TRAFFIC IMPACT ANALYSIS

Southeast Aurora Maintenance Facility (SEAM)

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I. INTRODUCTION

The Southeast Aurora Maintenance (SEAM) facility is a proposed 88-acre city facility located in southeastern Aurora along Quincy Avenue north of the Aurora reservoir. **Figure 1** shows a vicinity map. The site access will be onto Quincy Avenue that provides approximately 1/4 mile of frontage. The west property line is roughly defined by Powhaton Road, and the east property line aligns with Robertsdale Way. The SEAM development was recognized as part of an amendment to the Aurora Reservoir Master Plan approved in 2012.

Figure 2 shows a site plan for the first phase including the various fiber optics hardware anticipated in and around the site, at the request of the city. Long-term, access is planned to be provided via a full movement intersection located roughly equidistance between Powhaton Road and Robertsdale Way, referred to as the Maintenance Access. In addition, a three-quarter movement intersection near Robertsdale Way is also proposed, referred to as the Public Access. In the short-term (2021) upon the first phase of the site being completed and operational, the Public Access is proposed to be full-movement until through-traffic along Quincy Avenue builds to the point in which the left-out movement will need to be prohibited. As this facility is on the eastern edge of Aurora, relatively little traffic coming from or going to the east in the future is anticipated. The facility will be serving areas within city limits, and much of the last east of the site is unincorporated. There could be some city residential uses that occurs in the vicinity Watkins Road and Jewell Avenue that could contribute to the easterly component of traffic to/from this site, but most of the future development that could occur to the east is thought to ultimately be outside city limits. The vast majority of the site's traffic will be oriented to/from the west. For those few who would be heading east along Quincy Avenue, they would be directed on-site to use the Maintenance Access where left-out movements will be accommodated via a median acceleration lane. Some may conduct U-turns at the Powhaton intersection, and with Quincy Avenue ultimately planned to be a six-lane arterial roadway, there should be adequate width to accommodate U-turning passenger vehicles, but the intent is to encourage eastbound users to use the Maintenance Access.

Access opportunities for the site are limited. Large water lines along the site's western boundary and along the south side of Quincy Avenue across from the site preclude the potential of tying the site's access into the Powhaton Road intersection. The property to the east is the Pronghorn Open Space, including a parking area immediately east of the site along Quincy Avenue. Robertsdale Way is located along the south side of Quincy Avenue, and aligning the Public Access with this road requires obtaining ROW from the Pronghorn Open Space, which the City has indicated is not preferred. As such, the access scheme proposed for the site is governed by the constraints that exist on both sides of the site.

The proposed facility is intended to ultimately be used by numerous city departments. Aurora Water, Public Works, Parks and Recreation and Open Space (PROS), Internal Services, and Animal Care are the five major divisions anticipated to ultimately establish operations at the facility including:

- shop areas
- equipment storage
- material storage
- administrative office space
- fueling station and fleet services

The initial user will be Aurora Water that will provide quality water, sewer and stormwater services at the SEAM site. Thirteen Water Department groups are anticipated to be on-site, ranging from Support Services to Project Delivery and Planning.

The intent of this study is to assess the level of traffic impact associated with the proposed maintenance facility. The specific impacts are geared toward laneage needs at the site access points and Powhaton Road given the short-term traffic as well as given long-term traffic demands along Quincy Avenue, representing a build out scenario on the site.

NORTH

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NOTE: Drawing Not to Scale

FIGURE 1
Vicinity Map

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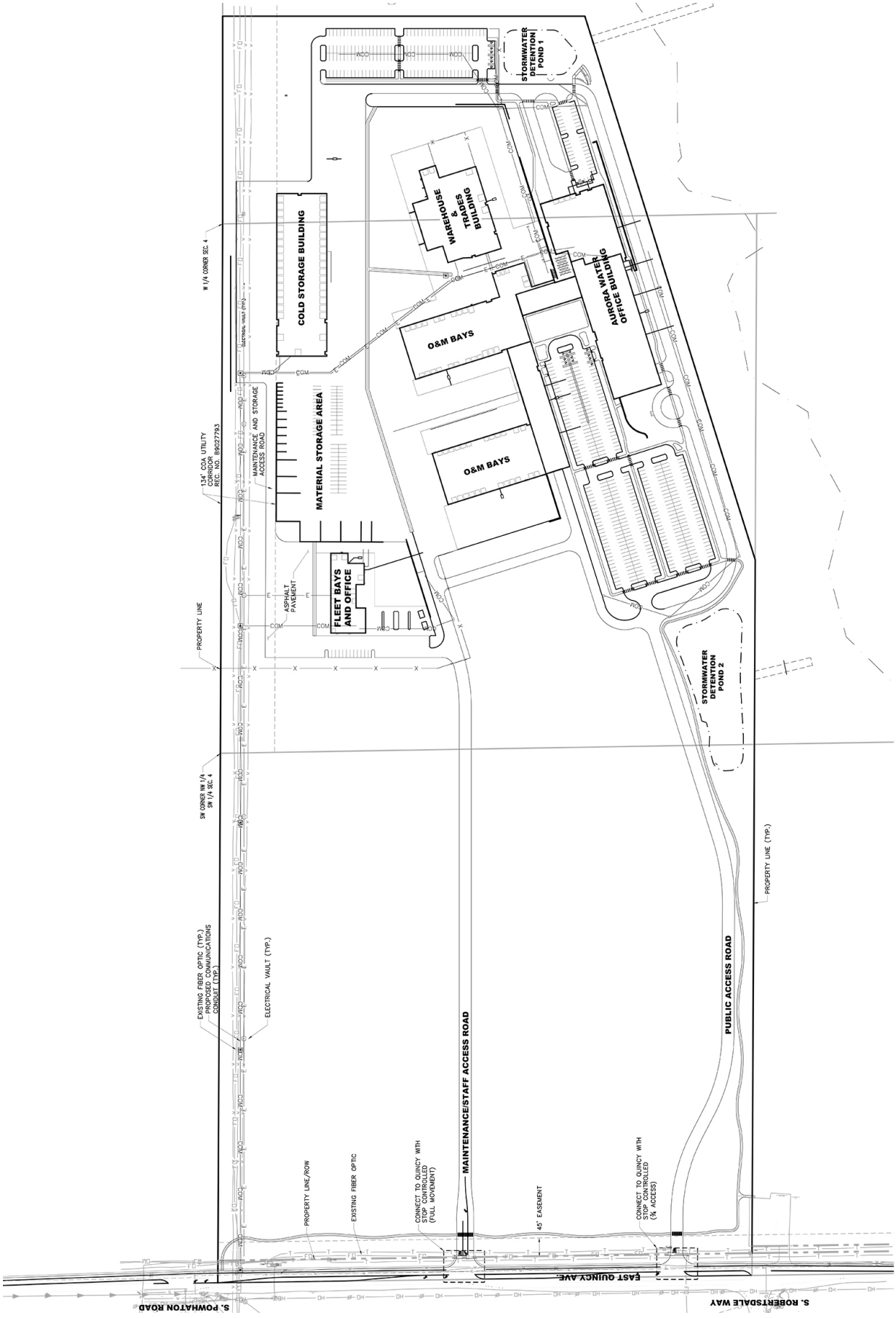

NOTE: Drawing Not to Scale

FIGURE 2

Site Plan

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II. EXISTING CONDITIONS

II.A. Land Use

Currently the site is vacant. To the west is property owned by the City and County of Denver in relation to the nearby disposal site, but the land itself is not in use. The Arapahoe County Fairgrounds are located roughly one-half mile to the west, south of Quincy Avenue. To the north and the east is open space (Pronghorn Natural Area) owned by the city, which extends to the south of Quincy Avenue. Also to the south across Quincy Avenue is Aurora Water's Binney Water Purification Facility (served by Robertsdale Way) and the Aurora Reservoir served by Powhaton Road. Immediately east of the site along Quincy Avenue is a trailhead for the Pronghorn Trail open space area with parking for approximately 20 vehicles.

The site's parcel boundaries along the east side and the west side impact the site's access opportunities. Ideally to align with driveways/cross streets interesting on the south side of Quincy, additional property to the east or to the west is needed to accommodate a site access drive. Acquiring that property for this purpose is not likely, and therefore site access needs to be planned such that there are two points onto Quincy Avenue at locations that do not create awkward movement conflicts with the Powhaton Road intersection not the Robertsdale Way intersection. As such, the site's access scheme was developed accordingly.

II.B. Roadways

The primary roadway in the area is Quincy Avenue that provides significant east-west continuity in the area. This roadway extends 8 miles to the west intersecting Parker Road; Quincy Avenue provides six through lanes of traffic west of E-470. To the east, Quincy Avenue extends for many miles until it eventually becomes a two-lane unimproved road. Along the site's frontage, Quincy Avenue is a two-lane paved highway with an eastbound right turn deceleration lane provided at Powhaton Road as well as at Robertsdale Way. According to Quincy Avenue Corridor Study, Gun Club Road to Powhaton Road (prepared by Parsons in March 2017), Quincy Avenue is recognized to ultimately be a 6-lane arterial road. This is confirmed in the current version of the Arapahoe County Transportation Plan (prepared by David Evans and Associates and adopted in 2010) as well as the Aurora Southeast Area Transportation Study (SEATS) (prepared by Felsburg Holt & Ullevig in 2007).

Other roadways in the immediate area include Powhaton Road and Robertsdale Way, both being north-south roadways that exist south of Quincy Avenue. Powhaton Road serves as the access roadway for the Aurora Reservoir, the Arapahoe Park racetrack, and a secondary access for the Arapahoe County Fairgrounds. Robertsdale Way provides access to the Binney Water Purification Facility, and this access is gated; the roadway's use is restricted to authorized personnel.

II.C. Traffic Counts

Current traffic count data was not collected due to the fact that COVID-19 was greatly affecting travel in the region. Collected data would have been too low as a starting point for this study. Rather, data from two other recent studies were considered in developing a baseline existing traffic count condition at the study area intersections.

The most recent study was completed in January 2020 by Kimley Horn, which comprised of a signal warrant analysis for the Quincy Avenue/Harvest Road intersections located a mile west of the site. That study presents two-days-worth of hourly counts at that intersection. While eastbound and westbound turns from Quincy Avenue were not recorded, estimating these movements from reflection counts along the Harvest Road approach indicates that Quincy Avenue served a total of approximately 300 vehicles per hour (vph) during the AM peak hour and 400 vph during the PM peak hour, east of Harvest Road. From the 2017 Quincy Avenue Corridor Study, Gun Club Road to Powhaton Road, this segment of Quincy Road was shown to serve 334 vph during the AM peak hour and 437 vph during the PM peak hours. The 2017 study peak hour traffic was approximately 10 percent greater than the estimated December 2019 traffic count data. As such, the 2017 Parson study was deemed acceptable to use as the existing baseline traffic data since it showed traffic levels that exceeded the 2018 traffic counts.

The counts from the 2017 corridor study, as they relate to the SEAM development, are shown on **Figure 3**. The data indicate that 253 vph travel Quincy Avenue at the site during the AM peak hour and 263 vph travel during the PM peak hour. The directional orientation of the counts are roughly 50/50 in the AM peak hour, and 55/45 in the PM peak hour, favoring the eastbound direction. Counts at the Powhaton Road intersection also indicate that there is a relatively strong pattern of traffic between the west leg of Quincy Avenue and the south leg of Powhaton Road. This traffic pattern tends to change by season given the seasonal nature of uses down Powhaton Road. While not specifically counted, Robertsdale Way is thought to carry very little traffic. The 2012 traffic study for SEAM showed less than 10 vph during either peak hour. Again, this access is gated and its use is restricted.

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

NORTH

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FIGURE 3
Existing 2017 Traffic Conditions

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III. FUTURE PROJECTED CONDITIONS

This traffic study assesses the traffic conditions with respect to impacts associated with the first phase in 2021 and in 2040 given build out of the SEAM master plan. Improvements are identified at the access intersections, realizing the site constraints that have governed their locations. The Powhaton Road intersection is also assessed given short-term and long-term conditions. Traffic projections shown in this study are based on the premise that short-term demands would reflect year 2021 relative to background traffic and 2040 relative to long-term traffic. Year 2021 will be the opening year for Phase 1 of the facility. The SEAM site would accommodate only Water Department functions as previously indicated for 2021, but 2040 would account for additional city department operations to make use of the site.

III.A. Site Trip Generation

The SEAM facility is unique in that there are not any trip making data readily available in the ITE Trip Generation Manual. However, the mix of specific operations proposed at the SEAM site can be itemized and estimated on individual basis. This was conducted with an understanding of the program for the short-term timeframe that just includes Water Department functions, and build-out of the site that includes four additional departments. **Table 1** shows the summary of the estimates for each Department, and **Appendix A** shows more of the detail relative to the anticipated functions for each Department that might ultimately make use of the site with an emphasis on daily trip-making and AM and PM peak period activity associated with each use.

Table 1. SEAM Trip Generation Estimates[1]

Department	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Water (at buildout)	139	75	214	104	155	259
PROS	17	9	26	10	16	26
Public Works	20	10	30	12	18	30
Animal Care	8	5	13	5	8	13
Internal Service	3	1	4	2	2	4
TOTALS	**187**	**100**	**287**	**133**	**199**	**332**
Phase 1[2]	107	57	164	82	123	205

Notes:
[1] See Appendix A for detail assumptions and calculations.
[2] Phase 1 includes a portion of the Water Department's ultimate plans.

As shown, build-out of the site would generate approximately 287 vph during the AM peak hour, and PM peak hour could see approximately 332 vph. The facility's peak hour of operation is likely not coincident with Quincy Avenue's pea hour demand. For purposes of this study, they are conservatively assumed to align. In the future, increased traffic will likely cause a spreading of peak demand which will overlap with that of the SEAM facility.

As a means of comparison, traffic counts at the Ellsworth Facility were obtained from the city. A per-acre trip generation rate was generated for the Ellsworth site and applied to the proposed SEAM facility as a means of determining if the estimates of **Table 1** are reasonable. **Table 2** shows the comparison between these two sites.

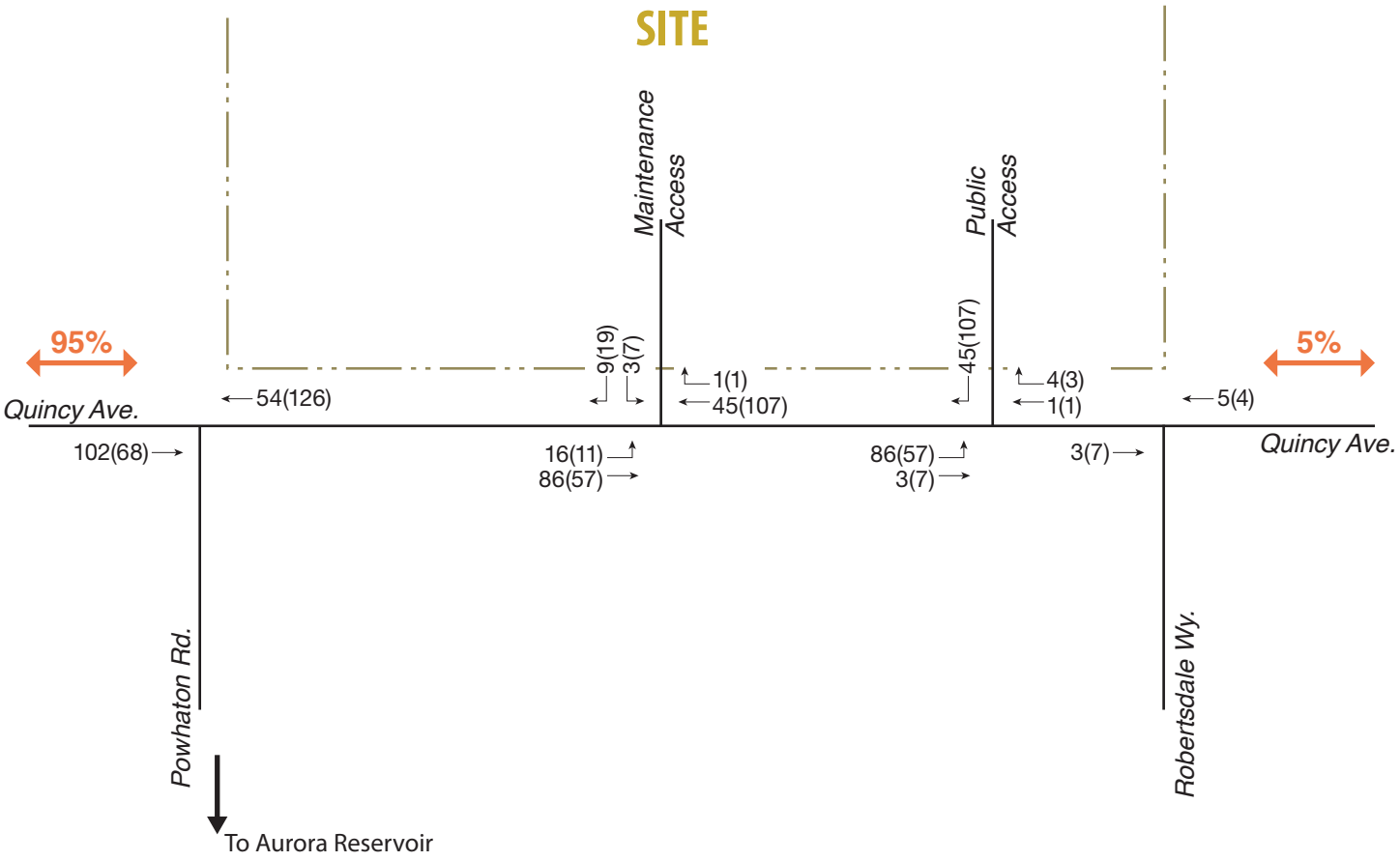
Table 2. SEAM – Ellsworth Trip Generation Comparison

Peak Hour	Ellsworth Facility (Measured Trip-making; 31-acre site)	SEAM Facility (Estimated Trip-making; 88-acre site)
AM Peak Hour		
Trips	165	287
Trips/Acre	5.3	3.26
PM Peak Hour		
Trips	87	333
Trips/Acre	2.8	3.78

As shown on **Table 2**, the estimated per-acre traffic generation rate estimated for SEAM's buildout compares reasonably well with the Ellsworth counts. The Ellsworth facility is lacking the appropriate land area for the uses it serves, so its generation (per acre) could very well be higher than that at SEAM, where adequate space is likely to be provided. The AM peak hour generation would tend to bear this out in comparing the 5.3 trips per acre at Ellsworth versus 3.26 projected at SEAM. The PM peak hour at the Ellsworth facility is clearly much lower than the AM peak hour. The trip estimates made in this study did not assume such and are based on the anticipated programing at the facility. So, the resulting PM peak hour trip generation rate (per acre) at SEAM is higher than the AM peak hour, which also resulted in a higher per-acre rate than the Ellsworth facility.

III.B. Trip Distribution and Traffic Assignment

The directional orientation of trips in and out of the facility has been estimated based on the site's location relative to its service area and the surrounding roadway network. Because the vast majority of the incorporated area of Aurora is located to the west, the vast majority of the trip-making associated with the facility will be to/from the west as explained in the Introduction to this report.; relatively few trips are anticipated to be oriented to and from the east. **Figure 4** shows the trip distribution used in this analysis as well as the resulting trip assignment traffic numbers for 2021 and **Figure 5** shows trip distribution and resulting trip assignment traffic numbers for build out, assumed to occur by 2040. While some westbound to eastbound U-turns are possible at the Powhaton Road intersection, outbound left-turning traffic will be encouraged to make use of the Maintenance site access road in which on-site way-finding would be provided as well as robust connectivity between the Public Access and the Maintenance Access as the remainder of the site develops. As shown, the point of greatest impact of SEAM will be on Quincy Avenue west of the site which is anticipated to serve 194 vph during the PM peak hour related to the initial phase of the facility. Build out could see 250 vph.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XX% = Trip Distribution %

NORTH

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NOTE: Drawing Not to Scale

FIGURE 4
2021 Site Generated Traffic

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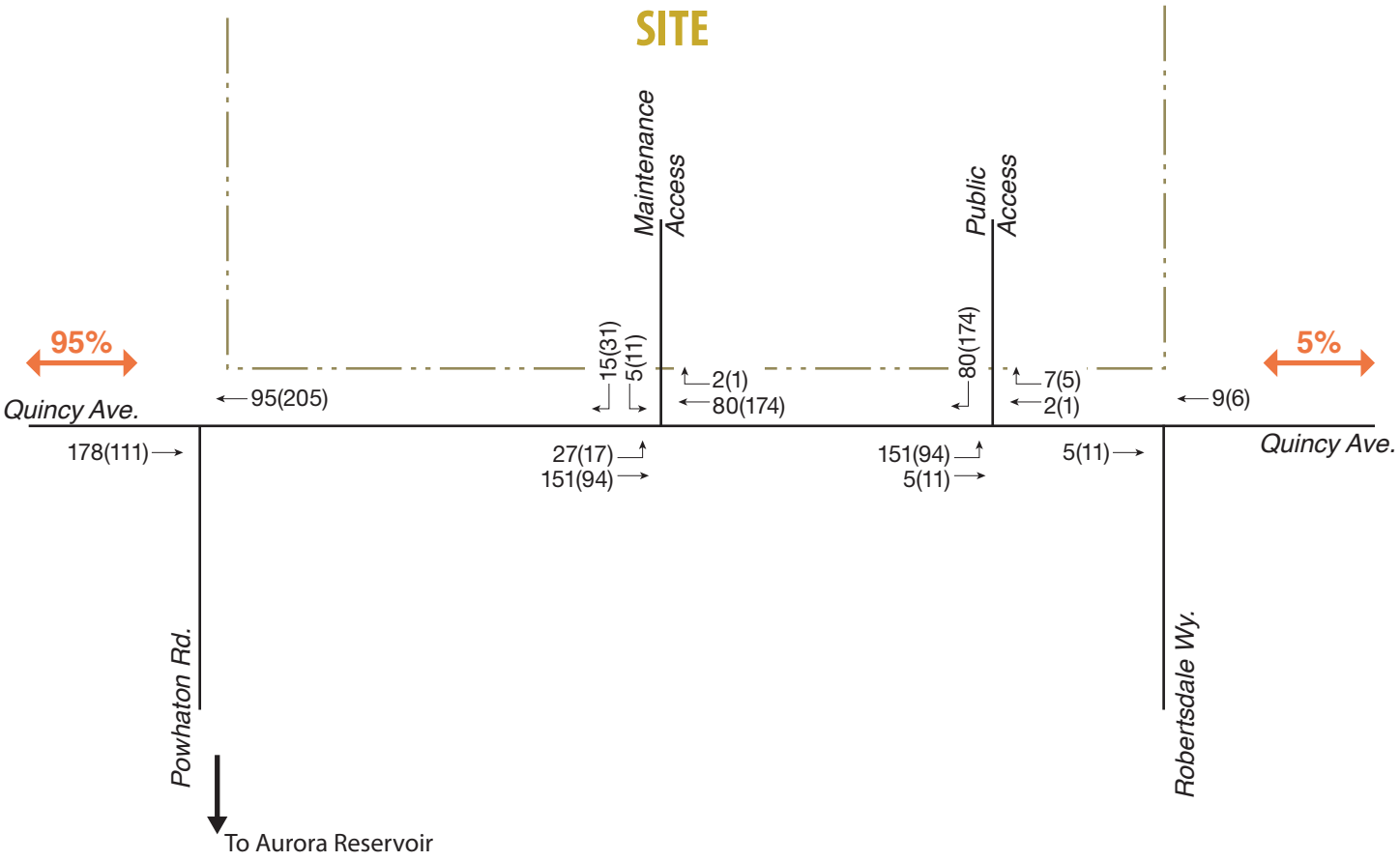

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XX% = Trip Distribution %

NORTH

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FIGURE 5
2040 Site Generated Traffic

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III.C. Background Traffic Volumes

Short-Term Background Traffic (2021)

Background traffic reflects all traffic passing through the study area that is not associated with the proposing facility. The short-term timeframe, considered to be year 2021, was developed by applying growth rate factors based on the Low Growth Near Term scenario (year 2025) presented in the 2017 Parsons study. These are shown on **Figure 6**. By 2021, Quincy Avenue is estimated to serve 526 vph during the PM peak hour in front of the site, increasing to 678 vph west of Powhaton Road.

Long-Term Background Traffic (2040)

By 2040, traffic along Quincy Avenue is expected to be significantly greater. This is based on traffic projections shown in the 2017 Parson study. By 2040, Quincy Avenue would most likely be widened to a six-lane arterial road serving approximately 4800 vph during the PM peak hour of background traffic. Much of this increase is due to potential growth to the east including Stated Land Board property as well as future developments along Watkins Road between Quincy Avenue and I-70. Year 2040 background traffic is shown on **Figure 7**.

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

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NOTE: Drawing Not to Scale

FIGURE 6

2021 Background Traffic Conditions

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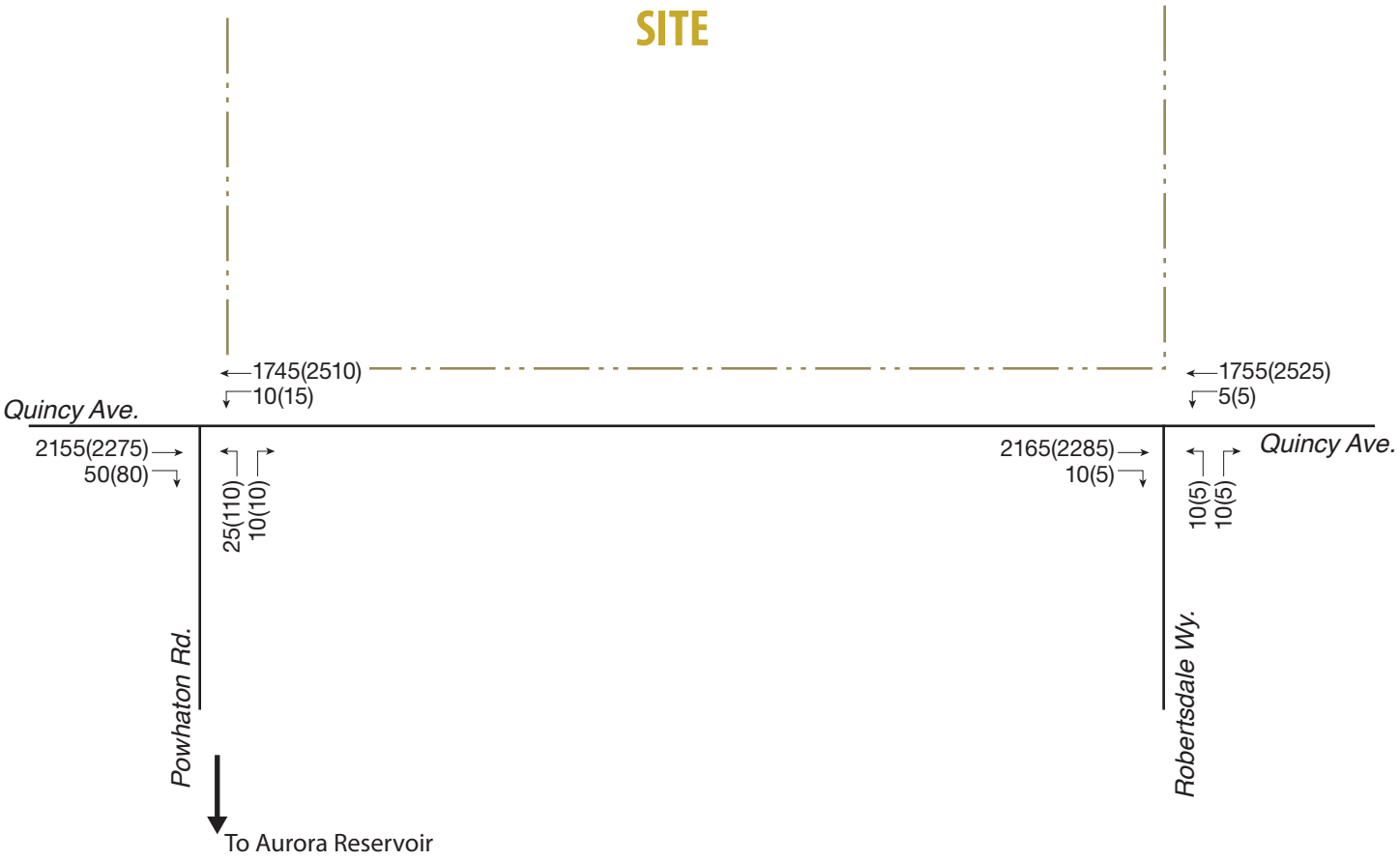

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

NORTH

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NOTE: Drawing Not to Scale

FIGURE 7

2040 Background Traffic Conditions

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IV. TOTAL TRAFFIC CONDITIONS

IV.A. Projected Volumes

The peak hour traffic volume estimates for the SEAM site shown on **Figure 4** and **Figure 5** were combined with the background traffic volume projections of **Figure 6** and **Figure 7** to create the total traffic for year 2021 and 2040 at the study area intersections. These estimated forecasts are shown on **Figure 8** and **Figure 9**, for 2021 and 2040 respectively.

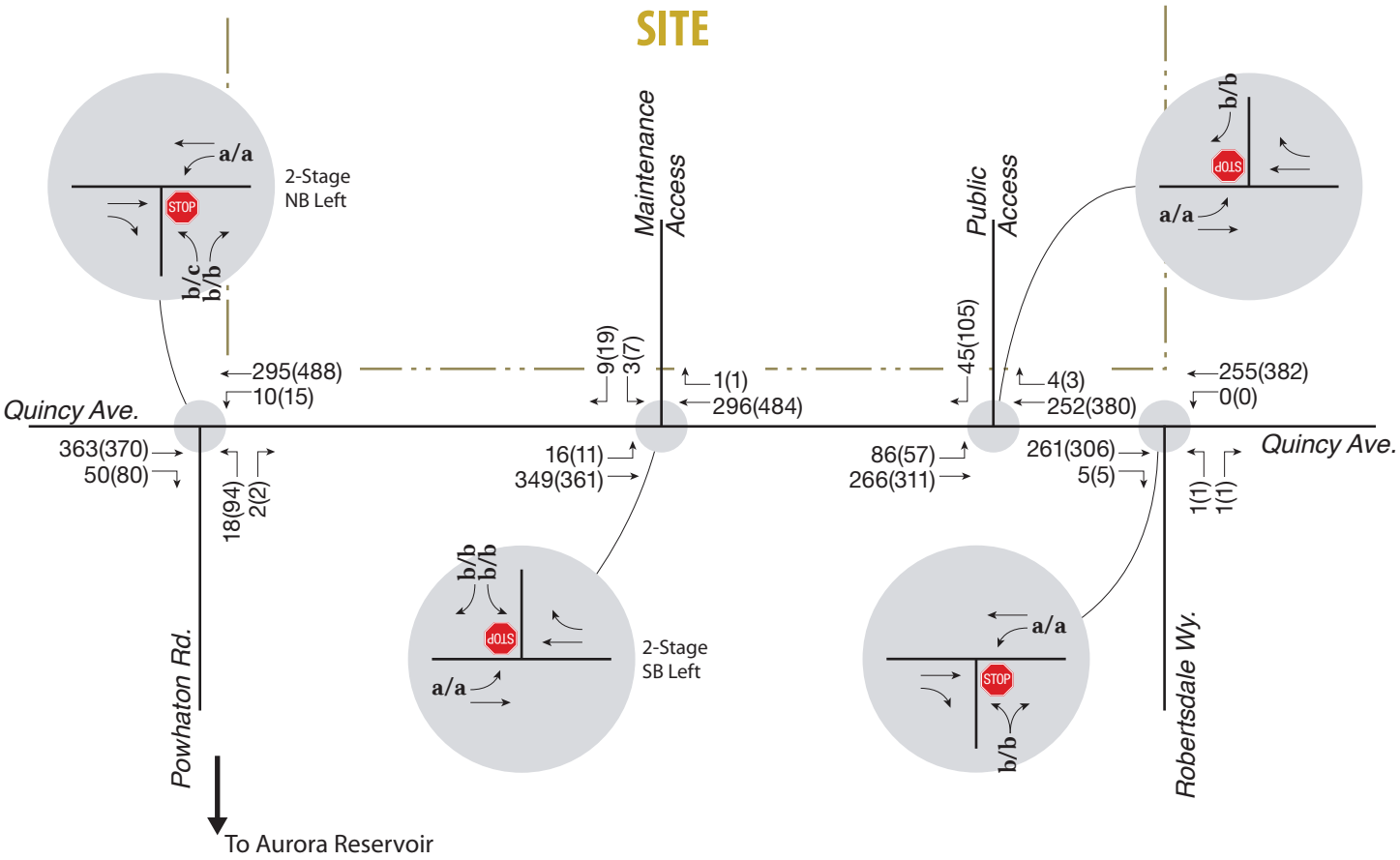
Total traffic along Quincy Avenue by 2021 will grow relative to existing conditions, but volumes will not be high for a two-lane arterial road. By 2040, the traffic is anticipated to increase significantly due primarily to background traffic growth. SEAM trips would constitute approximately 12 to 14 percent of the total Quincy Avenue peak hour near Powhaton Road in 2040.

IV.B. Traffic Signalization Warrant Analyses

The *Manual on Uniform Traffic Control Devices* (MUTCD) identifies eight warrants that provide guidance to determine whether installation of a traffic signal is justified. Some of these warrants are based on traffic volume levels, while others are based on the accident history of an intersection or whether the intersection is a designated school crossing. The warrants are primarily meant to assess whether signalizing an existing intersection might be appropriate. Select warrants are also appropriate to generally assess whether an intersection as the potential to be signalized in the future; the ultimate determination will need to occur in the future as traffic conditions evolve. City staff have typically preferred this general assessment to be made using the 4-hour warrant. Realizing that a study of this type typically only looks at two hours (AM and PM), estimates are made for two other hours by applying factors to the AM and PM peak hours. This generalized procedure is appropriate with respect to gauging the potential of an intersection ultimately warranting signalization based on best traffic projections developed today.

As previously mentioned, city staff envision very few users of the SEAM facility to be oriented to/from the east because the vast majority of the area within city limits is more readily access to/from the west, and this is thought to be the case in 2040 as well. As such, satisfying a signal warrant would need to more traditionally rely on right turn movements out of the site and/or left turn movement into the site, which are typically reduced by 50 percent relative to the signal warrant charts. A review of the peak hour projections indicates that warrants will not likely be met at either access given side-street traffic demands. As an alternative, the right turn movement out of the site should be provided with an acceleration lane in the long-term planning horizon, and the left-out movement should be provided a center harbor area which is discussed in more detail later.

The intersection of Quincy Avenue and Powhaton Street could satisfy warrants by 2040. **Appendix B** presents a four-hour warrant (warrant 2) and a peak hour warrant (warrant 3) study for this intersection, and the analysis indicates that it will be borderline based on the traffic counts collected. Again, the final determination will need to be made in the future, but the simplified analysis shown in **Appendix B** suggests that it is a distinct possibility. The 2040 demand is based on the 2017 Parsons Study in conjunction with traffic generated by the SEAM facility, and Powhaton traffic was based on August 2016 weekday counts. Weekend traffic along Powhaton is higher than weekday due to increased recreational use associate with the Aurora Reservoir, Arapahoe County Fairgrounds, and the Arapahoe Park racetrack. Conversely, non-summer traffic along Powhaton Road is typically much less since recreation activity tends to subside.



LEGEND

XXX(XXX)	=	AM(PM) Peak Hour Traffic Volumes
X/X	=	AM/PM Peak Hour Signalized Intersection Level of Service
x/x	=	AM/PM Peak Hour Unsignalized Intersection Level of Service
STOP	=	Stop Sign

NORTH

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NOTE: Drawing Not to Scale

FIGURE 8
2021 Opening Day Total Traffic Conditions

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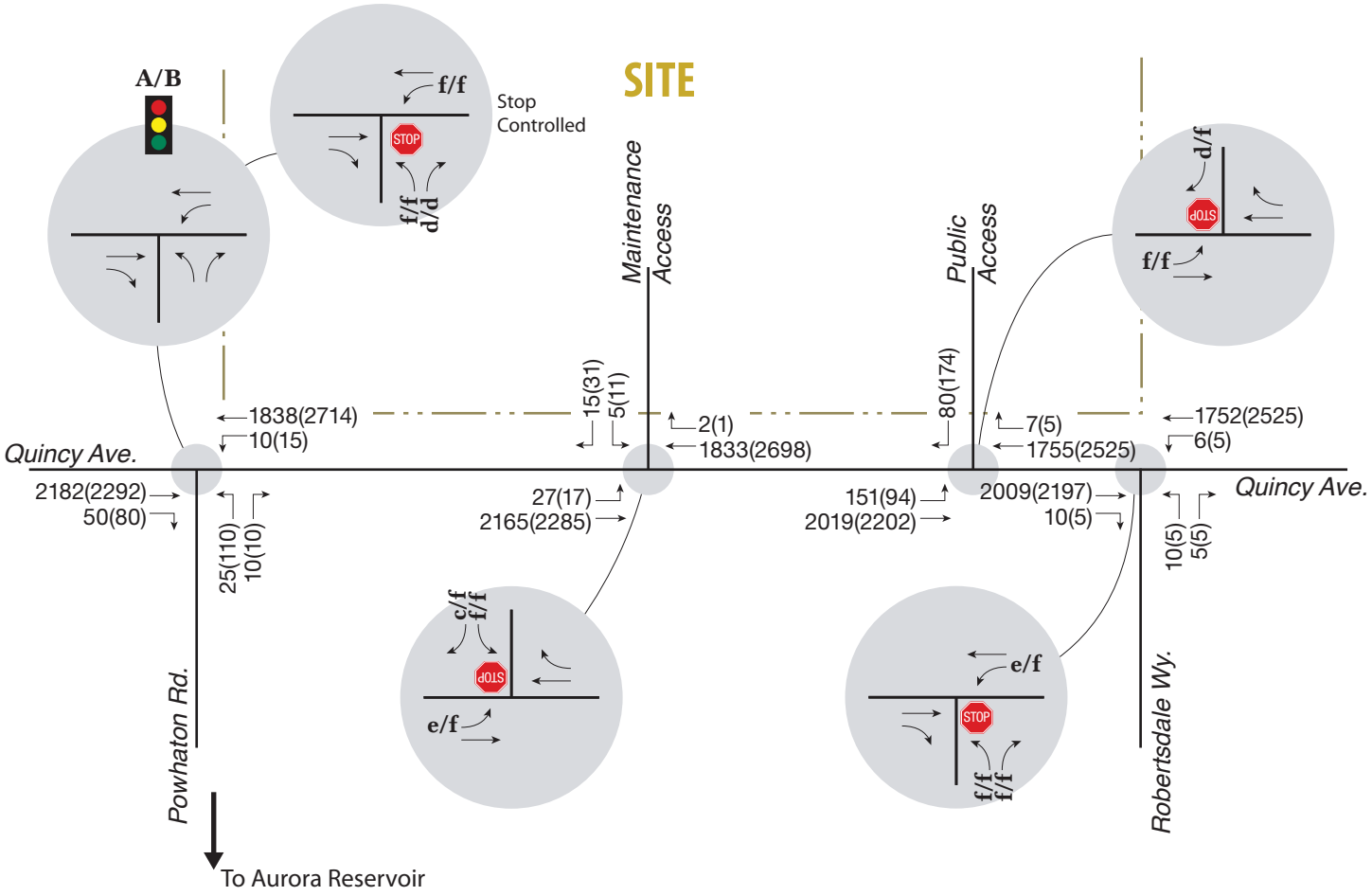

LEGEND

XXX(XXX)	=	AM(PM) Peak Hour Traffic Volumes
X/X	=	AM/PM Peak Hour Signalized Intersection Level of Service
x/x	=	AM/PM Peak Hour Unsignalized Intersection Level of Service
STOP	=	Stop Sign
	=	Traffic Signal

NORTH

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NOTE: Drawing Not to Scale

FIGURE 9
2040 Future Total Traffic Conditions

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As is evident from the warrant analysis, the Quincy/Powhaton intersection only meets warrant 2 given the peak hour traffic projections, realizing that Powhaton traffic can fluctuate significantly by time of year. To gain another sense as to the future need for signalization at the Quincy Avenue/Powhaton intersection, this intersection was analyzed under side-street stop control using the Highway Capacity Manual, Sixth Edition methodology to develop an estimate of minor movement delays. In 2040, the high delays experienced during the PM peak hour by the northbound left (>1600 s of control delay with median refuge/two-stage operation) and westbound left (98 s of control delay) movements, some form of signalization should ultimately be considered at the Powhaton Road intersection. This could include signal operations only during peak hours (such as weekends during the summer) followed by flashing mode for other times. Additional data to assess the traffic demand fluctuations along Powhaton Road, high season and low season, are needed to better assess the potential signalization need; current conditions with COVID preclude obtaining good data on this right now.

Additionally, the nature of traffic at this intersection could be impacted by other roadway network enhancements in the area such as the extension of Belleview Avenue to Powhaton Road as is recognized in the SEATS.

All that said, the need to signalize the Quincy Avenue/Powhaton Road intersection by 2040 is dependent upon numerous considerations, but there is a real possibility of its need or some other traffic control scheme such as a channelized tee intersection. For purposes of this report, a traffic signal and a stop-controlled intersection is analyzed at the Quincy/Powhaton intersection. Based on city criteria, the intersection laneage needs at the SEAM access intersections will not vary either way.

The city has also raised the possibility of installing a roundabout along Quincy Avenue at Powhaton Road, in part to possibly help accommodate U-turning traffic associated with outbound SEAM trips heading east. The level of traffic that Quincy Avenue is ultimately planned to accommodate would overwhelm a multi-lane roundabout, and this is not recommended. On-site circulation will be enhanced to accommodate the outbound traffic turning east such that all users will have direct access to the full-movement Maintenance Access.

The city has also suggested that a right-in/right-out restriction possible be implemented at the Public Access intersection, this is not supported by the applicant. At the request of the city, driver sight distance was assessed at the Public Access intersection with respect to the left-in movement. Based on Quincy Avenue profile information provided by Calibre Engineering, there is a slight crest-vertical curve along Quincy Avenue that extends east of the Public Access intersection. Assuming the driver's eye is 3.5 feet above the surface and an opposing vehicle is also 3.5 feet above the travel surface (as recommended in the AASHTO Green Book), an inbound left-turning driver will be able to see well beyond 1000 feet down the road to the east. This meets AASHTO's decision sight distance of 800 feet for a suburban setting given 45 MPH speed. Adequate driver sight distance is available at the Public Access intersection.

IV.C. Capacity Analyses

Short-Term (2021)

Given the total 2021 peak hour traffic projections, intersection operation analyses were conducted for the site access intersections as well as for the Powhatan Road intersection. Operational conditions were analyzed using procedures documented in the Highway Capacity Manual, Sixth Edition. These analysis procedures provide a level of service LOS, which is a qualitative measure based on the average delay per vehicle at a controlled intersection. LOS are described by a letter ranging from A to F. LOS A represents minimal delay while LOS F represents excessive congestion and delay unsignalized intersection analysis report to level service for each movement passing through the intercept action subject to yielding. Synchro software was used in developing LOS results.

The short-term analysis was done assuming that Quincy Avenue would continue to provide only two through lanes of traffic. Results of the short-term levels of service analysis are included on **Figure 8**. As shown, movements at all the intersection in the analysis areas operate at acceptable LOS. Based on the short-term traffic projections, the existing posted speed limit of 45 MPH, and anticipated truck traffic, center eastbound left turn lanes should be provided at both access points into site. Two approach lanes should be provided at the Maintenance Access (one for left out movements and one for right out movements), a right turn acceleration lane should also be provided for the right turn movements coming out of the SEAM site at both accesses. Given these improvements, short-term intersection operations will be adequate. Auxiliary lane length requirements are provided in the subsequent section of the report.

Long-Term (2040)

By 2040, the traffic along Quincy Avenue is generally anticipated to be much greater. Further, Quincy Avenue is expected to provide six lanes for through traffic. **Figure 9** shows the LOS results. Because of the heavy traffic projected along Quincy Avenue, many of the left turns, onto and from Quincy Avenue are not projected to operation well; some of the right movements onto Quincy Avenue will not work very well either. **Figure 10** shows the lane configuration and traffic control recommendation for 2040.

With respect to the Maintenance Access intersection, the left-in, left-out, and right-out movements area all anticipated to operate at a LOS F during the PM peak hour in 2040. At a minimum, the Maintenance Access should be designed with a center harboring lane, thereby allowing the left turn movements out of the site to conduct a two-stage movement in merging with eastbound Quincy Avenue traffic. This will ease the poor LOS, but the left-turn out will still experience delay.

An analysis was conducted for the Maintenance Access intersection to assess the approximate year in which it would begin to fail. Assuming a linear growth rate between existing traffic and 2040 projected traffic, the Maintenance Access will function properly under side-street stop control to approximately year 2026 at which point the left out movement will reach a LOS F. Future widening improvements to Quincy Avenue could be helpful and possibly buy more time for this movement. Most notable is the addition of a center left turn harbor lane (prior to the full-six laning of Quincy Avenue) thereby allowing a two-stage movement operation and possibly buying an additional five or six years before the movement would experience LOS F. For the right-turn out movement, a right turn acceleration lane the Maintenance Access should ultimately be constructed by 2040.

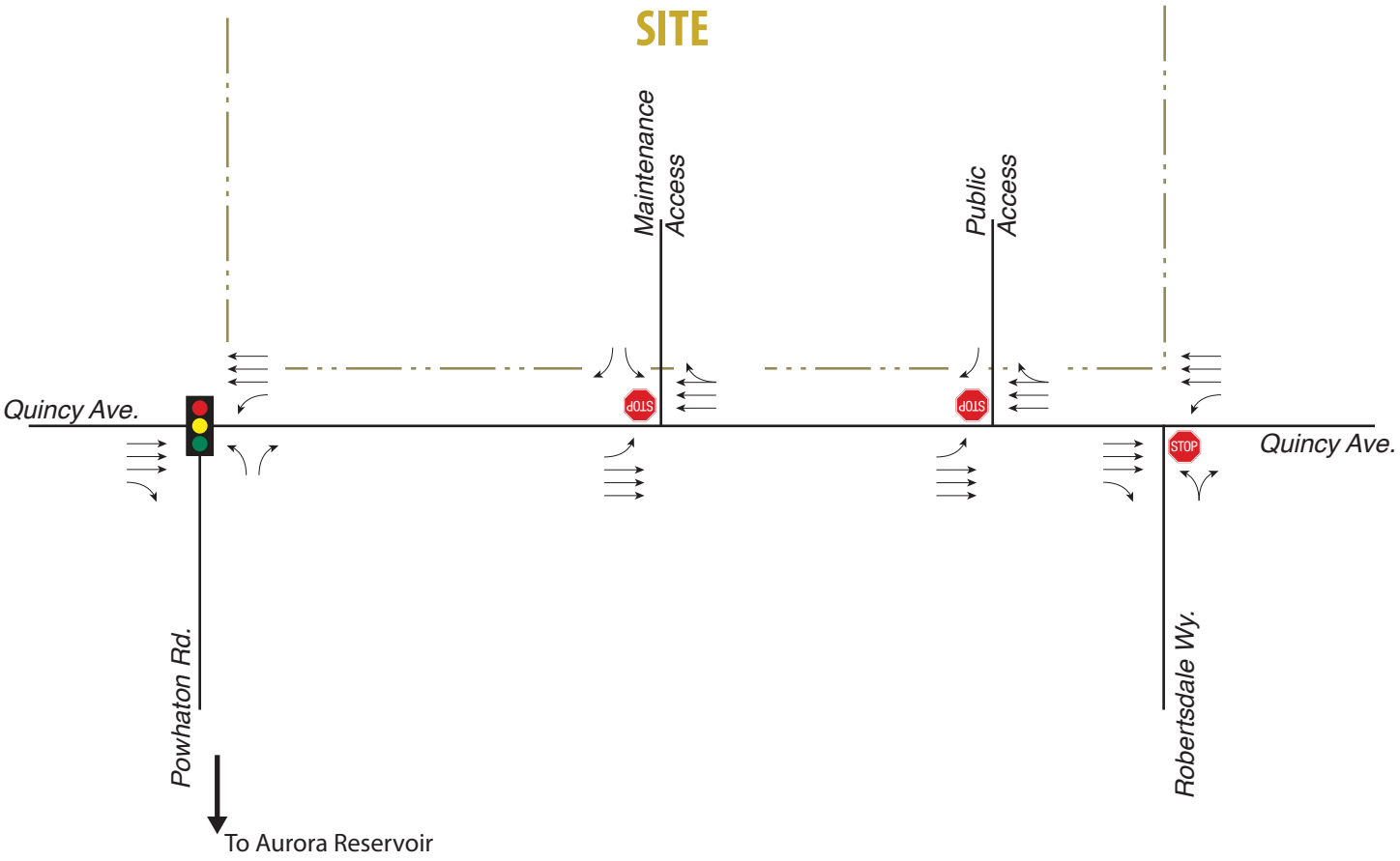
The Public Access intersection to the site will be limited to three-quarter movement and be appropriately separated from the minor road of Robertsdale Way. The left-in movement to the site is critical to the applicant. Drivers who desire to travel east from the site will be directed to the Maintenance Access through on-site way-finding signage, and internal connectivity between the two access intersections is planned to be well established in conjunction with the future development of the

remainder of the site. Movements at the Public Access will experience delays during peak hours given unsignalized control. A left turn lane along the center of Quincy Avenue will be critical at the eastern access. This left turn lane will need to be at least 435 feet long, and its design will need to take into account the harbor lane serving the left-out movement at the full-movement Maintenance Access.

Given the poor projected traffic conditions at both site accesses in 2040 and the area constraints that create a less than ideal access situation, some form of signalization for this area should ultimately be explored. As mentioned, there are numerous constraints in the area to overcome, some of which would entail great expense. A more thorough alternatives analysis should be conducted to assess possible alternations to the future access, conducted in conjunction with the remainder of the site's development. Potential alternatives are listed below, and each has its benefits and challenges:

- Signalizing and realigning the Public Access with Robertsdale Road. Full movement could then be allowed. The open space parking area access for Pronghorn would need to be integrated into this plan.
- Signalizing and realigning Robertsdale Road with the Public Access. Similar to above, full movement could be provided. The Pronghorn open space parking access may need to be integrated into this plan.
- Signalizing and establishing a full-movement access opposite Powhaton Road. Nearby unground utilities and the availability of property to the west pose major challenges, but this idea would be ideal relative to a traffic engineering perspective, allowing one signal to serve activity occurring on both sides of Quincy Avenue.
- Establishing a half-signal at the Maintenance Access such that eastbound through movements are not controlled. Signal phasing would include the westbound through movement, the eastbound left turn movement, and the southbound approach movement.

Potentially, phasing could be implemented as conditions evolve given the constraint access scheme. The first phase would entail full-movement unsignalized operations at both access intersections on opening day. Phase two could entail restricting the Public Access to there-quarter movement and establishing strong internal way-finding for outbound traffic heading east to utilize the Maintenance Access via a two-stage/median-refuge area. The ultimate phase could entail some form of signalization, the alternatives of which were listed above.



LEGEND

X/X	=	AM/PM Peak Hour Signalized Intersection Level of Service
x/x	=	AM/PM Peak Hour Unsignalized Intersection Level of Service
STOP	=	Stop Sign
	=	Traffic Signal

NORTH

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NOTE: Drawing Not to Scale

FIGURE 10
2040 Recommended SEAM Lane Geometry

SE Aurora Maintenance Facility 20-127-01 3/24/20

Queuing Analysis

Using the Analysis procedures that helped develop levels of service, 95th percentile queue can also be estimated for each of the peak hours for each of the study area intersection movements. **Table 3** shows the projected queue lengths resulting for the 2021 timeframe, and **Table 4** shows the same information given long-term traffic including buildout of the SEAM site. The tables also show State Highway Access Code recommendations that should be implemented in the design in support of these intersections, for the initial construction in 2021 and for build out by 2040 assuming the SEAM access intersections would remain unsignalized.

Table 3. Year 2021 Intersection Queuing Results

Location	Critical Movements	95% Queue Length (ft)	SHAC Recommended Auxiliary Lane Length* (with Quincy as an NR-B at 45 MPH)
		2021 (initial const.) (AM Peak/PM Peak)	
Quincy Avenue & Powhatan Road	EB Right	-	435
	WB Left-turn	0 / 0	435 **
	NB Left-turn	5 / 43	275
	NB Right-turn	0 / 0	-
Quincy Avenue & Maintenance Access (Full Movement Channelized Tee)	EB Left-turn	0 / 0	435
	WB Right-turn	0 / 0	Lane not needed
	SB Left-turn	0 / 3	200
	SB Right-turn	0 / 3	-
Quincy Avenue & Public Access (3/4 movement)	EB Left-turn	5 / 5	435
	SB Right-turn	5 / 18	Continuous

Notes:
*The SHAC Recommended Auxiliary Storage Lengths include the taper length of 162 feet.
** The existing right-turn deceleration lane is approximately 550' including taper.

Table 4. Year 2040 Intersection Queuing Results*

Location	Critical Movements	95% Queue Length (ft) 2040 Buildout (AM Peak/PM Peak)	SHAC Recommended Auxiliary Lane Length* (with Quincy as an NR-B at 45 MPH)
Quincy Avenue & Powhatan Road	EB Through	316 / 334	-
	EB Right	9 / 11	435
	WB Left-turn	11 / 18	435
	WB Through	233 / 490	-
	NB Left-turn	45 / 146	325
	NB Right-turn	17 / 17	-
Quincy Avenue & Maintenance Access (Full Movement Channelized Tee)	EB Left-turn	23 / 43	435
	WB Right-turn	0 / 0	Lane not needed
	SB Left-turn	20 / 70	200
	SB Right-turn	8 / 35	Continuous
Quincy Avenue & Public Access (3/4 movement)	EB Left-turn	258 / 263	435
	SB Right-turn	45 / 365	Continuous

Note:
*The SHAC Recommended Auxiliary Lane Lengths include the taper length of 162 feet.

The City of Aurora's *Traffic Impact Study Guidelines* indicate that the CDOT SHAC be used to determine storage and taper lengths based on speed limit, which is currently 45 MPH. The SHAC criteria for roadways greater than 45 MPH speed limit is to provide the deceleration length for that speed, which is 435 feet (which includes a 162-foot lead-in taper). The SHAC criteria often yield overly conservative results and provide storage well in excess of 95th percentile queues (which already incorporate a heavy vehicle percentage), often by a factor of two to three. The SHAC procedures do not account for other conditions in the intersection such as low opposing through movements if a left turn movement is in question. As such, there are instances above where the final recommendation would more appropriately align with the 95th percentile lengths relative to informing design.

With respect to the initial construction, the applicant plans to improve Quincy Avenue such that taper lengths and storage needs are provided at each access given that the through traffic along Quincy Avenue is currently low compared to 2040 conditions. Using the SHAC for these two components, the following initial construction is recommended:

- Maintenance Access – 225-foot eastbound left turn lane (which includes a 162-foot taper)
- Public Access – 250-foot eastbound left turn (which includes a 162-foot taper)

Right-turn deceleration lanes are not planned to be built due to an anticipated very low traffic demand.

V. SUMMARY AND RECOMMENDATIONS

The 88-acre Southeast Aurora Maintenance Facility is planned to ultimately house numerous city operational functions including the Water Department, Public Works, Animal Control, PROS, and Internal Services. The Water Department will occupy the site first with numerous functions. Peak hour trip generation is estimated to be approximately 164 vph during the AM peak hour and 205 trips during the PM peak hour with Phase 1 development. Once fully occupied, the trip generation will increase to 287 trips during the AM peak hour and 333 trips during the PM peak hour.

Two access point are needed to the site for life-safety reasons, and there are numerous constraints flanking the site. These constraints entail needing property beyond the site boundaries to establish an access that neatly aligns with a roadway across the street (south side of Quincy), the site's access scheme has been defined as a result. This includes a full-movement Maintenance Access at the site's midpoint onto Quincy Avenue and an ultimate three-quarter Public Access intersection near the eastern property line, removed from the Robertsdale Way intersection.

Quincy Avenue's traffic volume is not overwhelming today along the site's frontage with peak hour flows at around 250 vehicles per hour (both directions combined). Demands will increase significantly as the eastern area develops with peak hour flow ranging from 4000 vph in the AM peak hour to nearly 6000 vph during the PM peak hour.

The following short-term (opening year of 2021) improvements should be implemented:

- Establish a full-movement Maintenance Access at approximately the property's midpoint, which will be located approximately 725 feet east of Powhaton Road. Widen Quincy Avenue at this location to incorporate a 225-foot-long center left turn lane. Provide two southbound approach lanes (one for left turn movements and one for right turn movements) that provide at least 50 feet of storage.
- Establish a three-quarter movement Public Access (no left out) near the eastern property line, which could provide full movements for the interim time period while background traffic along Quincy Avenue remains relatively low. Since this cannot be easily aligned with Robertsdale Way, the access will be located approximately 200 feet west of Robertsdale Way. Widen Quincy Avenue at this location to incorporate a 250-foot long center left turn lane into the site.

By 2040, Quincy Avenue will need to be widened to include six through-lanes due to background traffic growth. Other city departments will also be making use of the SEAM site by that time. Improvements needed by 2040 include the following:

- Consider installing a traffic signal at the Quincy/Powhaton intersection if and when warrants are met and incorporate an eastbound right turn lane and two northbound lanes (one for left turns and one for right turns) that provide approximately 150 feet of storage. The potential to satisfy signalization warrants is primarily driven by activity to the south along Powhaton Road and only minimally by SEAM activity.
- Improve the full-movement Maintenance Access intersection (possibly as part of widening Quincy Avenue to six-lanes) such that the center left turn lane is 435-feet long. Extend the southbound approach lanes (one for left turn movements and one for right turn movements) that provide at least 75 feet of storage (for the left turn). Also for the long-term, a left turn harbor area to receive outbound left turn movements should be included in the arterial design.
- Improve the three-quarter Public Access (perhaps as part of the widening of Quincy Avenue) such that the center left turn lane is 435 feet long. This will entail some overlap with the left turn acceleration serving the Maintenance Access.

- Explore a means of ultimately providing signalized access to the SEAM site given the heavy through traffic projected for Quincy Avenue. Additional discussion is necessary to fully vet pros and cons given the constraints in the area. Several signalization options have been provided in this study for future consideration as site development and traffic conditions evolve.

APPENDIX A. TRIP GENERATION ESTIMATES

APPENDIX A. TRIP GENERATION ESTIMATES

The planned SEAM facility does not correspond to any of the standard ITE Land Uses; additionally, existing City facilities do not conform to the future programing of the site either. Hence, SEAM trip **generation** estimates used in this study are based on information garnered from multiple planning resources that detail the requirements of each department that will be housed at the site.

The main sources of information used to develop estimates of trip generation are:

Source 1. Aurora Water Facilities Master Plan (2017)
Source 2. The Aurora Reservoir (Parks and Water Mater Plan – An Amendment to include SEAM Master Plan) (2012)
Source 3. Southeast Maintenance Facility Draft (2010)

The resources were used to gain an understanding of the programing of various work groups and City functions including Aurora Water, Animal Care, Internal Services, Parks Recreation and Open Space (PROS) and Public Works – Streets. The programing data included number of staff anticipated in the future, their anticipated time on-site, and their hours of operations. This information was used to determine the expected trips generated during the AM and PM peak hours. The data generated was compared to an existing City of Aurora site with similar operations located at Ellsworth Avenue & Potomac Street.

Table A1 below is based on the resources cited above and is the basis of determining the number of staff expected to enter and exit the site during the AM and PM peak hours. This estimate considers the following:

1. Number of staff anticipated per master plan programing. Aurora Water staff estimates are from source #1 above while the remaining are from source #3.
2. The hours of operations for each department was determined (source #1) and is also shown for each department and for each group within Aurora Water.
3. Hours of operation helped determine the number of staff anticipated to enter/exit the site during the AM/PM peak hours.
4. Time-in-office estimates were also determined from source #1 above. This represents an estimate of the number of staff that will be required to be off-site.
5. The 'total' time-in-office estimates provided for Aurora Water in Table A1 is the weighted average of all groups within the department. The weighted average determined for Aurora Water was also used for the other departments (Internal Services, Public Works, PROS and Animal Care) since this information is currently unavailable.
6. Expected number of staff entering or exiting the site was based on percentage of time-in-office described above. This was used to determine the number of staff members expected to access the site during typical weekday AM and PM peak hours. This estimate explains why 100% of the staff member do not arrive or exit the site at the same time beyond a random probability distribution.
7. The usage of time-in-office is based on the data collected at the Ellsworth/Potomac site which shows that the peak hour usage is heavily influenced by, not only hours of operation but also time-in-office.

Table A2 provides a summary of the peak hour trips generated, based on the methodology described above. The table also provides an estimate of total trips entering and exiting the site. Since the focus of this study is the years 2021 and 2040, only opening day and build out trip generation scenarios are shown.

Table A1

Aurora Water	Current	2021	2026	2036	Hours of Operation		Time in Office (%)	
	# of Staff				From	To	2021	2036
Water Support Services	74	83	98	103	6:00 AM	4:00 PM	56%	54%
Water - Transmission & Distribution	69	80	97	115	6:00 AM	4:00 PM	60%	60%
Water - O & M Stormwater	29	64	78	94	7:00 AM	3:30 PM	60%	60%
Water - O & M Wastewater	26	26	28	42	7:00 AM	3:30 PM	60%	60%
Water - O & M Pumping	20	22	24	26	7:00 AM	4:00 PM	60%	60%
Water - Source Water	7	9	10	11	7:00 AM	3:30 PM	52%	47%
Water - WQ Lab	10	12	14	16	6:00 AM	5:00 PM	60%	57%
Water - Public Relations & Conservation	29	33	41	46	7:00 AM	4:00 PM	70%	70%
Water - Water Resources	16	18	20	23	7:00 AM	4:00 PM	100%	100%
Water - WQ & Environmental Program	16	19	19	21	7:00 AM	4:00 PM	64%	63%
Water - Planning Services	16	17	18	18	7:00 AM	4:00 PM	100%	100%
Water - Engineering Services	7	7	9	12	7:00 AM	4:00 PM	86%	83%
Water - Project Delivery/Planning	38	40	44	46	7:00 AM	4:00 PM	63%	63%
Total	357	430	500	573			64%	63%
Summary of Staff Arriving at 7 AM		255	291	339				
Summary of Staff Leaving at 4PM		319		410				
Other services on-site (Future Scenario Only)								
Internal Service				7	7:00 AM	4:00 PM	64%	63%
Public Works - Streets				48	7:00 AM	4:00 PM	64%	63%
Parks, Recreation & Open Space				42	7:00 AM	4:00 PM	64%	63%
Animal Care Center				20	7:00 AM	4:00 PM	64%	63%

Table A2

	2021		2036	
AM (7 AM arrivals) & Based on Time in Office	164		288	Time in office used to estimate how many trip ends occur during the peak hour.
PM (4 PM departures) & Based on Time in Office	205		333	

AM Peak (2021)				AM Peak (2036)			
	65%	35%			65%	35%	
2021 Staff	IN	OUT		2036 Staff	IN	OUT	
	107	57	164		188	100	

PM Peak (2021)				PM Peak (2036)			
	40%	60%			40%	60%	
2021 Staff	IN	OUT		2036 Staff	IN	OUT	
	82	123	205		134	199	

APPENDIX B. YEAR 2040 SIGNAL WARRANT ANALYSIS – QUINCY AVE & POWHATON RD

MUTCD Volume-based Warrant Evaluation
Quincy Ave & Powhatan Rd
2040 Total Traffic

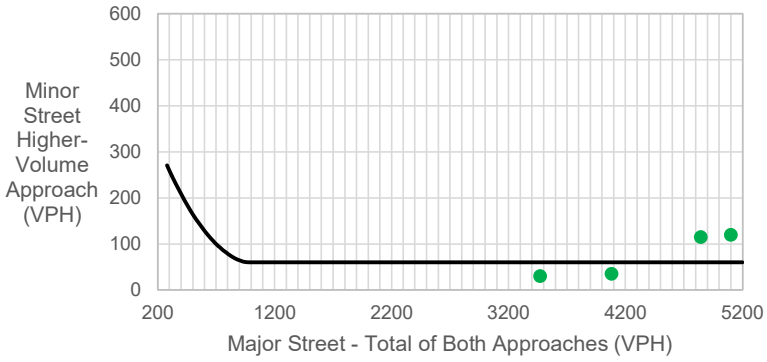
Major Street:	Quincy Ave	Minor Street:	Powhatan Rd
Approach Speed:	45 MPH	Right Turn Volume Included:	100% NB, 100% SB
Lanes Moving Traffic:	2 or more	Lanes Moving Traffic:	1
Option:	High speed major-street		

WARRANT 2, Four Hour Vehicular Volume

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
PM Peak Hour	5101	120
95% PM Peak Hour	4845	115
AM Peak Hour	4080	35
85% AM Peak Hour	3469	30

Satisfied	No

(70% Factor)



WARRANT 3, Peak Hour

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
PM Peak Hour	5101	120

Satisfied	Yes

(70% Factor)

APPENDIX C. YEAR 2021 TOTAL TRAFFIC LEVEL OF SERVICE WORKSHEETS

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	261	5	0	255	1	1
Future Vol, veh/h	261	5	0	255	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	284	5	0	277	1	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	289	0	561	284
Stage 1	-	-	-	-	284	-
Stage 2	-	-	-	-	277	-
Critical Hdwy	-	-	4.2	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	-	-	2.29	-	3.59	3.39
Pot Cap-1 Maneuver	-	-	1228	-	475	736
Stage 1	-	-	-	-	746	-
Stage 2	-	-	-	-	752	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1228	-	475	736
Mov Cap-2 Maneuver	-	-	-	-	559	-
Stage 1	-	-	-	-	746	-
Stage 2	-	-	-	-	752	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	635	-	-	1228	-
HCM Lane V/C Ratio	0.003	-	-	-	-
HCM Control Delay (s)	10.7	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	86	266	252	4	0	45
Future Vol, veh/h	86	266	252	4	0	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	93	289	274	4	0	49

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	278	0	-	0	-	276
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.2	-	-	-	-	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.29	-	-	-	-	3.39
Pot Cap-1 Maneuver	1240	-	-	-	0	744
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1240	-	-	-	-	744
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1240	-	-	-	744
HCM Lane V/C Ratio	0.075	-	-	-	0.066
HCM Control Delay (s)	8.1	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	349	296	1	3	9
Future Vol, veh/h	16	349	296	1	3	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	385	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	17	379	322	1	3	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	323	0	-	0	736	323
Stage 1	-	-	-	-	323	-
Stage 2	-	-	-	-	413	-
Critical Hdwy	4.2	-	-	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	2.29	-	-	-	3.59	3.39
Pot Cap-1 Maneuver	1193	-	-	-	375	700
Stage 1	-	-	-	-	716	-
Stage 2	-	-	-	-	651	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1193	-	-	-	370	700
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	706	-
Stage 2	-	-	-	-	651	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	10.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1193	-	-	-	477	700
HCM Lane V/C Ratio	0.015	-	-	-	0.007	0.014
HCM Control Delay (s)	8.1	-	-	-	12.6	10.2
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0	-	-	-	0	0

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	363	50	10	295	18	2
Future Vol, veh/h	363	50	10	295	18	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	450	-	-	0	500
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	395	54	11	321	20	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	395	0	738	395
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	343	-
Critical Hdwy	-	-	4.2	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	-	-	2.29	-	3.59	3.39
Pot Cap-1 Maneuver	-	-	1121	-	374	637
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	701	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1121	-	370	637
Mov Cap-2 Maneuver	-	-	-	-	478	-
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	12.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	478	637	-	-	1121	-
HCM Lane V/C Ratio	0.041	0.003	-	-	0.01	-
HCM Control Delay (s)	12.9	10.7	-	-	8.2	0
HCM Lane LOS	B	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	306	5	0	382	1	1
Future Vol, veh/h	306	5	0	382	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	333	5	0	415	1	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	338	0	748	333
Stage 1	-	-	-	-	333	-
Stage 2	-	-	-	-	415	-
Critical Hdwy	-	-	4.2	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	-	-	2.29	-	3.59	3.39
Pot Cap-1 Maneuver	-	-	1178	-	369	691
Stage 1	-	-	-	-	709	-
Stage 2	-	-	-	-	650	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1178	-	369	691
Mov Cap-2 Maneuver	-	-	-	-	477	-
Stage 1	-	-	-	-	709	-
Stage 2	-	-	-	-	650	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	564	-	-	1178	-
HCM Lane V/C Ratio	0.004	-	-	-	-
HCM Control Delay (s)	11.4	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	311	380	3	0	105
Future Vol, veh/h	57	311	380	3	0	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	400	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	62	338	413	3	0	114

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	416	0	-	0	-	415
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.2	-	-	-	-	6.3
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.29	-	-	-	-	3.39
Pot Cap-1 Maneuver	1101	-	-	-	0	621
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1101	-	-	-	-	621
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1101	-	-	-	621
HCM Lane V/C Ratio	0.056	-	-	-	0.184
HCM Control Delay (s)	8.5	-	-	-	12.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.7

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	361	484	1	7	19
Future Vol, veh/h	11	361	484	1	7	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	360	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	12	392	526	1	8	21

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	527	0	-	0	943	527
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	416	-
Critical Hdwy	4.2	-	-	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	2.29	-	-	-	3.59	3.39
Pot Cap-1 Maneuver	1000	-	-	-	282	536
Stage 1	-	-	-	-	576	-
Stage 2	-	-	-	-	649	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1000	-	-	-	279	536
Mov Cap-2 Maneuver	-	-	-	-	403	-
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	649	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1000	-	-	-	403	536
HCM Lane V/C Ratio	0.012	-	-	-	0.019	0.039
HCM Control Delay (s)	8.6	-	-	-	14.1	12
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	370	80	15	488	94	2
Future Vol, veh/h	370	80	15	488	94	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Yield	-	None	-	None
Storage Length	-	450	-	-	0	500
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	402	87	16	530	102	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	402	0	964	402
Stage 1	-	-	-	-	402	-
Stage 2	-	-	-	-	562	-
Critical Hdwy	-	-	4.2	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	-	-	2.29	-	3.59	3.39
Pot Cap-1 Maneuver	-	-	1115	-	274	631
Stage 1	-	-	-	-	659	-
Stage 2	-	-	-	-	555	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1115	-	269	631
Mov Cap-2 Maneuver	-	-	-	-	393	-
Stage 1	-	-	-	-	659	-
Stage 2	-	-	-	-	544	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	17.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	393	631	-	-	1115	-
HCM Lane V/C Ratio	0.26	0.003	-	-	0.015	-
HCM Control Delay (s)	17.3	10.7	-	-	8.3	0
HCM Lane LOS	C	B	-	-	A	A
HCM 95th %tile Q(veh)	1	0	-	-	0	-

APPENDIX D. YEAR 2040 TOTAL TRAFFIC LEVEL OF SERVICE WORKSHEETS

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2009	10	6	1752	10	5
Future Vol, veh/h	2009	10	6	1752	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	2184	11	7	1904	11	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2195	0	2960	1092
Stage 1	-	-	-	-	2184	-
Stage 2	-	-	-	-	776	-
Critical Hdwy	-	-	5.44	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	-	-	3.17	-	3.87	3.97
Pot Cap-1 Maneuver	-	-	93	-	25	174
Stage 1	-	-	-	-	40	-
Stage 2	-	-	-	-	365	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	93	-	23	174
Mov Cap-2 Maneuver	-	-	-	-	36	-
Stage 1	-	-	-	-	40	-
Stage 2	-	-	-	-	338	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	111.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	49	-	-	93	-
HCM Lane V/C Ratio	0.333	-	-	0.07	-
HCM Control Delay (s)	111.5	-	-	46.6	-
HCM Lane LOS	F	-	-	E	-
HCM 95th %tile Q(veh)	1.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	9.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	151	2019	1755	7	0	80
Future Vol, veh/h	151	2019	1755	7	0	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	164	2195	1908	8	0	87

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1916	0	-	0	-	958
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	5.44	-	-	-	-	7.24
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	3.17	-	-	-	-	3.97
Pot Cap-1 Maneuver	~ 130	-	-	-	0	214
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	~ 130	-	-	-	-	214
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	16	0	32.9
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	~ 130	-	-	-	214
HCM Lane V/C Ratio	1.263	-	-	-	0.406
HCM Control Delay (s)	230.4	-	-	-	32.9
HCM Lane LOS	F	-	-	-	D
HCM 95th %tile Q(veh)	10.3	-	-	-	1.8

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

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	2165	1833	2	5	15
Future Vol, veh/h	27	2165	1833	2	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	29	2353	1992	2	5	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1994	0	-	0	2992	997
Stage 1	-	-	-	-	1993	-
Stage 2	-	-	-	-	999	-
Critical Hdwy	5.44	-	-	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	3.17	-	-	-	3.87	3.97
Pot Cap-1 Maneuver	118	-	-	-	24	201
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	276	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	118	-	-	-	18	201
Mov Cap-2 Maneuver	-	-	-	-	36	-
Stage 1	-	-	-	-	41	-
Stage 2	-	-	-	-	276	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	48.9
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	118	-	-	-	36	201
HCM Lane V/C Ratio	0.249	-	-	-	0.151	0.081
HCM Control Delay (s)	45.3	-	-	-	122	24.5
HCM Lane LOS	E	-	-	-	F	C
HCM 95th %tile Q(veh)	0.9	-	-	-	0.5	0.3

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2182	50	10	1838	25	10
Future Vol, veh/h	2182	50	10	1838	25	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	150	-	500	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	2372	54	11	1998	27	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2426	0	3193	1186
Stage 1	-	-	-	-	2372	-
Stage 2	-	-	-	-	821	-
Critical Hdwy	-	-	5.44	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	-	-	3.17	-	3.87	3.97
Pot Cap-1 Maneuver	-	-	70	-	~ 19	150
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	345	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	70	-	~ 16	150
Mov Cap-2 Maneuver	-	-	-	-	~ 27	-
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	291	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	284.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	27	150	-	-	70	-
HCM Lane V/C Ratio	1.006	0.072	-	-	0.155	-
HCM Control Delay (s)	$ 385.5	30.9	-	-	65.7	-
HCM Lane LOS	F	D	-	-	F	-
HCM 95th %tile Q(veh)	3.2	0.2	-	-	0.5	-

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

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2182	50	10	1838	25	10
Future Volume (veh/h)	2182	50	10	1838	25	10
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1796	1796	1796	1796	1796	1796
Adj Flow Rate, veh/h	2372	54	11	1998	27	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	7	7	7
Cap, veh/h	3698	1148	131	3698	292	260
Arrive On Green	0.75	0.75	0.75	0.75	0.17	0.17
Sat Flow, veh/h	5065	1522	136	5065	1711	1522
Grp Volume(v), veh/h	2372	54	11	1998	27	11
Grp Sat Flow(s),veh/h/ln	1635	1522	136	1635	1711	1522
Q Serve(g_s), s	27.6	1.1	5.0	20.3	1.6	0.7
Cycle Q Clear(g_c), s	27.6	1.1	32.7	20.3	1.6	0.7
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3698	1148	131	3698	292	260
V/C Ratio(X)	0.64	0.05	0.08	0.54	0.09	0.04
Avail Cap(c_a), veh/h	3698	1148	131	3698	292	260
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.0	3.8	14.8	6.1	41.9	41.6
Incr Delay (d2), s/veh	0.9	0.1	1.3	0.6	0.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	0.3	0.2	5.4	0.7	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.9	3.8	16.1	6.7	42.5	41.9
LnGrp LOS	A	A	B	A	D	D
Approach Vol, veh/h	2426			2009	38	
Approach Delay, s/veh	7.8			6.7	42.3	
Approach LOS	A			A	D	

Timer - Assigned Phs		2		4		8
Phs Duration (G+Y+Rc), s		25.0		95.0		95.0
Change Period (Y+Rc), s		4.5		4.5		4.5
Max Green Setting (Gmax), s		20.5		90.5		90.5
Max Q Clear Time (g_c+I1), s		3.6		29.6		34.7
Green Ext Time (p_c), s		0.1		35.8		26.3

Intersection Summary	
HCM 6th Ctrl Delay	7.6
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2197	5	5	2525	5	5
Future Vol, veh/h	2197	5	5	2525	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	100	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	2388	5	5	2745	5	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2393	0	3496	1194
Stage 1	-	-	-	-	2388	-
Stage 2	-	-	-	-	1108	-
Critical Hdwy	-	-	5.44	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	-	-	3.17	-	3.87	3.97
Pot Cap-1 Maneuver	-	-	73	-	12	148
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	241	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	73	-	11	148
Mov Cap-2 Maneuver	-	-	-	-	26	-
Stage 1	-	-	-	-	30	-
Stage 2	-	-	-	-	225	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	111.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	44	-	-	73	-
HCM Lane V/C Ratio	0.247	-	-	0.074	-
HCM Control Delay (s)	111.8	-	-	58.2	-
HCM Lane LOS	F	-	-	F	-
HCM 95th %tile Q(veh)	0.8	-	-	0.2	-

Intersection	
Int Delay, s/veh	28.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	94	2202	2525	5	0	174
Future Vol, veh/h	94	2202	2525	5	0	174
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	102	2393	2745	5	0	189

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2750	0	-	0	-	1375
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	5.44	-	-	-	-	7.24
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	3.17	-	-	-	-	3.97
Pot Cap-1 Maneuver	~ 47	-	-	-	0	~ 111
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	~ 47	-	-	-	-	~ 111
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	29.7	0	$ 419.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	~ 47	-	-	-	111
HCM Lane V/C Ratio	2.174	-	-	-	1.704
HCM Control Delay (s)	$ 726.1	-	-	-	$ 419.3
HCM Lane LOS	F	-	-	-	F
HCM 95th %tile Q(veh)	10.5	-	-	-	14.6

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

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	2285	2698	1	11	31
Future Vol, veh/h	17	2285	2698	1	11	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	18	2484	2933	1	12	34

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2934	0	-	0	3964	1467
Stage 1	-	-	-	-	2934	-
Stage 2	-	-	-	-	1030	-
Critical Hdwy	5.44	-	-	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	3.17	-	-	-	3.87	3.97
Pot Cap-1 Maneuver	38	-	-	-	~ 6	96
Stage 1	-	-	-	-	13	-
Stage 2	-	-	-	-	266	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	38	-	-	-	~ 3	96
Mov Cap-2 Maneuver	-	-	-	-	~ 6	-
Stage 1	-	-	-	-	~ 7	-
Stage 2	-	-	-	-	266	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	$ 463.2
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	38	-	-	-	6	96
HCM Lane V/C Ratio	0.486	-	-	-	1.993	0.351
HCM Control Delay (s)	168.8	-	-	-	$ 1595.1	61.5
HCM Lane LOS	F	-	-	-	F	F
HCM 95th %tile Q(veh)	1.7	-	-	-	2.5	1.4

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

Intersection	
Int Delay, s/veh	52.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2292	80	15	2714	110	10
Future Vol, veh/h	2292	80	15	2714	110	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	150	-	0	500
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	2491	87	16	2950	120	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2578	0	3703	1246
Stage 1	-	-	-	-	2491	-
Stage 2	-	-	-	-	1212	-
Critical Hdwy	-	-	5.44	-	5.84	7.24
Critical Hdwy Stg 1	-	-	-	-	6.74	-
Critical Hdwy Stg 2	-	-	-	-	6.14	-
Follow-up Hdwy	-	-	3.17	-	3.87	3.97
Pot Cap-1 Maneuver	-	-	58	-	~ 9	136
Stage 1	-	-	-	-	~ 25	-
Stage 2	-	-	-	-	211	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	58	-	~ 7	136
Mov Cap-2 Maneuver	-	-	-	-	~ 21	-
Stage 1	-	-	-	-	~ 25	-
Stage 2	-	-	-	-	153	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	$ 2275.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	21	136	-	-	58	-
HCM Lane V/C Ratio	5.694	0.08	-	-	0.281	-
HCM Control Delay (s)	$ 2479.3	33.8	-	-	89.8	-
HCM Lane LOS	F	D	-	-	F	-
HCM 95th %tile Q(veh)	15.3	0.3	-	-	1	-

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

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	2292	80	15	2714	110	10
Future Volume (veh/h)	2292	80	15	2714	110	10
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1796	1796	1796	1796	1796	1796
Adj Flow Rate, veh/h	2491	87	16	2950	120	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	7	7	7
Cap, veh/h	3739	1161	120	3739	278	247
Arrive On Green	0.76	0.76	0.76	0.76	0.16	0.16
Sat Flow, veh/h	5065	1522	117	5065	1711	1522
Grp Volume(v), veh/h	2491	87	16	2950	120	11
Grp Sat Flow(s),veh/h/ln	1635	1522	117	1635	1711	1522
Q Serve(g_s), s	29.4	1.7	9.2	43.0	7.6	0.7
Cycle Q Clear(g_c), s	29.4	1.7	38.6	43.0	7.6	0.7
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	3739	1161	120	3739	278	247
V/C Ratio(X)	0.67	0.07	0.13	0.79	0.43	0.04
Avail Cap(c_a), veh/h	3739	1161	120	3739	278	247
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.9	3.6	16.2	8.5	45.3	42.4
Incr Delay (d2), s/veh	1.0	0.1	2.3	1.8	4.8	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.7	0.4	0.3	11.4	3.6	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.8	3.7	18.5	10.3	50.1	42.7
LnGrp LOS	A	A	B	B	D	D
Approach Vol, veh/h	2578			2966	131	
Approach Delay, s/veh	7.7			10.3	49.5	
Approach LOS	A			B	D	

Timer - Assigned Phs		2		4		8
Phs Duration (G+Y+Rc), s		24.0		96.0		96.0
Change Period (Y+Rc), s		4.5		4.5		4.5
Max Green Setting (Gmax), s		19.5		91.5		91.5
Max Q Clear Time (g_c+I1), s		9.6		31.4		45.0
Green Ext Time (p_c), s		0.2		38.8		39.9

Intersection Summary		
HCM 6th Ctrl Delay		10.0
HCM 6th LOS		B