THE GATEWAY DEVELOPMENT

SHAWNEE MISSION PARKWAY (US-56) AND ROELAND DRIVE

MISSION, KANSAS

TRAFFIC IMPACT STUDY

REVISED MARCH, 2017

OA Project No. 2015-2039

03/17/2017

OLSSON ASSOCIATES

1.0 INTRODUCTION & OBJECTIVE

This report studies traffic impacts for The Gateway mixed-use development, located on the site of the former Mission Mall at Shawnee Mission Parkway (US-56) and Roeland Drive in Mission, Kansas. The study was based on the site plan dated February 1st, 2017. However there have been numerous revisions to both the site plan and traffic study over the years so there are several references to previous work through the report. City of Mission staff was contacted regarding the scope of work for this study.

The objective of this study is to evaluate the existing traffic, roadway conditions and traffic impacts expected from the proposed development. The appropriate intersection geometrics and traffic control improvements necessary to accommodate the increased traffic on the study area roadways were identified. For the purposes of this study the following scenarios will be analyzed for the PM peak hour period for vehicular traffic operations:

- Existing conditions
- Existing plus Development conditions
- Future year 2035 conditions

Specifics regarding each scenario will be discussed in further detail later in the report. The existing study area intersections include the following, maintaining jurisdiction is noted after each intersection:

- Shawnee Mission Parkway (US-56) and Roeland Drive (KDOT)
- Roeland Drive and Martway Street (City of Mission)
- Roeland Drive and Johnson Drive (City of Mission)
- Johnson Drive and Roe Avenue (City of Mission)
- Site driveways and access points, as appropriate

US-56 is maintained by Kansas Department of Transportation (KDOT) and borders the proposed project. Thus, the report has been completed consistent with the policies and procedures described in the KDOT *Access Management Policy* where applicable on US-56. Remaining study intersections will be consistent using the City criteria along with engineering judgment. The approximate location of the development area is shown on the vicinity map, **Figure 1**. **Figure 2** illustrates the site plan for The Gateway development.

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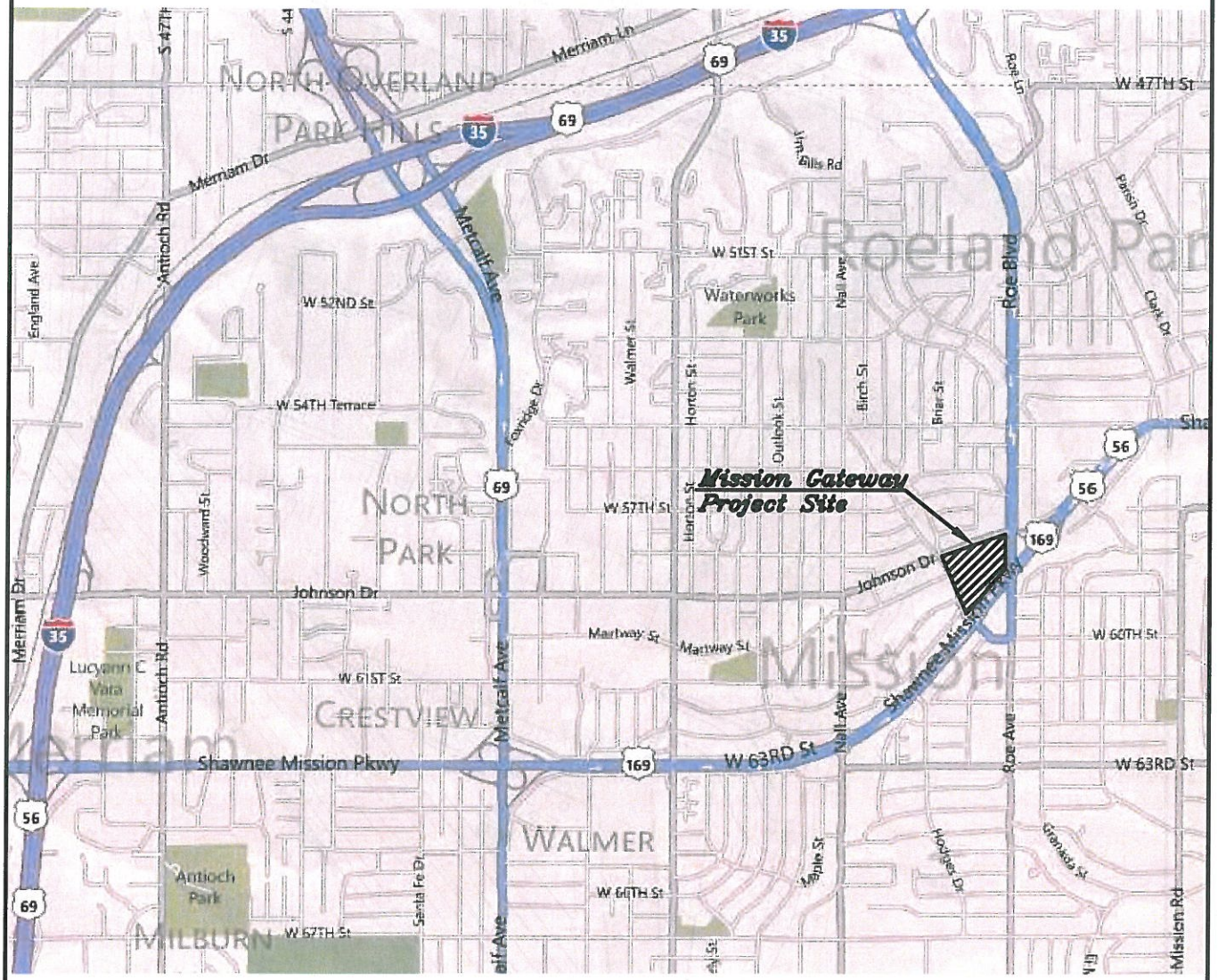

Source: Bing Maps

OLSSON ASSOCIATES	Vicinity Map	FIGURE 1

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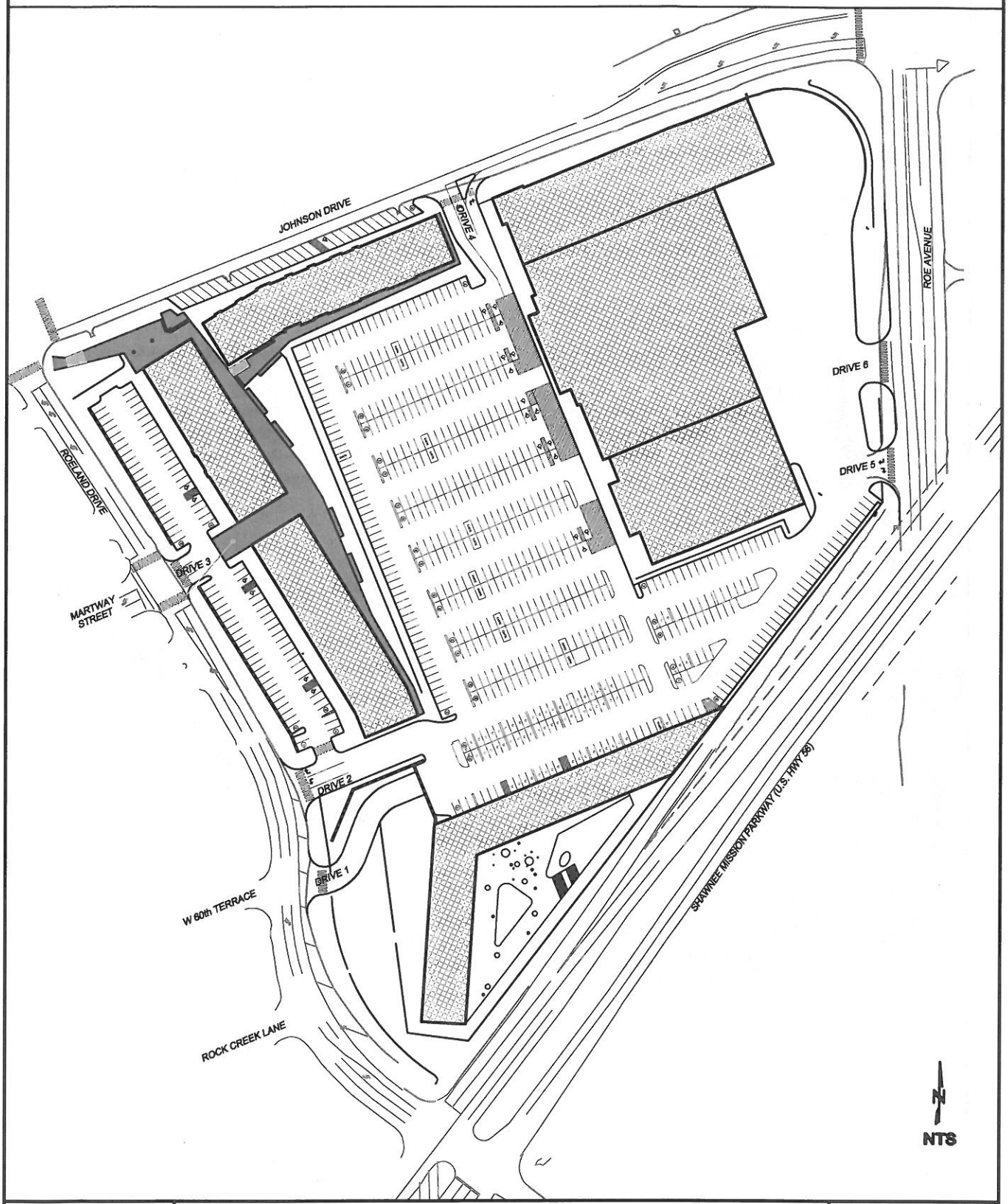

OLSSON ASSOCIATES	Site Plan	FIGURE 2

2.0 DESCRIPTION OF STUDY AREA

2.1 Proposed Development

An update to the site plan occurred since the preliminary review comments dated February 24th, 2017. At present, the site plan depicts the proposed development as an arrangement of buildings and central parking structure that will include several land-uses. The proposed mixed-use development consists of 175,799 square feet of retail space, 58,516 square feet of office, and 168 units of residential. This is a total decrease of 35,116 square feet in retail space, an increase of 3,970 square feet of office, a decrease of 200 hotel rooms, and a decrease of 14 residential units from the previous site plan. It should be noted that the decrease in square footage of the site will decrease the number of trips entering and exiting the site. To remain conservative, operations of the study area was analyzed with the same trips generated by the previous site plan. The development is bounded by Johnson Drive on the north, US-56 on the south, Roe Avenue on the east, and Roeland Drive on the west.

Access to the development is proposed from five access points, three on Roeland Drive, one on Johnson Drive, and one on Roe Avenue. Spacing for each of the following proposed drives were measured center to center.

Drive 1 is a full access drive which feeds into Level 2 of the main parking structure. Level 2 also provides access to Level 3 of the parking structure. The main parking structure provides parking for all land uses within the development, however Levels 2 and 3 are primarily used for the Hotel, Office, and Residential land uses. This access is located closest to the Hotel and is anticipated to be the major access for that particular land use. Drive 1 is located on Roeland Drive approximately 450 feet north of US-56, aligned across from West 60th Terrace.

Drive 2 is a full access drive proposed to be located approximately 120 feet north of Drive 1 along Roeland Drive, which leads into Level 1 of the parking structure. Drive 2 also provides access to frontage parking along the east side of Roeland Drive which will primarily be utilized by the retail land uses.

Drive 3 is proposed to align across from Martway Street and will provide access into the frontage parking along the east side of Roeland Drive. This drive will also primarily serve the retail land uses.

Drive 4 is a full access on Johnson Drive located approximately 560 feet east of Roeland Drive providing access into Level 1 of the parking structure. This drive is anticipated to primarily serve the retail components.

Drive 5 is an existing curb cut right-in/right-out drive on Roe Avenue located approximately 550 feet south of Johnson Drive serving primarily the retail development with access into Level 1 of the parking structure. One additional existing curb cut is a full

access servicing a truck loading dock gains access from Roe Avenue approximately 250 feet north of Drive 5.

2.2 Roadway Classification and Characteristics

US-56 is a four-lane east/west divided major arterial roadway with a posted speed limit of 45 mph near the site. The roadway serves as a regional function connecting I-35 with the Country Club Plaza. US-56 falls under the jurisdiction of the Kansas Department of Transportation (KDOT). US-56 is classified as a Type D route per the KDOT *Access Management Policy* and a Principle Arterial by KDOT's Functional Classification map.

KDOT's Functional Classification map also shows roadway classifications for City streets as follows:

Roeland Drive is a three-lane north/south undivided local roadway with a posted speed limit of 25 mph near the site.

Johnson Drive is a three-lane east/west minor arterial roadway that terminates with US-56 east of Roe Avenue. The posted speed limit is 30 mph near the site.

Roe Avenue is a four-lane north/south divided arterial roadway with a posted speed limit of 35 mph near the site.

Martway Street is a three-lane east/west local roadway that terminates at Roeland Drive. The posted speed limit is 25 mph near the site. Rock Creek Trail currently resides along the south side of Martway Street and is proposed to cross Roeland Drive and continue north on the east side of Roeland Drive once the development is constructed.

2.3 Study Intersection Characteristics

The intersection of Roeland Drive and US-56 is a signalized four-legged intersection. Dedicated left-turn lanes are provided for all movements at the intersection except the south approach. Dedicated right-turn lanes are provided for the southbound and eastbound movements. The intersection is currently split phased for north/south traffic. No Pedestrian accommodations are provided at the intersection.

The intersection of Roeland Drive and Martway Street is a signalized three-legged intersection. Dedicated left-turn lanes are provided for the northbound and eastbound movements at the intersection. Pedestrian accommodations are provided for the southbound movement at the intersection, including marked crosswalks, pedestrian indications, and push buttons. Currently, this signalized intersection operates in "Flash" mode for all periods of the day. During "Flash" operation mode, no pedestrian accommodations are provided.

The intersection of Roeland Drive and Johnson Drive is a signalized four-legged intersection. Dedicated left-turn lanes are provided for the northbound, eastbound, and westbound directions at the intersection. Dedicated right-turn lanes are provided for the

eastbound and westbound movements. Pedestrian accommodations are provided along the west and south legs of the intersection and include marked crosswalks, pedestrian indications, and push buttons.

The intersection of Roe Avenue and Johnson Drive is a signalized four-legged intersection. Dedicated left-turn lanes are provided for all movements at the intersection with dual left-turn lanes allocated for the eastbound movement. A dedicated right-turn lane is provided for the southbound movement. A channelized right-turn lane is provided for the northbound movement. Pedestrian accommodations are provided on the west and north legs of the intersection and included marked crosswalks, pedestrian indications, and push buttons.

3.0 DATA COLLECTION

Traffic count data was collected at the study intersections of US-56 and Roeland Drive, Roeland Drive and Martway Street, Roeland Drive and Johnson Drive, and Roe Avenue and Johnson Drive with the previous study and utilized within this study. AM and PM peak hour turning movement counts for study area intersections were collected from 6:30 to 8:30 AM and 4:30 to 6:30 PM respectively. Counts were taken between December 13th, 2011 and January 10th, 2012. This count data was determined to be suitable for existing analysis based on KDOT area count maps. Historical KDOT count maps were reviewed to determine if volumes along US-56 experienced significant change since 2011 when the data was collected. Based on KDOT count maps along US-56, traffic volumes have been flat or had a slight decrease since 2011. KDOT historical count maps from 2011, 2012, and 2013 can be found in the **Appendix**.

Considering traffic conditions, the highest volume of traffic occurs during the PM peak hour period. Reviewing the trip generation calculations discussed later in **Section 5.1**, the PM peak hour period is expected to generate the highest volume of new trips to the roadway network. Based on previous traffic impact studies for this development location, it was determined that the PM peak hour period conditions and associated improvements necessary for satisfactory operations would be more critical than the AM peak hour period conditions. Thus, operational analysis and review was completed for only the PM peak hour period.

The peak hour of traffic fluctuated between study intersections. To provide a baseline of traffic volumes, a consistent peak hour period was chosen for the study intersections. Based on the traffic count data collected the PM peak hour period is from approximately 5:00 to 6:00 PM.

Data sheets for the traffic counts are provided in the **Appendix.**

4.0 EXISTING TRAFFIC CONDITIONS

The analysis of existing conditions is based on the traffic counts collected for the study intersections. **Section 2.2** details roadway classification and intersection characteristics for the existing network. Existing traffic volumes used for analysis are illustrated in **Figure 3.** The existing intersection geometrics and traffic control for the study area intersections are illustrated in **Figure 4.**

4.1 Capacity Analysis

Signalized intersection capacity analyses were performed using SYNCHRO, version 9.1, based on the Highway Capacity Manual (HCM) delay methodology. Unsignalized capacity analyses were performed in accordance with chapter 17 of the HCM using the Highway Capacity Software (HCS2010), version 6.1. For simplicity, the amount of delay is equated to a grade or Level of Service (LOS) based on thresholds of driver acceptance. A letter grade between A and F is assigned, where LOS A represents the best operation. **Table 1** represents the LOS associated with intersection control delay, in seconds per vehicle (sec/veh), for signalized and unsignalized intersections.

Table 1: Intersection Level of Service Summary

Level-of-Service Criteria		
Level of Service (LOS)	**Stop Control** Approach Delay sec/veh	**Signal Control** Control Delay sec/veh
A	≤ 10	≤ 10
B	>10 and ≤ 15	>10 and ≤ 20
C	>15 and ≤ 25	>20 and ≤ 35
D	>25 and ≤ 35	>35and ≤ 55
E	>35 and ≤ 50	>55 and ≤ 80
F	>50	>80

Typically, the LOS for traffic signal controlled intersections should be LOS D or better. A LOS D or better at traffic signal controlled intersections is in regards to the overall intersection LOS; some individual movements may operate at a lower LOS. If an individual movement LOS is D or worse, queuing results will be reviewed to determine if queuing for the movement is accommodated. LOS D is desirable for stop controlled intersections; however, LOS E and F are often accepted during peak periods due low side street volumes waiting for gaps in the heavy mainline volume stream.

The Mid-America Regional Council (MARC) supplied timings for the signalized intersection of US-56 and Roeland Drive. Olsson Associates recently completed timing adjustments at the intersection of Roe Avenue with Johnson Drive for the City of Roeland Park, these timing adjustments were included in Mission Gateway analysis scenarios. Remaining signal timings and phasing for signalized intersections were acquired from the prior traffic study. As previously mentioned, the signalized intersection of Roeland Drive

with Martway Street is currently operating in "flash" mode with northbound/southbound movements observing the yellow, "caution" indication and the eastbound movement having the red, "stop" indication flashing, representing unsignalized stop control along Martway Street. The intersection was analyzed with both control methods of stop and signal control for comparative purposes.

Capacity analysis was completed as discussed above for the signalized study area intersections. **Table 2** details level of service for each signalized study intersection.

Table 2: Existing Signalized Intersection Capacity Analysis

Intersection	PM Peak Hour*
US-56 and Roeland Drive	C (28.5)
Roeland Drive and Martway Street	A (9.6)
Roeland Drive and Johnson Drive	B (14.0)
Roe Avenue and Johnson Drive	C (29.7)

*LOS (Delay, in seconds)

During the PM peak hour period the overall operations at the signalized intersection are acceptable with a LOS C or better. All individual movements operate at LOS D or better during the peak hour periods with the following exceptions:

US-56 & Roeland Drive:

- During the PM peak hour period the westbound left-turn movement is operating at LOS F and the eastbound left-turn, southbound through, and northbound movements are operating at LOS E.
    - The low level of service for the westbound left-turn movement is attributed to the abrupt arrival rate of vehicles which may be a result of the westbound through movements' queue length extending beyond the adjacent left-turn storage bay.
    - Remaining movements operating at LOS E are attributed to heavy main-line traffic volumes being accommodated. These movements' 95th-percentile queue lengths are contained within the available storage.

Unsignalized capacity analysis was conducted for the intersection of Martway Street and Roeland Drive to replicate existing "flash" operations of the signalized intersection. Under the current conditions, the intersection operates acceptably as an unsignalized intersection.

Capacity analysis sheets are included in the **Appendix. Figure 5** illustrates the existing level of service for study intersections.

4.2 Existing Recommendations

Study intersections are currently operating overall at acceptable levels of service. The intersection of Martway Street and Roeland Drive operates acceptably with signal timings in place as well as in "flash" operation. The need for a signal will be analyzed in the Existing plus Development scenario to determine if the intersection conditions warrant a signal.

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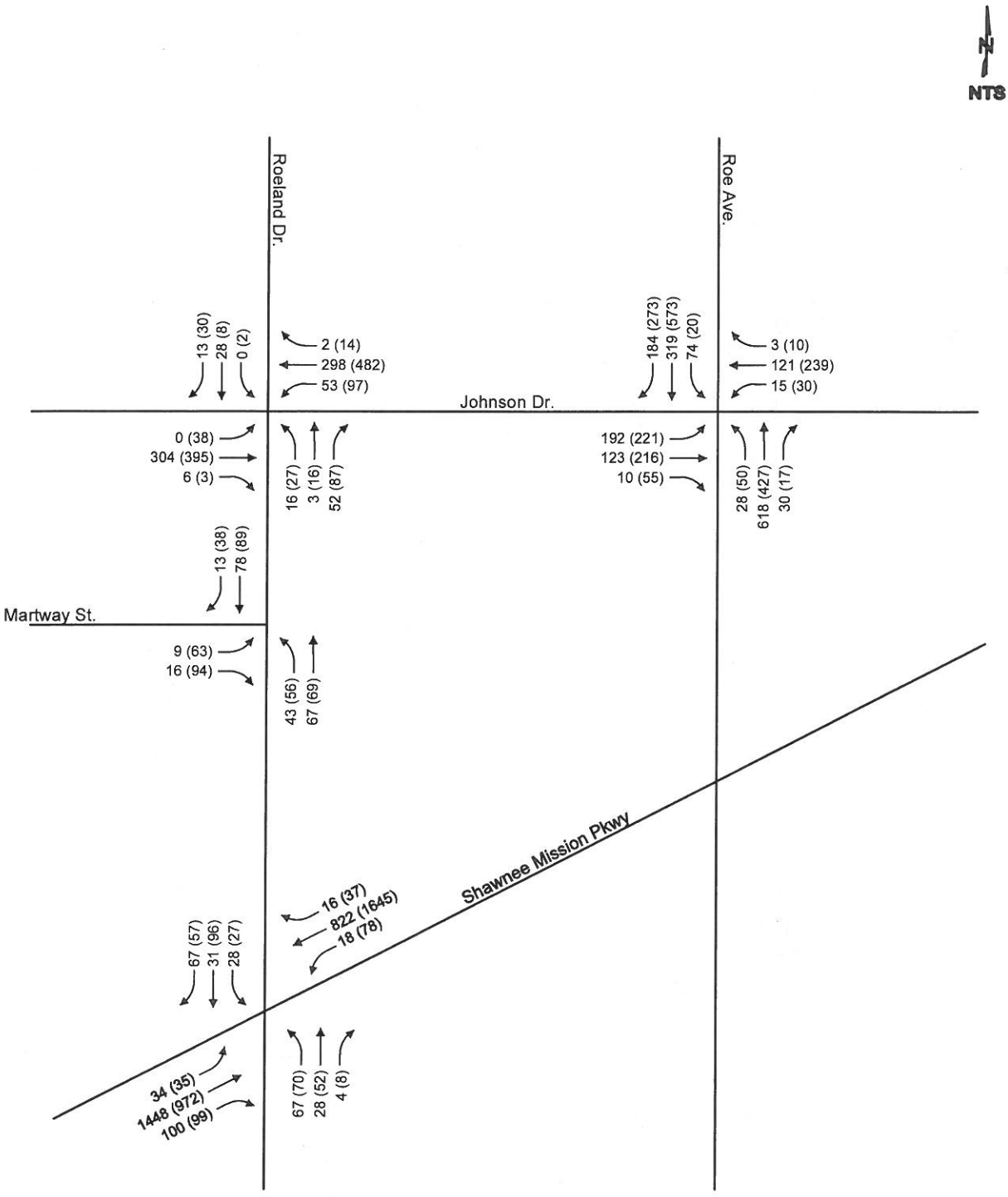

LEGEND
XX (XX) - AM PM Peak Hour Volumes

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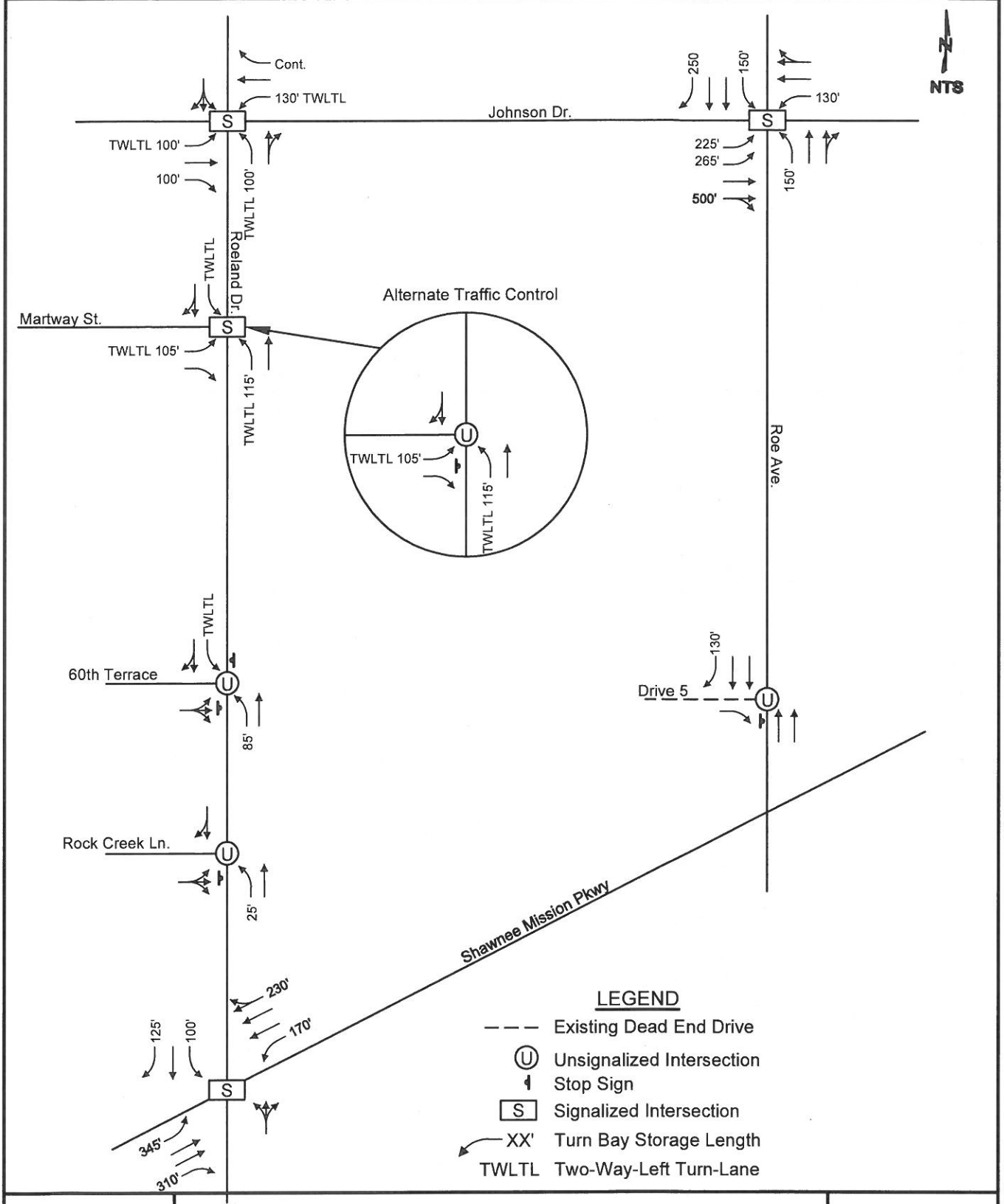

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Existing Lane Configurations & Traffic Control

FIGURE 4

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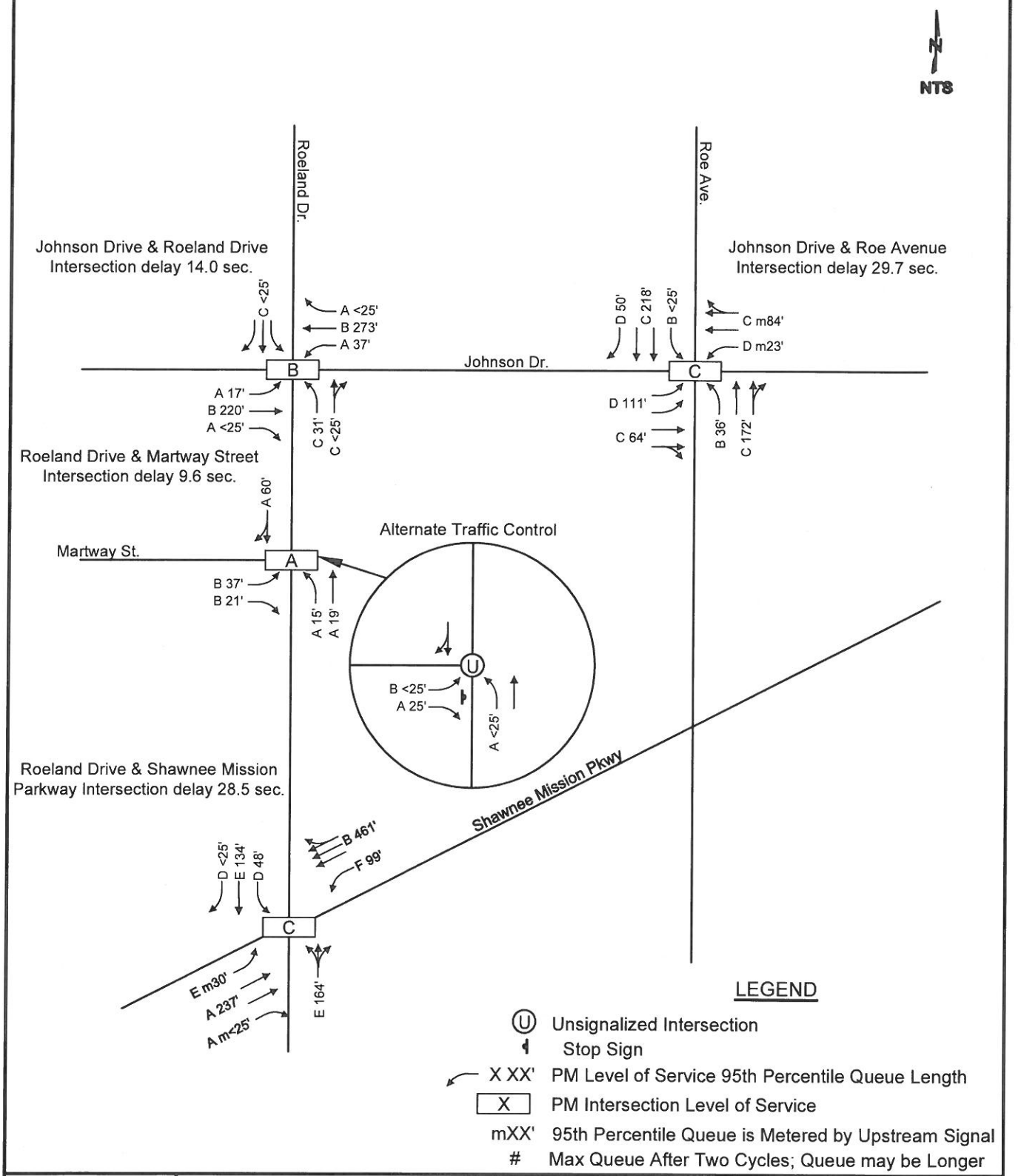

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Existing Level of Service

FIGURE 5

5.0 EXISTING PLUS DEVELOPMENT CONDITIONS

It should be noted, an update to the site plan has occurred since the preliminary review comments dated February 24th, 2017. The proposed development is an arrangement of buildings and central parking structure that will include several land-uses. The proposed mixed-use development consists of 175,799 square feet of retail space, 58,516 square feet of office, and 168 units of residential. This is a total decrease of 35,116 square feet in retail space, an increase of 3,970 square feet of office, a decrease of 200 hotel rooms, and a decrease of 14 residential units from the previous site plan. It should be noted that the decrease in square footage of the site will decrease the number of trips entering and exiting the site. Operations of the study area was analyzed with the same trips generated by the previous site plan. Given the overall decrease in trips generated by the site compared to the previous site plan, the capacity analysis of this section is considered conservative. Actual operations with the study area is expected to be better than what is analyzed in this report.

Access to the development is described in **Section 2.1**. Access spacing, throat length, and geometrics will be reviewed considering the policies and procedures described in the KDOT *Access Management Policy* where applicable on US-56. Remaining study intersections will be consistent with the City of Mission standard guidelines and engineering judgment.

Figure 2 illustrates the proposed site plan.

5.1 Trip Generation Comparison

An updated site plan was provided on February 1st, 2017. Changes to the site plan depict a land use change to the building in the northeast section of the property. In the previous October 2015 study, the original use for the facility was intended to be a 158,800 square foot *Free Standing Discount Superstore.* The current site plan shows the building divided into three separate retail stores totaling 123,684 square feet. To accurately describe the buildings functionality, the land use was updated from *Free Standing Discount Superstore* to *Shopping Center.* Other updates include a total increase in 3,970 square feet of office, the removal of 200 hotel rooms, and removal of 14 residential units as stated in **Section 5.0.**

Trips are expected to decrease by 1,316 vehicles during an average weekday and a decrease of 115 vehicles is expected during the PM peak hour, compared to trips generated by the previous site plan. Trip distribution remained unchanged from the previous site plan. A comparison between both land uses are shown in **Table 3.** The updated site plan can be found in **Figure 2.**

Table 3: Trip Generation Update

5.2 Trip Generation and Distribution

Trip generation characteristics expected for the development are shown in **Table 3**. These characteristics are based on trip generation data included in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (9th Edition). For trip generation determination, the site's land uses were classified as a mixed-use development including Shopping Center, Apartment, General Office Building, Hotel, and Specialty Retail Center. Trip generation was based on the square footage of the retail and office developments while residential and hotel trip generation was based on the dwelling units.

The proposed development is expected to generate 11,270 daily trips on an average weekday. The site is expected to generate 436 trips during the AM peak hour period, and 1,216 trips during the PM peak hour period.

As discussed in **Section 3.0** the PM peak hour period was determined most critical and operational analysis and review was completed for this period.

Table 4: Proposed Development Trip Generation

Daily Trip Generation

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	Daily Trips	Trip Distribution Enter	Trip Distribution Exit	Daily Trips Enter	Daily Trips Exit
820/1561	Shopping Center	123,684	SF	Equation	7798	50%	50%	3,899	3,899
220/333	Apartment	182	DU	Equation	1,227	50%	50%	614	613
710/1259	General Office Building	54,540	SF	Equation	828	50%	50%	415	413
310/613	Hotel	200	Rooms	Equation	1,417	50%	50%	709	708
826/1579	Specialty Retail Center	52,115	SF	Equation	2,268	50%	50%	1,134	1,134
Total					**11,270**			**6,771**	**6,767**

AM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	AM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	AM Peak Hour Trips Enter	AM Peak Hour Trips Exit
820/1562	Shopping Center	123,684	SF	Average	119	62%	38%	74	45
220/336	Apartment	182	DU	Equation	93	20%	80%	19	74
710/1260	General Office Building	54,540	SF	Equation	118	88%	12%	104	14
310/614	Hotel	200	Rooms	Equation	106	59%	41%	63	43
826/**	Specialty Retail	52,115	SF	-	0	50%	50%	0	0
Total					**436**			**260**	**176**

**No ITE AM Trip Estimation Available

PM Peak Hour Trip Generation (Adjacent Street)

ITE Code/Page	Land Use	Size		Trip Gen. Avg. Rate/Eq.	PM Peak Hour Trips	Trip Distribution Enter	Trip Distribution Exit	PM Peak Hour Trips Enter	PM Peak Hour Trips Exit
820/1563	Shopping Center	123,684	SF	Equation	691	48%	52%	332	359
220/337	Apartment	182	DU	Equation	118	65%	35%	77	41
710/1261	General Office Building	54,540	SF	Equation	140	17%	83%	24	116
310/581	Hotel	200	Rooms	Average	120	51%	49%	62	58
826/1580	Specialty Retail	52,115	SF	Equation	147	44%	56%	65	82
Total					**1,216**			**560**	**656**

After determination of trip generation for the site, multi-use development (captured trips) and pass-by trips (re-assignment) were determined for the PM peak hour. Based on information in the *Trip Generation Manual,* multi-use trip reductions should be applied first and then pass-by assignment can be considered. When a site consists of multiple land uses, total trips to a development can be reduced due to internal capture on the site. These are trips that stay within the development area and do not leave the site to travel to office or retail sites, for example. The multi-use reduction percentage is determined using various tables included in the *Trip Generation Manual.* Worksheets used to determine the multi-use reduction percentage are included in the ***Appendix***. Based on the worksheets, the multi-use percentage was determined to be 11%, 12%, and 34% for retail, office, and residential trips respectively.

After multi-use trip reduction is applied to the total development volumes, pass-by can be applied. Primary, multi-use, and pass-by distribution were preformed using SYNCHRO *Traffic Impact Analysis* application. When considering pass-by, trips to a site can be classified as pass-by or primary. Primary trips account for those drivers making a specific trip to a site. For example, a driver traveling from work directly home would be a primary trip. Pass-by trips are those trips which divert from their intended destination. For example, a driver is traveling from work to home on a roadway adjacent to the site, but decides to stop and visit a retail site. These pass-by trips are re-assigned within the network via roadways adjacent to the project site. According to the ITE Trip Generation Handbook, the pass-by trips for a retail shopping center vary from 12% to 89% during the PM peak hour period. To be conservative, 15% pass-by trips during the PM peak hour was used for this study.

Considering multi-use (internal capture) calculations, 464 trips are expected to enter the site and 560 trips are expected to exit the site during the PM peak hour period. For the re-assignment of pass-by trips, the total PM peak hour primary trips for the development is expected to be 411 trips entering and 501 trips exiting. The pass-by trips are expected to be 53 trips entering and 59 trips exiting. Complete trip generation data is illustrated in **Table 3**, **Table 4** illustrates site internal interaction with primary or pass-by trip information.

Table 5: Trip Generation with Internal Interaction and Pass-by Trips

Total Development Plan															
			ITE		AM Peak Hour					PM Peak Hour				
Land Use	Intensity		Code	Daily	Total	% In	% Out	In	Out	Total	% In	% Out	In	Out
Shopping Center	123,684	SF	820	7,798	119	62%	38%	74	45	691	48%	52%	332	359
Apartment	182	DU	220	1,227	93	20%	80%	19	74	118	65%	35%	77	41
General Office Building	54,540	SF	710	828	118	88%	12%	104	14	140	17%	83%	24	116
Hotel	200	DU	310	1,417	106	59%	41%	63	43	120	51%	49%	62	58
Specialty Retail	52,115	SF	826	2,268	0	50%	50%	0	0	147	44%	56%	65	82
Fast-Food - Without Drive-Thru	0	SF	933	0	0	60%	40%	0	0	0	51%	49%	0	0
			Total Trips	13,538	436			260	176	1,216			560	656
			*Internal Trips		—			—	—	192			96	96
			*External Trips		436			260	176	1,024			464	560
			**15% Pass By Trips		0					112			53	59
			**Non Pass By Trips		436			260	176	912			411	501

A traffic distribution was developed for the proposed site considering the usage of the site, access to the adjacent roadway network, and the distribution used in the approved study. Traffic distribution has changed slightly from the previously approved study in that more trips have been assigned to Roe Avenue traveling south and less trips traveling south on Roeland Drive. Trip generation and distribution was provided to the City's traffic consultant and approved with the previous study. The distribution for trips generated from the site is illustrated in **Table 5**. Slight modifications to the distribution were made when distributing trips to account for the redundant access to the site from the south and east.

Table 6: Traffic Distribution

Roadway To/From	Distribution	by Direction
North (Roe Avenue)	15%	20%
North (Roeland Drive)	5%	
South (Roe Avenue)	10%	20%
South (Roeland Drive)	10%	
East (Shawnee Mission Pkwy)	15%	25%
East (Johnson Drive)	10%	
West (Shawnee Mission Pkwy)	20%	35%
West (Johnson Drive)	10%	
West (Martway Avenue)	5%	
Total	100%	100%

The PM peak hour period trips for the development, following distribution and assignment to the roadway network, are illustrated in **Figure 6**. Trips associated with the proposed development were added to the existing plus approved development traffic volumes. The resulting existing plus development traffic volumes are illustrated in **Figure 7**.

5.3 Driveway Spacing

Five access points are proposed to provide access to the development. All drive spacing was measured by using center-to-center criteria. Three drives are proposed along Roeland Drive.

Drive 1 is proposed to align with 60th Terrace as an unsignalized full access drive.

Drive 2 is proposed to be located approximately 120' north of Drive 1 as an unsignalized full access drive with two exiting lanes.

Drive 3 is proposed to align with the intersection of Martway Street at Roeland Drive as the east leg with two exiting lanes.

Drive 4 is proposed along Johnson Drive approximately 560' east of Roeland Drive as full access drive with two exiting lanes.

Drive 5 is proposed at an existing right-in/right-out curb cut along Roe Avenue. Approximately 150' north of Drive 5, measured center to center, a separate drive is provided for truck traffic.

US-56 is classified as a Class D route per the KDOT *Access Management Policy* and a Principle Arterial by KDOT's Functional Classification map. Per the KDOT *Access Management Policy*, adequate upstream and downstream spacing for the full access Drive 1 is provided.

Remaining sight access points were analyzed based on KDOT's *Access Management Policy.* Based on this policy, all remaining driveway spacing is acceptable for unsignalized accesses.

5.4 Signal Warrant Analysis

As stated previously, the signalized intersection of Martway Street and Roeland Drive currently operates in "flash" mode, effectively making the intersection a stop controlled intersection for eastbound movements along Martway Street. Thus, the warrants for signalization were evaluated to determine if the need for a traffic signal still exists with the proposed development volumes.

A traffic signal may be justified if traffic conditions meet any of the applicable eight signal warrants described in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). The MUTCD provides criteria for conducting an engineering study to determine whether a traffic signal is appropriate at any intersection. Those criteria are embodied in the eight traffic signal warrants. Data collection from 2011 provides enough information to analyze Warrant 3, Peak Hour traffic volumes. Warrant 3 is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

The results of analyzing Warrant 3 on anticipated Existing Plus Development conditions indicate that the projected traffic volumes at Martway Street and Roeland Drive do not warrant a signal. Although a signal warrant is not met for at Martway Street and Roeland Drive consideration should be given to keep the signal in place due to the signal being a vital connection for pedestrians along the Rock Creek Trail. The signal will allow pedestrians traveling along the trail to cross the street safely. No other warrants for signalization were analyzed due to limited data. The signal will need to be modified to accommodate Drive 3 and for pedestrians crossing Roeland Drive if the signal is to remain. Capacity analysis results will be utilized to determine if the intersection operates efficiently as two-way stop controlled.

5.5 Auxiliary Turn Lanes

US-56 is maintained by Kansas Department of Transportation (KDOT) and borders the proposed project. Thus, the report has been completed consistent with the policies and procedures described in the KDOT *Access Management Policy* where applicable. These methods are used to determine when turn lanes are required at study area intersections, in addition to noting when turning volumes warrant auxiliary lane improvements. The Access Management Policy and queue length information obtained from analysis reports were used to determine the recommended length of turn lanes at existing intersections and at proposed site drives as necessary.

5.5.1 Left-Turn Lanes

The KDOT *Access Management Policy* provides guidance regarding the recommendation of left-turn storage along drives. Queue lengths at study intersections were reviewed to determine if the appropriate turn bay length is provided. The following left-turn lane improvements are recommended at study area intersections based on the minimum recommendations as described in **Section 5.4**:

Roeland Drive and Drive 1

- Re-stripe the north approach to maximize the length of the southbound left-turn in the existing two-way left-turn lane.

Roeland Drive and Drive 2

- Re-stripe the north approach to provide a 75-foot southbound left-turn in the existing two-way left-turn lane.
    - This should provide reverse left-turn lane striping between Martway Street and Drive 2.
- According to the site plan a northbound right turn lane should be installed. The addition of a northbound right turn lane will ensure that inbound vehicle blockages do not impact the northbound through movement.

Roeland Drive and Martway Street/Drive 3

- Provide a separate left-turn lane to mirror the west approach and remove left-turn traffic from the shared through/right-turn lane.
- Re-stripe the north approach to provide a 100-foot southbound left-turn in the existing two-way left-turn lane.
    - This should provide reverse left-turn lane striping between Johnson Drive and Martway Street.

5.5.2 Right-Turn Lanes

The KDOT *Access Management Policy* also provides guidance regarding the recommendation of right-turn lanes. Queue lengths at study intersections were reviewed to determine if the appropriate turn bay length is provided. The following right-turn lane improvements are recommended at study area intersections based on the minimum recommendations as described in **Section 5.4**:

US-56 and Roeland Drive

- An auxiliary right-turn lane is warranted under Existing conditions primarily due to through volumes, with or without the proposed development. Currently, a third through lane is added on the outside of the westbound US-56 lanes. This lane is existing pavement from the previously removed entrance ramp at Roe Avenue and the third lane is continued for approximately 650 feet west of Roeland Drive. This added through lane is underutilized by through traffic at its current state due to the short distance upstream and downstream of Roeland Drive and acts as a right-turn lane. Thus, no improvements of an additional right-turn lane are recommended at the intersection.

Johnson Drive and Drive 4

- Provide separate left and right-turn lanes on the south leg of the intersection exiting the site.
    - The right-turn lane should be made to release traffic into the existing second eastbound through lane on the outside of Johnson Drive. Provisions should be made to eliminate the potential for eastbound through traffic to merge

into the outside through lane across Drive 4. As generally shown on the site plan, **Figure 2**.

Roe Avenue and Drive 5

- There is currently a 130' right turn lane depicted in the site plan at Drive 5. This turn lane should be extended 120' for a total of 250' to accommodate both the Truck entrance and Drive 5.

Roeland Drive and Drive 2

- The addition of a northbound right turn lane would ensure that inbound vehicle blockages do not impact the northbound through movement. However, due to 20' of throat distance at Drive 2 it is not recommended to place a northbound right turn lane.

Roeland Drive and Drive 1

- To ensure that inbound vehicle blockages do not impact the northbound through movement, a northbound 130' right turn lane plus taper is required. Contrary to Drive 2, Drive 1 has an acceptable throat distance which will allow for the installation of an auxiliary right turn lane.

Figure 8 details recommended lane configurations and storage lengths.

5.6 Driveway Throat Length

Driveway throat lengths are important to address during site plan development to provide for adequate room to maneuver when transitioning from City streets to internal site areas. Inadequate throat lengths can result in slow traffic operation, safety, and capacity issues. Queues can block access on the intersection approach or result in delays for right-turning vehicles off City Streets.

Drive 1 provides approximately 200' of uninterrupted throat distance and is expected to be acceptable.

Drive 2, in a more typical parking lot configuration, only provides 20' of throat distance before access to parking is provided north of the Drive. As standard, it is recommended to provide an additional 55' for a total of 75' of throat to accommodate intersection queueing and room for vehicles to maneuver. However, given the constraints of the site, and understanding that additional queuing within an internal parking lot that has other exit options is more acceptable then in public streets, it is suggested, as an acceptable solution, to provide "Do Not Block Intersection" signing for westbound vehicles approaching Roeland Drive at the parking lot drive. It should be noted that with separate left and right-turn lanes for exiting traffic, queueing is anticipated to be less than two vehicles and is not anticipated to block access to the parking lot for entering vehicles.

Drive 3 also provides approximately 20' of throat distance and similar to Drive 2, it is recommended to provide an additional 55' for a total of 75' of throat to accommodate

intersection queueing and room for vehicles to maneuver. Also similar to Drive 2, it is understood that queuing within the internal parking lot is more acceptable, and given the site constraints, other exit points, and as noted that with separate left and shared through/right-turn lanes provided, queueing is anticipated to be approximately 1 vehicle with signal control or stop controlled approaches and would be contained within the given throat length. In addition to throat distance recommendations at Drive 3, it is suggested to provide signing to allow entering vehicles the right-of-way at the intersection of Drive 3 with the internal parking lots.

Drive 4 provides approximately 125' of uninterrupted throat distance and is expected to be acceptable as the queue length expected for both the northbound left and right-turn movements is one vehicle.

Drive 5 is proposed to provide approximately 60' of throat distance and is recommended to be reconfigured to provide a minimum of 75' of throat distance.

Recommended driveway throat lengths are illustrated in **Table 6.**

Table 7: Recommended Driveway Throat Lengths

Drive	Throat Length	
	Proposed	Recommended
Drive 1	200'	200'
Drive 2	20'	75'
Drive 3	20'	75'
Drive 4	125'	125'
Drive 5	60'	75'

5.7 Truck Movements

The development plans indicate several possible truck movements. It is essential with a site of this intensity to consider truck and emergency access routing to and through the site. Where raised medians on driveways force wide swings into public streets, raised medians should be cut back or removed. Corner radii at driveways should be sized to accommodate anticipated trucks.

The site plan includes a truck entrance on Roe Avenue just north of Drive 5. The curb cut for Drive 5 and a 130' southbound right turn lane was included with the Roe Avenue roadway design plans and is currently in place. The site plan has since been revised, from previous site plans, to allow trucks entering the site the ability to maneuver internally, without impeding traffic along Roe Avenue. However, since the Truck entrance is located just after the lane taper or the existing right turn lane for Drive 5, we recommend that the existing turn lane be extended 120' for a total of 250' to accommodate both the Truck entrance and Drive 5. It is also recommended to provide edge striping internal to the site between Drive 6 and Drive 5 to delineate the westbound driving path from the dock area.

5.8 Pedestrian Accommodations

Access to the Rock Creek Trail is at Roeland drive and Martway Street. As described in **Section 2.3**, although the signal at this intersection is currently in "Flash" operation pedestrian accommodations include marked crosswalks, pedestrian indications, and push buttons. It is recommended to update these facilities in compliance with ADA Title II requirements. Adequate curb ramp design with detectable warnings and vibrotactile pedestrian push buttons should be included in every direction. Due to its close proximity to the Rock Creek Trail, Roeland Drive and Johnson Drive should also be updated with these accommodations.

Pedestrian accommodations should also be provided long the southern leg of Shawnee Mission Parkway and Roeland Drive. This will provide connectivity to the sidewalks ending just before the intersection. As described above, accommodations should be updated to ADA standards, this includes adequate ramp design with detectable warnings and vibrotactile push buttons. In addition, due to the width of the south leg of the intersection, pedestrian refuge should be provided within the medians.

5.9 Capacity Analysis

Section 4.1 details the methods used for capacity analysis. **Table 7** represents the LOS and delay associated with the signalized study intersections. To complete signalized capacity analysis and provide a direct comparison accounting for changes in traffic volumes at the study intersections, signal timings remained consistent with existing timings, except for the US-56 and Roeland Drive intersection. At the intersection of US-56 and Roeland Drive the southbound movement was given additional green time to account for the vehicles exiting the site during the PM peak hour period.

Capacity analysis sheets for signalized intersections are included in the **Appendix.**

Table 8: Existing plus Development Signalized Intersection Capacity Analysis

Intersection	PM Peak Hour*
US-56 and Roeland Drive	C (19.0)
Roeland Drive and Martway Street/Drive 3	B (11.2)
Roeland Drive and Johnson Drive	B (18.0)
Roe Avenue and Johnson Drive	C (30.8)

*LOS (Delay, in seconds)

The overall LOS for the signalized study intersections is expected to be remain a LOS C or better with timing modifications at US-56 and Roeland Drive. Capacity analysis sheets illustrating this improvement are provided in the **Appendix.**

US-56 & Roeland Drive:

- During the PM peak hour period at US-56 and Roeland Drive the existing deficiencies remain with the westbound left-turn and northbound movements. 95th-percentile queue lengths are anticipated to increase by less than two vehicles over Existing conditions.
- The southbound left-turn movement's 95th-percentile queue length is expected to exceed the available storage length during the PM peak hour period. The southbound through movement's 95th-percentile queue length is expected to extend past the Roeland Drive and Rock Creek Lane intersection during portions of the PM peak hour period blocking the intersection. If blocking would occur, it is anticipated that the effect on the northbound left-turn movement turning onto Rock Creek Lane would be minimal. This is not anticipated to occur during other periods of the day. The 95th-percentile queue represents the queue length that has a 5 percent probability of being exceeded during the peak hour period. Thus the queueing, if it were to occur, would be expected to be a limited occurrence.
    - It is recommended to install signage for southbound traffic at Rock Creek Lane and Roeland Drive to prevent road users from blocking access into and out of Rock Creek Lane during periods of high demand.

With the exception of the intersection of US-56 and Roeland Drive, as discussed above, other study intersections are expected to operate at acceptable LOS.

Unsignalized analysis was conducted for the remaining unsignalized study intersections. All movements at unsignalized intersections are expected to operate at LOS D or better during the PM peak hour period considering Existing plus Development conditions. To minimize the delay and queuing separate left-turn and right-turn lanes for exiting vehicles are recommended at Drives 2, 3 and 4 as depicted in the site plan.

Taking into consideration the signal warrant analysis and current operational state of the intersection of Roeland Drive with Martway Street/Drive 3 this intersection was analyzed

as a two-way stop controlled intersection with stop control along Martway Street and Drive 3. The resulting LOS analysis indicate that the intersection will work at acceptable levels with side-street delay being minimal. Although signal warrant analysis indicates that a signal is no longer warranted and capacity analysis suggests that the signal would perform adequately under unsignalized conditions, consideration should be given to keep the signal in place due to the signal providing connection for pedestrians along the Rock Creek Trail.

Figure 9 illustrates the Existing plus Development level of service for study intersections.

6.0 Existing plus Development Recommendations

Study intersections are expected to operate at acceptable levels of service for the Existing Plus Development scenario considering the following recommended improvements:

Roeland Drive and Drive 1:

- Re-stripe the north approach to maximize the length of the southbound left-turn in the existing two-way left-turn lane.
- To ensure that inbound vehicle blockages do not impact the northbound through movement, a northbound 130' right turn lane plus taper is required. Contrary to Drive 2, Drive 1 has an acceptable throat distance which will allow for the installation of an auxiliary right turn lane.

Roeland Drive and Drive 2:

- Provide a separate left-turn and right-turn lane for exiting traffic.
- Re-stripe the north approach to provide a 75-foot southbound left-turn in the existing two-way left-turn lane.
    - This should provide reverse left-turn lane striping between Martway Street and Drive 2.
- It is recommended to provide 75' of throat distance at the intersection to allow entering vehicles to safely maneuver into the parking area.
- Provide "Do Not Block Intersection" signing for westbound vehicles approaching Roeland Drive at the parking lot drive.
- The addition of a northbound right turn lane would ensure that inbound vehicle blockages do not impact the northbound through movement. However, due to 20' of throat distance at Drive 2 it is not recommended to place a northbound right turn lane.

Roeland Drive and Martway Street/Drive 3:

- Provide a separate left-turn lane to mirror the west approach and remove left-turn traffic from the shared through/right-turn lane.
- Re-stripe the north approach to provide a 100-foot southbound left-turn in the existing two-way left-turn lane.
    - This should provide reverse left-turn lane striping between Johnson Drive and Martway Street.

- It is recommended to provide 75' of throat distance at the intersection to allow entering vehicles to safely maneuver into the parking area and store queued vehicles exiting the site to City streets.
- Provided adequate pedestrian accommodations in compliance with ADA standards.
- Provide signing to allow entering vehicles the right-of-way at the intersection of Drive 3 with the internal parking lots. This eliminates the potential for entering traffic to queue back into City streets.
- Although a signal warrant is not met for the intersection, consideration should be given to keep the signal in place due to the signal providing connection for pedestrians along the Rock Creek Trail. The signal will allow pedestrians traveling along the trail to cross the street safely.
    - Modify signal to accommodate Drive 3 and for pedestrians crossing Roeland Drive if the signal is to remain.

Johnson Drive and Drive 4:

- It is recommended to provide 125' of throat distance at the intersection to store queued vehicles exiting the site to City streets.
- Provide separate exiting left and right-turn lanes at the intersection.
    - The right-turn lane should be made to release traffic into the existing second eastbound through lane on the outside of Johnson Drive. Provisions should be made to eliminate the potential for eastbound through traffic to merge into the outside through lane across Drive 4.

Roe Avenue and Drive 5:

- As stated in Existing plus Development conditions, there is currently a 130' right turn lane depicted in the site plan at Drive 5. This turn lane should be extended 120' for a total of 250' to accommodate both the Truck entrance and Drive 5.
- It is also recommended to provide edge striping internal to the site between Drive 6 and Drive 5 to delineate the westbound driving path from the dock area.

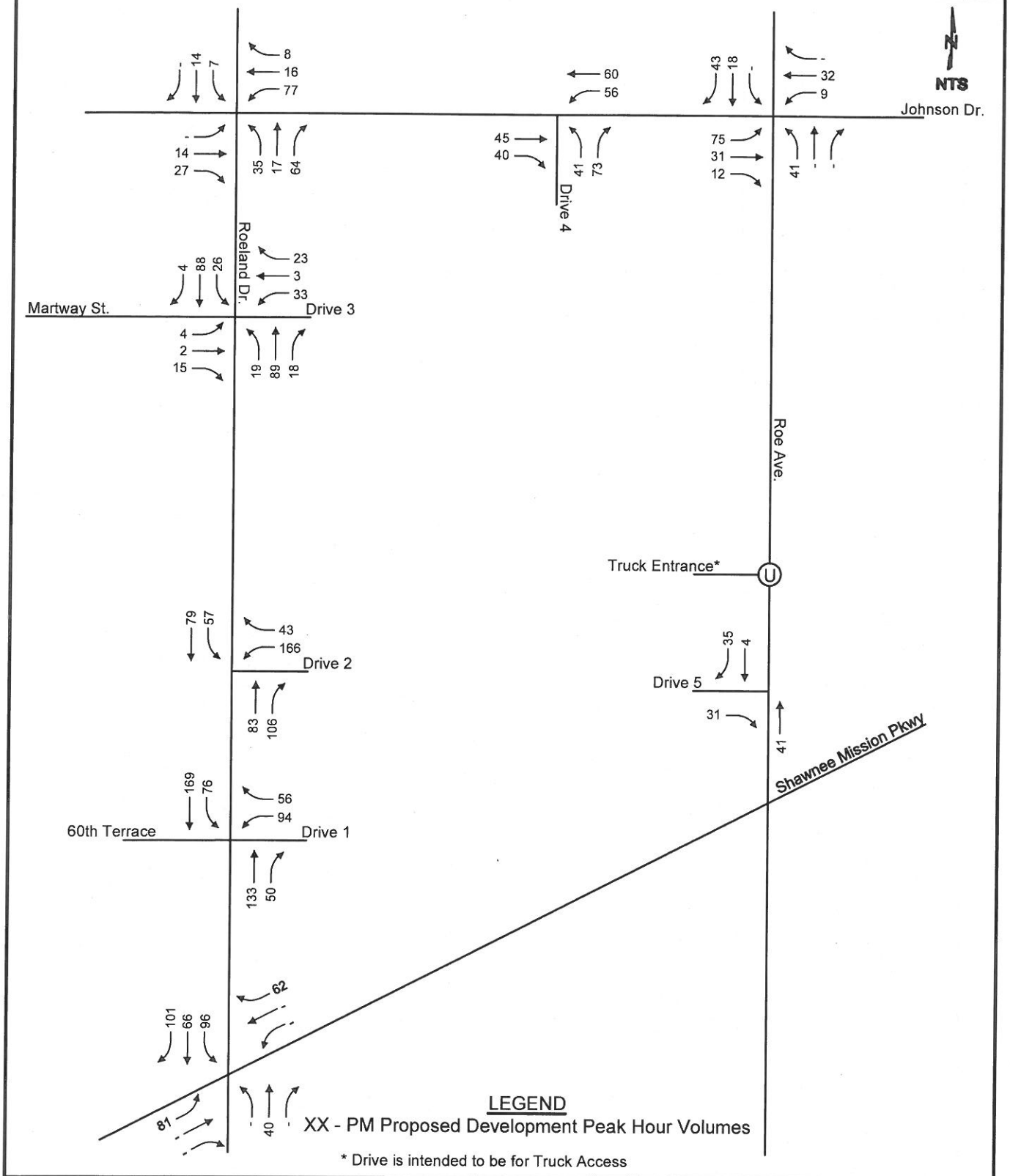
US-56 and Roeland Drive:

- Due to the increased demand on the north approach of the intersection, it is recommended to provide additional green time of up to 5 seconds to the southbound movements. This additional time will relieve congestion and reduce potential queue lengths on the approach while only minimally impacting the mainline traffic along US-56.
    - It is recommended to install signage just north of Rock Creek Lane along Roeland Drive to prevent road users from blocking access into and out of Rock Creek Lane during periods of high demand.
- Provided adequate pedestrian accommodations along the south leg of the intersection in compliance with ADA standards.

Johnson Drive and Roeland Drive:

- It is recommended to provide adequate pedestrian accommodations along the south leg of the intersection in compliance with ADA standards.

MISSION GATEWAY
MISSION, KANSAS

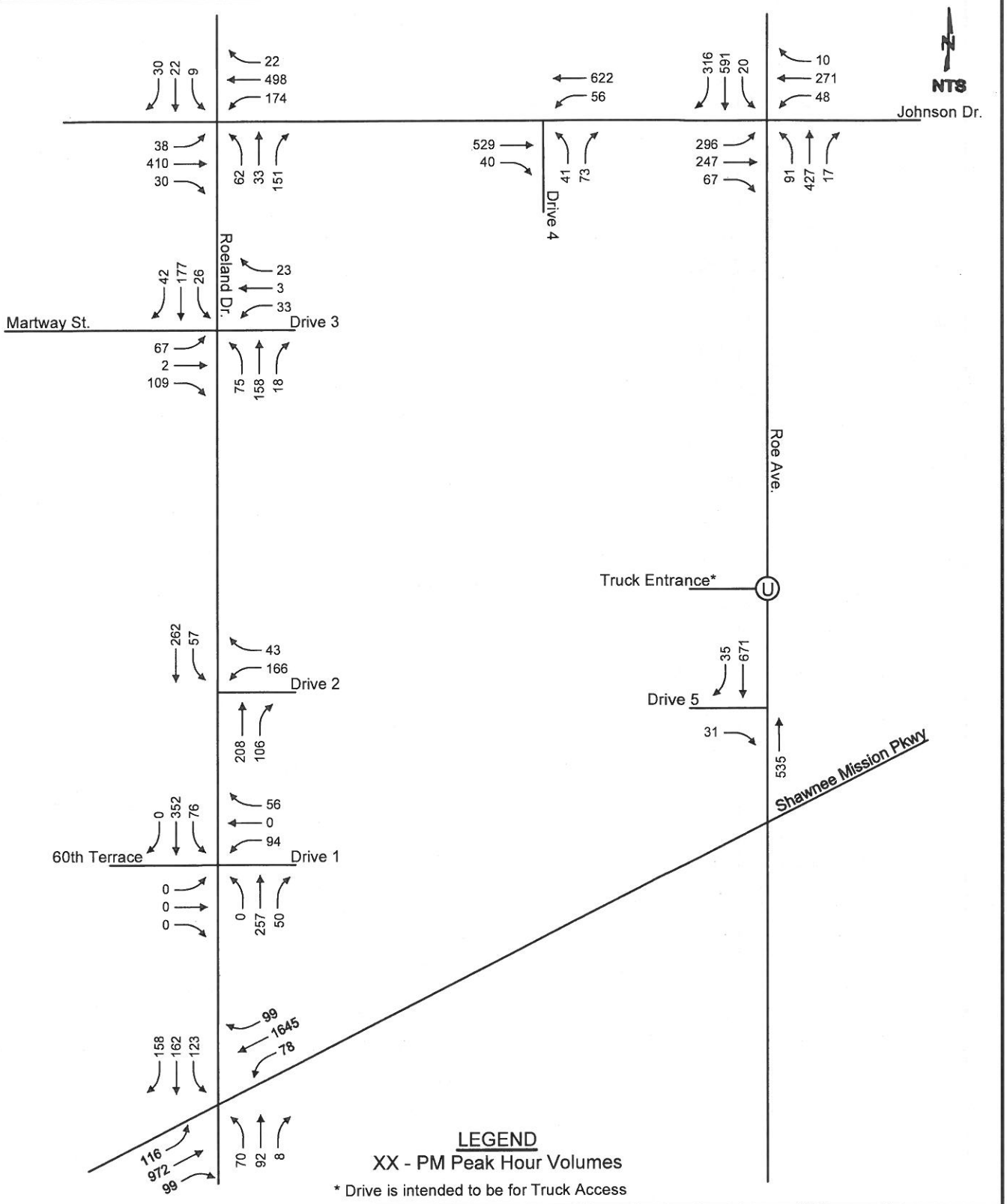


OLSSON ASSOCIATES

Development Peak Hour Volumes

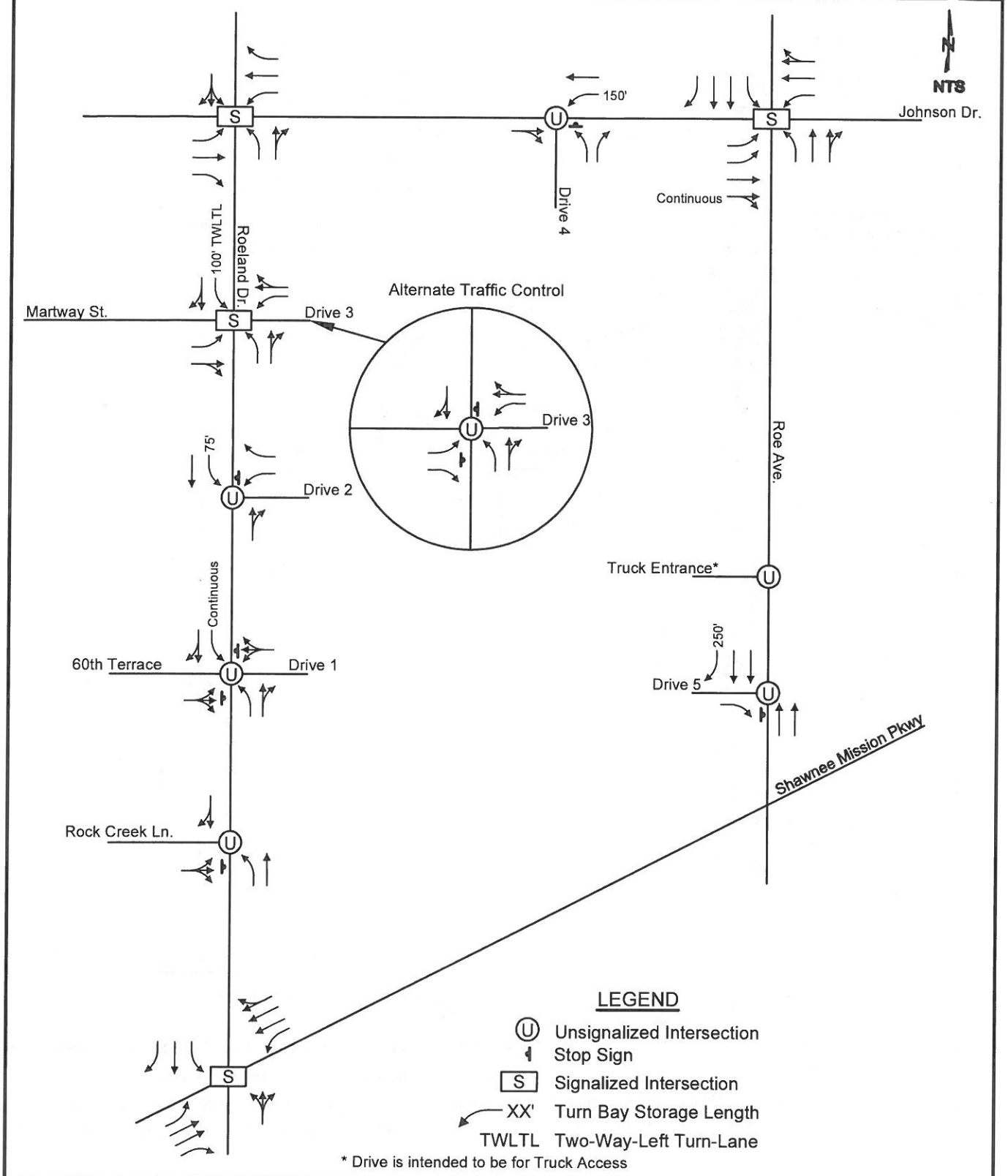
FIGURE 6

MISSION GATEWAY
MISSION, KANSAS



OLSSON ASSOCIATES	Existing Plus Development Peak Hour Volumes	FIGURE 7

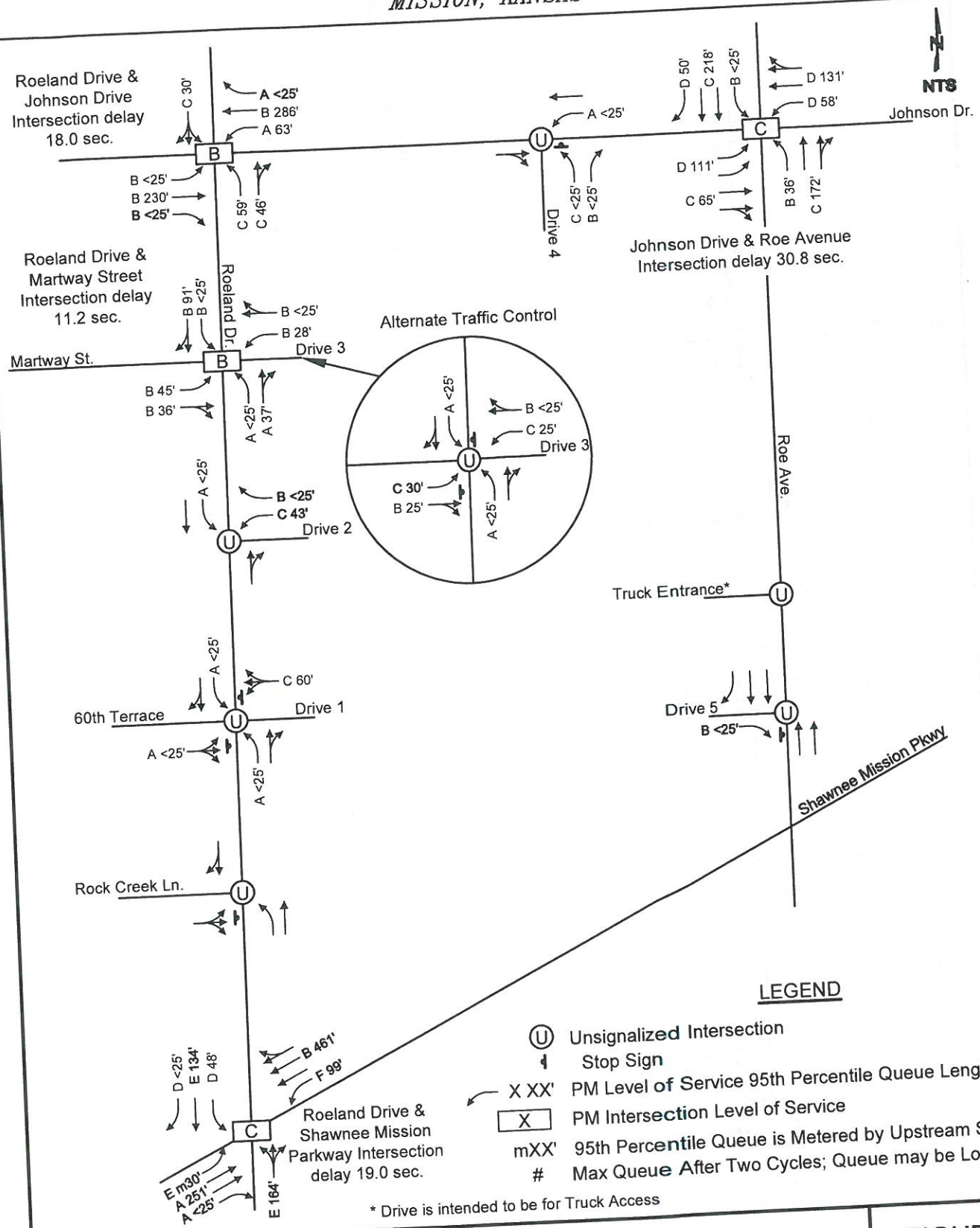
MISSION GATEWAY
MISSION, KANSAS



OLSSON ASSOCIATES

Existing Plus Development
Lane Configuration & Traffic Control

FIGURE
8



OLSSON ASSOCIATES

Existing Plus Development
Level of Service

FIGURE
9

6.0 FUTURE YEAR 2035 TRAFFIC CONDITIONS

The future year 2035 conditions consider the Mission Gateway development plus growth of background traffic volumes. KDOT Historical count maps from 2011, 2012, and 2013 were reviewed to determine an annual growth rate for the study area. Based on these maps, no significant growth has occurred in the previous 3 years. For conservative analysis a 0.5% annual growth rate was utilized along roadways classified greater than collector streets to account for any potential growth in the study area. The assumed growth rate is consistent with the previously completed traffic impact study completed by Olsson Associates and greater than previous impact studies in this area. The growth rate was applied to the existing through volumes along Shawnee Mission Parkway, Johnson Drive, and Roe Avenue to obtain future year background volumes.

The background additional volumes were added to the existing plus development volumes resulting in future year 2035 traffic volumes, illustrated in **Figure 10.** Future year 2035 intersection geometrics and traffic control for the study area intersections are illustrated in **Figure 11**.

6.1 Capacity Analysis

Section 4.1 details the methods used for capacity analysis. **Table 8** represents the LOS and delay associated with the signalized study intersections. To complete signalized capacity analysis, signal timings were reviewed and updated as necessary to account for changes in traffic volumes at study intersections for the future year 2035.

Capacity analysis sheets for signalized intersections are included in the **Appendix.**

Table 9: Future Year 2035 Signalized Intersection Capacity Analysis

Intersection	PM Peak Hour*
US-56 and Roeland Drive	D (35.6)
Roeland Drive and Martway Street/Drive 3	B (11.1)
Roeland Drive and Johnson Drive	B (19.7)
Roe Avenue and Johnson Drive	C (33.5)

*LOS (Delay, in seconds)

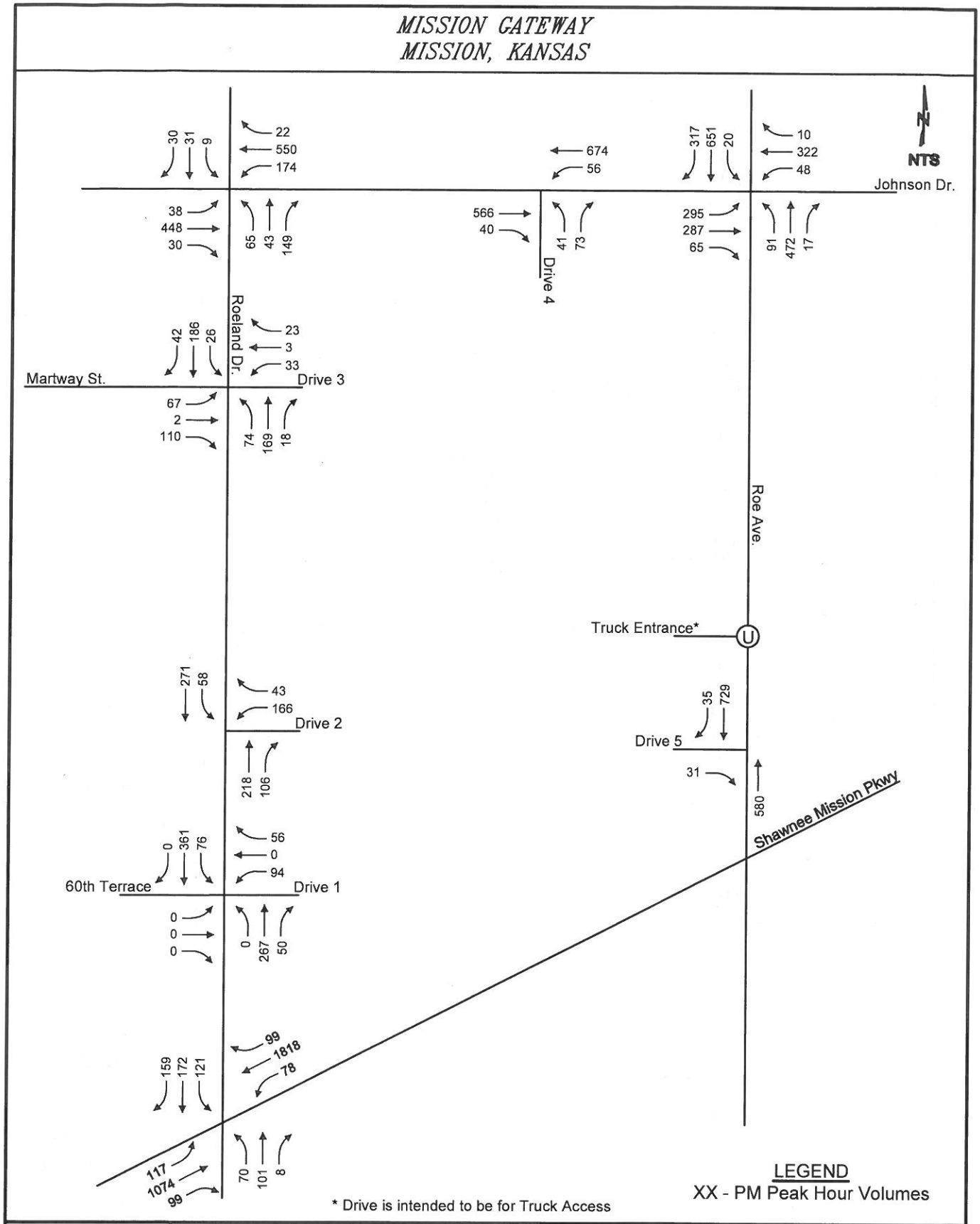
Based on Future 2035 analysis, all signalized intersections are expected to operate at acceptable LOS D or better during the PM peak hour period. Intersection delay and queuing are expected to experience minimal increases over the Existing plus Development scenario.

Based on Future 2035 analysis, the deficiencies at signalized and unsignalized intersections and throat lengths are consistent with the Existing plus Development scenario. No additional improvements are expected to be necessary.

Figure 12 illustrates the future year 2035 level of service for study intersections.

6.2 Future Year 2035 Recommendations

Based on the analysis conducted, study area intersections are expected to operate at acceptable levels of service without additional improvement from the Existing plus Development scenario.

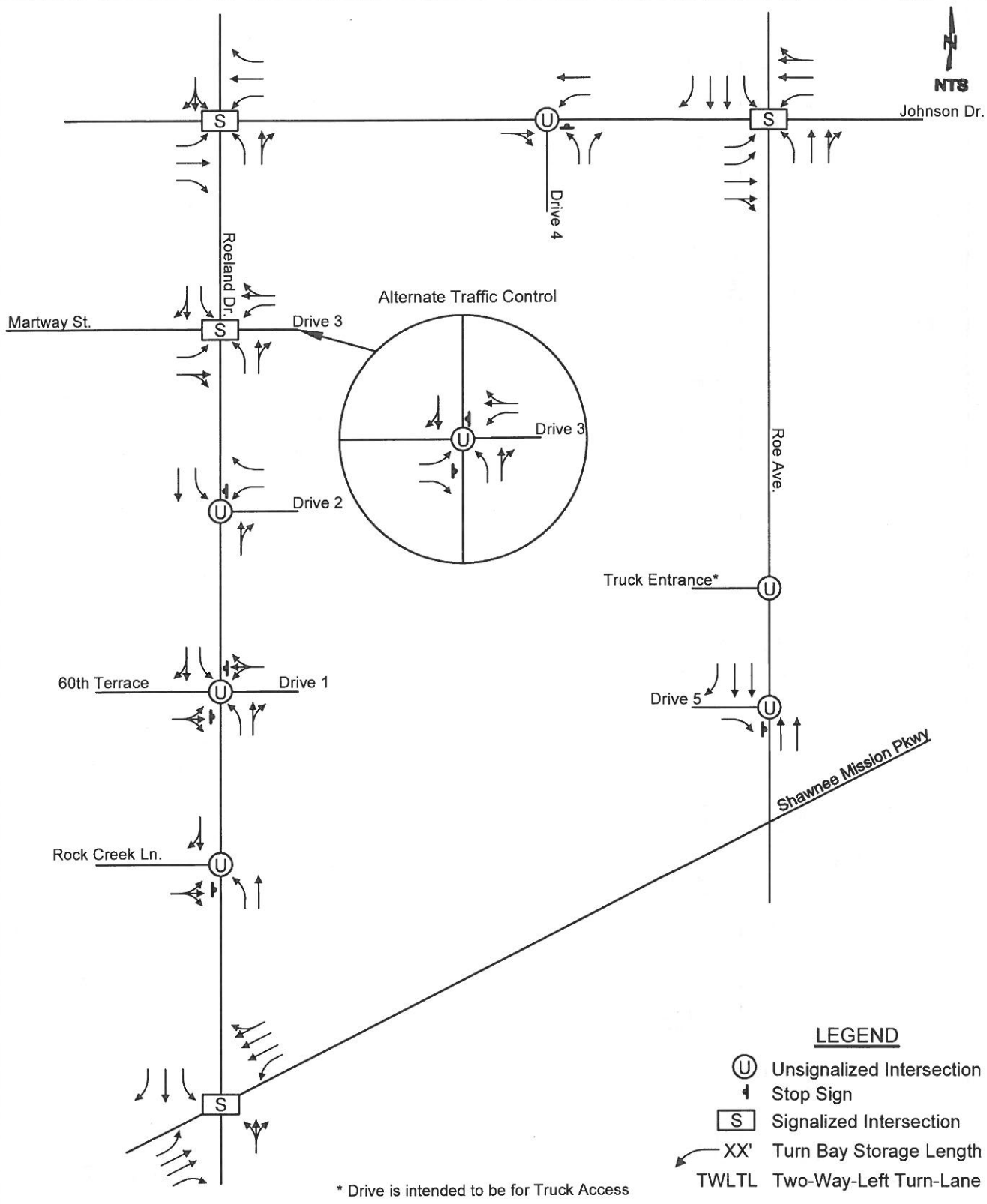


OLSSON ASSOCIATES

Future Year 2035
Peak Hour Volumes

FIGURE
10

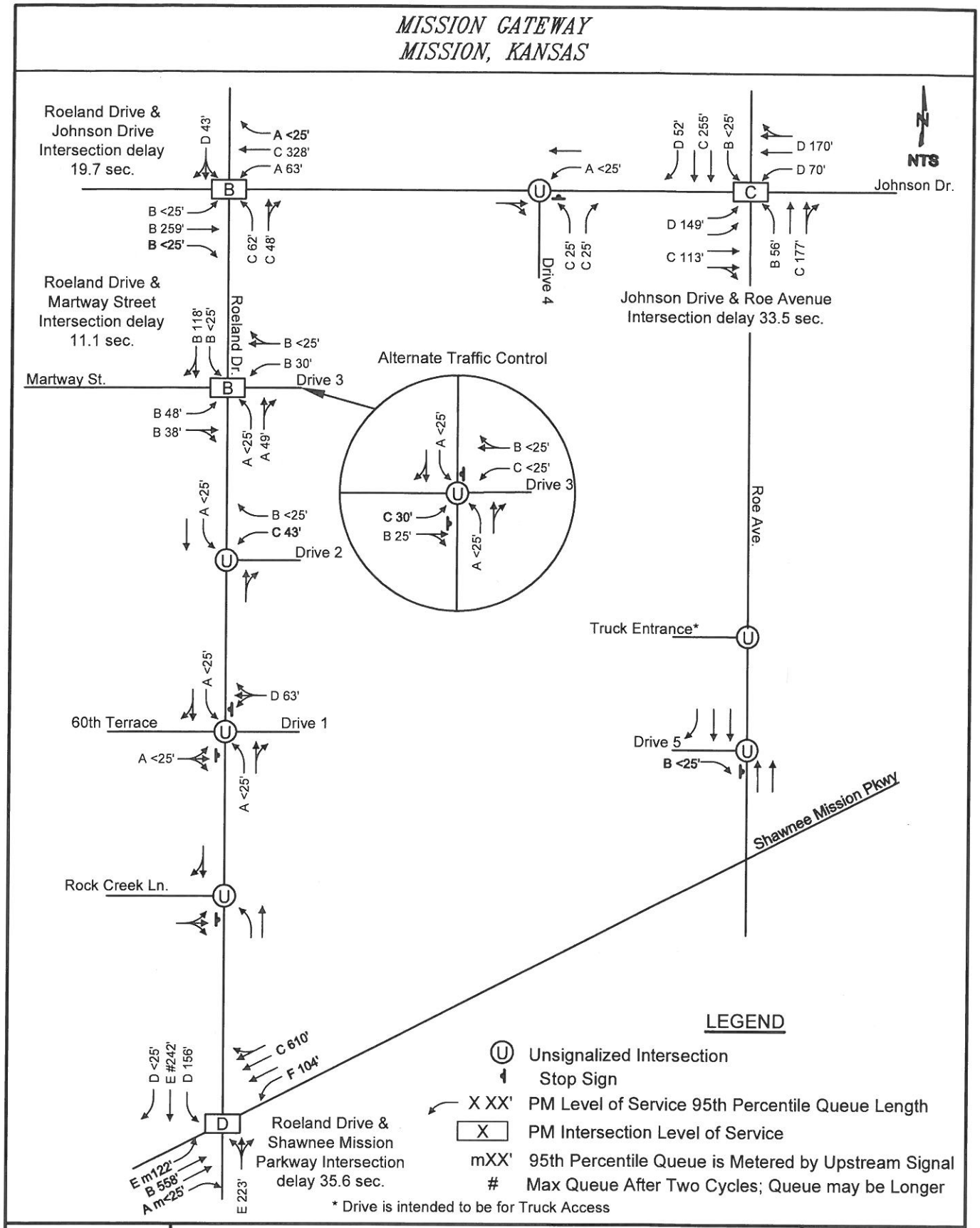
MISSION GATEWAY
MISSION, KANSAS



OLSSON ASSOCIATES

Future Year 2035
Lane Configuration & Traffic Control

FIGURE
11



OLSSON ASSOCIATES

Future Year 2035
Level of Service

FIGURE
12

7.0 RECOMMENDATIONS & CONCLUSIONS

Based on completion of capacity analysis and review of the proposed project plan, the following improvements are recommended for the project study area for each scenario.

Existing Conditions

Study intersections are currently operating overall at acceptable levels of service. The intersection of Martway Street and Roeland Drive operates acceptably with signal timings in place as well as in "flash" operation. The need for a signal will be analyzed in the Existing plus Development scenario to determine if the intersection conditions warrant a signal.

Existing plus Development Conditions

Study intersections are expected to operate at acceptable levels of service for the Existing plus Development scenario considering the following recommended improvements:

Roeland Drive and Drive 1:

- Re-stripe the north approach to maximize the length of the southbound left-turn in the existing two-way left-turn lane.
- To ensure that inbound vehicle blockages do not impact the northbound through movement, a northbound 130' right turn lane plus taper is required. Contrary to Drive 2, Drive 1 has an acceptable throat distance which will allow for the installation of an auxiliary right turn lane.

Roeland Drive and Drive 2:

- Provide a separate left-turn and right-turn lane for exiting traffic.
- Re-stripe the north approach to provide a 75-foot southbound left-turn in the existing two-way left-turn lane.
    - This should provide reverse left-turn lane striping between Martway Street and Drive 2.
- It is recommended to provide 75' of throat distance at the intersection to allow entering vehicles to safely maneuver into the parking area.
- Provide "Do Not Block Intersection" signing for westbound vehicles approaching Roeland Drive at the parking lot drive.
- The addition of a northbound right turn lane would ensure that inbound vehicle blockages do not impact the northbound through movement. However, due to 20' of throat distance at Drive 2 it is not recommended to place a northbound right turn lane.

Roeland Drive and Martway Street/Drive 3:

- Provide a separate left-turn lane to mirror the west approach and remove left-turn traffic from the shared through/right-turn lane.
- Re-stripe the north approach to provide a 100-foot southbound left-turn in the existing two-way left-turn lane.

- This should provide reverse left-turn lane striping between Johnson Drive and Martway Street.

- It is recommended to provide 75' of throat distance at the intersection to allow entering vehicles to safely maneuver into the parking area and store queued vehicles exiting the site to City streets.
- Provide signing to allow entering vehicles the right-of-way at the intersection of Drive 3 with the internal parking lots. This eliminates the potential for entering traffic to queue back into City streets.
- Although a signal warrant is not met for the intersection consideration should be given to keep the signal in place due to the signal providing connection for pedestrians along the Rock Creek Trail. The signal will allow pedestrians traveling along the trail to cross the street safely.
    - Modify signal to accommodate Drive 3 and for pedestrians crossing Roeland Drive if the signal is to remain.
- Provided adequate pedestrian accommodations in compliance with ADA standards.

Johnson Drive and Drive 4:

- It is recommended to provide 125' of throat distance at the intersection to store queued vehicles exiting the site to City streets.
- Provide separate exiting left and right-turn lanes at the intersection.
    - The right-turn lane should be made to release traffic into the existing second eastbound through lane on the outside of Johnson Drive. Provisions should be made to eliminate the potential for eastbound through traffic to merge into the outside through lane across Drive 4.

Roe Avenue and Drive 5:

- As stated in Existing Plus Development conditions, there is currently a 130' right turn lane depicted in the site plan at Drive 5. This turn lane should be extended 120' for a total of 250' to accommodate both the Truck entrance and Drive 5.
- It is also recommended to provide edge striping internal to the site between Drive 6 and Drive 5 to delineate the westbound driving path from the dock area.

US-56 and Roeland Drive:

- Due to the increased demand on the north approach of the intersection, it is recommended to provide additional green time of up to 5 seconds to the southbound movements. This additional time will relieve congestion and reduce potential queue lengths on the approach while only minimally impacting the mainline traffic along US-56.
    - It is recommended to install signage just north of Rock Creek Lane along Roeland Drive to prevent road users from blocking access into and out of Rock Creek Lane during periods of high demand.
- Provided adequate pedestrian accommodations along the south leg of the intersection in compliance with ADA standards.

Johnson Drive and Roeland Drive:

- It is recommended to provide adequate pedestrian accommodations along the south leg of the intersection in compliance with ADA standards.

Future Year 2035 Conditions

Based on the analysis conducted, study area intersections are expected to operate at acceptable levels of service without additional improvement from the Existing plus Development scenario.