.45	1.202	0.174	0.794
HCM Control Delay	80.2	42.4	13.3	538.2	21.4	85.2	17.4	34.4
HCM Lane LOS	F	E	B	F	C	F	C	D
HCM 95th-tile Q	9.9	6.2	0.1	60.2	1.7	11	0.5	4.2

Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	23	526	546	39	99	61
Future Vol, veh/h	23	526	546	39	99	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	75	75	92	92
Heavy Vehicles, %	6	6	5	5	2	2
Mvmt Flow	33	762	728	52	108	66

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	780	0	-	0	1556	728
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	828	-
Critical Hdwy	4.16	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.254	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	820	-	-	-	124	423
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	429	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	820	-	-	-	119	423
Mov Cap-2 Maneuver	-	-	-	-	119	-
Stage 1	-	-	-	-	459	-
Stage 2	-	-	-	-	429	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	84.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	820	-	-	-	119	423
HCM Lane V/C Ratio	0.041	-	-	-	0.904	0.157
HCM Control Delay (s)	9.6	-	-	-	126.7	15.1
HCM Lane LOS	A	-	-	-	F	C
HCM 95th %tile Q(veh)	0.1	-	-	-	5.7	0.6

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	44	15	92	174	4
Future Vol, veh/h	13	44	15	92	174	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	73	73	74	74
Heavy Vehicles, %	2	2	4	4	2	2
Mvmt Flow	14	48	21	126	235	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	406	238	240	0	-	0
Stage 1	238	-	-	-	-	-
Stage 2	168	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.14	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.236	-	-	-
Pot Cap-1 Maneuver	601	801	1315	-	-	-
Stage 1	802	-	-	-	-	-
Stage 2	862	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	591	801	1315	-	-	-
Mov Cap-2 Maneuver	591	-	-	-	-	-
Stage 1	789	-	-	-	-	-
Stage 2	862	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.3	1.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1315	-	741	-	-
HCM Lane V/C Ratio	0.016	-	0.084	-	-
HCM Control Delay (s)	7.8	-	10.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	5	29	14	2	73
Future Vol, veh/h	39	5	29	14	2	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	66	66	71	71
Heavy Vehicles, %	2	2	4	4	2	2
Mvmt Flow	42	5	44	21	3	103

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	164	55	0	0	65	0
Stage 1	55	-	-	-	-	-
Stage 2	109	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	827	1012	-	-	1537	-
Stage 1	968	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	1012	-	-	1537	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	968	-	-	-	-	-
Stage 2	914	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	843	1537	-
HCM Lane V/C Ratio	-	-	0.057	0.002	-
HCM Control Delay (s)	-	-	9.5	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

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	48	485	4	11	468	98	1	2	13	60	2	22
Future Vol, veh/h	48	485	4	11	468	98	1	2	13	60	2	22
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	-	-	100	-	-	20	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	86	86	86	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	52	522	4	13	544	114	2	3	22	82	3	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	658	0	0	526	0	0	1270	1310	522	1211	1200	544
Stage 1	-	-	-	-	-	-	626	626	-	570	570	-
Stage 2	-	-	-	-	-	-	644	684	-	641	630	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	925	-	-	1036	-	-	146	160	559	157	183	533
Stage 1	-	-	-	-	-	-	475	480	-	501	501	-
Stage 2	-	-	-	-	-	-	465	452	-	458	470	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	925	-	-	1036	-	-	126	144	559	137	165	533
Mov Cap-2 Maneuver	-	-	-	-	-	-	126	144	-	137	165	-
Stage 1	-	-	-	-	-	-	437	442	-	461	491	-
Stage 2	-	-	-	-	-	-	428	443	-	402	433	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.2	16	61
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	355	925	-	-	1036	-	-	171
HCM Lane V/C Ratio	0.075	0.056	-	-	0.012	-	-	0.673
HCM Control Delay (s)	16	9.1	0	-	8.5	0	-	61
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	3.9

Intersection	
Intersection Delay, s/veh	106.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	357	176	188	361	36	276	200	201	28	99	24
Future Vol, veh/h	35	357	176	188	361	36	276	200	201	28	99	24
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	2	2	1	1	1	2	2	2	3	3	3
Mvmt Flow	39	401	198	200	384	38	300	217	218	32	114	28
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	227.7	59.8	61.4	19.1
HCM LOS	F	F	F	C

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	50%	0%	67%	0%	91%	0%	80%
Vol Right, %	0%	50%	0%	33%	0%	9%	0%	20%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	276	401	35	533	188	397	28	123
LT Vol	276	0	35	0	188	0	28	0
Through Vol	0	200	0	357	0	361	0	99
RT Vol	0	201	0	176	0	36	0	24
Lane Flow Rate	300	436	39	599	200	422	32	141
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.763	1.005	0.104	1.455	0.505	1.001	0.093	0.384
Departure Headway (Hd)	10	9.106	9.699	8.937	9.998	9.405	11.452	10.774
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	363	401	372	413	364	389	315	336
Service Time	7.7	6.806	7.399	6.637	7.698	7.105	9.152	8.474
HCM Lane V/C Ratio	0.826	1.087	0.105	1.45	0.549	1.085	0.102	0.42
HCM Control Delay	38.6	77.1	13.5	241.8	22.5	77.4	15.3	20
HCM Lane LOS	E	F	B	F	C	F	C	C
HCM 95th-tile Q	6.1	12.3	0.3	30.2	2.7	12	0.3	1.8

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	68	490	548	113	71	43
Future Vol, veh/h	68	490	548	113	71	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	150	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	93	93	92	92
Heavy Vehicles, %	3	3	1	1	2	2
Mvmt Flow	76	544	589	122	77	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	711	0	-	0	1285	589
Stage 1	-	-	-	-	589	-
Stage 2	-	-	-	-	696	-
Critical Hdwy	4.13	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.227	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	884	-	-	-	182	508
Stage 1	-	-	-	-	554	-
Stage 2	-	-	-	-	495	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	884	-	-	-	166	508
Mov Cap-2 Maneuver	-	-	-	-	166	-
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	495	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	32.4
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	884	-	-	-	166	508
HCM Lane V/C Ratio	0.085	-	-	-	0.465	0.092
HCM Control Delay (s)	9.5	-	-	-	44.2	12.8
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.3	-	-	-	2.2	0.3

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	31	50	221	120	13
Future Vol, veh/h	8	31	50	221	120	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	87	87
Heavy Vehicles, %	2	2	2	2	3	3
Mvmt Flow	9	34	54	240	138	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	494	146	153	0	-	0
Stage 1	146	-	-	-	-	-
Stage 2	348	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	535	901	1428	-	-	-
Stage 1	881	-	-	-	-	-
Stage 2	715	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	515	901	1428	-	-	-
Mov Cap-2 Maneuver	515	-	-	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	715	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	1.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1428	-	781	-	-
HCM Lane V/C Ratio	0.038	-	0.054	-	-
HCM Control Delay (s)	7.6	-	9.9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	3	102	46	6	57
Future Vol, veh/h	27	3	102	46	6	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	73	73
Heavy Vehicles, %	2	2	3	3	5	5
Mvmt Flow	29	3	111	50	8	78

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	230	136	0	0	161	0
Stage 1	136	-	-	-	-	-
Stage 2	94	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.15	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.245	-
Pot Cap-1 Maneuver	758	913	-	-	1400	-
Stage 1	890	-	-	-	-	-
Stage 2	930	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	753	913	-	-	1400	-
Mov Cap-2 Maneuver	753	-	-	-	-	-
Stage 1	890	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.9	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	766	1400	-
HCM Lane V/C Ratio	-	-	0.043	0.006	-
HCM Control Delay (s)	-	-	9.9	7.6	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	21.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	461	9	6	580	25	6	1	18	70	0	42
Future Vol, veh/h	17	461	9	6	580	25	6	1	18	70	0	42
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	-	-	100	-	-	20	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	64	64	64	75	75	75	71	71	71
Heavy Vehicles, %	6	6	6	3	3	3	24	24	24	2	2	2
Mvmt Flow	25	678	13	9	906	39	8	1	24	99	0	59

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	945	0	0	691	0	0	1701	1691	678	1671	1665	906
Stage 1	-	-	-	-	-	-	728	728	-	924	924	-
Stage 2	-	-	-	-	-	-	973	963	-	747	741	-
Critical Hdwy	4.16	-	-	4.13	-	-	7.34	6.74	6.44	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.34	5.74	-	6.12	5.52	-
Follow-up Hdwy	2.254	-	-	2.227	-	-	3.716	4.216	3.516	3.518	4.018	3.318
Pot Cap-1 Maneuver	710	-	-	899	-	-	64	83	416	~ 76	97	334
Stage 1	-	-	-	-	-	-	382	398	-	323	348	-
Stage 2	-	-	-	-	-	-	277	307	-	405	423	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	710	-	-	899	-	-	50	77	416	~ 67	90	334
Mov Cap-2 Maneuver	-	-	-	-	-	-	50	77	-	~ 67	90	-
Stage 1	-	-	-	-	-	-	360	375	-	305	341	-
Stage 2	-	-	-	-	-	-	223	301	-	359	399	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.1	38	245
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	142	710	-	-	899	-	-	67	334
HCM Lane V/C Ratio	0.235	0.035	-	-	0.01	-	-	1.472	0.177
HCM Control Delay (s)	38	10.3	0	-	9	0	-	$ 381.2	18.1
HCM Lane LOS	E	B	A	-	A	A	-	F	C
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-	-	8.4	0.6

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

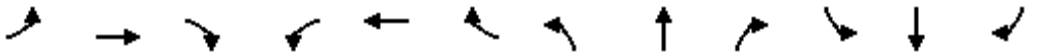
Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	48	485	4	11	468	98	1	2	13	60	2	22
Future Vol, veh/h	48	485	4	11	468	98	1	2	13	60	2	22
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	-	-	100	-	-	20	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	86	86	86	60	60	60	73	73	73
Heavy Vehicles, %	3	3	3	3	3	3	0	0	0	5	5	5
Mvmt Flow	52	522	4	13	544	114	2	3	22	82	3	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	658	0	0	526	0	0	1270	1310	522	1211	1200	544
Stage 1	-	-	-	-	-	-	626	626	-	570	570	-
Stage 2	-	-	-	-	-	-	644	684	-	641	630	-
Critical Hdwy	4.13	-	-	4.13	-	-	7.1	6.5	6.2	7.15	6.55	6.25
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.15	5.55	-
Follow-up Hdwy	2.227	-	-	2.227	-	-	3.5	4	3.3	3.545	4.045	3.345
Pot Cap-1 Maneuver	925	-	-	1036	-	-	146	160	559	157	183	533
Stage 1	-	-	-	-	-	-	475	480	-	501	501	-
Stage 2	-	-	-	-	-	-	465	452	-	458	470	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	925	-	-	1036	-	-	126	144	559	137	165	533
Mov Cap-2 Maneuver	-	-	-	-	-	-	126	144	-	137	165	-
Stage 1	-	-	-	-	-	-	437	442	-	461	491	-
Stage 2	-	-	-	-	-	-	428	443	-	402	433	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.2	16	50
HCM LOS			C	F

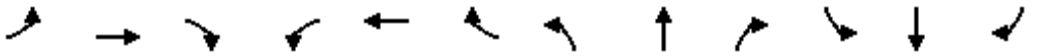
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	355	925	-	-	1036	-	-	137	449
HCM Lane V/C Ratio	0.075	0.056	-	-	0.012	-	-	0.6	0.073
HCM Control Delay (s)	16	9.1	0	-	8.5	0	-	64.5	13.7
HCM Lane LOS	C	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	3.1	0.2



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	305	314	108	289	17	261	78	153	37	145	35
Future Volume (veh/h)	12	305	314	108	289	17	261	78	153	37	145	35
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	1826	1826	1826	1811	1811	1811	1841	1841	1841	1870	1870	1870
Adj Flow Rate, veh/h	16	418	430	138	371	22	362	108	212	50	196	47
Peak Hour Factor	0.73	0.73	0.73	0.78	0.78	0.78	0.72	0.72	0.72	0.74	0.74	0.74
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	2	2	2
Cap, veh/h	313	685	580	239	635	38	424	134	263	282	231	55
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.24	0.24	0.24	0.16	0.16	0.16
Sat Flow, veh/h	968	1826	1547	629	1693	100	1753	555	1090	1781	1458	350
Grp Volume(v), veh/h	16	418	430	138	0	393	362	0	320	50	0	243
Grp Sat Flow(s),veh/h/ln	968	1826	1547	629	0	1793	1753	0	1645	1781	0	1807
Q Serve(g_s), s	0.8	11.1	14.4	11.4	0.0	10.5	11.8	0.0	11.0	1.5	0.0	7.8
Cycle Q Clear(g_c), s	11.3	11.1	14.4	22.5	0.0	10.5	11.8	0.0	11.0	1.5	0.0	7.8
Prop In Lane	1.00		1.00	1.00		0.06	1.00		0.66	1.00		0.19
Lane Grp Cap(c), veh/h	313	685	580	239	0	672	424	0	397	282	0	286
V/C Ratio(X)	0.05	0.61	0.74	0.58	0.00	0.58	0.85	0.00	0.81	0.18	0.00	0.85
Avail Cap(c_a), veh/h	313	685	580	239	0	672	424	0	397	282	0	286
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.5	15.2	16.2	25.1	0.0	15.0	21.7	0.0	21.4	21.9	0.0	24.6
Incr Delay (d2), s/veh	0.3	4.0	8.3	9.8	0.0	3.7	19.3	0.0	15.8	1.4	0.0	25.7
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(50%),veh/ln	0.2	4.5	5.4	2.4	0.0	4.1	6.4	0.0	5.3	0.6	0.0	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	19.2	24.5	34.9	0.0	18.7	41.0	0.0	37.3	23.2	0.0	50.2
LnGrp LOS	B	B	C	C	A	B	D	A	D	C	A	D
Approach Vol, veh/h		864			531			682			293	
Approach Delay, s/veh		21.9			22.9			39.3			45.6	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.0		27.0		14.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		14.5		22.5		9.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			30.0									
HCM 6th LOS			C									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	357	176	188	361	36	276	200	201	28	99	24
Future Volume (veh/h)	35	357	176	188	361	36	276	200	201	28	99	24
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	1885	1885	1885	1870	1870	1870	1856	1856	1856
Adj Flow Rate, veh/h	39	401	198	200	384	38	300	217	218	32	114	28
Peak Hour Factor	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	1	1	1	2	2	2	3	3	3
Cap, veh/h	304	701	594	289	633	63	490	235	236	221	180	44
Arrive On Green	0.38	0.38	0.38	0.38	0.38	0.38	0.28	0.28	0.28	0.13	0.13	0.13
Sat Flow, veh/h	965	1870	1585	826	1688	167	1781	855	859	1767	1437	353
Grp Volume(v), veh/h	39	401	198	200	0	422	300	0	435	32	0	142
Grp Sat Flow(s),veh/h/ln	965	1870	1585	826	0	1855	1781	0	1714	1767	0	1790
Q Serve(g_s), s	2.0	10.2	5.4	12.3	0.0	11.0	8.8	0.0	14.8	1.0	0.0	4.5
Cycle Q Clear(g_c), s	13.1	10.2	5.4	22.5	0.0	11.0	8.8	0.0	14.8	1.0	0.0	4.5
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.50	1.00		0.20
Lane Grp Cap(c), veh/h	304	701	594	289	0	696	490	0	471	221	0	224
V/C Ratio(X)	0.13	0.57	0.33	0.69	0.00	0.61	0.61	0.00	0.92	0.14	0.00	0.63
Avail Cap(c_a), veh/h	304	701	594	289	0	696	490	0	471	221	0	224
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.5	14.9	13.4	24.8	0.0	15.2	19.0	0.0	21.1	23.4	0.0	24.9
Incr Delay (d2), s/veh	0.9	3.4	1.5	12.8	0.0	3.9	5.6	0.0	26.1	1.4	0.0	12.9
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(50%),veh/ln	0.5	4.2	1.8	3.6	0.0	4.5	3.8	0.0	8.4	0.4	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.3	18.3	14.9	37.7	0.0	19.1	24.6	0.0	47.2	24.8	0.0	37.9
LnGrp LOS	C	B	B	D	A	B	C	A	D	C	A	D
Approach Vol, veh/h		638			622			735			174	
Approach Delay, s/veh		17.4			25.0			38.0			35.5	
Approach LOS		B			C			D			D	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.0		27.0		12.0		27.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		16.5		22.5		7.5		22.5				
Max Q Clear Time (g_c+I1), s		0.0		0.0		0.0		0.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			28.0									
HCM 6th LOS			C									