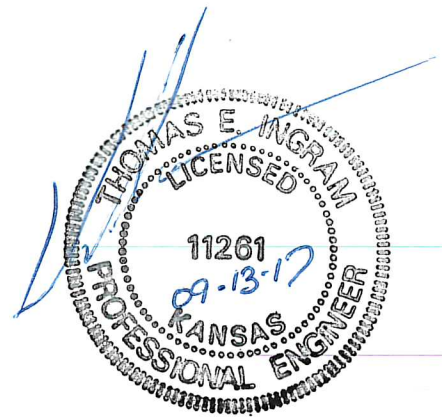


MARTWAY MIXED USE DEVELOPMENT  
Proposed Building Redevelopment and Parking  
6045 Martway  
Mission, Kansas 66202  
CFS Project No. 17-5085

*Traffic Impact Analysis*

September 13, 2017

Prepared for:  
Clockwork Architecture & Design  
423 Delaware, Suite 102  
Kansas City, Missouri 64105



Prepared by:  
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# Table of Contents

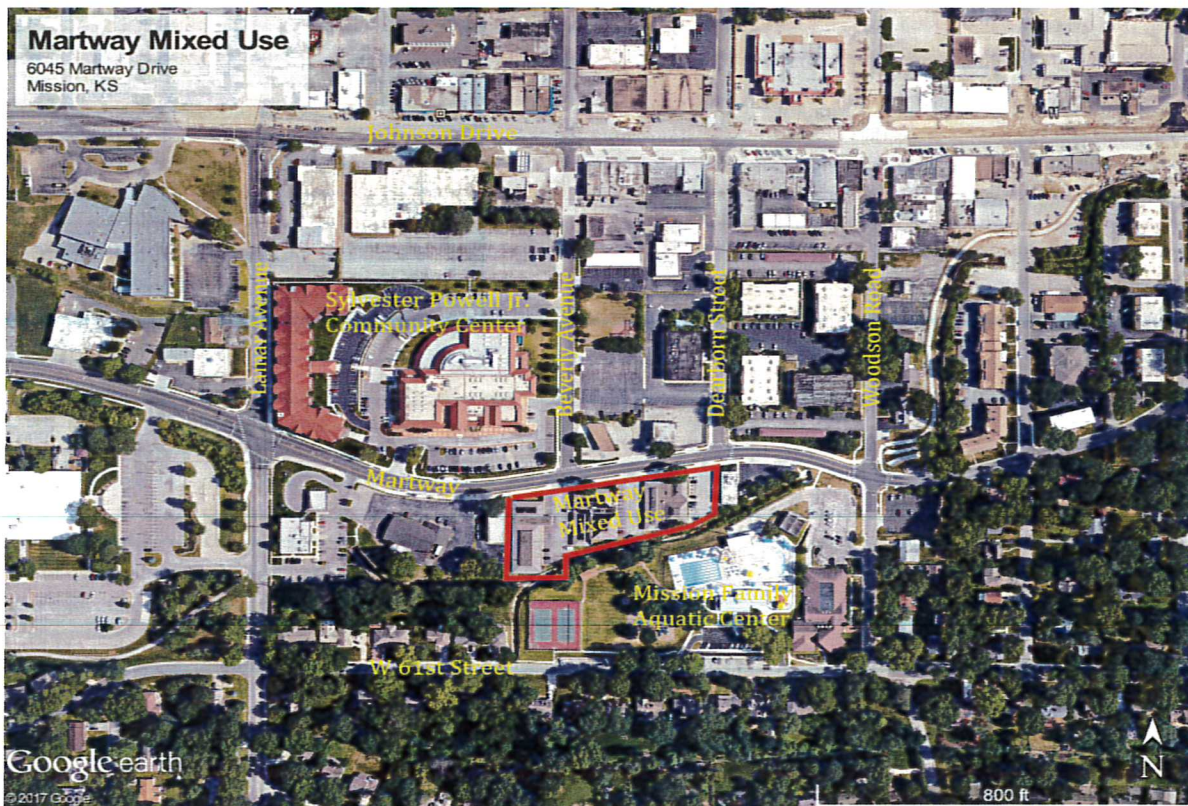
Review of Existing Site Conditions	3
Existing and Projected Traffic Volumes	6
Site's Trip Generation and Design Hour Volume Data	8
Trip Distribution and Traffic Assignment	8
Capacity Analysis	9
Traffic Accident History	10
Internal Circulation and Parking	10
Traffic Operations and Geometric Improvements	11
Summary and Recommendations	12

<i>Appendix I -</i>	<i>Exhibit Maps (Site Plan, FEMA FIRM Map)</i>
<i>Appendix II -</i>	<i>Traffic Counts</i>
<i>Appendix III -</i>	<i>Trip Generation &amp; Traffic Distribution</i>
<i>Appendix IV -</i>	<i>Synchro Results, AM Peak Traffic Conditions / Pre-Development</i>
<i>Appendix V -</i>	<i>Synchro Results, AM Peak Traffic Conditions / Post-Development</i>
<i>Appendix VI -</i>	<i>Synchro Results, PM Peak Traffic Conditions / Pre-Development</i>
<i>Appendix VII -</i>	<i>Synchro Results, PM Peak Traffic Conditions / Post-Development</i>

# Review of Existing Site Conditions

This Traffic Impact Analysis for the proposed Martway Mixed Use building and parking lot improvements at 6045 Martway in Mission, Kansas, has been prepared in accordance with the City of Mission's Street Design Criteria. The proposed 1.767 acre site calls for the removal of three existing single-story office buildings along the southern side of Martway Street between Beverly Avenue and Dearborn Street and replacing them with a multi-story apartment building elevated on piers to provide street-level parking.

The site is bounded on the north by Martway Street, on the south by Rock Creek, and along the east and west by low-rise commercial/office buildings. Johnson Drive and Mission's downtown shopping area is located less than a quarter mile to the north. The Sylvester Powell Jr. Community Center is located to the northwest. The Mission Aquatic Center is located across Rock Creek to the southeast.



**Site Location Map, Mission, Kansas  
Proposed Martway Mixed Use Development**

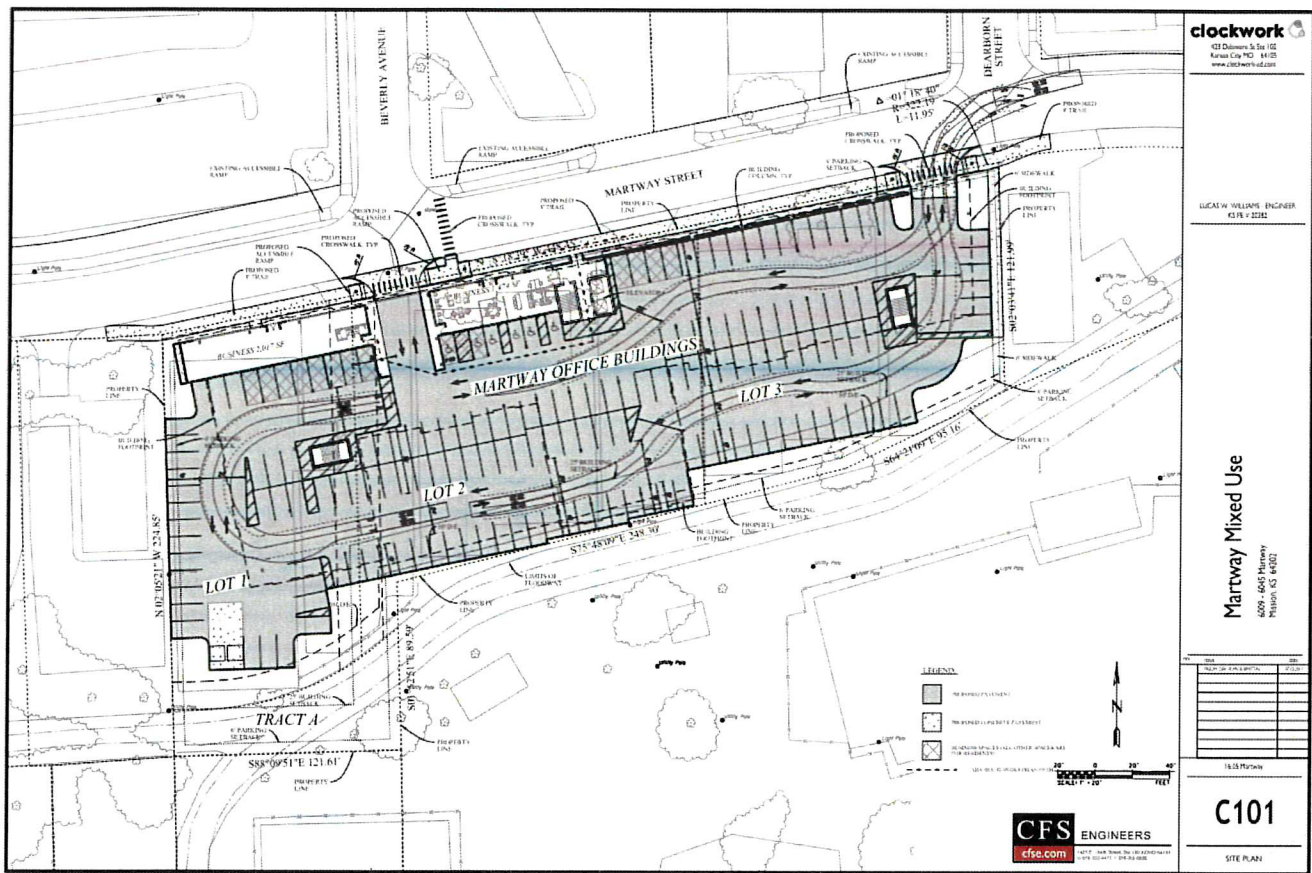
Area Street and Highway Network: The existing streets around the Martway Mixed Use Development site include:

- Martway Street – Two-lane collector.
  - Posted speed limit of 25 mph.
- Lamar Avenue – Two-lane collector.
  - Posted speed limit of 30 mph.
- Johnson Drive – Four-lane thoroughfare.
  - Posted speed limit of 30 mph.
- Beverly Avenue – Two-lane local.
  - Posted speed limit of 25 mph.
- Dearborn Street – Two-lane local.
  - Posted speed limit of 25 mph.
- Woodson Road – Two-lane local.
  - Posted speed limit of 25 mph.
- W. 61<sup>st</sup> Street – Two-lane local.
  - Posted speed limit of 25 mph.

The existing intersection of Martway & Beverly Avenue is a tee intersection with a 25 ft+/- offset driveway for the existing office building parking lot. For the proposed improvements, the existing driveway would be shifted to the east to align with Beverly Avenue. Both Martway Street and Beverly Avenue are two lane, 28 ft wide (back of curb to back of curb). The intersection corner radii are 25 ft. There are sidewalks along the north and south sides of Martway and along the west on Beverly. There is a painted crosswalk across the northern leg of the intersection. The intersection is stop controlled with free movement for the east and westbound traffic on Martway and a stop sign for southbound traffic on Beverly.

Grades along Martway are less than 2% and the intersection sight distance from the proposed western driveway entrance to the Martway Mixed Use Development was estimated at approximately 500 ft looking east and approximately 450 ft looking west. Martway has a posted speed limit of 25 mph. A realistic design speed for regular traffic was estimated at 35 mph. AASHTO's Exhibit 9-55, Design Intersection Sight Distance-Case B1- Left Turn from Stop, requires a design intersection sight distance of 390 ft at a design speed of 35 mph. AASHTO's Exhibit 9-58, Design Intersection Sight Distance-Case B2- Right Turn from Stop, requires a design intersection sight distance of 335 ft at a design speed of 35 mph. The proposed western driveway entrance to the Martway Mixed Use Development appears to have adequate intersection sight distance.





## Proposed Martway Mixed Use Site Plan and Street-Level Parking Layout

The existing intersection of Martway & Dearborn Street is a tee intersection with a 35 ft+/- offset driveway for the existing office building parking lot. For the proposed improvements, the existing driveway would be held in the same location. Both Martway and Dearborn Street are two lane, 28 ft wide (back of curb to back of curb). The intersection corner radii are 25 ft. There are sidewalks along the north and south sides of Martway and along the west on Dearborn. There is a painted crosswalk across the northern leg of the intersection. The intersection is stop controlled with free movement for the east and westbound traffic on Martway and a stop sign for southbound traffic on Dearborn.

Grades along Martway are less than 2% and the intersection sight distance from the proposed eastern driveway entrance to the Martway Mixed Use Development was estimated at approximately 400 ft looking east and approximately 700 ft looking west. Martway east of the driveway entrance curves to the south, so motorists would have to turn their heads further to observe oncoming traffic, but there are no physical obstructions within the right-of-way to obscure the view. Martway has a posted speed limit of 25 mph. A realistic design speed for regular traffic was estimated at 35 mph. AASHTO's Exhibit 9-55, Design Intersection Sight Distance-Case B1- Left Turn from Stop, requires a design intersection sight distance of 390 ft at a design speed of 35 mph. AASHTO's Exhibit 9-58, Design Intersection Sight Distance-Case B2- Right Turn from Stop, requires a design intersection sight distance of 335 ft at a design speed of 35 mph. The proposed eastern driveway entrance to the Martway Mixed Use Development appears to have adequate intersection sight distance.

There are no known programmed improvements or future planned improvements for any of the roadways listed above in the region surrounding the Martway Mixed Use site.

Land Uses and Proposed Density: For the proposed 1.767 acre site, three lots would be combined into one (parcels KP20600000 0001, 0002 & 0003). The site has a current land use of offices with three existing single-story office buildings with a total footprint of approximately 34,465 sqft. For the proposed mixed use apartments and general office space, the existing buildings would be demolished and replaced with a multi-story apartment building with 156 units and 3,491 sqft of general office space. The main building would be raised on support piers to allow for parking beneath the structure. The general office space would be on the ground floor/parking level, comprised of two enclosed building sections flanking the sides of the entrance drive even with Beverly Avenue.

Water Conflicts: The FEMA FIRM Panel 20091C0024G indicates that a portion of the site is designated within 100-year flood zone AE from flooding from the adjacent Rock Creek which flows along the rear property line. In a 100-year flooding event, approximately 40 parking spaces along the creek could have up to seven inches of overbank water. A portion of the existing parking lot has been in the floodplain fringe area, and the reconfigured parking would closely match the existing parking limits in this area.

Existing Alternative Transportation Mode Choices: There are sidewalks along both sides of Martway Street, along the western side of Beverly Avenue, and along the western side of Dearborn Street. Portions of the Rock Creek Walking Trail coincide with the widened sidewalk section along the southern side of Martway Street fronting the proposed site. There are no designated bicycle lanes on any of the surrounding streets. There are Johnson County bus transit service stops on both sides of Martway Street approximately 300 ft west of Beverly Avenue.

Anticipated Phasing and Time-line: Construction is anticipated to begin in the spring of 2018 and would take approximately 18 months.

## Existing and Projected Traffic Volumes

Existing Traffic Volumes: Weekday AM and PM Peak Hour traffic counts were taken at the intersections of Martway & Beverly Avenue and at Martway & Dearborn Street. Traffic volumes were recorded in 15 minute intervals on Wednesday June 14, 2017 and on Thursday June 15, 2017 during the AM Peak Hour from 7AM to 9AM and during the PM Peak Hour from 4PM to 6PM. Bad weather conditions or national holiday traffic did not impact traffic counts. The following tables summarize the traffic volumes measured for a typical AM and PM Peak Hour on a weekday:

### **Martway & Beverly Avenue, AM Peak Hour Traffic Movements (Wednesday, 06-14-17)**

PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.94	56	160	2	3	124	35	1	0	1	19	0	41



**Martway & Beverly Avenue, PM Peak Hour Traffic Movements (Wednesday, 06-14-17)**

PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.91	36	253	0	0	274	36	1	0	3	42	0	76

**Martway & Dearborn Street, AM Peak Hour Traffic Movements (Thursday, 06-15-17)**

PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.92	16	131	7	3	137	5	1	0	1	5	1	24

**Martway & Dearborn Street, PM Peak Hour Traffic Movements (Thursday, 06-15-17)**

PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.92	32	268	0	1	244	16	6	0	3	12	0	26

The PM peak hour traffic was notably heavier than the AM. Directional east-west distribution along Martway Street was roughly even during both AM and PM peak hours. The following tables show the measured traffic volumes and directional distribution percentages used to develop the trip distribution of the additional trip generation volumes:

**Directional Distribution (AM Incoming)**

Intersection	Direction	Volume	Percentage
Beverly & Martway	EB	218	48.3%
	SB	60	13.4%
Dearborn & Martway	WB	145	31.8%
	SB	30	6.5%
Total		457	100.0%

**Directional Distribution (AM Outgoing)**

Intersection	Direction	Volume	Percentage
Beverly & Martway	WB	166	40.0%
	NB	91	22.0%
Dearborn & Martway	EB	137	32.9%
	NB	21	5.1%
Total		431	100.0%

**Directional Distribution (PM Incoming)**

Intersection	Direction	Volume	Percentage
Beverly & Martway	EB	289	41.0%
	SB	118	16.7%
Dearborn & Martway	WB	261	36.9%
	SB	38	5.4%
Total		719	100.0%

**Directional Distribution (PM Outgoing)**

Intersection	Direction	Volume	Percentage
Beverly & Martway	WB	351	46.7%
	NB	72	9.6%
Dearborn & Martway	EB	283	37.3%
	NB	48	6.4%
Total		755	100.0%

# Site's Trip Generation and Design Hour Volume Data

Trip Generation and Design Hour Volume Data: Trip generation calculations utilized the land use types categorized by the Institute of Transportation Engineer's Trip Generation Guidelines, 9<sup>th</sup> Edition. The ITE Land Use categories used to estimate the traffic volumes anticipated to be generated by the site were Apartments (ITE Code 220) and General Office (ITE Code 710). The estimated number of trips generated by the buildings were calculated based on the total 156 dwelling units (DU) in the apartments and 3,491 sqft of floor area for the general office space. Both the ITE's trip generation equations and the average rates were used to calculate the site-generated traffic, and the higher/more conservative figures were used to model the proposed traffic characteristics of the development. The following table shows the parameters for measurement units, total trip generation volumes for the weekday AM and PM peak hour traffic, and the corresponding total vehicles for AM and PM peak hour traffic and the total weekday traffic at the site:

**ITE Traffic Generation Volumes for the Proposed Site Improvements (vph)**

Description / ITE Code	Units	AM Total	AM Enter	AM Exit	PM Total	PM Enter	PM Exit	Weekday Total
Apartments (220)	156 DU	87	25	62	109	66	43	1069
General Office (710)	3.49 KSF	16	8	8	6	3	3	156
Total		103	33	70	115	69	46	1225

Reductions for Pass-By and Diverted-Link Trips: Not applicable for apartments, and the amount of general office space was relatively small compared to the entire development, so pass-by and diverted-link trips were not included in the proposed trip distribution and traffic assignment.

## Trip Distribution and Traffic Assignment

Trip Distribution and Traffic Assignment: Trip distribution patterns were determined based on a gravity model based on the peak hour counts around the development's surrounding origins and destinations. Directional percentages were applied along incoming and outgoing paths so that site-generated trips could be distributed proportionally. Appendix III includes trip generation calculations and traffic distribution diagrams for the existing traffic volumes, the site-generated traffic and the existing plus site-generated traffic for the AM and PM peak hour conditions.



# Capacity Analysis

Creating Synchro Scenarios: Using the traffic counts and the ITE trip generation volumes, four Synchro models were created for the traffic conditions surrounding the site.

- Scenario 1 - Existing street/pre-development conditions  
(Pre-development AM Peak Traffic 2017)
- Scenario 2 - Proposed site with trip-generated conditions  
(Post-development AM Peak Traffic 2017)
- Scenario 3 - Existing street/pre-development conditions  
(Pre-development PM Peak Traffic 2017)
- Scenario 4 - Proposed site with trip-generated conditions  
(Post-development PM Peak Traffic 2017)

Capacity and Level of Service Analysis: Three performance measures commonly used for Traffic Impact Studies are vehicle delay, level-of-service (LOS), and queue length. Vehicle delay is the average delay, in seconds, experienced by one vehicle passing through the intersection. The quality of traffic operation at an intersection is defined through level-of-service (LOS) which consists of assignments of 'A' for free-flowing conditions through 'F' for congested conditions. The procedures and methodology for determining the LOS are outlined in the Highway Capacity Manual (HCM 2010), produced by the Transportation Research Board. LOS 'A' through 'C' is considered acceptable. For intersections, no individual lane should be below LOS D. 95th percentile queue length is the overall length of a string of stopped vehicles. Note that for stop control intersections, the queue length is measured in terms of accumulated number of vehicles which would be lined up waiting to proceed. The "-" symbol represents shared lane or non-existent movement, thus no queue length given. The results of the Synchro models for the left-turn movements at the intersections of Martway & Beverly Avenue are summarized in the table below (Delays are in seconds and Queues are in vehicle lengths set at a nominal 25 ft for the actual length of the design vehicle plus the buffer spacing between vehicles):

## **Martway & Beverly Avenue (Two-Way Stop Controlled)**

Scenario	Intersection Delay (sec)	NBL D-LOS-Q	EBL D-LOS-Q	WBL D-LOS-Q	SBL D-LOS-Q
1-AM-Pre	2.4	0/A/0	7.7/A/0.1	0/A/0	10.5/B/0.3
2-AM-Post	3.2	12.4/B/0.2	7.7/A/0.1	7.6/A/0	11.2/B/0.4
3-PM-Pre	2.7	0/A/0	8/A/0.1	0/A/0	13.9/B/0.9
4-PM-Post	3.5	15.3/C/0.2	8.1/A/0.1	7.9/A/0	16.1/C/1.3

Martway & Beverly Avenue (Two-Way Stop Controlled): At the Beverly Avenue intersection, the intersection delay was 2.4 sec (LOS A) in the AM and 2.7 sec (LOS A) in the PM for the pre-development scenarios. The post-development scenarios intersection delays increased marginally to 3.2 sec (LOS A) in the AM and 3.5 sec (LOS A) in the PM. Eastbound and westbound movements were free except for the left-turns which had to yield to oncoming traffic. EB and WB average delay for left-

turns ranged from 7.6 sec (LOS A) to 8.1 sec (LOS A) throughout all scenarios. Northbound delays increased to 12.4 sec in the AM and 15.3 sec in the PM for the post-development scenario. Southbound delays increases to 11.2 sec in the AM and 16.1 sec in the PM for the post-development scenario. The longest 95th percentile queue length of any of the scenarios was 1.3 vehicle lengths.

#### **Martway & Dearborn Street Avenue (Two-Way Stop Controlled)**

Scenario	Intersection Delay (sec)	NBL D-LOS-Q	EBL D-LOS-Q	WBL D-LOS-Q	SBL D-LOS-Q
1-AM-Pre	1.2	0/A/0	7.6/A/0	0/A/0	9.5/A/0.1
2-AM-Post	2.3	11.1/B/0.2	7.6/A/0	7.6/A/0	9.7/A/0.1
3-PM-Pre	1.1	0/A/0	7.9/A/0.1	0/A/0	11.7/B/0.2
4-PM-Post	1.8	14.6/B/0.2	7.9/A/0.1	7.9/A/0	12.5/B/0.3

Martway & Dearborn Street (Two-Way Stop Controlled): At the Dearborn Street intersection, the intersection delay was 1.4 sec (LOS A) in the AM and 1.3 sec (LOS A) in the PM for the pre-development scenarios. The post-development scenarios intersection delays increased marginally to 2.3 sec (LOS A) in the AM and 1.8 sec (LOS A) in the PM. Eastbound and westbound movements were free except for the left-turns which had to yield to oncoming traffic. EB and WB average delay for left-turns ranged from 7.6 sec (LOS A) to 7.9 sec (LOS A) throughout all scenarios. Northbound delays increased to 11.1 sec in the AM and 14.6 sec in the PM for the post-development scenario. Southbound delays increases to 9.7 sec in the AM and 12.5 sec in the PM for the post-development scenario. The longest 95th percentile queue length of any of the scenarios was 0.3 vehicle lengths.

## **Traffic Accident History**

Traffic Accident History: No accident report were reviewed in the preparation of this study.

## **Internal Circulation and Parking**

Proposed Site Access: The proposed Martway Mixed Use parking area would have two entranced drives coinciding with the existing entrances to the office buildings at 6009 and 6045 Martway. The entrances would be open without any security gating. The parking configuration would include head-in parking spaces around the outer perimeter with an inside tier of head-to-head parking spaces which would allow the service drive to loop around the central spaces and connect to both the east and west access driveway back to Martway Street. The proposed apartment building would be perched above supported by piers.

The proposed building would consist of 3,491 sqft of lower-floor general office space with 156 apartment units on the upper floors. Per the City of Mission's MS-2 Parking Regulations, Chapter 410.250, the proposed development would require the following number of parking spaces:



### Parking Requirements

Building Use	Space Requirements	Parking Required
General Office	4 per 1000 sqft * 3,491 sqft	14 spaces
Apartments (156 Total Units)		
Studio Apartments (24 Units)	1 space per unit * 24 units	24 spaces
One Bedroom (92 Units)	1 space per unit * 92 units	92 spaces
Two Bedroom (40 Units)	2 spaces per unit * 40 units	80 spaces
		210 spaces

The proposed parking lot plan has a total of 166 spaces (including five ADA accessible spaces and one ADA van-accessible space), so the developer would need to lease an additional 44 off-site parking spaces to meet the City's total 210 space requirement for the proposed apartments and general office space. Superimposing the 100-year FEMA floodplain elevations from Rock Creek onto the proposed parking lot grading indicated that 40 spaces would be within the floodplain limits, however, no space would have more than the allowable 7 inches of water during the 100-year event.

## Traffic Operations and Geometric Improvements

Driveways: The proposed west driveway entrance would be re-aligned to match Beverly Avenue and the proposed east driveway would remain close to its existing location. The east and west driveways are spaced approximately 300 ft apart and both entrances would be two-lane, full-access connections. Security gating would not be installed at either driveway entrance.

Right-Turn Lane for eastbound Martway Street at East or West Entrance Driveway: A review of KDOT's Access Management Policy indicated that neither driveway entrance would warrant the addition of a right-turn lane. The design speed for Martway Street coupled with the relatively low traffic volumes would not meet the minimum threshold levels on the KDOT Access Management Policy's Table 4-25, Right-Turn Treatment Guidelines for Two-Lane Highways.

Left-Turn Lane for westbound Martway Street at East or West Entrance Driveway: A review of KDOT's Access Management Policy indicated that neither driveway entrance would warrant the addition of a left-turn lane. The design speed for Martway Street coupled with the relatively low traffic volumes would not meet the minimum threshold levels on the KDOT Access Management Policy's Table 4-27, Recommended Left-Turn Lane Warrants for Two-Lane Highways.

Signalization: With the relatively low volume of traffic on Martway Street and the trips that would be generated from the proposed Martway Mixed Use development, signals are not warranted on Martway Street at either of the intersections with Beverly Avenue or with Dearborn Street.

# Summary and Recommendations

Summary: This study addressed the street access and potential traffic congestion for the proposed Martway Mixed Use Development at 6045 Martway Street in Mission, Kansas. The site would call for the demolition of three existing single-story office buildings and replacing them with a multi-story apartment building perched above a ground-floor parking lot. The apartment building would have 156 units comprised of 24 studio, 92 single and 40 double bedroom apartments. The development would need a total of 210 spaces and the proposed below-building parking lot would provide 166 spaces, with the developer obtaining off-site parking agreements to make-up the additional 44 spaces required.

An assessment of the proposed trip generation traffic and the traffic volumes on Martway Street at the intersections with Beverly Avenue and with Dearborn Street indicated that no right or left-turn auxiliary lanes would be warranted for the proposed driveway entrances to the site. Level-of-service ratings at the intersections would remain at the LOS-A or B levels, and queued traffic would be kept at low levels.

Recommendations: The following recommendations are made for the Martway Mixed Use Development and the surrounding area:

- The proposed west driveway entrance would be re-aligned to match Beverly Avenue and the east driveway entrance should remain at the present locations for the existing buildings at 6009 and 6045 Martway. Both driveways should be full-access entrances.
- The proposed development requires 210 parking spaces, and the proposed parking lot provides 166 spaces. The developer would need to lease an additional 44 off-site parking spaces to meet the City's total 210 space requirement.
- The existing Rock Creek walking trail running along the front side of the proposed building would remain unaltered by the development. During construction, the developer must make provisions to close the trail and divert pedestrian traffic to the northern side of Martway Street. The developer shall make all reasonable efforts to re-open the trail as quickly as possible once construction has been substantially completed and there would be no hazards to pedestrians.

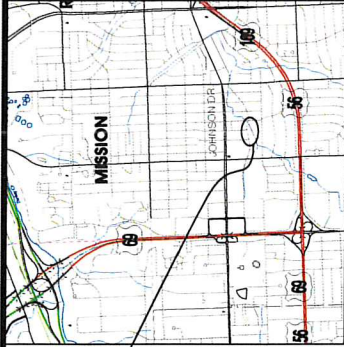


## **Appendix I - Exhibit Maps (Site Plan, FEMA FIRM Map)**

# MARTWAY MIXED USE

PRELIMINARY DEVELOPMENT PLAN  
6009-6025 MARTWAY, MISSION, KS 66200

PROJECT LOCATION



VICINITY MAP

**LEGAL DESCRIPTION**  
LOTS 1, 2 AND 3 OF MARTWAY OFFICE BUILDING A SUBDIVISION OF LAND IN THE NORTHWEST QUARTER OF SECTION 16, T4S, R10E, MISSOURI MERIDIAN, IN THE CITY OF MISSION, JOHNSON COUNTY, KANSAS

## SITE DEVELOPMENT SUMMARY TABLE

EXISTING FINISH	
MS-2	
LAND AREA:	
1.787 ACRES OR 78,471 SQUARE FEET MORE OR LESS	
LAND USE:	
OFFICE	
PROPOSED:	
A MIXED USE DEVELOPMENT WITH A 4-STORY APARTMENT COMPLEX WITH COMMERCIAL SPACE AND PARKING DECK ON THE FIRST FLOOR	
BUILDING HEIGHT:	
MAXIMUM BUILDING HEIGHT: 1-STORY/45'-0"	
MAXIMUM BUILDING HEIGHT: 1-STORY/45'-0"	
BUILDING FLOOR AREA:	
1ST FLOOR AREA: 13,401 S.F.	
2ND FLOOR AREA: 13,401 S.F.	
3RD FLOOR AREA: 13,401 S.F.	
4TH FLOOR AREA: 13,401 S.F.	
TOTAL FLOOR AREA: 53,604 S.F.	
FLOOR AREA RATIO: 15.99 S.F./S.F.	
307	
PARKING DECK AREA:	
PROPOSED PARKING: 1,170 & 37	
PARKING DECK AREA:	
1,170 S.F. (1,170 S.F. MINIMUM)	
37 S.F. (37 S.F. MINIMUM)	
TOTAL PARKING DECK AREA: 1,207 S.F.	
TOTAL PARKING DECK AREA: 1,207 S.F.	

PARKING DECK AREA	
1,170 S.F. (1,170 S.F. MINIMUM)	
37 S.F. (37 S.F. MINIMUM)	
TOTAL PARKING DECK AREA: 1,207 S.F.	
TOTAL PARKING DECK AREA: 1,207 S.F.	

OWNER:  
CITY OF MISSION, KS  
6009-6025 MARTWAY, MISSION, KS 66200

ARCHITECT:  
CFS ENGINEERS  
1401 E. 10TH STREET, STE. 100  
KANSAS CITY, MO 64105

DEVELOPER:  
CFS ENGINEERS  
1401 E. 10TH STREET, STE. 100  
KANSAS CITY, MO 64105

ENGINEER/LANDSCAPE ARCHITECT/SURVEYOR/PLANNER:  
CFS ENGINEERS  
1401 E. 10TH STREET, STE. 100  
KANSAS CITY, MO 64105

REQUESTED DEVIATIONS:  
1. THE CHUTE PARKING SPACE REQUIREMENT BE REDUCED FROM 25 SPACES TO 166 SPACES.  
2. THE REAR YARD SETBACK REQUIREMENT BE REDUCED FROM 25 TO A 5' SETBACK.  
3. THE MAXIMUM BUILDING HEIGHT REQUIREMENT BE REDUCED FROM A 3-STORY 45 FOOT TO A 3-STORY 5 FOOT MAXIMUM BUILDING HEIGHT.  
4. THE MINIMUM GREEN SPACE REQUIREMENT BE REDUCED FROM 15 UNITS PER ACRE TO 10 UNITS PER ACRE.  
5. THE PARKING LOT SETBACK BE REDUCED FROM 4 TO 2.  
6. THE MINIMUM GREEN SPACE BETWEEN PARKING AND INTERIOR LOT LINES BE REDUCED FROM 4 TO 2.  
7. THE INTERIOR PARKING LOT TRUE REQUIREMENTS.  
8. THE PARKING LOT INTERIOR OPEN SPACE REQUIREMENT.

COMMENTS:  
THE DEVELOPER REQUESTS THE FOLLOWING DEVIATIONS TO THE CITY OF MISSION'S MUNICIPAL CODE.

1. THE CHUTE PARKING SPACE REQUIREMENT BE REDUCED FROM 25 SPACES TO 166 SPACES.  
2. THE REAR YARD SETBACK REQUIREMENT BE REDUCED FROM 25 TO A 5' SETBACK.  
3. THE MAXIMUM BUILDING HEIGHT REQUIREMENT BE REDUCED FROM A 3-STORY 45 FOOT TO A 3-STORY 5 FOOT MAXIMUM BUILDING HEIGHT.  
4. THE MINIMUM GREEN SPACE REQUIREMENT BE REDUCED FROM 15 UNITS PER ACRE TO 10 UNITS PER ACRE.  
5. THE PARKING LOT SETBACK BE REDUCED FROM 4 TO 2.  
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LEGEND

LIMITS OF DEVELOPMENT

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DEARBORN STREET

MISSION HILLS APARTMENTS, LLC  
ST. PAUL, MN 55102  
ZONING: MS-2  
LAND USE: APARTMENTS

MISSION HILLS APARTMENTS, LLC  
ST. PAUL, MN 55102  
ZONING: MS-2  
LAND USE: APARTMENTS

REAL ESTATE COOPERATION, INC.  
8014 STATE LINE  
LEAWOOD, KS 66208  
ZONING: MS-2  
LAND USE: OFFICE

CRENSHAW BUILDING, LLC  
6000 MARTWAY ST.  
LEAWOOD, KS 66208  
ZONING: MS-2  
LAND USE: OFFICE

MISSION BANK  
5301 JONSON DRIVE  
MISSION, KS 66202  
ZONING: MS-2  
LAND USE: COMMERCIAL

REAL ESTATE COOPERATION, INC.  
8014 STATE LINE  
LEAWOOD, KS 66208  
ZONING: MS-2  
LAND USE: OFFICE

REAL ESTATE COOPERATION, INC.  
8014 STATE LINE  
LEAWOOD, KS 66208  
ZONING: MS-2  
LAND USE: OFFICE

CITY OF MISSION  
6000 WOODSON ST.  
MISSION, KS 66202  
ZONING: MS-2  
LAND USE: COMMERCIAL

MARTWAY 59, LLC  
12205 BUENA VISTA ST.  
LEAWOOD, KS 66009  
ZONING: MS-2  
LAND USE: OFFICE

CITY OF MISSION  
6000 WOODSON ST.  
MISSION, KS 66202  
ZONING: MS-2  
LAND USE: GOV./PUB.

CITY OF MISSION  
6000 WOODSON ST.  
MISSION, KS 66202  
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CITY OF MISSION  
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ZONING: MS-2  
LAND USE: GOV./PUB.

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clockwork  
433 Delaware St. Suite 102  
Kansas City, MO 64105  
www.clockwork-ks.com

LUCAS W. WILLIAMS - ENGINEER  
KS PE # 0382

Martway Mixed Use  
6009 - 6045 Martway  
Mission, KS 64202

ITEM	DESCRIPTION	DATE
1	PRELIMINARY DEVELOPMENT PLAN	11/20/2017
2	FINAL DEVELOPMENT PLAN	11/20/2017
3	FINAL DEVELOPMENT PLAN	11/20/2017
4	FINAL DEVELOPMENT PLAN	11/20/2017
5	FINAL DEVELOPMENT PLAN	11/20/2017
6	FINAL DEVELOPMENT PLAN	11/20/2017
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98	FINAL DEVELOPMENT PLAN	11/20/2017
99	FINAL DEVELOPMENT PLAN	11/20/2017
100	FINAL DEVELOPMENT PLAN	11/20/2017

C100

OVERALL SITE PLAN

CFS ENGINEERS  
cfe.com

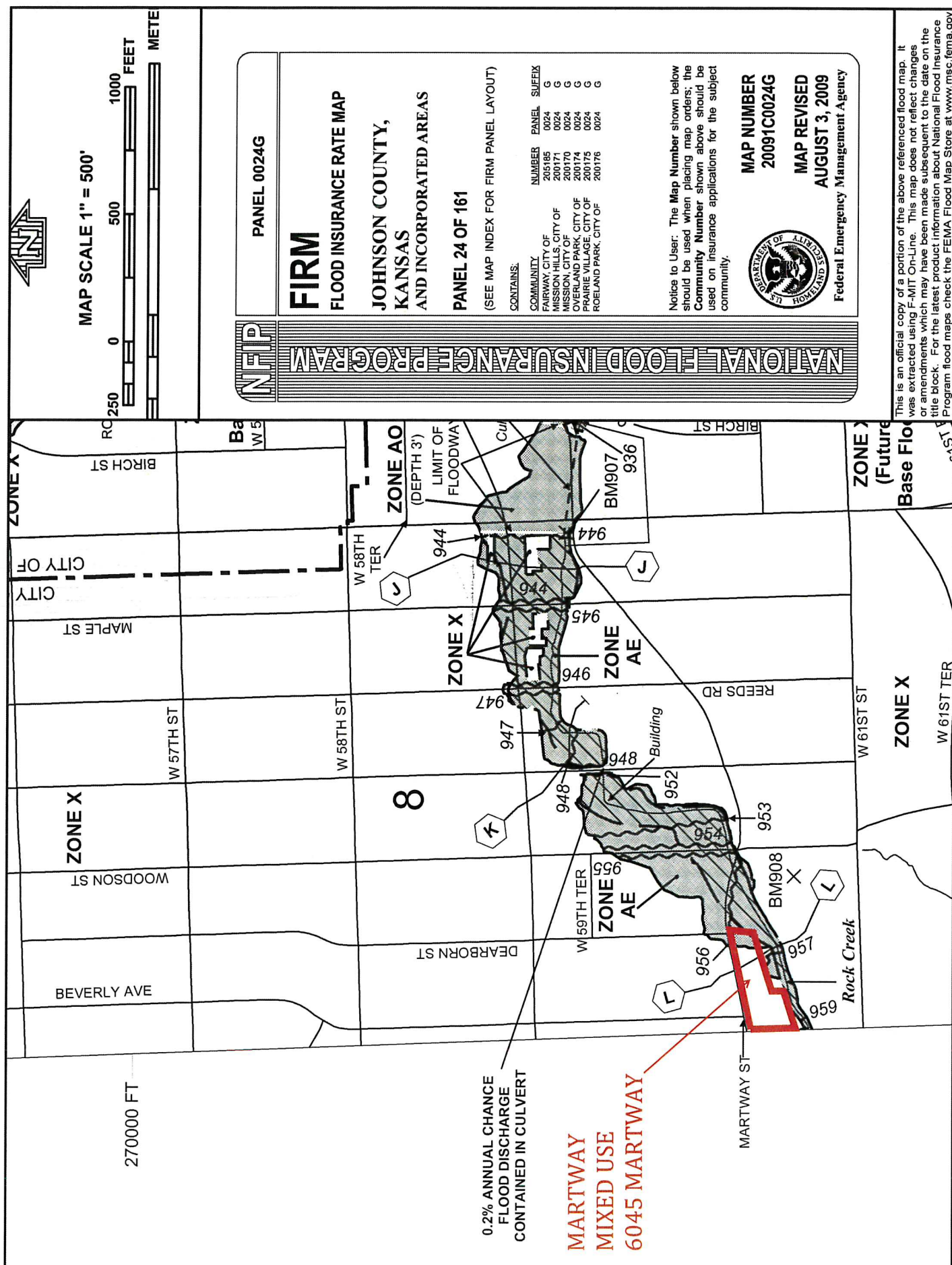
1401 E. 10TH STREET, STE. 100  
KANSAS CITY, MO 64105  
P: 816-333-2477 F: 816-333-2668

LIMITS OF DEVELOPMENT

Scale: 1" = 100' (SEE NOTE 1)











# Appendix II – Traffic Counts

# **Martway St, Mission, Kansas - 2017 Traffic Counts**

Wed 6-14-2017	Martway St & Beverly Ave Turning Movement Counts												Total Sum
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
7:00 AM	3	17	1	0	20	1	0	0	0	4	1	0	47
7:15 AM	7	20	0	1	24	3	0	0	0	2	0	6	63
7:30 AM	10	34	2	0	30	9	0	0	0	4	0	15	104
7:45 AM	12	46	0	0	38	13	0	0	0	3	0	6	118
8:00 AM	15	37	0	0	23	5	0	0	0	8	0	11	99
8:15 AM	16	37	1	2	31	11	0	0	0	5	0	7	110
8:30 AM	13	40	1	1	32	6	1	0	1	3	0	17	115
8:45 AM	5	30	0	1	24	7	0	0	1	2	1	17	88
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
0.94	56	160	2	3	124	35	1	0	1	19	0	41	

Max													118
Hourly Sum	32	117	3	1	112	26	0	0	0	13	1	27	332
Hourly Sum	44	137	2	1	115	30	0	0	0	17	0	38	384
Hourly Sum	53	154	3	2	122	38	0	0	0	20	0	39	431
Hourly Sum	56	160	2	3	124	35	1	0	1	19	0	41	442
Hourly Sum	49	144	2	4	110	29	1	0	2	18	1	52	412

Wed 6-14-2017	Martway St & Beverly Ave Turning Movement Counts												Total Sum
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
4:00 PM	2	50	2	0	59	5	3	0	3	4	0	15	143
4:15 PM	9	37	0	0	45	8	0	0	1	5	0	14	119
4:30 PM	8	70	0	0	62	7	1	0	0	7	0	15	170
4:45 PM	9	61	0	0	70	9	0	0	0	10	0	16	175
5:00 PM	8	58	0	0	67	9	0	0	2	10	0	25	179
5:15 PM	11	64	0	0	75	11	0	0	1	15	0	20	197
5:30 PM	4	59	0	0	72	4	1	0	0	6	0	13	159
5:45 PM	4	68	0	0	45	9	0	0	1	5	0	8	140
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
0.91	36	253	0	0	274	36	1	0	3	42	0	76	

Max													197
Hourly Sum	28	218	2	0	236	29	4	0	4	26	0	60	607
Hourly Sum	34	226	0	0	244	33	1	0	3	32	0	70	643
Hourly Sum	36	253	0	0	274	36	1	0	3	42	0	76	721
Hourly Sum	32	242	0	0	284	33	1	0	3	41	0	74	710
Hourly Sum	27	249	0	0	259	33	1	0	4	36	0	66	675



Thur 6-15-2017	Martway St & Dearborn St Turning Movement Counts												Total Sum
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
7:00 AM	2	15	2	0	23	0	0	0	0	0	0	2	44
7:15 AM	3	22	0	0	32	0	0	0	0	1	0	3	61
7:30 AM	4	19	0	0	34	0	0	0	0	1	0	7	65
7:45 AM	5	25	3	0	47	1	0	0	0	2	0	7	90
8:00 AM	4	38	2	1	32	1	1	0	1	1	1	7	89
8:15 AM	5	34	1	2	26	2	0	0	0	0	0	5	75
8:30 AM	2	34	1	0	32	1	0	0	0	2	0	5	77
8:45 AM	8	30	0	0	31	3	0	0	0	1	0	4	77
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
0.92	16	131	7	3	137	5	1	0	1	5	1	24	
Max													90
Hourly Sum	14	81	5	0	136	1	0	0	0	4	0	19	260
Hourly Sum	16	104	5	1	145	2	1	0	1	5	1	24	305
Hourly Sum	18	116	6	3	139	4	1	0	1	4	1	26	319
Hourly Sum	16	131	7	3	137	5	1	0	1	5	1	24	331
Hourly Sum	19	136	4	3	121	7	1	0	1	4	1	21	318

Thur 6-15-2017	Martway St & Dearborn St Turning Movement Counts												Total Sum
Time	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
4:00 PM	3	46	0	0	53	2	3	0	1	2	0	4	114
4:15 PM	5	63	1	0	49	2	0	0	1	0	0	3	124
4:30 PM	1	56	0	0	61	3	0	0	0	2	0	9	132
4:45 PM	6	72	0	0	58	2	1	0	1	2	0	7	149
5:00 PM	3	70	0	0	67	4	1	0	0	4	0	9	158
5:15 PM	8	72	0	1	67	6	4	0	1	3	0	3	165
5:30 PM	15	54	0	0	52	4	0	0	1	3	0	7	136
5:45 PM	14	50	0	0	61	1	3	0	0	1	0	5	135
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
0.92	32	268	0	1	244	16	6	0	3	12	0	26	
Max													165
Hourly Sum	15	237	1	0	221	9	4	0	3	6	0	23	519
Hourly Sum	15	261	1	0	235	11	2	0	2	8	0	28	563
Hourly Sum	18	270	0	1	253	15	6	0	2	11	0	28	604
Hourly Sum	32	268	0	1	244	16	6	0	3	12	0	26	608
Hourly Sum	40	246	0	1	247	15	8	0	2	11	0	24	594



Wed 6-14-2017	Martway St & Beverly Ave Turning Movement Counts											
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.94	56	160	2	3	124	35	1	0	1	19	0	41

Wed 6-14-2017	Martway St & Beverly Ave Turning Movement Counts											
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.91	36	253	0	0	274	36	1	0	3	42	0	76

Thur 6-15-2017	Martway St & Dearborn St Turning Movement Counts											
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.92	16	131	7	3	137	5	1	0	1	5	1	24

Thur 6-15-2017	Martway St & Dearborn St Turning Movement Counts											
PHF	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
0.92	32	268	0	1	244	16	6	0	3	12	0	26

# **Appendix III – Trip Generation & Traffic Distribution**

### Trip Generation Calculation - Weekday Peak AM and PM Hour

**Martway Mixed-Use - 6045 Martway, Mission, Kansas**

Cook Flatt and Strobel, Engineers  
CFS Project No. 17-5085

Date: 09/13/17

Date: 09/13/2025

Land Use	ITE Land Use Code	Square Footage or Unit Quantity	Total Daily Traffic	Pass-By Traffic Percent	AM Peak Hour (7-9 AM)						PM Peak Hour (4-6 PM)						Notes										
					Total			New-Gen			Pass-By			Total				New-Gen			Pass-By						
					2-Way PHV	2-Way PVH	Enter %	2-Way PHV	Enter	Exit %	2-Way PHV	Enter	Exit %	2-Way PHV	Enter	Exit %		2-Way PHV	Enter	Exit %	2-Way PHV	Enter	Exit %	2-Way PHV	Enter	Exit %	
Pre-Development Conditions General Office (KSF)	710	34,465	1527	0%	54	54	0	88%	48	48	0	12%	6	6	0	51	51	0	17%	9	9	0	83%	42	42	0	
	Total					54	54			48	48			6	6		51	51			9	9		42	42	0	
Post-Development Conditions Apartments (Dwelling Units) (Equations)	220	156	1069	0%	87	87	0	29%	25	25	0	71%	62	62	0	109	109	0	61%	66	66	0	39%	43	43	0	
	710	3,491		0%	5	5	0	88%	4	4	0	12%	1	1	0	5	5	0	17%	1	1	0	83%	4	4	0	
Total			1069			92	92			29	29			63	63		114	114			67	67		47	47	0	

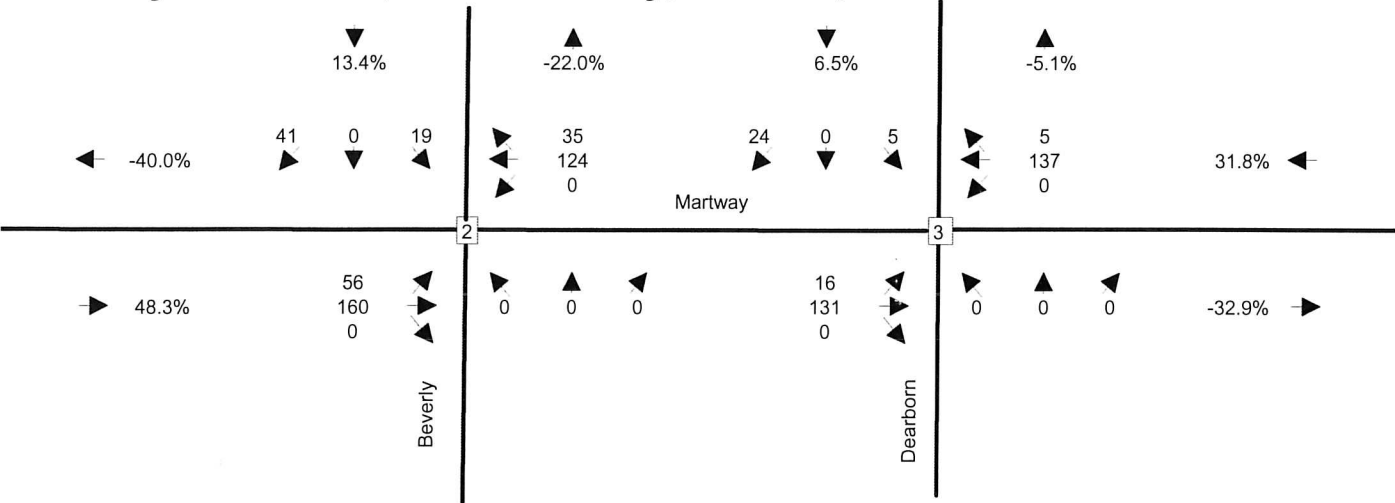
Notes:

ITE 9th Edition Trip Generation



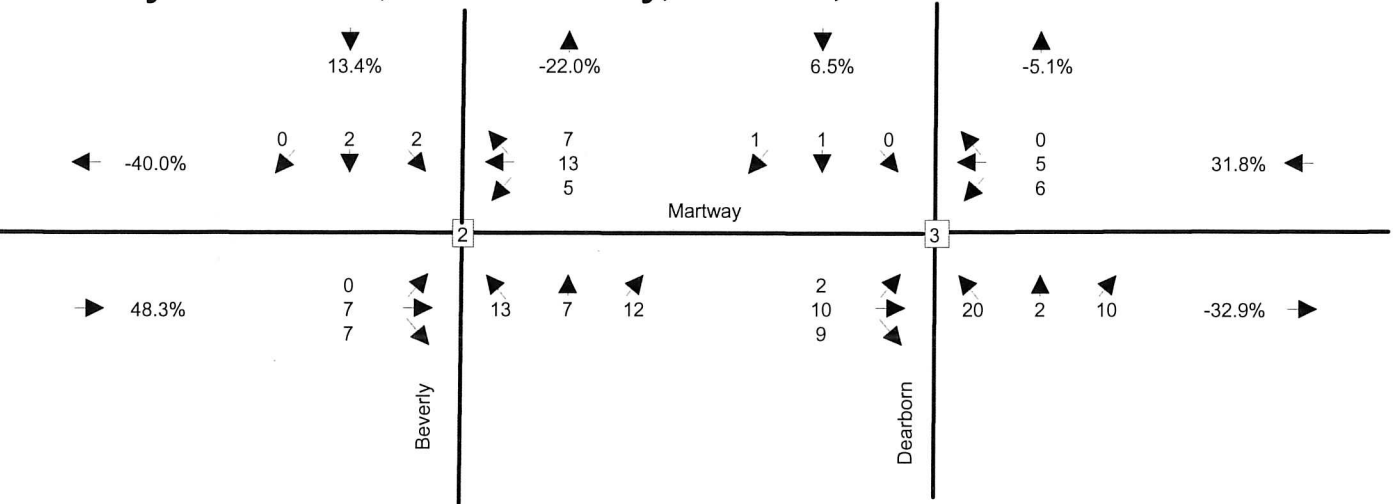
# AM Peak Hour Existing Traffic

Martway Mixed-Use, 6045 Martway, Mission, Kansas



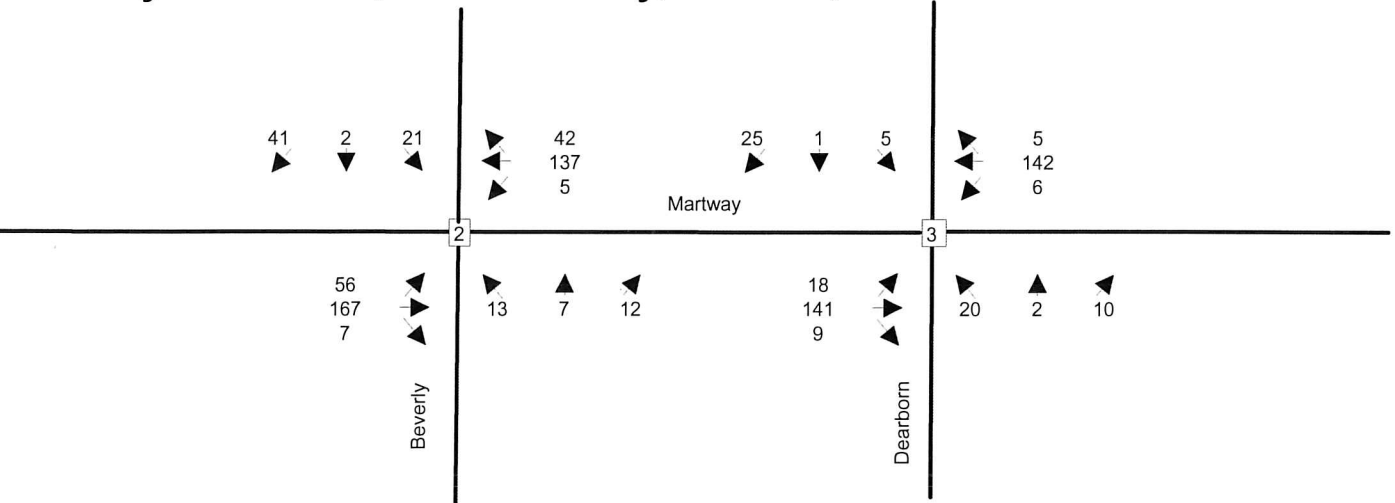
# AM Peak Hour Site-Generated Traffic

Martway Mixed-Use, 6045 Martway, Mission, Kansas



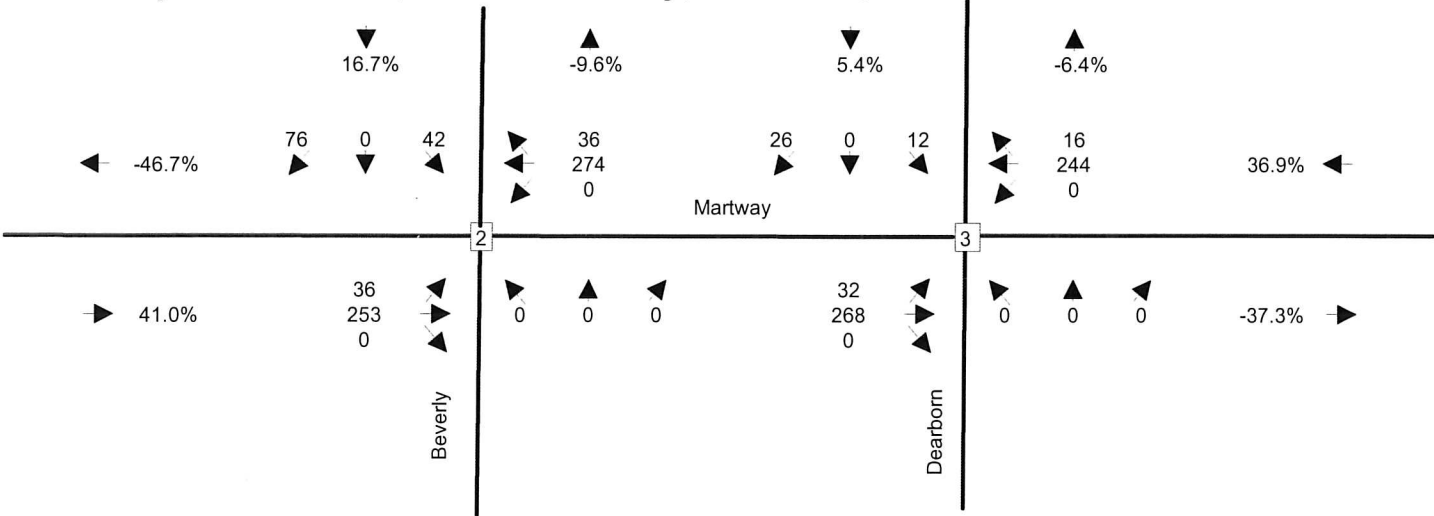
# AM Peak Hour Existing Plus Site-Generated Traffic

Martway Mixed-Use, 6045 Martway, Mission, Kansas



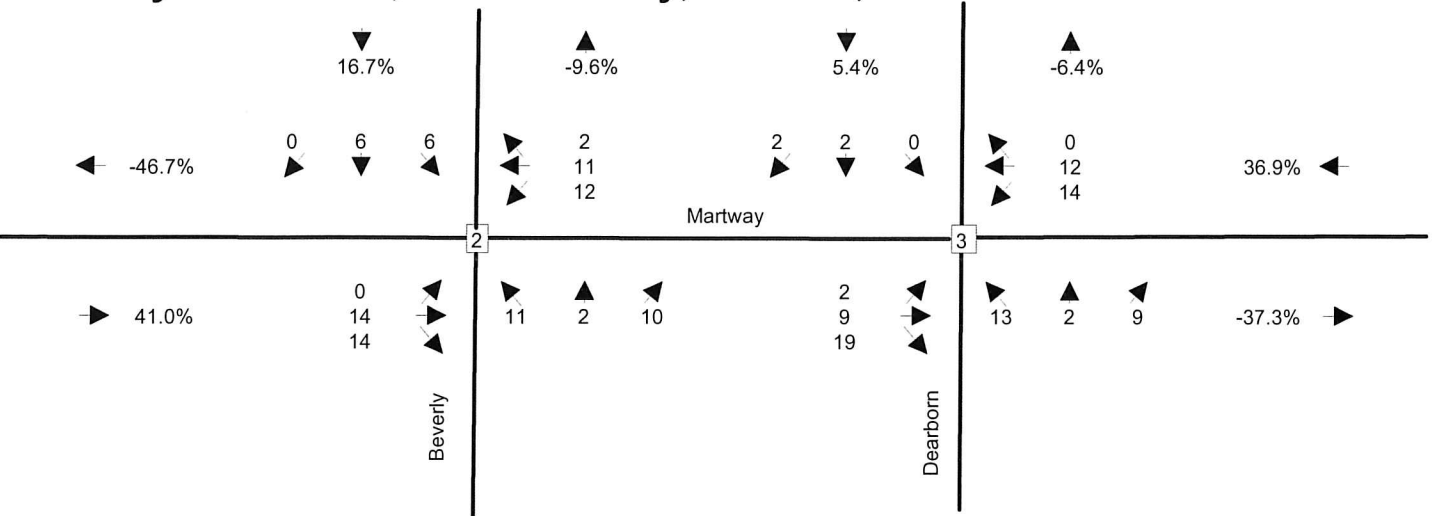
**PM Peak Hour Existing Traffic**

**Martway Mixed-Use, 6045 Martway, Mission, Kansas**



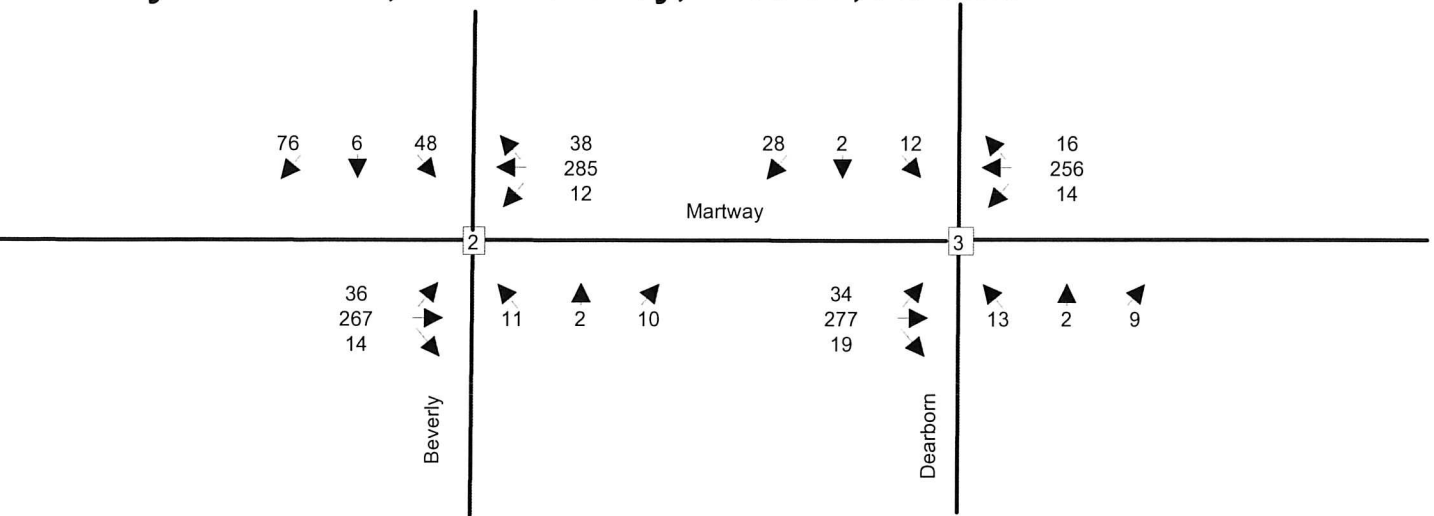
**PM Peak Hour Site-Generated Traffic**

**Martway Mixed-Use, 6045 Martway, Mission, Kansas**



**PM Peak Hour Existing Plus Site-Generated Traffic**

**Martway Mixed-Use, 6045 Martway, Mission, Kansas**

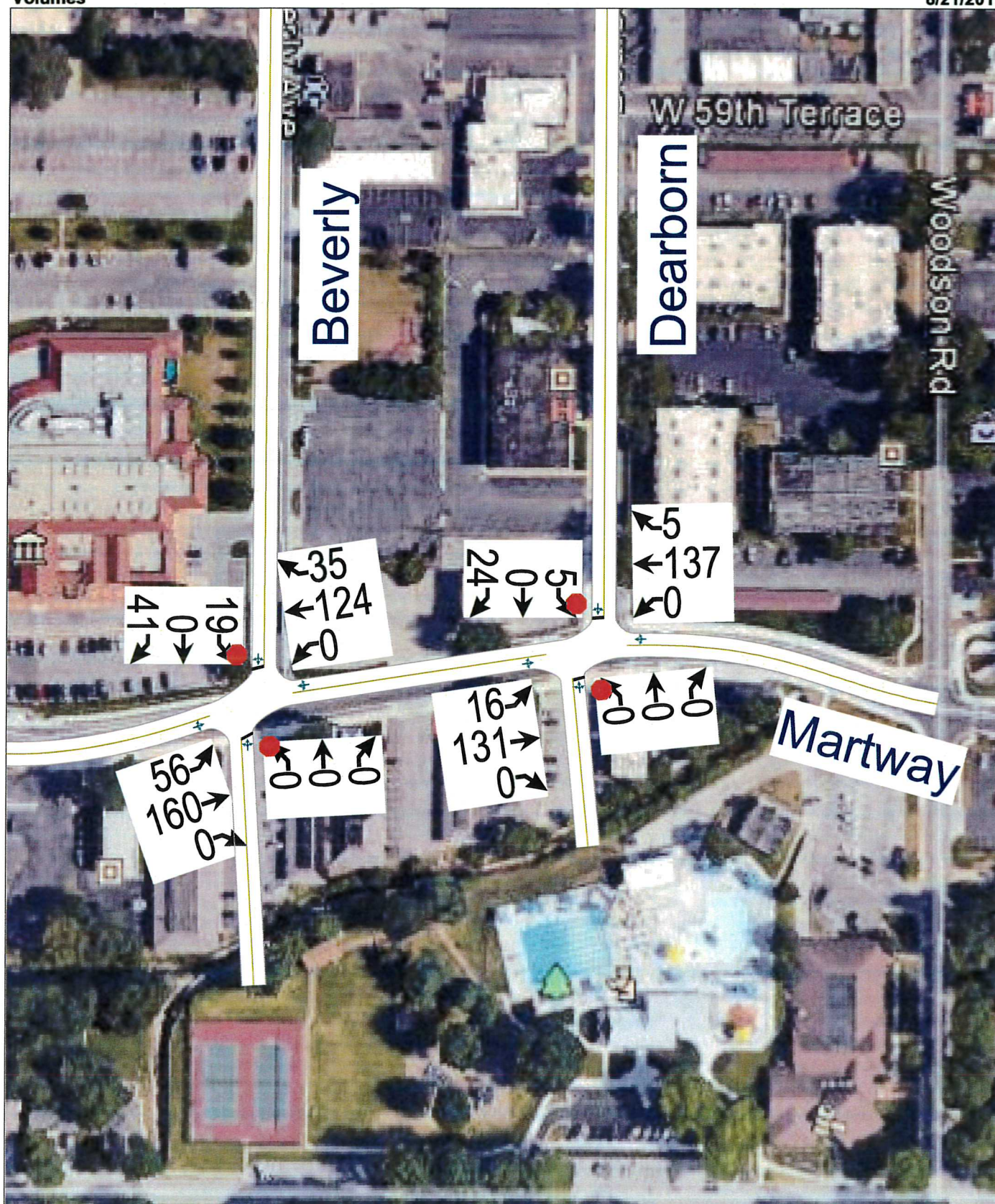


# **Appendix-IV - Synchro Results, AM Peak Traffic Conditions / Pre-Development**



Map - Martway Mixed Use-AM Pre-Development  
Volumes

8/21/2017



Martway Mixed Use-AM Pre-Development

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HCM 2010 TWSC  
2: Martway & Beverly

8/21/2017

Intersection

Int Delay, s/veh 2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	56	160	0	0	124	35	0	0	0	19	0	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	174	0	0	135	38	0	0	0	21	0	45

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	173	0	0	174	0	0	472	469	174	450	450	154
Stage 1	-	-	-	-	-	-	296	296	-	154	154	-
Stage 2	-	-	-	-	-	-	176	173	-	296	296	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1404	-	-	1403	-	-	502	492	869	519	504	892
Stage 1	-	-	-	-	-	-	712	668	-	848	770	-
Stage 2	-	-	-	-	-	-	826	756	-	712	668	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1404	-	-	1403	-	-	459	468	869	500	480	892
Mov Cap-2 Maneuver	-	-	-	-	-	-	459	468	-	500	480	-
Stage 1	-	-	-	-	-	-	678	636	-	807	770	-
Stage 2	-	-	-	-	-	-	785	756	-	678	636	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0	0	10.5
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1404	-	-	1403	-	-	715
HCM Lane V/C Ratio	-	0.043	-	-	-	-	-	0.091
HCM Control Delay (s)	0	7.7	0	-	0	-	-	10.5
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	0.3



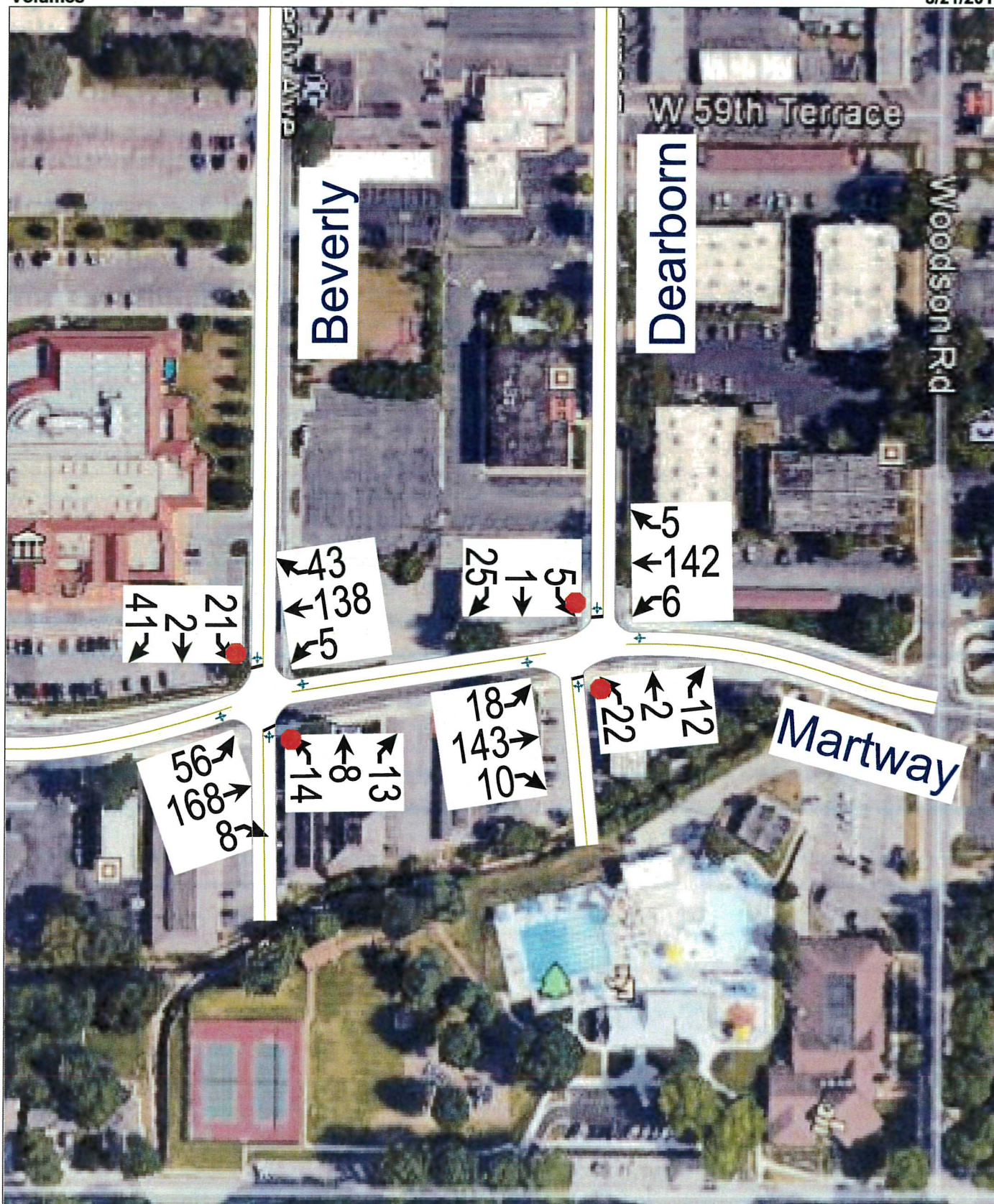
HCM 2010 TWSC  
3: Martway & Dearborn

8/21/2017

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	131	0	0	137	5	0	0	0	5	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	142	0	0	149	5	0	0	0	5	0	26
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	154	0	0	142	0	0	342	331	142	329	329	152
Stage 1	-	-	-	-	-	-	177	177	-	152	152	-
Stage 2	-	-	-	-	-	-	165	154	-	177	177	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1426	-	-	1441	-	-	612	588	906	624	590	894
Stage 1	-	-	-	-	-	-	825	753	-	850	772	-
Stage 2	-	-	-	-	-	-	837	770	-	825	753	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1426	-	-	1441	-	-	588	580	906	618	582	894
Mov Cap-2 Maneuver	-	-	-	-	-	-	588	580	-	618	582	-
Stage 1	-	-	-	-	-	-	814	743	-	839	772	-
Stage 2	-	-	-	-	-	-	813	770	-	814	743	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0			0			9.5		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	-	1426	-	-	1441	-	-	830				
HCM Lane V/C Ratio	-	0.012	-	-	-	-	-	0.038				
HCM Control Delay (s)	0	7.6	0	-	0	-	-	9.5				
HCM Lane LOS	A	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0.1				



# **Appendix V - Synchro Results, AM Peak Traffic Conditions / Post-Development**





HCM 2010 TWSC  
2: Martway & Beverly

8/21/2017

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	56	168	8	5	138	43	14	8	13	21	2	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	183	9	5	150	47	15	9	14	23	2	45
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	197	0	0	191	0	0	517	517	187	504	497	173
Stage 1	-	-	-	-	-	-	309	309	-	184	184	-
Stage 2	-	-	-	-	-	-	208	208	-	320	313	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1376	-	-	1383	-	-	469	462	855	478	475	871
Stage 1	-	-	-	-	-	-	701	660	-	818	747	-
Stage 2	-	-	-	-	-	-	794	730	-	692	657	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1376	-	-	1383	-	-	425	437	855	444	449	871
Mov Cap-2 Maneuver	-	-	-	-	-	-	425	437	-	444	449	-
Stage 1	-	-	-	-	-	-	666	627	-	777	744	-
Stage 2	-	-	-	-	-	-	748	727	-	638	624	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.9			0.2			12.4			11.2		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	527	1376	-	-	1383	-	-	648				
HCM Lane V/C Ratio	0.072	0.044	-	-	0.004	-	-	0.107				
HCM Control Delay (s)	12.4	7.7	0	-	7.6	0	-	11.2				
HCM Lane LOS	B	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.4				



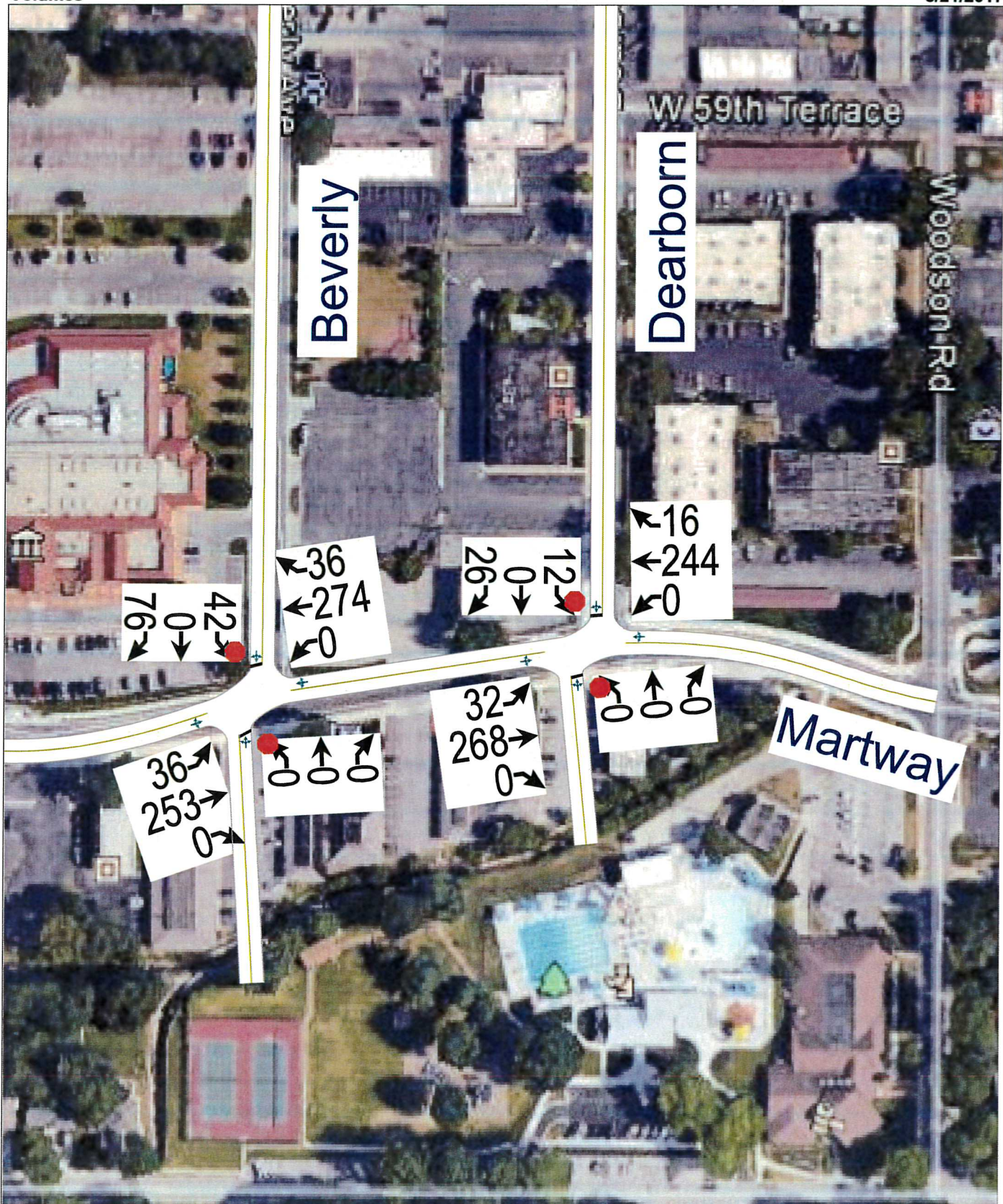
HCM 2010 TWSC  
3: Martway & Dearborn

8/21/2017

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	18	143	10	6	142	5	22	2	12	5	1	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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	155	11	7	154	5	24	2	13	5	1	27
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	160	0	0	166	0	0	384	373	161	378	375	157
Stage 1	-	-	-	-	-	-	200	200	-	170	170	-
Stage 2	-	-	-	-	-	-	184	173	-	208	205	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1419	-	-	1412	-	-	574	557	884	580	556	889
Stage 1	-	-	-	-	-	-	802	736	-	832	758	-
Stage 2	-	-	-	-	-	-	818	756	-	794	732	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1419	-	-	1412	-	-	547	545	884	561	544	889
Mov Cap-2 Maneuver	-	-	-	-	-	-	547	545	-	561	544	-
Stage 1	-	-	-	-	-	-	789	724	-	819	754	-
Stage 2	-	-	-	-	-	-	788	752	-	767	720	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0.3			11.1			9.7		
HCM LOS							B			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	626	1419	-	-	1412	-	-	797				
HCM Lane V/C Ratio	0.063	0.014	-	-	0.005	-	-	0.042				
HCM Control Delay (s)	11.1	7.6	0	-	7.6	0	-	9.7				
HCM Lane LOS	B	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

# **Appendix VI - Synchro Results, PM Peak Traffic Conditions / Pre-Development**







HCM 2010 TWSC  
2: Martway & Beverly

8/21/2017

Intersection

Int Delay, s/veh 2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	36	253	0	0	274	36	0	0	0	42	0	76
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	275	0	0	298	39	0	0	0	46	0	83

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	337	0	0	275	0	0	712	690	275	670	670	317
Stage 1	-	-	-	-	-	-	353	353	-	317	317	-
Stage 2	-	-	-	-	-	-	359	337	-	353	353	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1222	-	-	1288	-	-	347	368	764	371	378	724
Stage 1	-	-	-	-	-	-	664	631	-	694	654	-
Stage 2	-	-	-	-	-	-	659	641	-	664	631	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1222	-	-	1288	-	-	298	354	764	360	364	724
Mov Cap-2 Maneuver	-	-	-	-	-	-	298	354	-	360	364	-
Stage 1	-	-	-	-	-	-	639	607	-	668	654	-
Stage 2	-	-	-	-	-	-	584	641	-	639	607	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0	0	13.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1222	-	-	1288	-	-	532
HCM Lane V/C Ratio	-	0.032	-	-	-	-	-	0.241
HCM Control Delay (s)	0	8	0	-	0	-	-	13.9
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	0.9



HCM 2010 TWSC  
3: Martway & Dearborn

8/21/2017

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	32	268	0	0	244	16	0	0	0	12	0	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	35	291	0	0	265	17	0	0	0	13	0	28

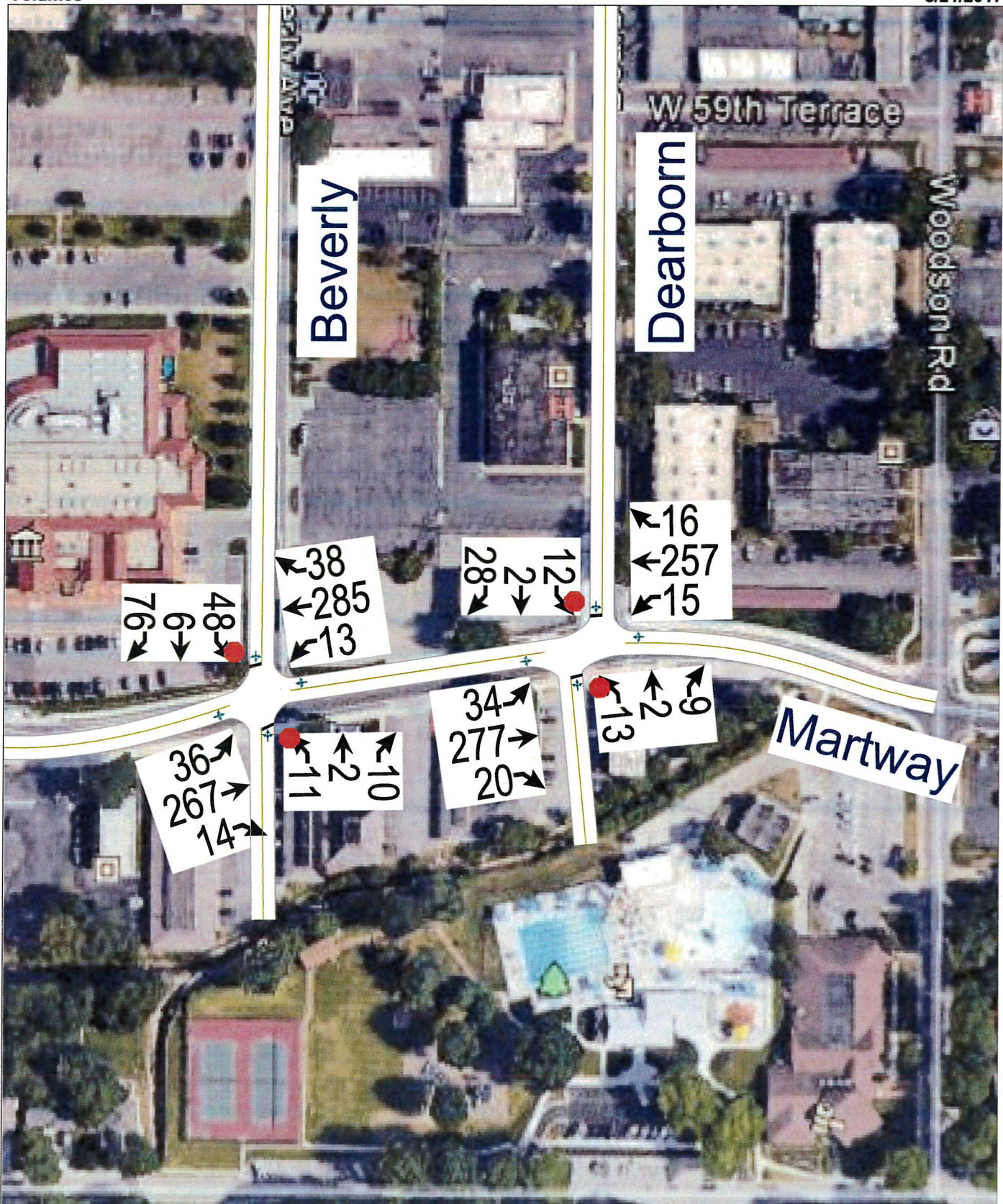
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	283	0	0	291	0	0	649	644	291	635	635	274
Stage 1	-	-	-	-	-	-	361	361	-	274	274	-
Stage 2	-	-	-	-	-	-	288	283	-	361	361	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1279	-	-	1271	-	-	383	391	748	391	396	765
Stage 1	-	-	-	-	-	-	657	626	-	732	683	-
Stage 2	-	-	-	-	-	-	720	677	-	657	626	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1279	-	-	1271	-	-	360	378	748	381	383	765
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	378	-	381	383	-
Stage 1	-	-	-	-	-	-	635	605	-	708	683	-
Stage 2	-	-	-	-	-	-	693	677	-	635	605	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0	0	11.7
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1279	-	-	1271	-	-	580
HCM Lane V/C Ratio	-	0.027	-	-	-	-	-	0.071
HCM Control Delay (s)	0	7.9	0	-	0	-	-	11.7
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.1	-	-	0	-	-	0.2

# **Appendix VII - Synchro Results, PM Peak Traffic Conditions / Post-Development**







HCM 2010 TWSC  
2: Martway & Beverly

8/21/2017

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	36	267	14	13	285	38	11	2	10	48	6	76
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	39	290	15	14	310	41	12	2	11	52	7	83
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	351	0	0	305	0	0	779	755	298	742	743	330
Stage 1	-	-	-	-	-	-	376	376	-	359	359	-
Stage 2	-	-	-	-	-	-	403	379	-	383	384	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1208	-	-	1256	-	-	313	338	741	332	343	712
Stage 1	-	-	-	-	-	-	645	616	-	659	627	-
Stage 2	-	-	-	-	-	-	624	615	-	640	611	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1208	-	-	1256	-	-	262	320	741	312	325	712
Mov Cap-2 Maneuver	-	-	-	-	-	-	262	320	-	312	325	
Stage 1	-	-	-	-	-	-	620	592	-	633	618	-
Stage 2	-	-	-	-	-	-	538	606	-	604	587	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.9			0.3			15.3			16.1		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	373	1208	-	-	1256	-	-	466				
HCM Lane V/C Ratio	0.067	0.032	-	-	0.011	-	-	0.303				
HCM Control Delay (s)	15.3	8.1	0	-	7.9	0	-	16.1				
HCM Lane LOS	C	A	A	-	A	A	-	C				
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	1.3				



HCM 2010 TWSC  
3: Martway & Dearborn

8/21/2017

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	34	277	20	15	257	16	13	2	9	12	2	28
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	301	22	16	279	17	14	2	10	13	2	30

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	297	0	0	323	0	0	723	715	312	713	718	288
Stage 1	-	-	-	-	-	-	386	386	-	321	321	-
Stage 2	-	-	-	-	-	-	337	329	-	392	397	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1264	-	-	1237	-	-	342	356	728	347	355	751
Stage 1	-	-	-	-	-	-	637	610	-	691	652	-
Stage 2	-	-	-	-	-	-	677	646	-	633	603	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1264	-	-	1237	-	-	314	338	728	327	337	751
Mov Cap-2 Maneuver	-	-	-	-	-	-	314	338	-	327	337	-
Stage 1	-	-	-	-	-	-	614	588	-	666	642	-
Stage 2	-	-	-	-	-	-	637	636	-	600	581	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	0.4	14.6	12.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	402	1264	-	-	1237	-	-	526
HCM Lane V/C Ratio	0.065	0.029	-	-	0.013	-	-	0.087
HCM Control Delay (s)	14.6	7.9	0	-	7.9	0	-	12.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.3