
TRAFFIC ANALYSIS MEMORANDUM

FOR THE

CULVER DRIVE AND ALTON PARKWAY

INTERSECTION IMPROVEMENT PROJECT

CIP No. 311905

LEAD AGENCY:



ONE CIVIC CENTER PLAZA
IRVINE, CA 92623-9575

PREPARED BY:



38 TECHNOLOGY DRIVE
IRVINE, CA 92618
949-923-6000

NOVEMBER 2019

Table of Contents

	PAGE
Chapter 1 Introduction	1-1
1.1 Purpose.....	1-1
1.2 Project Intersection Improvement Alternatives.....	1-1
1.3 Report Organization	1-2
Chapter 2 Methodology	2-1
2.1 Traffic Analysis Methodology.....	2-1
2.2 Traffic Counts.....	2-1
2.3 Traffic Forecasting Methodology	2-3
2.4 Intersection Analysis and Level of Service Performance Criteria.....	2-3
Chapter 3 Existing (May 2018) Traffic Conditions	3-1
3.1 Existing No Build Intersection Analysis.....	3-1
3.2 Existing Build (Existing with Project) Intersection Analysis	3-1
Chapter 4 Interim Year Traffic Conditions	4-1
4.1 Interim Year No Build Intersection Analysis.....	4-1
4.2 Interim Year Build Intersection Analysis	4-1
Chapter 5 Buildout Traffic Conditions	5-1
5.1 Buildout No Build Intersection Analysis	5-1
5.2 Buildout Build Intersection Analysis.....	5-1
5.3 Alternatives 4 and 5 Buildout Operational Queue Analysis	5-2
Chapter 6 Project Vehicle Miles Traveled (VMT) Discussion	6-1
Chapter 7 Conclusions and Recommendation	7-1

APPENDICES

Appendix A – Existing Traffic Counts

Appendix B – ITAM Model Peak Hour Intersection Traffic Volume Forecasts and Level of Service
Computation Worksheets (ICU Calculations)

Appendix C – Alternatives 4 and 5 Operational Analysis Queue Reports



List of Figures

	PAGE
Figure 1-1	Intersection Geometric Alternatives1-3
Figure 2-1	Existing Traffic Volumes and Intersection Configuration2-2
Figure 7-1	Future Traffic Volumes and Alternative 5 Project Intersection Configuration7-3

List of Tables

	PAGE
Table 1-1	Intersection Configuration Alternatives.....1-2
Table 2-1	Existing Average Weekday AM and PM Peak Hour Intersection Volumes2-1
Table 2-2	ITAM Model Forecast AM and PM Peak Hour Intersection Volumes.....2-3
Table 2-3	Intersection Capacity Utilization Level of Service Descriptions.....2-4
Table 3-1	Level of Service with Existing (2018) Traffic Volumes3-1
Table 4-1	Level of Service with ITAM Interim Year Traffic Forecasts4-1
Table 5-1	Level of Service with ITAM Buildout Traffic Forecasts.....5-1
Table 5-2	Alternatives 4 and 5 – Existing and Buildout Queue Lengths Compared to Theoretical 95 th Percentile Queues5-4

Chapter 1 - Introduction

1.1 Purpose

This traffic analysis has been prepared as a companion document to the Project Report for the Culver Drive/Alton Parkway Intersection Improvement Project. This report summarizes level of service (LOS) analysis of no build (no project) and with project intersection geometric Alternatives 1 through 5 as included in the Project Report for widening improvements at the intersection. For each alternative, existing (2018), Interim Year, and Buildout AM/PM peak hour traffic conditions were evaluated to identify which alternatives are feasible to best improve level of service (LOS) performance criteria. Based on the findings and recommendations of this analysis and with concurrence from the City of Irvine, a preferred alternative has been selected for preliminary project development.

1.2 Project Intersection Improvement Alternatives

The geometric alternatives considered for this project are shown on Figure 1-1 and summarized in Table 1-1. Alternative development began with Alternative 1 as included in the *2015 IBC Vision Plan Traffic Study* to increase through lane capacity in the eastbound direction on Alton Parkway. Alternative 2 and Alternative 3, a combination of Alternatives 1 and 2, were identified through meeting and discussion at project development team (PDT) meetings and consider increasing through lane capacity in the westbound and both the eastbound and westbound directions, respectively. Finally, Alternatives 4 and 5 were developed based on the *2016 Citywide Traffic Operation & Traffic Management Study* and include adding a fourth northbound through lane on Culver Drive. The improvements associated with each alternative are identified below:

Alternative 1 - *2015 IBC Vision Plan Traffic Study*: Convert existing dedicated EB right-turn lane to 3rd EB through lane with defacto right-turn lane.

Alternative 2 – Convert existing SB free-right turn lane to conventional dedicated right-turn lane and provide 3rd WB through lane and defacto WB right-turn lane.

Alternative 3 - Convert existing dedicated EB right-turn lane to 3rd EB through lane with defacto right-turn lane (*2015 IBC Vision Plan Traffic Study*). Convert existing SB free-right turn lane to conventional dedicated right-turn lane and provide 3rd WB through lane and defacto WB right-turn lane.



Alternative 4 – 2016 Citywide Traffic Operation & Traffic Management Study Alternative: Add 4th NB through lane with defacto NB right-turn lane on Culver Drive. Provide a bus turnout on northeast corner of the intersection and increase storage length of east-west dual left-turn lanes on Alton Parkway approaches to 300 feet. Increase WB right-turn lane storage length to 300 feet with overlap signal phasing, and provide standard bike lane striping.

Alternative 5 - Add 4th NB through lane and defacto NB right-turn lane on Culver Drive (2016 Citywide Traffic Operation & Traffic Management Study). Convert existing SB free-right turn lane to conventional dedicated right-turn lane with overlap signal phasing. Provide a bus turnout on northeast corner of the intersection and increase storage length of east-west dual left-turn lanes on Alton Parkway approaches to 300 feet. Increase WB right-turn lane storage length to 300 feet and provide standard bike lane striping.

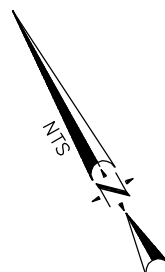
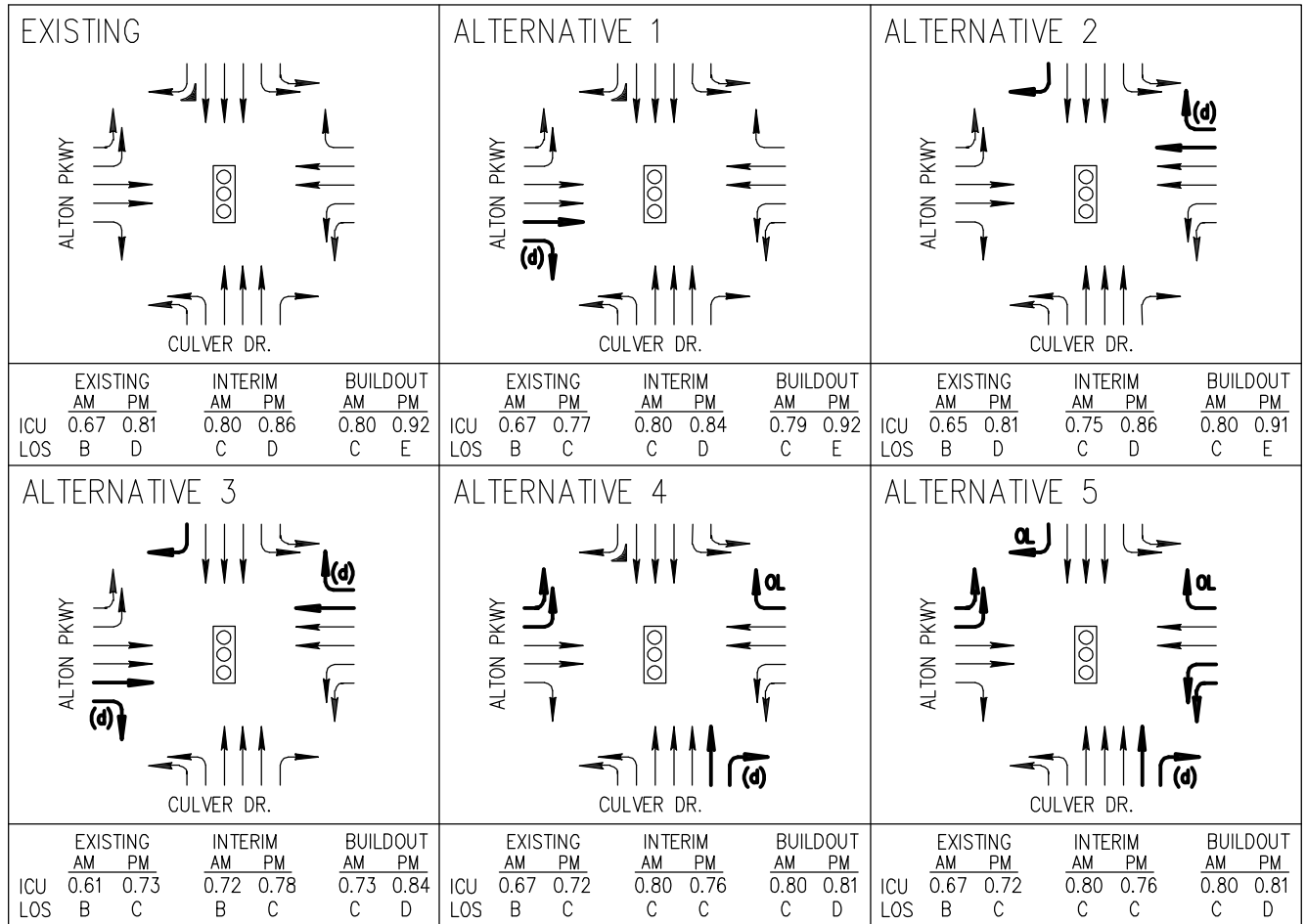
Table 1-1
Culver Drive / Alton Parkway
Intersection Improvement Project
Intersection Configuration Alternatives

Alternative	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing	2	3	1	2	3	1(Fr)	2	2	1	2	2	1
Alternative 1	2	3	1	2	3	1(Fr)	2	3	1(d)	2	2	1
Alternative 2	2	3	1	2	3	1	2	2	1	2	3	1(d)
Alternative 3	2	3	1	2	3	1	2	3	1(d)	2	3	1(d)
Alternative 4	2	4	1(d)	2	3	1(Fr)	2	2	1	2	2	1(OL)
Alternative 5	2	4	1(d)	2	3	1(OL)	2	2	1	2	2	1(OL)

(d) – defacto right-turn (Fr) – free right-turn (OL) – Overlap right-turn signal phasing

1.3 Report Organization

The remainder of this report identifies the analysis methodology used to evaluate intersection performance with existing and future traffic volumes for no build and build intersection improvement alternatives and presents conclusions and recommendations for preliminary project development.



LEGEND

- (d) – DEFACTO RIGHT-TURN
- OL – OVERLAP RIGHT-TURN
- ↗ – FREE RIGHT-TURN



Chapter 2 - Methodology

2.1 Traffic Analysis Methodology

The methodology used in this report was to calculate intersection level of service for the various analysis scenarios using the Intersection Capacity Utilization (ICU) method in accordance with City parameters and guidelines. Traffic volumes used for the calculations were obtained from counts of existing traffic (May 2018) conducted during peak hours and from traffic volume forecasts obtained using the City ITAM model. These components of the analysis are discussed in more detail below.

2.2 Traffic Counts

Existing AM and PM peak hour turning movement volumes provided for this analysis by the City were conducted on Tuesday, May 8, 2018 and Thursday, May 10, 2018. UCI and local schools were in session on these count days. These two counts were averaged and represent typical existing weekday turning movement volumes at the intersection (see Table 2-1). Existing peak hour volumes and the current intersection configuration are shown on Figure 2-1. Figure 2-1 also shows existing weekday 24-hour volumes on each approach of the intersection based on City of Irvine and Orange County Traffic Flow Map data. Existing peak hour intersection turning movement counts from each day are provided in Appendix A.

**Table 2-1
 Culver Drive / Alton Parkway
 Existing Average Weekday AM and PM Peak Hour Intersection Volumes**

AM Peak Hour														
Date	Weekday	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
May 8, 10 2018	Tuesday, Thursday	127	976	257	123	1804	301	130	406	156	295	658	202	5435

PM Peak Hour														
Date	Weekday	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
May 8, 10 2018	Tuesday, Thursday	178	1948	386	241	1186	318	271	830	188	251	634	254	6685

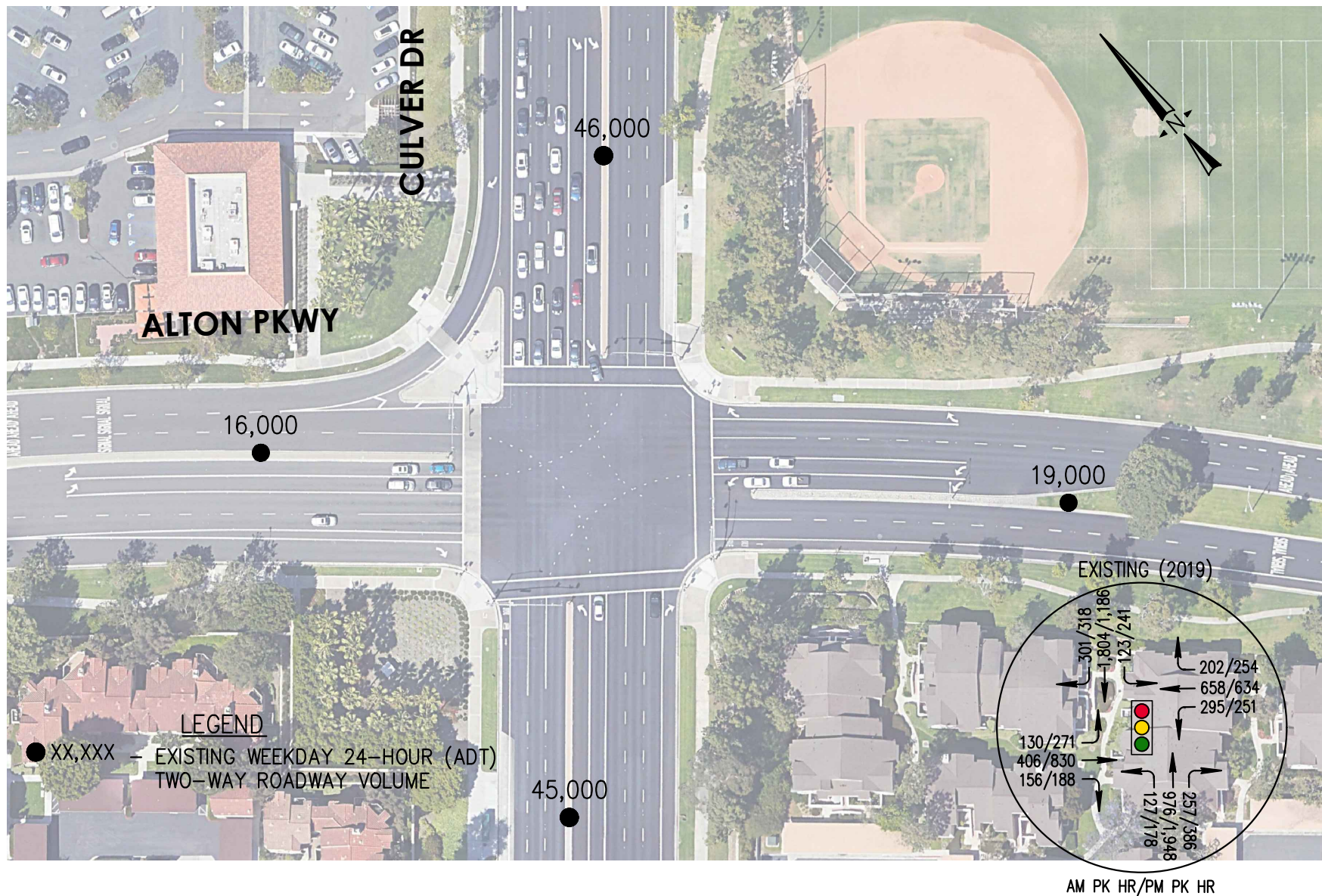


Figure 2-1
Existing Traffic Volumes and Intersection Configuration



2.3 Traffic Forecasting Methodology

Forecasts of Interim Year and Buildout intersection turning movements at the intersection were provided by the City of Irvine’s ITAM model. These forecasts are shown below in Table 2-2 and are also provided in Appendix B.

**Table 2-2
 Culver Drive / Alton Parkway
 ITAM Model Forecast AM and PM Peak Hour Intersection Volumes**

Year	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Interim-AM	165	1051	286	172	2151	345	165	482	163	296	770	204
Interim-PM	232	2045	337	259	1181	292	352	844	286	263	706	243
Buildout-AM	139	1109	317	222	2215	336	218	672	181	287	707	235
Buildout-PM	246	2266	368	292	1259	318	363	861	275	278	767	274

2.4 Intersection Analysis and Level of Service Performance Criteria

Using existing and future forecast traffic volumes, Intersection Capacity Utilization (ICU) analysis was performed for the intersection. In ICU analysis, the volume of traffic using the intersection is compared to the capacity of the intersection. ICU’s are calculated for the peak hours of traffic and include the unique features of the intersection such as turning movement volumes, intersection lane configurations, and traffic signal phasing. ICU is generally expressed as a percent. The percentage represents that portion of the hour required to provide sufficient capacity to accommodate all intersection traffic and provides a guide to the number and types of lanes required at the intersection. This percent can also be used to determine a level of service (LOS) based on the utilized capacity of the intersection. Table 2-3 provides ICU level of service ranges and descriptions. The City of Irvine target minimum Level of Service to be provided at the intersection is LOS D.

All parameters used in ICU analysis such as lane capacities and clearance intervals are per City of Irvine guidelines. ICU worksheets are provided in Appendix C.



**TABLE 2-3
 INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS
 LEVEL OF SERVICE DESCRIPTIONS**

Level of Service	Traffic Flow Description	Nominal Range of ICU
A	Low volumes; high speeds; speed not restricted by other vehicles; all signal cycles clear with no vehicles waiting through more than one signal cycle.	0.00 - 0.60
B	Operating speeds beginning to be affected by other traffic; between one and ten percent of the signal cycles have one or more vehicles which wait through more than one cycle during peak traffic periods.	0.61 - 0.70
C	Operating speeds and maneuverability closely controlled by other traffic; between 11 and 30 percent of the signal cycles have one or more vehicles which wait through more than one cycle during peak traffic periods; recommended ideal design standard.	0.71 - 0.80
D	Tolerable operating speeds; 31 to 70 percent of the signal cycles have one or more vehicles which wait through more than one cycle during peak traffic periods; often used as design standard in urban areas.	0.81 - 0.90
E	Capacity; the maximum traffic volume an intersection can accommodate; restricted speeds; 71 to 100 percent of the signal cycles have one or more vehicles which wait through more than one cycle during peak traffic periods.	0.91 - 1.00
F	Long queues of traffic; unstable flow; stoppages of long duration; traffic volumes and traffic speed can drop to zero; traffic volumes will be less than the volume which occurs at Level of Service E.	over 1.00



Chapter 3 - Existing (May 2018) Traffic Conditions

Table 3-1 provides a summary of no build and project improvement alternatives LOS at the intersection under existing peak hour traffic conditions.

**Table 3-1
 Culver Drive / Alton Parkway
 Level of Service with Existing (2018) Traffic Volumes**

Existing (2018) Conditions	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
No Build (Existing Improvements)	0.67	B	0.81	D
Project Improvements Alt. 1	0.67	B	0.77	C
Project Improvements Alt. 2	0.65	B	0.81	D
Project Improvements Alt. 3	0.61	B	0.73	C
Project Improvements Alt. 4	0.67	B	0.72	C
Project Improvements Alt. 5	0.67	B	0.72	C

3.1 Existing No Build Intersection Analysis

Table 3-1 shows that with existing intersection improvements the intersection is providing acceptable LOS during peak hours. The LOS is B during the AM peak hour and LOS D during the PM peak hour.

3.2 Existing Build (Existing with Project) Intersection Analysis

Table 3-1 shows that with implementation of any improvement alternative, the existing AM peak hour LOS remains at LOS B under existing volume conditions. During the PM peak hour, implementation of any alternative except Alternative 2 would improve the ICU value at the intersection from LOS D to LOS C.



Chapter 4 - Interim Year Traffic Conditions

Table 4-1 provides a summary of no build and project improvement alternatives LOS at the intersection under interim year peak hour traffic conditions.

Table 4-1
Culver Drive / Alton Parkway
Level of Service with ITAM Interim Year Traffic Forecasts

Interim Year 2017 Conditions	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
No Build (Existing Improvements)	0.80	C	0.86	D
Project Improvements Alt. 1	0.80	C	0.84	D
Project Improvements Alt. 2	0.75	C	0.86	D
Project Improvements Alt. 3	0.72	C	0.78	C
Project Improvements Alt. 4	0.80	C	0.76	C
Project Improvements Alt. 5	0.80	C	0.76	C

4.1 Interim Year No Build Intersection Analysis

Table 4-1 shows that with existing intersection improvements the level of service at the intersection is expected to decline from LOS B to LOS C during the AM peak hour and remain at LOS D during the PM peak hour with Interim Year forecast volumes.

4.2 Interim Year Build Intersection Analysis

Table 4-1 shows that with implementation of any improvement alternative, AM peak hour LOS is predicted to remain at LOS C under Interim Year traffic conditions. During the PM peak hour, Alternatives 1 and 2 are predicted to maintain LOS D while Alternatives 3, 4, and 5 would improve level of service to LOS C during the PM Peak hour.



Chapter 5 – Buildout Traffic Conditions

Table 5-1 provides a summary of no build and project improvement alternatives LOS at the intersection under Buildout peak hour traffic conditions.

Table 5-1
Culver Drive / Alton Parkway
Level of Service with ITAM Buildout Traffic Forecasts

Buildout Conditions	AM Peak Hour		PM Peak Hour	
	ICU	LOS	ICU	LOS
No Build (Existing Improvements)	0.80	C	0.92	E
Project Improvements Alt. 1	0.79	C	0.92	E
Project Improvements Alt. 2	0.80	C	0.91	E
Project Improvements Alt. 3	0.73	C	0.84	D
Project Improvements Alt. 4	0.80	C	0.81	D
Project Improvements Alt. 5	0.80	C	0.81	D

5.1 Buildout No Build Intersection Analysis

Table 5-1 shows that with existing intersection improvements the intersection is expected to decline to LOS C during the AM peak hour and to unacceptable LOS E during the PM peak hour with Buildout Year forecast volumes.

5.2 Buildout Build Intersection Analysis

Table 5-1 shows that all improvement alternatives are predicted to maintain LOS C during the AM peak hour under Buildout Year conditions. Table 5-1 shows that Alternatives 1 and 2 would result in unacceptable LOS E during the PM peak hour with Buildout Year peak hour traffic conditions. Alternatives 3, 4, and 5 provide acceptable LOS D in the PM peak hour.

5.3 Alternatives 4 and 5 Buildout Operational Queue Analysis

For Alternatives 4 and 5, an additional operational analysis was performed for existing and future Buildout peak hour conditions to determine the required turn pocket storage lengths for turning movements. Alternatives 4 and 5 both implement the same improvements at the intersection to add a fourth NB through lane on Culver Drive. The difference between the alternatives is that Alternative 4 maintains the existing SB free right-turn lane on Culver Drive while Alternative 5 converts the free-right lane to a conventional dedicated right-turn lane with overlap signal phasing. Therefore, the analysis summarized in Table 5-2 applies to both alternatives with the exception of the length of queue reported for the SB dedicated right turn lane which is applicable only to Alternative 5.

Existing peak hour volumes were evaluated with Alternative 4 and 5 improvements and a 150-second cycle length and represent worst-case short term theoretical queuing conditions following project implementation. Buildout conditions represent the highest future traffic volume forecasts for the intersection. Buildout conditions turn pocket lengths were evaluated based on 120-second and 200-second signal cycle lengths. Storage lengths for all evaluation scenarios are based on 95th percentile vehicle queues (the queue length that is not exceeded 95 percent of the time). The theoretical calculated queue lengths were used to determine proposed pocket lengths included as part of the intersection improvements and to confirm the adequacy of existing turn pockets lengths and provide adjustments, if necessary.

The queue for a given traffic movement is generally calculated based on the red signal interval of the movement and the arrival rate (volume) of the movement. Green splits and red intervals for each movement are derived from the ICU calculations. Red intervals for right turn movements have been adjusted to account for vehicles making right-turns-on-red (RTOR) as appropriate and to consider the use of overlap right-turn signal phasing where proposed.

Table 5-2 shows theoretical 95th percentile vehicle queues for left- and right-turn movements on all approaches to the intersection for the analysis scenarios discussed above. The calculated theoretical queue length is considered to exceed the provided storage if the queue exceeds the storage by one vehicle length (25') or more.



Table 5-2 shows that for existing (150-second cycle) and Buildout (120-second cycle) peak hour conditions, proposed turn pocket storage lengths with implementation of Alternatives 4 and 5 meet or exceed theoretical 95th percentile queues with the exception of the northbound “defacto” right-turn lane during the PM peak hour. The “defacto” right-turn lane length is considered to be defined by 200 feet of broken bike lane striping within the 19-foot adjacent curb lane. Vehicles are not legally permitted to enter the bike lane until the solid bike lane striping becomes broken. Therefore, queues of right-turn vehicles exceeding 200’ would require right turning vehicles to remain in the adjacent through lane until reaching the broken striping. Vehicles may enter the bike lane early at peak times and this is an operational concern for bicyclists more than vehicles. Occasional police enforcement can be effective in increasing compliance with required driver actions, if necessary.

Table 5-2 also shows forecast turning movement queues for Buildout peak hour conditions based on a 200-second cycle length with implementation of Alternatives 4 and 5. A 200-second cycle length represents worst-case upper bound queuing lengths for Buildout peak hour conditions. Table 5-2 shows that the theoretical calculated queue lengths for northbound and westbound right-turns will exceed the provided pocket lengths during both peak hours. The issues associated with the NB defacto right-turn lane are discussed above. The westbound right-turn lane has a proposed length of 300 feet with a forecast PM peak hour queue length of 350 feet. The excess queue length is only 2 vehicles which could be accommodated along the transition taper and considering the 200-second cycle length a longer pocket isn’t considered justified or cost effective. The eastbound right-turn queue length will exceed the striped turn lane length during the PM hour, but this is a lane drop of the third eastbound through lane so the actual effective storage length is greater than the forecast queue and this storage length is also considered acceptable.

Table 5-2 shows that the only left-turn queue length forecast to exceed the provided storage is the southbound left-turn on Culver Drive during the PM peak hour under Buildout conditions and a 200-second cycle length. The excess queue length is approximately 2-3 vehicles and may also be accommodated within the dual left turn pocket transition. It is also noted that through lane queues govern on each approach and control access to the left-turn lanes such that left-turns on occasion during peak hours will be intermixed with through traffic until reaching the transition opening into the turn lane.



Table 5-2
Culver Drive / Alton Parkway
Alternatives 4 and 5
Existing and Buildout Queue Lengths Compared to
Theoretical 95th Percentile Queues

Alternatives 4/5		Existing Vols.		Buildout Vols.		Buildout Vols.		Existing Storage	Proposed Storage
		150-sec. cycle		120-sec. cycle		200-sec. cycle			
Move-ment	No. of Lanes	95th%tile Queue		95th%tile Queue		95th%tile Queue		Ft.	Ft.
		AM	PM	AM	PM	AM	PM		
NBL	2	115	140	100	150	150	225	265	265
NBT	4	170	360	150	340	240	530	-	-
NBR	1(d)	200	325	175	250	275	375	190	200
SBL	2	115	175	140	175	215	265	200	200
SBT	3	385	290	345	260	535	400	-	-
SBR	1(OL)	200	150	175	200	275	300	300(Fr)	290
EBL	2	115	190	140	200	215	300	240	300
EBT	2	240	375	290	325	450	515	-	-
EBR	1	225	200	200	225	300	350	290	290
WBL	2	200	190	165	165	265	250	155	300
WBT	2	325	315	290	315	465	490	-	-
WBR	1	225	250	225	250	325	350	150	300

Legend:

Existing Improvement

Proposed Improvement

(d) – Defacto right turn lane **(OL)** – Overlap right-turn signal phasing **(Fr)** – Free right-turn lane



Chapter 6 Project Vehicle Miles Traveled (VMT) Discussion

The California Environmental Quality Act (CEQA) requires a roadway improvement project that would induce a measurable and substantial increase in vehicle travel to conduct a vehicle miles travelled (VMT) analysis identifying the amount of vehicle travel produced by the project. The types of projects requiring analysis generally include, additional though lanes on existing or new highways, including general purpose lanes, HOV lanes, peak period lanes, auxiliary lanes, or lanes through grade-separated interchanges. Many types of roadway projects are not expected to result in a substantial increase in vehicle travel and are not considered vehicle inducing including but not limited to the following:

- Rehabilitation and maintenance projects
- Safety projects
- Roadway shoulder enhancement projects
- Addition of an auxiliary lane of less than one mile in length
- Installation, removal, and reconfiguration of traffic lanes that are not for through traffic (i.e. turn lanes)
- Projects that improve conditions for pedestrians, cyclists, and, if applicable, transit
- Other types of projects that do not add vehicle capacity and are not expected to measurably increase vehicle travel

The proposed project improvement alternatives included in this analysis are not considered to be vehicle travel inducing. The intersection improvement alternatives included in this study are considered “spot” capacity improvements and while all alternatives provide at least one additional through lane at the intersection, these additional “through” (auxiliary) lanes are merged into existing through lanes beyond the intersection (in approximately 600 feet) without continuing to an adjacent intersection. Therefore, while the intersection operates more efficiently, no vehicle inducing capacity is added to roadway segments. Other improvements included in the alternatives involve only turn lane modifications and are also considered exempt from the need for further analysis.

The ICU analysis methodology used in this study to evaluate and identify the LOS benefit of each improvement alternative is also based on the assumption that for each analysis scenario, Existing, Interim Year, and Buildout Year, proposed improvements are not vehicle travel inducing. Otherwise, for each analysis scenario, the improvement in ICU value and LOS realized with improvement alternative implementation would be negated by the increase in traffic volume.



Chapter 7 Conclusions and Recommendation

Existing intersection improvements are providing LOS B in the AM peak hour and LOS D in the PM peak hour under current 2019 traffic conditions. For Interim Year conditions based on City of Irvine ITAM model traffic volume forecasts, AM peak hour LOS is predicted to decline to LOS C and PM peak hour LOS will remain at LOS D with existing improvements. For forecast Buildout peak hour conditions, AM peak hour LOS is forecast to remain at LOS C while PM peak hour LOS is predicted to decline to unacceptable LOS E with existing intersection improvements. Alternatives 3, 4, and 5 would each improve PM peak hour LOS to target LOS D and provide AM peak hour LOS C under Buildout conditions .

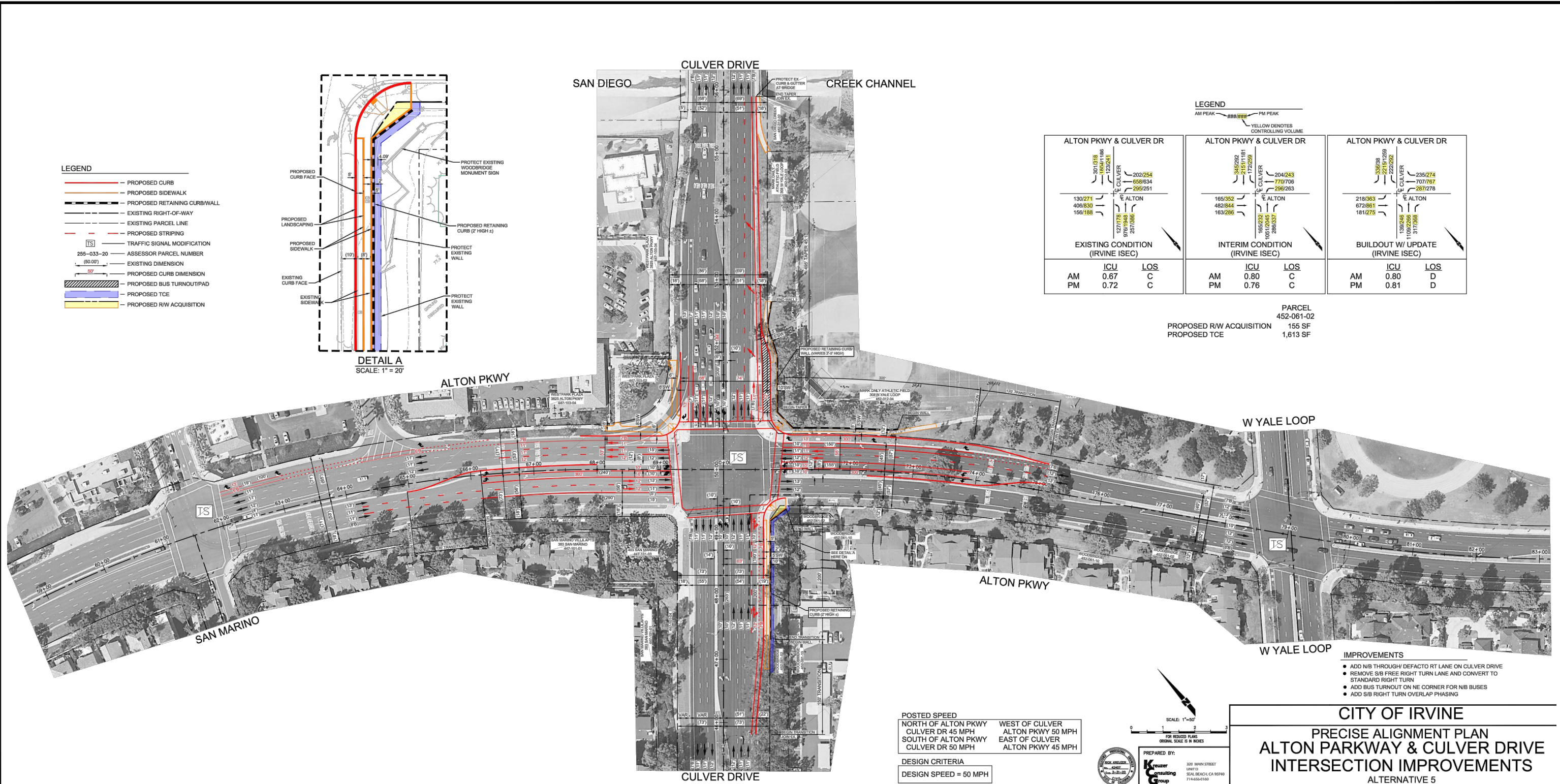
Alternative 3 provides additional through lanes on both the east and westbound approaches of Alton Parkway and converts the existing SB free right-turn lane on Culver Drive into a conventional dedicated right-turn lane. This alternative results in the lowest AM peak hour ICU value within the LOS C range and a 0.03 higher PM peak hour ICU value within the LOS D range compared to Alternatives 4 and 5 under future Buildout conditions. Alternative 3 is also considered to have the greatest level of local community impact.

Alternatives 4 and 5 both implement the same improvements at the intersection to add a fourth NB through lane on Culver Drive. The difference between alternatives is that Alternative 4 maintains the existing SB free right-turn lane on Culver Drive while Alternative 5 converts the free-right lane to a conventional dedicated right-turn lane with overlap signal phasing. Alternatives 4 and 5 achieve identical ICU and LOS values for all analysis scenarios and provide the lowest ICU value of 0.81 within the LOS D range under future Buildout conditions. However, while Alternatives 4 and 5 provide the same overall ICU and LOS improvements at the intersection, Alternative 5 also provides the following desirable benefits:

- The conversion of the SB free right-turn lane into a conventional dedicated right-turn lane is a more pedestrian and bicycle friendly option that enhances bike lane connectivity and pedestrian safety and is consistent with City policy to promote these modes; and
- Removal of the existing SB free right-turn lane eliminates weaving and merging in the westbound direction of Alton Parkway between vehicles completing the free-right turn and vehicles accessing the adjacent Westpark Plaza commercial center driveway.

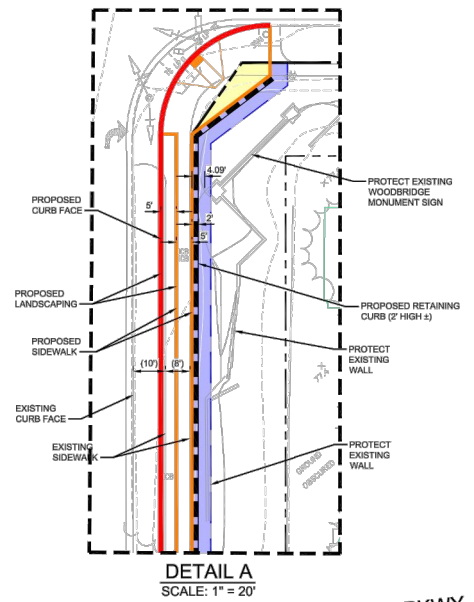


Therefore, Alternative 5 has been identified with concurrence from the City of Irvine as the preferred alternative for preliminary project development. A concept plan for Alternative 5 including Interim Year and Buildout traffic volumes is shown on Figure 7-1.



LEGEND

- PROPOSED CURB
- PROPOSED SIDEWALK
- PROPOSED RETAINING CURB/WALL
- EXISTING RIGHT-OF-WAY
- EXISTING PARCEL LINE
- PROPOSED STRIPING
- TRAFFIC SIGNAL MODIFICATION
- ASSESSOR PARCEL NUMBER
- EXISTING DIMENSION
- PROPOSED CURB DIMENSION
- PROPOSED BUS TURNOUT/PAD
- PROPOSED TCE
- PROPOSED RW ACQUISITION



LEGEND

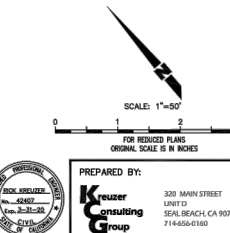
AM PEAK: ###/###/###
PM PEAK: ###/###/###
YELLOW DENOTES CONTROLLING VOLUME

ALTON PKWY & CULVER DR			ALTON PKWY & CULVER DR			ALTON PKWY & CULVER DR		
	ICU	LOS		ICU	LOS		ICU	LOS
AM	0.67	C	AM	0.80	C	AM	0.80	D
PM	0.72	C	PM	0.76	C	PM	0.81	D

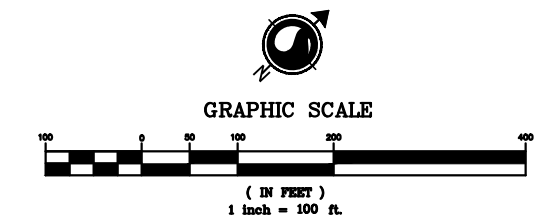
PARCEL 452-081-02
PROPOSED RW ACQUISITION 155 SF
PROPOSED TCE 1,613 SF

POSTED SPEED
NORTH OF ALTON PKWY WEST OF CULVER: CULVER DR 45 MPH, ALTON PKWY 50 MPH
SOUTH OF ALTON PKWY EAST OF CULVER: CULVER DR 50 MPH, ALTON PKWY 45 MPH

DESIGN CRITERIA
DESIGN SPEED = 50 MPH



CITY OF IRVINE
PRECISE ALIGNMENT PLAN
ALTON PARKWAY & CULVER DRIVE
INTERSECTION IMPROVEMENTS
ALTERNATIVE 5



- IMPROVEMENTS**
- ADD N/B THROUGH/ DEFACTO RT LANE ON CULVER DRIVE
 - REMOVE S/B FREE RIGHT TURN LANE AND CONVERT TO STANDARD RIGHT TURN
 - ADD BUS TURNOUT ON NE CORNER FOR N/B BUSES
 - ADD S/B RIGHT TURN OVERLAP PHASING

CULVER DRIVE AND ALTON PARKWAY INTERSECTION IMPROVEMENTS (CIP 311906)

Figure 7-1
Future Traffic Volumes and Alternative 5 Project Intersection Configuration



October 11, 2019
DRAWING: \\at0300-prj\at0300-prj\workgroup_2019\active_2019\2525200\Design\Traffic\report\Figures\Figure 6-1 - Future Traffic Volumes & at 1 Proj Intersection Configuration PLOTTED: 11/14/2019 6:00 PM BY: Phom, Kelly

Appendix A

**Existing Peak Hour
Intersection Turning Movement Counts**

- Tuesday, May 8, 2018

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/8/2018
 Day: Tuesday

	Culver Drive Southbound			Alton Parkway Westbound			Culver Drive Northbound			Alton Parkway Eastbound			TOTAL
	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	
7:00 AM	19	247	21	40	66	25	18	132	26	8	26	29	657
7:15 AM	19	363	47	52	78	20	22	149	38	15	55	30	888
7:30 AM	25	494	50	57	75	31	24	168	59	30	82	50	1145
7:45 AM	46	513	60	87	139	69	14	201	75	30	138	51	1423
8:00 AM	36	415	76	86	200	62	48	255	59	28	85	38	1388
8:15 AM	29	426	86	61	171	45	34	260	66	33	98	39	1348
8:30 AM	20	465	75	73	159	33	26	234	57	39	78	32	1291
8:45 AM	19	410	68	59	137	43	34	243	53	37	109	29	1241
TOTAL VOLUMES:	213	3333	483	515	1025	328	220	1642	433	220	671	298	9381

AM Peak Hr Begins at: 745 AM

PEAK VOLUMES:	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	TOTAL
	131	1819	297	307	669	209	122	950	257	130	399	160	5450

PEAK HR FACTOR:	0.908			0.851			0.918			0.787			0.957
-----------------	-------	--	--	-------	--	--	-------	--	--	-------	--	--	-------

	Culver Drive Southbound			Alton Parkway Westbound			Culver Drive Northbound			Alton Parkway Eastbound			TOTAL
	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	
3:00 PM	28	268	74	48	100	45	52	424	54	48	90	42	1273
3:15 PM	56	248	90	66	123	51	51	392	63	55	103	48	1346
3:30 PM	45	255	62	63	107	56	42	416	48	55	103	53	1305
3:45 PM	52	257	72	60	118	54	40	403	42	34	119	57	1308
4:00 PM	43	218	61	59	105	54	51	431	55	61	110	55	1303
4:15 PM	51	233	65	54	120	54	40	387	85	38	153	44	1324
4:30 PM	48	271	76	52	124	34	46	414	70	32	129	27	1323
4:45 PM	55	272	78	55	130	49	46	450	82	56	148	48	1469
5:00 PM	44	243	73	59	147	52	40	441	72	61	174	57	1463
5:15 PM	52	265	69	52	156	55	44	484	106	62	226	47	1618
5:30 PM	52	313	75	65	163	77	43	506	84	68	207	61	1714
5:45 PM	55	323	96	60	169	60	46	499	106	70	207	51	1742
6:00 PM	57	264	86	56	138	78	37	451	85	66	176	49	1543
6:15 PM	62	294	85	50	134	70	55	484	83	74	178	47	1616
TOTAL VOLUMES:	819	4282	1233	905	2106	937	725	7117	1203	920	2477	782	23506

PM Peak Hr Begins at: 515 PM

PEAK VOLUMES:	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	TOTAL
	216	1165	326	233	626	270	170	1940	381	266	816	208	6617

PEAK HR FACTOR:	0.900			0.925			0.957			0.960			0.950
-----------------	-------	--	--	-------	--	--	-------	--	--	-------	--	--	-------

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/8/2018
 Day: Tuesday

PEDESTRIANS

	North Leg Culver Drive	East Leg Alton Parkway	South Leg Culver Drive	West Leg Alton Parkway	
	Pedestrians	Pedestrians	Pedestrians	Pedestrians	
7:00 AM	7	2	1	4	14
7:15 AM	7	2	1	1	11
7:30 AM	8	2	4	2	16
7:45 AM	16	0	5	4	25
8:00 AM	8	0	2	3	13
8:15 AM	7	1	1	1	10
8:30 AM	4	2	0	2	8
8:45 AM	7	0	1	5	13
TOTAL VOLUMES:	64	9	15	22	110

	North Leg Culver Drive	East Leg Alton Parkway	South Leg Culver Drive	West Leg Alton Parkway	
	Pedestrians	Pedestrians	Pedestrians	Pedestrians	
3:00 PM	18	1	5	7	31
3:15 PM	30	2	5	5	42
3:30 PM	28	2	7	5	42
3:45 PM	7	2	4	3	16
4:00 PM	6	0	1	0	7
4:15 PM	3	1	2	4	10
4:30 PM	5	2	4	5	16
4:45 PM	7	1	2	3	13
5:00 PM	5	4	1	1	11
5:15 PM	2	1	4	5	12
5:30 PM	6	1	0	1	8
5:45 PM	7	3	0	1	11
6:00 PM	5	1	0	4	10
6:15 PM	0	0	4	1	5
TOTAL VOLUMES:	129	21	39	45	234

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/8/2018
 Day: Tuesday

BICYCLES

	Southbound Culver Drive			Westbound Alton Parkway			Northbound Culver Drive			Eastbound Alton Parkway			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	1	0	1	1	0	0	0	0	0	0	0	3
7:45 AM	0	0	0	0	0	0	0	0	1	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	1	0	0	1	0	0	0	0	2
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	2	0	1	2	0	0	1	1	0	0	0	7

	Southbound Culver Drive			Westbound Alton Parkway			Northbound Culver Drive			Eastbound Alton Parkway			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:30 PM	0	1	0	0	0	0	0	0	0	1	0	0	2
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	2	0	0	0	0	0	0	0	0	0	0	2
5:15 PM	0	1	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	1	0	1
6:00 PM	0	0	0	0	1	0	0	1	0	0	1	0	3
6:15 PM	0	1	0	0	0	0	0	1	0	0	0	0	2
TOTAL VOLUMES:	0	5	0	0	1	0	0	4	0	1	2	0	13

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/10/2018
 Day: Thursday

	Culver Drive Southbound			Alton Parkway Westbound			Culver Drive Northbound			Alton Parkway Eastbound			TOTAL
	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	
7:00 AM	20	189	37	31	55	27	26	109	23	6	35	23	581
7:15 AM	29	320	38	38	78	24	15	121	32	20	56	25	796
7:30 AM	24	455	44	59	96	33	32	149	60	22	85	40	1099
7:45 AM	37	473	55	83	128	57	22	210	59	25	123	40	1312
8:00 AM	33	427	73	83	202	76	37	259	65	28	99	34	1416
8:15 AM	28	416	76	57	166	48	29	255	71	42	107	50	1345
8:30 AM	32	477	83	73	160	31	29	234	47	24	94	40	1324
8:45 AM	22	469	72	70	118	39	36	254	73	36	112	27	1328
TOTAL VOLUMES:	225	3226	478	494	1003	335	226	1591	430	203	711	279	9201

AM Peak Hr Begins at: 800 AM

PEAK VOLUMES:	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	TOTAL
	115	1789	304	283	646	194	131	1002	256	130	412	151	5413

PEAK HR FACTOR:	0.932	0.778	0.957	0.871	0.956
-----------------	-------	-------	-------	-------	-------

	Culver Drive Southbound			Alton Parkway Westbound			Culver Drive Northbound			Alton Parkway Eastbound			TOTAL
	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	
3:00 PM	40	243	81	54	111	60	43	298	62	55	83	42	1172
3:15 PM	49	260	73	69	143	59	47	405	74	49	112	50	1390
3:30 PM	49	267	68	82	137	64	53	413	47	47	107	37	1371
3:45 PM	33	265	65	56	139	68	50	446	63	55	140	40	1420
4:00 PM	54	265	65	59	134	62	31	390	58	39	132	55	1344
4:15 PM	55	252	61	43	136	63	37	401	65	49	150	59	1371
4:30 PM	49	258	72	58	128	50	49	407	84	74	158	52	1439
4:45 PM	55	221	65	59	157	46	37	450	72	63	170	43	1438
5:00 PM	50	241	81	54	148	53	31	406	84	71	169	48	1436
5:15 PM	66	292	77	62	166	56	44	511	94	72	229	44	1713
5:30 PM	70	305	63	66	172	57	49	488	109	62	209	40	1690
5:45 PM	70	311	92	65	153	66	53	489	94	79	223	46	1741
6:00 PM	59	298	77	75	151	58	40	467	94	63	183	38	1603
6:15 PM	64	283	70	74	139	54	52	471	81	67	177	47	1579
TOTAL VOLUMES:	886	4342	1157	1025	2304	928	708	6980	1256	975	2602	726	23889

PM Peak Hr Begins at: 515 PM

PEAK VOLUMES:	SL	ST	SR	WL	WT	WR	NL	NT	NR	EL	ET	ER	TOTAL
	265	1206	309	268	642	237	186	1955	391	276	844	168	6747

PEAK HR FACTOR:	0.941	0.972	0.975	0.925	0.969
-----------------	-------	-------	-------	-------	-------

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/10/2018
 Day: Thursday

PEDESTRIANS

	North Leg Culver Drive	East Leg Alton Parkway	South Leg Culver Drive	West Leg Alton Parkway	
	Pedestrians	Pedestrians	Pedestrians	Pedestrians	
7:00 AM	5	1	0	1	7
7:15 AM	6	1	1	3	11
7:30 AM	6	2	3	3	14
7:45 AM	19	1	8	6	34
8:00 AM	8	2	3	4	17
8:15 AM	2	1	2	4	9
8:30 AM	2	3	2	2	9
8:45 AM	8	2	0	3	13
TOTAL VOLUMES:	56	13	19	26	114

	North Leg Culver Drive	East Leg Alton Parkway	South Leg Culver Drive	West Leg Alton Parkway	
	Pedestrians	Pedestrians	Pedestrians	Pedestrians	
3:00 PM	8	1	4	6	19
3:15 PM	24	3	4	3	34
3:30 PM	41	1	6	5	53
3:45 PM	13	1	1	5	20
4:00 PM	7	0	5	6	18
4:15 PM	7	2	1	0	10
4:30 PM	6	1	1	2	10
4:45 PM	6	1	2	1	10
5:00 PM	3	2	2	1	8
5:15 PM	6	3	2	3	14
5:30 PM	2	2	3	5	12
5:45 PM	9	0	3	5	17
6:00 PM	4	0	1	5	10
6:15 PM	6	2	3	3	14
TOTAL VOLUMES:	142	19	38	50	249

Location: Irvine
 N/S: Culver Drive
 E/W: Alton Parkway



ITAM: 229
 Date: 5/10/2018
 Day: Thursday

BICYCLES

	Southbound Culver Drive			Westbound Alton Parkway			Northbound Culver Drive			Eastbound Alton Parkway			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	1	0	0	0	0	1
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	2	0	0	0	0	0	1	0	0	0	0	3

	Southbound Culver Drive			Westbound Alton Parkway			Northbound Culver Drive			Eastbound Alton Parkway			
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	1	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	1	0	0	1	0	0	0	0	2
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VOLUMES:	0	0	0	0	2	0	0	2	0	0	0	0	4

Appendix B

ITAM Model Peak Hour Intersection Traffic Volume Forecasts and Level of Service Computation Worksheets (ICU Calculations)

- Existing (June 2019)

229 . Culver Dr. at Alton Pkwy.

ITAM 18 Existing Conditions (IRVINE ISEC)

	LANES	CAPACITY	AM PK HOUR VOL	HOUR V/C	PM PK HOUR VOL	HOUR V/C
NBL	2	3400	127	.04*	178	.05
NBT	3	5100	976	.19	1948	.38*
NBR	1	1700	257	.15	386	.23
SBL	2	3400	123	.04	241	.07*
SBT	3	5100	1804	.35*	1186	.23
SBR	f		301		318	
EBL	2	3400	130	.04*	271	.08
EBT	2	3400	406	.12	830	.24*
EBR	1	1700	156	.09	188	.11
WBL	2	3400	295	.09	251	.07*
WBT	2	3400	658	.19*	634	.19
WBR	1	1700	202	.12	254	.15
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				.67		.81

229 . Culver Dr. at Alton Pkwy.

ITAM 18 Interim With Update (IRVINE ISEC)						
	LANES	CAPACITY	AM PK HOUR VOL	HOUR V/C	PM PK HOUR VOL	HOUR V/C
NBL	2	3400	165	.05*	232	.07
NBT	3	5100	1051	.21	2045	.40*
NBR	1	1700	286	.17	337	.20
SBL	2	3400	172	.05	259	.08*
SBT	3	5100	2151	.42*	1181	.23
SBR	f		345		292	
EBL	2	3400	165	.05*	352	.10
EBT	2	3400	482	.14	844	.25*
EBR	1	1700	163	.10	286	.17
WBL	2	3400	296	.09	263	.08*
WBT	2	3400	770	.23*	706	.21
WBR	1	1700	204	.12	243	.14
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				.80		.86

229 . Culver Dr. at Alton Pkwy.

ITAM 18 Buildout With Update (IRVINE ISEC)						
	LANES	CAPACITY	AM PK HOUR VOL	V/C	PM PK HOUR VOL	V/C
NBL	2	3400	139	.04*	246	.07
NBT	3	5100	1109	.22	2266	.44*
NBR	1	1700	317	.19	368	.22
SBL	2	3400	222	.07	292	.09*
SBT	3	5100	2215	.43*	1259	.25
SBR	f		336		318	
EBL	2	3400	218	.06	363	.11*
EBT	2	3400	672	.20*	861	.25
EBR	1	1700	181	.11	275	.16
WBL	2	3400	287	.08*	278	.08
WBT	2	3400	707	.21	767	.23*
WBR	1	1700	235	.14	274	.16
Clearance Interval				.05*		.05*
TOTAL CAPACITY UTILIZATION				.80		.92

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Existing Peak Hour Volumes w/ Ex. Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	127	178	0.04 *	0.05
NT	3	5100	976	1948	0.19	0.38 *
NR	1	1700	257	386	0.15	0.23
SL	2	3400	123	241	0.04	0.07 *
ST	3	5100	1804	1186	0.35 *	0.23
SR (Free)	1	1700	301	318	0.18	0.19
EL	2	3400	130	271	0.04 *	0.08
ET	2	3400	406	830	0.12	0.24 *
ER	1	1700	156	188	0.09	0.11
WL	2	3400	295	251	0.09	0.07 *
WT	2	3400	658	634	0.19 *	0.19
WR	1	1700	202	254	0.12	0.15

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.67	0.81
LOS	B	D

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Interim Year Peak Hour Volumes w/ Ex. Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	165	232	0.05 *	0.07
NT	3	5100	1051	2045	0.21	0.40 *
NR	1	1700	286	337	0.17	0.20
SL	2	3400	172	259	0.05	0.08 *
ST	3	5100	2151	1181	0.42 *	0.23
SR (Free)	1	1700	345	292	0.20	0.17
EL	2	3400	165	352	0.05 *	0.10
ET	2	3400	482	844	0.14	0.25 *
ER	1	1700	163	286	0.10	0.17
WL	2	3400	296	263	0.09	0.08 *
WT	2	3400	770	706	0.23 *	0.21
WR	1	1700	204	243	0.12	0.14

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.80	0.86
LOS	C	D

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Buildout Peak Hour Volumes w/ Ex. Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	139	246	0.04 *	0.07
NT	3	5100	1109	2266	0.22	0.44 *
NR	1	1700	317	368	0.19	0.22
SL	2	3400	222	292	0.07	0.09 *
ST	3	5100	2215	1259	0.43 *	0.25
SR (Free)	1	1700	336	318	0.20	0.19
EL	2	3400	218	363	0.06	0.11 *
ET	2	3400	672	861	0.20 *	0.25
ER	1	1700	181	275	0.11	0.16
WL	2	3400	287	278	0.08 *	0.08
WT	2	3400	707	767	0.21	0.23 *
WR	1	1700	235	274	0.14	0.16

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.80	0.92
LOS	C	E

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Existing Peak Hour Volumes w/ Alt.1. Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	127	178	0.04 *	0.05
NT	3	5100	976	1948	0.19	0.38 *
NR	1	1700	257	386	0.15	0.23
SL	2	3400	123	241	0.04	0.07 *
ST	3	5100	1804	1186	0.35 *	0.23
SR (Free)	1	1700	301	318	0.18	0.19
EL	2	3400	130	271	0.04 *	0.08 *
ET	3	5100	406	830	0.08	0.16
ER (d)	1	1700	156	188	0.09	0.11
WL	2	3400	295	251	0.09	0.07
WT	2	3400	658	634	0.19 *	0.19 *
WR	1	1700	202	254	0.12	0.15

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.67	0.77
LOS	B	C

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Interim Year Peak Hour Volumes w/ Alt.1 Imps. **DATE:** 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	165	232	0.05 *	0.07
NT	3	5100	1051	2045	0.21	0.40 *
NR	1	1700	286	337	0.17	0.20
SL	2	3400	172	259	0.05	0.08 *
ST	3	5100	2151	1181	0.42 *	0.23
SR (Free)	1	1700	345	292	0.20	0.17
EL	2	3400	165	352	0.05 *	0.10 *
ET	3	5100	482	844	0.09	0.17
ER(d)	1	1700	163	286	0.10	0.17
WL	2	3400	296	263	0.09	0.08
WT	2	3400	770	706	0.23 *	0.21 *
WR	1	1700	204	243	0.12	0.14

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.80	0.84
LOS	C	D

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Buildout Peak Hour Volumes w/ Alt.1 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	139	246	0.04 *	0.07
NT	3	5100	1109	2266	0.22	0.44 *
NR	1	1700	317	368	0.19	0.22
SL	2	3400	222	292	0.07	0.09 *
ST	3	5100	2215	1259	0.43 *	0.25
SR (Free)	1	1700	336	318	0.20	0.19
EL	2	3400	218	363	0.06 *	0.11 *
ET	3	5100	672	861	0.13	0.17
ER (d)	1	1700	181	275	0.11	0.16
WL	2	3400	287	278	0.08	0.08
WT	2	3400	707	767	0.21 *	0.23 *
WR	1	1700	235	274	0.14	0.16

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.79	0.92
LOS	C	E

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Existing Peak Hour Volumes w/ Alt.2. Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	127	178	0.04 *	0.05
NT	3	5100	976	1948	0.19	0.38 *
NR	1	1700	257	386	0.15	0.23
SL	2	3400	123	241	0.04	0.07 *
ST	3	5100	1804	1186	0.35 *	0.23
SR (Free)	1	1700	301	318	0.18	0.19
EL	2	3400	130	271	0.04 *	0.08
ET	3	5100	406	830	0.08	0.16 *
ER(d)	1	1700	156	188	0.09	0.11
WL	2	3400	295	251	0.09	0.07 *
WT	3	5100	658	634	0.13 *	0.12
WR(d)	1	1700	202	254	0.12	0.15

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.61	0.73
LOS	B	C

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

INTERSECTION CAPACITY UTILIZATION CALCULATION WORKSHEET

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Interim Year Peak Hour Volumes w/ Alt.2 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	165	232	0.05 *	0.07
NT	3	5100	1051	2045	0.21	0.40 *
NR	1	1700	286	337	0.17	0.20
SL	2	3400	172	259	0.05	0.08 *
ST	3	5100	2151	1181	0.42 *	0.23
SR (Free)	1	1700	345	292	0.20	0.17
EL	2	3400	165	352	0.05 *	0.10
ET	3	5100	482	844	0.09	0.17 *
ER(d)	1	1700	163	286	0.10	0.17
WL	2	3400	296	263	0.09	0.08 *
WT	3	5100	770	706	0.15 *	0.14
WR(d)	1	1700	204	243	0.12	0.14

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.72	0.78
LOS	C	C

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Buildout Peak Hour Volumes w/ Alt.2 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	139	246	0.04 *	0.07
NT	3	5100	1109	2266	0.22	0.44 *
NR	1	1700	317	368	0.19	0.22
SL	2	3400	222	292	0.07	0.09 *
ST	3	5100	2215	1259	0.43 *	0.25
SR (Free)	1	1700	336	318	0.20	0.19
EL	2	3400	218	363	0.06	0.11 *
ET	3	5100	672	861	0.13 *	0.17
ER (d)	1	1700	181	275	0.11	0.16
WL	2	3400	287	278	0.08 *	0.08
WT	3	5100	707	767	0.14	0.15 *
WR(d)	1	1700	235	274	0.14	0.16

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.73	0.84
LOS	C	D

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Existing Peak Hour Volumes w/ Alt.3 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	127	178	0.04 *	0.05
NT	4	6800	976	1948	0.14	0.29 *
NR	1	1700	257	386	0.15	0.23
SL	2	3400	123	241	0.04	0.07 *
ST	3	5100	1804	1186	0.35 *	0.23
SR (Free)	1	1700	301	318	0.18	0.19
EL	2	3400	130	271	0.04 *	0.08
ET	2	3400	406	830	0.12	0.24 *
ER	1	1700	156	188	0.09	0.11
WL	2	3400	295	251	0.09	0.07 *
WT	2	3400	658	634	0.19 *	0.19
WR	1	1700	202	254	0.12	0.15

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.67	0.72
LOS	B	C

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

INTERSECTION CAPACITY UTILIZATION CALCULATION WORKSHEET

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Interim Year Peak Hour Volumes w/ Alt.3 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	165	232	0.05 *	0.07
NT	4	6800	1051	2045	0.15	0.30 *
NR	1	1700	286	337	0.17	0.20
SL	2	3400	172	259	0.05	0.08 *
ST	3	5100	2151	1181	0.42 *	0.23
SR (Free)	1	1700	345	292	0.20	0.17
EL	2	3400	165	352	0.05 *	0.10
ET	2	3400	482	844	0.14	0.25 *
ER	1	1700	163	286	0.10	0.17
WL	2	3400	296	263	0.09	0.08 *
WT	2	3400	770	706	0.23 *	0.21
WR	1	1700	204	243	0.12	0.14

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.80	0.76
LOS	C	C

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

**INTERSECTION CAPACITY UTILIZATION
CALCULATION WORKSHEET**

INTERSECTION 229. Culver Drive (N/S) and Alton Parkway (E/W)

CONDITION: Buildout Peak Hour Volumes w/ Alt.3 Imps.

DATE: 06-Jun-19

INTERSECTION CAPACITY UTILIZATION (ICU) ANALYSIS

MOVEMENT	LANES	SAT. CAPACITY (C)	VOLUME		V/C	
			AM	PM	AM	PM
NL	2	3400	139	246	0.04 *	0.07
NT	4	6800	1109	2266	0.16	0.33 *
NR	1	1700	317	368	0.19	0.22
SL	2	3400	222	292	0.07	0.09 *
ST	3	5100	2215	1259	0.43 *	0.25
SR (Free)	1	1700	336	318	0.20	0.19
EL	2	3400	218	363	0.06	0.11 *
ET	2	3400	672	861	0.20 *	0.25
ER	1	1700	181	275	0.11	0.16
WL	2	3400	287	278	0.08 *	0.08
WT	2	3400	707	767	0.21	0.23 *
WR	1	1700	235	274	0.14	0.16

(d) - defacto right turn lane

CLEARANCE	0.05	0.05
CRITICAL RIGHT	-	-
ICU	0.80	0.81
LOS	C	D

NOTE: ICU is the sum of critical movements denoted by an asterisk (*) plus critical right-turn value if any.

Appendix C

Alternatives 4 and 5 Operational Analysis Queue Reports

Appendix C-1
Existing Volumes
(150 sec cycle)
AM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

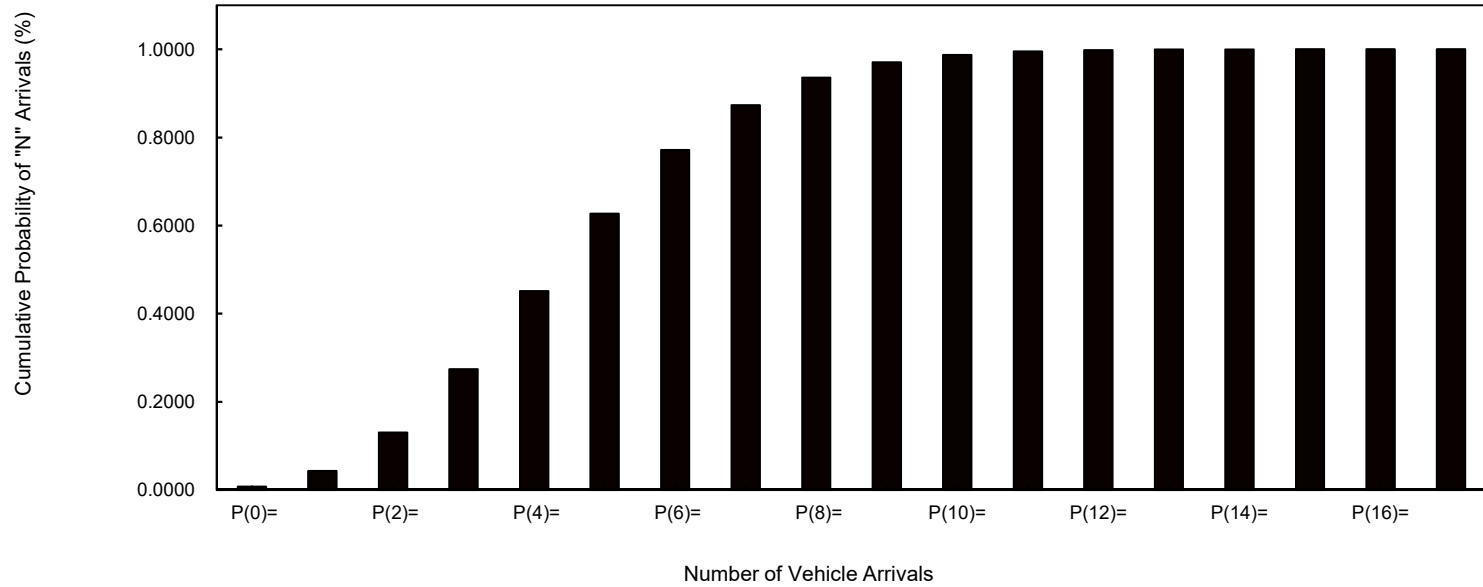
DATE: 13-Nov-19

140	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
127	PEAK HOUR VOLUME
4.94	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0072		
P(1)=	0.0354	P(21)=	0.0000
P(2)=	0.0874	P(22)=	0.0000
P(3)=	0.1438	P(23)=	0.0000
P(4)=	0.1776	P(24)=	0.0000
P(5)=	0.1754	P(25)=	0.0000
P(6)=	0.1444	P(26)=	0.0000
P(7)=	0.1019	P(27)=	0.0000
P(8)=	0.0629	P(28)=	0.0000
P(9)=	0.0345	P(29)=	0.0000
P(10)=	0.0170	P(30)=	0.0000
P(11)=	0.0077	P(31)=	0.0000
P(12)=	0.0031	P(32)=	0.0000
P(13)=	0.0012	P(33)=	0.0000
P(14)=	0.0004	P(34)=	0.0000
P(15)=	0.0001	P(35)=	0.0000
P(16)=	0.0000	P(36)=	0.0000
P(17)=	0.0000	P(37)=	0.0000
P(18)=	0.0000	P(38)=	0.0000
P(19)=	0.0000	P(39)=	0.0000
P(20)=	0.0000	P(40)=	0.0000

9 vehicles @ 25'/vehicle = 225' Storage Length/2 lanes @ 115' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

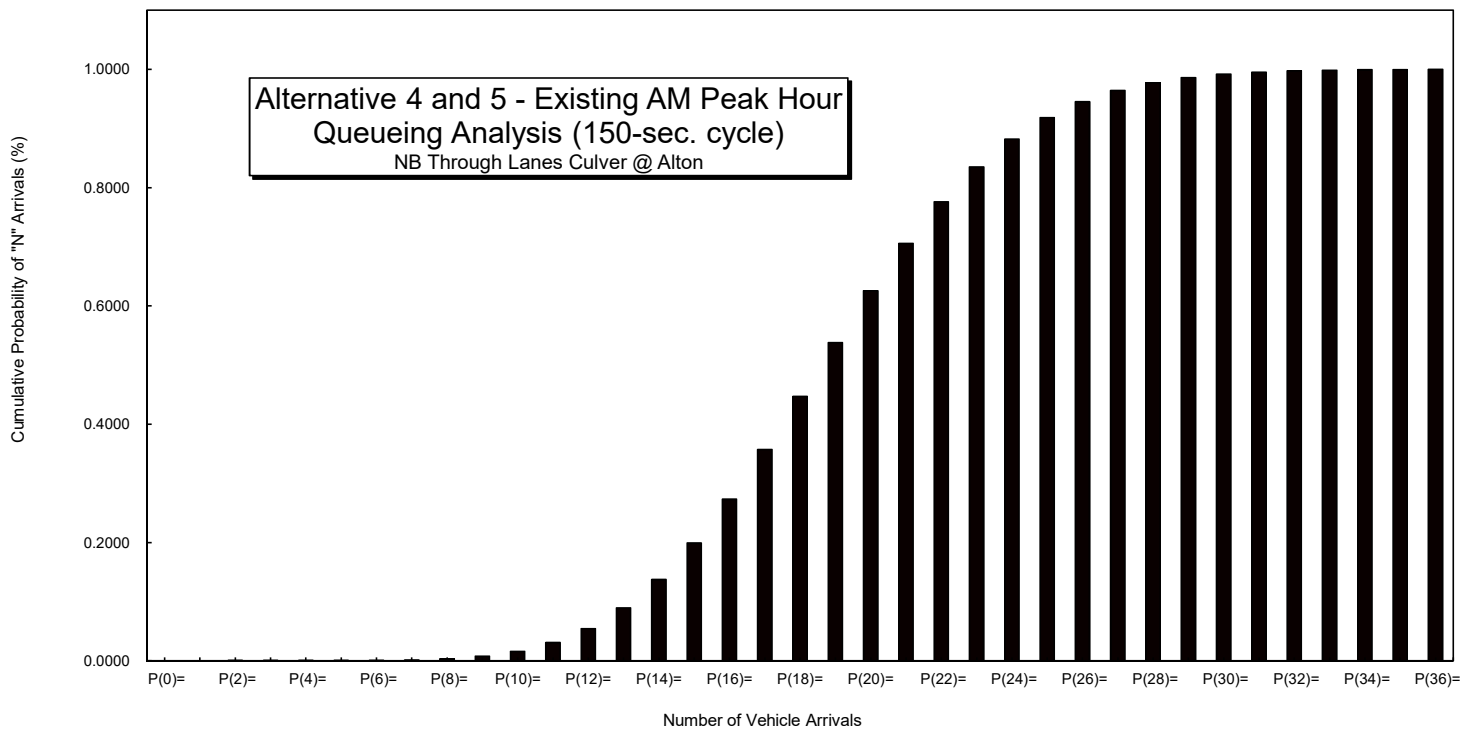
CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

DATE: 13-Nov-19

71	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
976	PEAK HOUR VOLUME
19.25	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(21)=	0.0803	0.7058
P(2)=	0.0000	0.0000	P(22)=	0.0702	0.7760
P(3)=	0.0000	0.0000	P(23)=	0.0588	0.8347
P(4)=	0.0000	0.0000	P(24)=	0.0471	0.8819
P(5)=	0.0001	0.0001	P(25)=	0.0363	0.9182
P(6)=	0.0003	0.0004	P(26)=	0.0269	0.9450
P(7)=	0.0008	0.0013	P(27)=	0.0192	0.9642
P(8)=	0.0020	0.0033	P(28)=	0.0132	0.9774
P(9)=	0.0044	0.0077	P(29)=	0.0087	0.9861
P(10)=	0.0084	0.0161	P(30)=	0.0056	0.9917
P(11)=	0.0147	0.0308	P(31)=	0.0035	0.9952
P(12)=	0.0236	0.0544	P(32)=	0.0021	0.9973
P(13)=	0.0349	0.0893	P(33)=	0.0012	0.9985
P(14)=	0.0480	0.1374	P(34)=	0.0007	0.9992
P(15)=	0.0616	0.1990	P(35)=	0.0004	0.9996
P(16)=	0.0742	0.2732	P(36)=	0.0002	0.9998
P(17)=	0.0840	0.3572	P(37)=	0.0001	0.9999
P(18)=	0.0898	0.4470	P(38)=	0.0001	0.9999
P(19)=	0.0910	0.5379	P(39)=	0.0000	1.0000
P(20)=	0.0876	0.6255	P(40)=	0.0000	1.0000

27 vehicles @ 25'/vehicle = 675' Storage Length/4 lanes @ 170' each



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

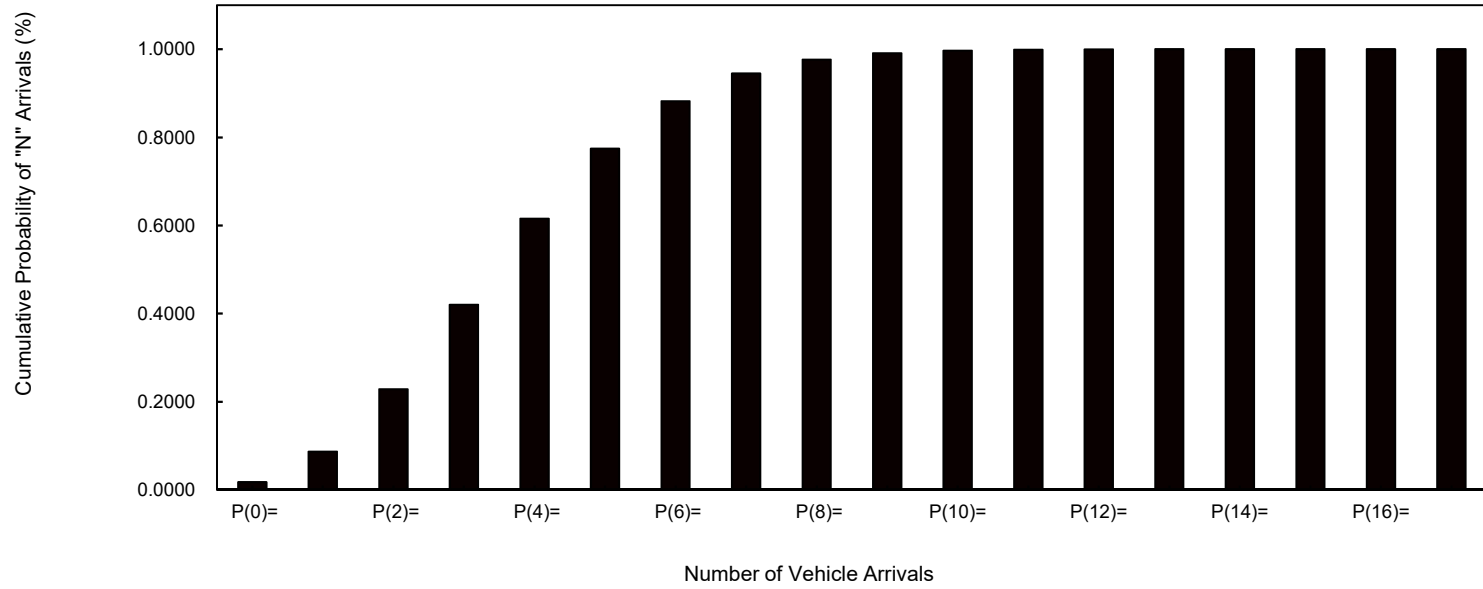
DATE: 13-Nov-19

57	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
257	PEAK HOUR VOLUME
4.07	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>		
P(0)=	0.0171	0.0171			
P(1)=	0.0695	0.0866	P(21)=	0.0000	1.0000
P(2)=	0.1415	0.2281	P(22)=	0.0000	1.0000
P(3)=	0.1919	0.4201	P(23)=	0.0000	1.0000
P(4)=	0.1953	0.6153	P(24)=	0.0000	1.0000
P(5)=	0.1589	0.7742	P(25)=	0.0000	1.0000
P(6)=	0.1078	0.8820	P(26)=	0.0000	1.0000
P(7)=	0.0626	0.9446	P(27)=	0.0000	1.0000
P(8)=	0.0319	0.9765	P(28)=	0.0000	1.0000
P(9)=	0.0144	0.9909	P(29)=	0.0000	1.0000
P(10)=	0.0059	0.9968	P(30)=	0.0000	1.0000
P(11)=	0.0022	0.9989	P(31)=	0.0000	1.0000
P(12)=	0.0007	0.9997	P(32)=	0.0000	1.0000
P(13)=	0.0002	0.9999	P(33)=	0.0000	1.0000
P(14)=	0.0001	1.0000	P(34)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

8 vehicles @ 25'/vehicle = 200' Storage Length

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

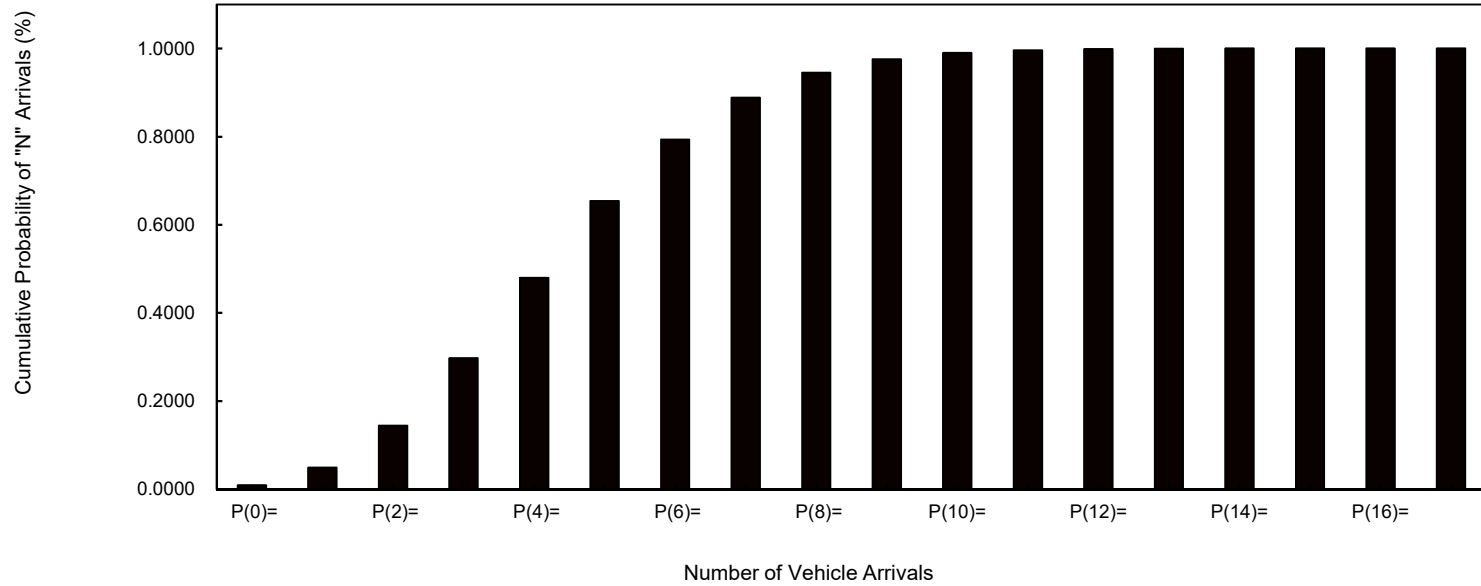
DATE: 13-Nov-19

140	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
123	PEAK HOUR VOLUME
4.78	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0084		
P(1)=	0.0400		
P(2)=	0.0957		
P(3)=	0.1526		
P(4)=	0.1825		
P(5)=	0.1746		
P(6)=	0.1392		
P(7)=	0.0951		
P(8)=	0.0569		
P(9)=	0.0302		
P(10)=	0.0145		
P(11)=	0.0063		
P(12)=	0.0025		
P(13)=	0.0009		
P(14)=	0.0003		
P(15)=	0.0001		
P(16)=	0.0000		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

9 vehicles @ 25'/vehicle = 225' Storage Length/2 lanes @ 115' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

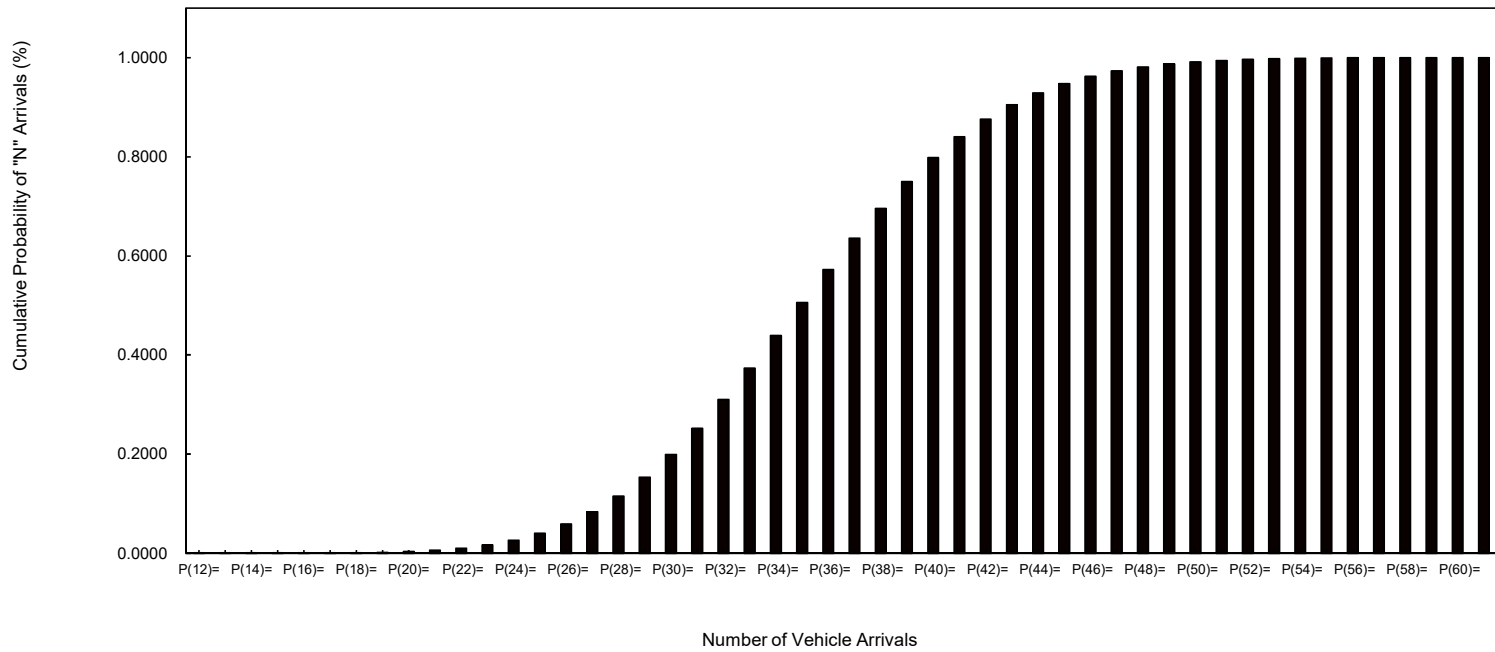
CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle) DATE: 14-Nov-19

71	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1804	PEAK HOUR VOLUME
35.58	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(36)=	0.0662	0.5721
P(2)=	0.0000	0.0000	P(37)=	0.0636	0.6357
P(3)=	0.0000	0.0000	P(38)=	0.0596	0.6953
P(4)=	0.0000	0.0000	P(39)=	0.0544	0.7496
P(5)=	0.0000	0.0000	P(40)=	0.0483	0.7980
P(6)=	0.0000	0.0000	P(41)=	0.0420	0.8399
P(7)=	0.0000	0.0000	P(42)=	0.0355	0.8755
P(8)=	0.0000	0.0000	P(43)=	0.0294	0.9049
P(9)=	0.0000	0.0000	P(44)=	0.0238	0.9287
P(10)=	0.0000	0.0000	P(45)=	0.0188	0.9475
P(11)=	0.0000	0.0000	P(46)=	0.0145	0.9620
P(12)=	0.0000	0.0000	P(47)=	0.0110	0.9730
P(13)=	0.0000	0.0000	P(48)=	0.0082	0.9812
P(14)=	0.0000	0.0000	P(49)=	0.0059	0.9871
P(15)=	0.0001	0.0001	P(50)=	0.0042	0.9913
P(16)=	0.0001	0.0002	P(51)=	0.0029	0.9942
P(17)=	0.0002	0.0004	P(52)=	0.0020	0.9962
P(18)=	0.0005	0.0009	P(53)=	0.0014	0.9976
P(19)=	0.0009	0.0018	P(54)=	0.0009	0.9985
P(20)=	0.0015	0.0033	P(55)=	0.0006	0.9991
P(21)=	0.0026	0.0059	P(56)=	0.0004	0.9994
P(22)=	0.0042	0.0101	P(57)=	0.0002	0.9997
P(23)=	0.0065	0.0166	P(58)=	0.0001	0.9998
P(24)=	0.0096	0.0262	P(59)=	0.0001	0.9999
P(25)=	0.0137	0.0400	P(60)=	0.0001	0.9999
P(26)=	0.0188	0.0587	P(61)=	0.0000	1.0000
P(27)=	0.0247	0.0835	P(62)=	0.0000	1.0000
P(28)=	0.0314	0.1149	P(63)=	0.0000	1.0000
P(29)=	0.0386	0.1535	P(64)=	0.0000	1.0000
P(30)=	0.0458	0.1993	P(65)=	0.0000	1.0000
P(31)=	0.0525	0.2518	P(66)=	0.0000	1.0000
P(32)=	0.0584	0.3101	P(67)=	0.0000	1.0000
P(33)=	0.0629	0.3731	P(68)=	0.0000	1.0000
P(34)=	0.0659	0.4390	P(69)=	0.0000	1.0000
P(35)=	0.0670	0.5059	P(70)=	0.0000	1.0000

46 vehicles @ 25'/vehicle = 1150' Storage Length/3 lanes @ 385' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

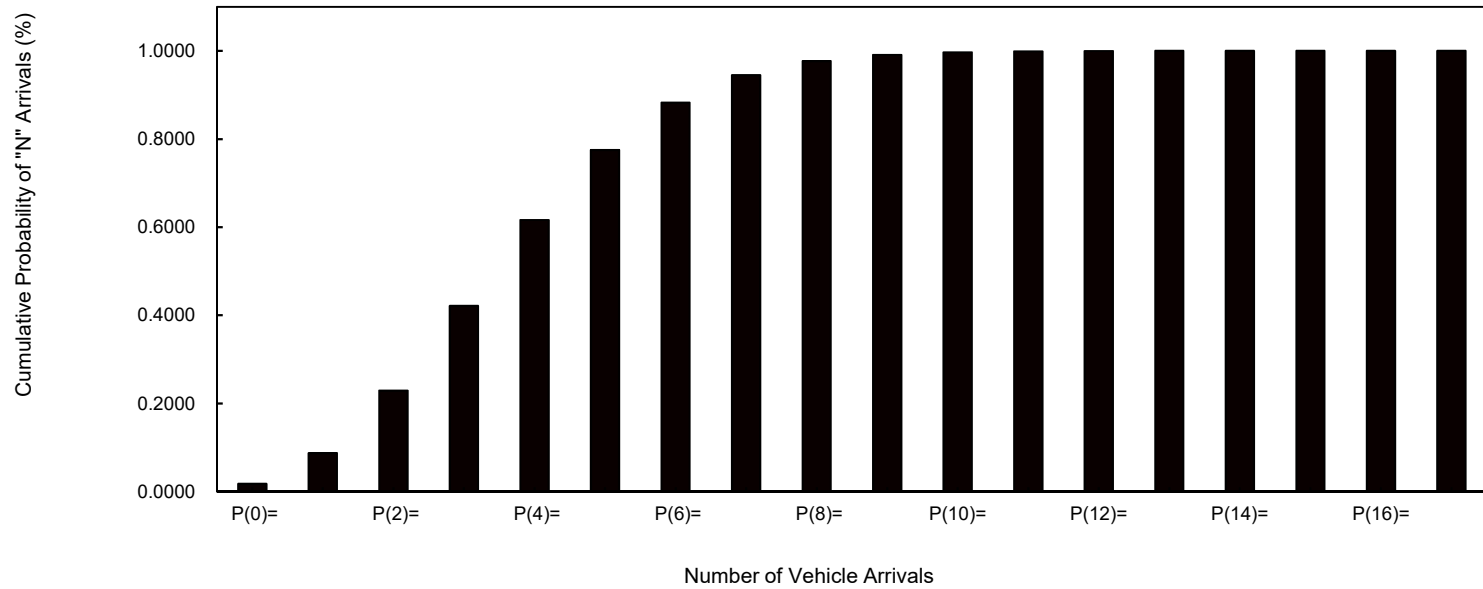
CONDITION: AM Pk Hr - Ex. Vols. - Alt. 5 Improvements (150-sec cycle) DATE: 13-Nov-19

62	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
236	PEAK HOUR VOLUME
4.06	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE		
P(0)=	0.0172	0.0172			
P(1)=	0.0698	0.0870	P(21)=	0.0000	1.0000
P(2)=	0.1418	0.2288	P(22)=	0.0000	1.0000
P(3)=	0.1922	0.4210	P(23)=	0.0000	1.0000
P(4)=	0.1953	0.6162	P(24)=	0.0000	1.0000
P(5)=	0.1587	0.7750	P(25)=	0.0000	1.0000
P(6)=	0.1075	0.8825	P(26)=	0.0000	1.0000
P(7)=	0.0624	0.9449	P(27)=	0.0000	1.0000
P(8)=	0.0317	0.9767	P(28)=	0.0000	1.0000
P(9)=	0.0143	0.9910	P(29)=	0.0000	1.0000
P(10)=	0.0058	0.9968	P(30)=	0.0000	1.0000
P(11)=	0.0022	0.9990	P(31)=	0.0000	1.0000
P(12)=	0.0007	0.9997	P(32)=	0.0000	1.0000
P(13)=	0.0002	0.9999	P(33)=	0.0000	1.0000
P(14)=	0.0001	1.0000	P(34)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

8 vehicles @ 25'/vehicle = 200' Storage Length

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec cycle)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

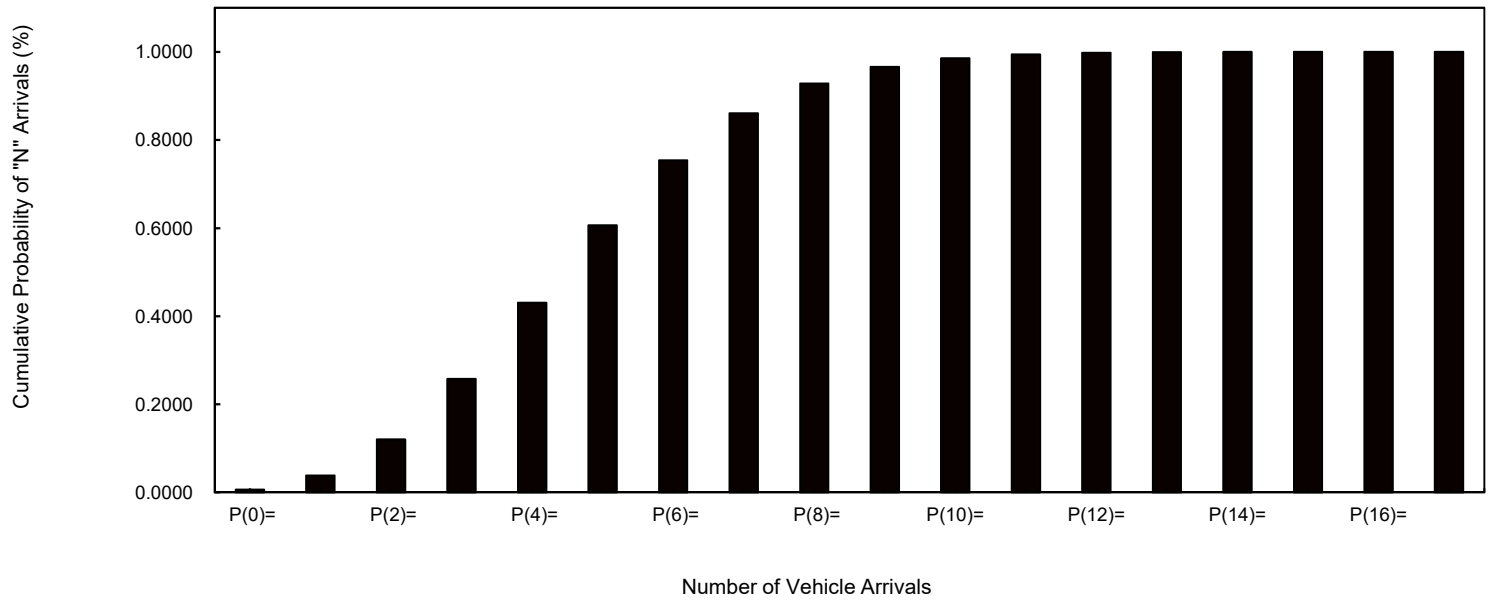
DATE: 13-Nov-19

140	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
130	PEAK HOUR VOLUME
5.06	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0064		
P(1)=	0.0322		
P(2)=	0.0815		
P(3)=	0.1373		
P(4)=	0.1735		
P(5)=	0.1754		
P(6)=	0.1478		
P(7)=	0.1067		
P(8)=	0.0675		
P(9)=	0.0379		
P(10)=	0.0192		
P(11)=	0.0088		
P(12)=	0.0037		
P(13)=	0.0014		
P(14)=	0.0005		
P(15)=	0.0002		
P(16)=	0.0001		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

9 vehicles @ 25'/vehicle =225' Storage Length/2 lanes @ 115' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

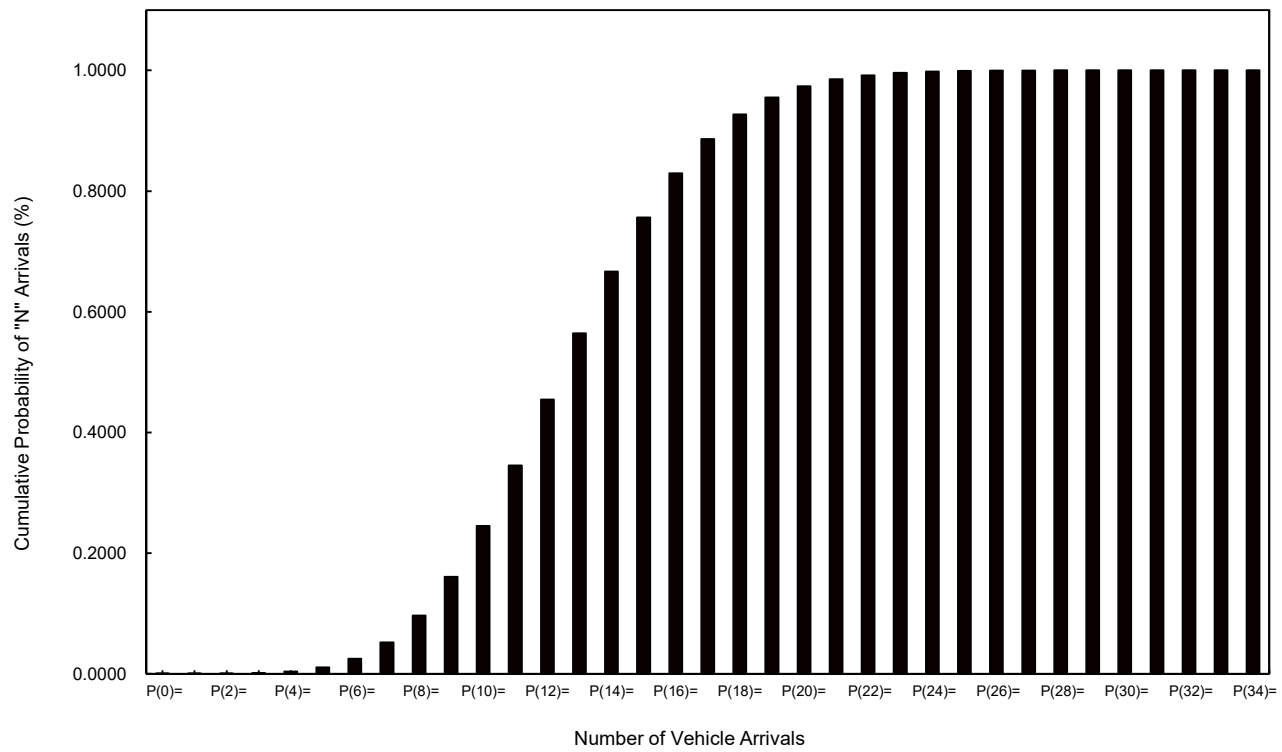
DATE: 13-Nov-19

116	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
406	PEAK HOUR VOLUME
13.08	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0115
P(2)=	0.0002	P(22)=	0.0068
P(3)=	0.0008	P(23)=	0.0039
P(4)=	0.0025	P(24)=	0.0021
P(5)=	0.0066	P(25)=	0.0011
P(6)=	0.0145	P(26)=	0.0006
P(7)=	0.0271	P(27)=	0.0003
P(8)=	0.0443	P(28)=	0.0001
P(9)=	0.0644	P(29)=	0.0001
P(10)=	0.0842	P(30)=	0.0000
P(11)=	0.1002	P(31)=	0.0000
P(12)=	0.1092	P(32)=	0.0000
P(13)=	0.1099	P(33)=	0.0000
P(14)=	0.1027	P(34)=	0.0000
P(15)=	0.0896	P(35)=	0.0000
P(16)=	0.0732	P(36)=	0.0000
P(17)=	0.0564	P(37)=	0.0000
P(18)=	0.0410	P(38)=	0.0000
P(19)=	0.0282	P(39)=	0.0000
P(20)=	0.0184	P(40)=	0.0000

19 vehicles @ 25'/vehicle = 475' Storage Length/2 lanes @ 240' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

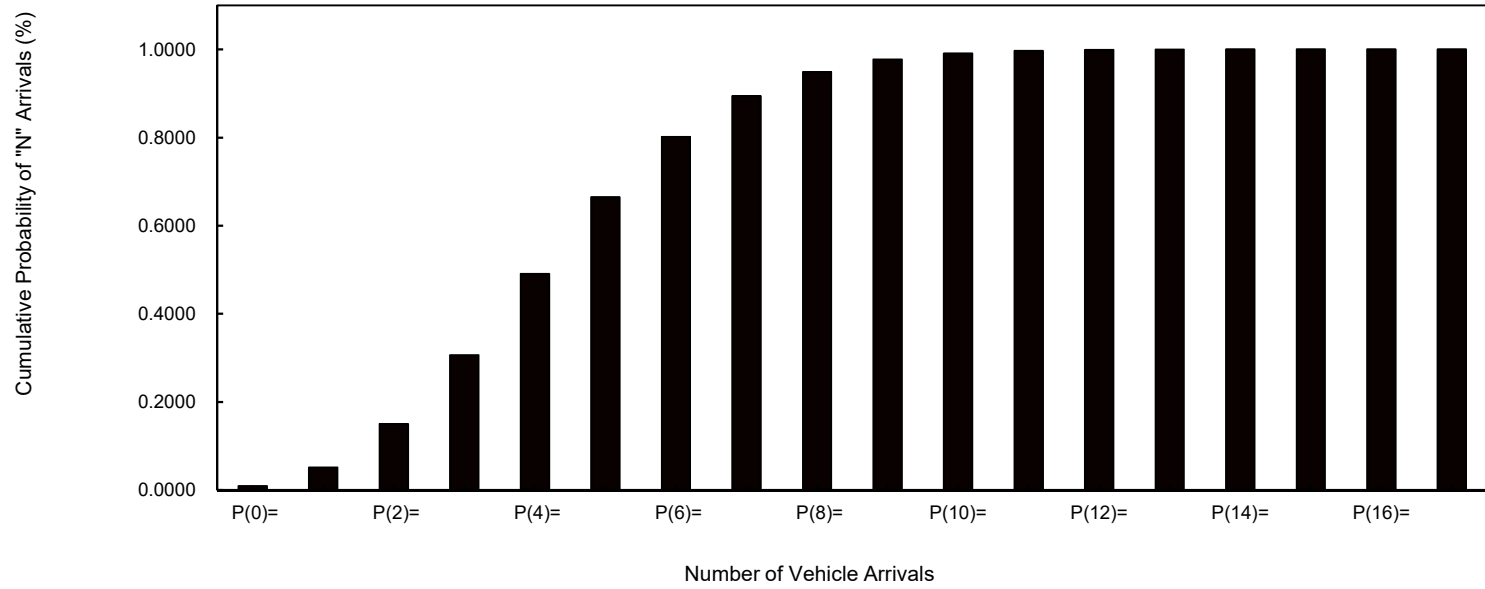
DATE: 13-Nov-19

109	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
156	PEAK HOUR VOLUME
4.72	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0089		
P(1)=	0.0420		
P(2)=	0.0991		
P(3)=	0.1561		
P(4)=	0.1843		
P(5)=	0.1741		
P(6)=	0.1370		
P(7)=	0.0925		
P(8)=	0.0546		
P(9)=	0.0287		
P(10)=	0.0135		
P(11)=	0.0058		
P(12)=	0.0023		
P(13)=	0.0008		
P(14)=	0.0003		
P(15)=	0.0001		
P(16)=	0.0000		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

9 vehicles @ 25'/vehicle = 225' Storage Length

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

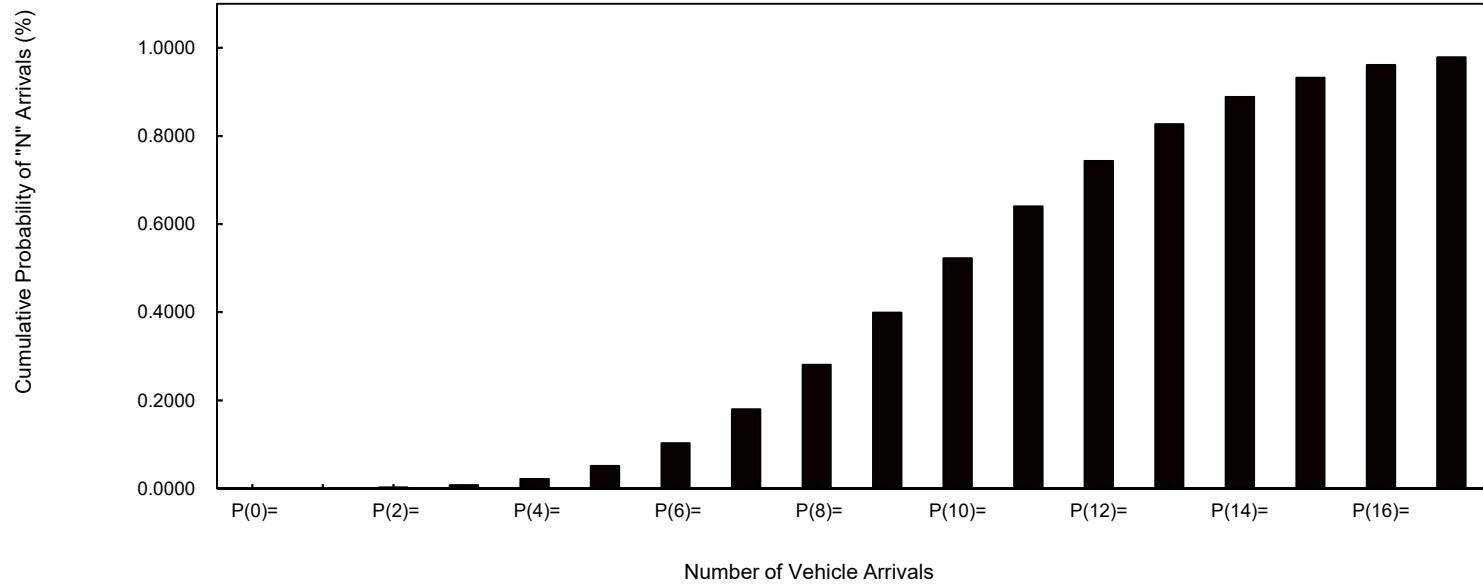
DATE: 13-Nov-19

128	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
295	PEAK HOUR VOLUME
10.49	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0003		
P(2)=	0.0015		
P(3)=	0.0054		
P(4)=	0.0140		
P(5)=	0.0295		
P(6)=	0.0515		
P(7)=	0.0772		
P(8)=	0.1012		
P(9)=	0.1179		
P(10)=	0.1237		
P(11)=	0.1179		
P(12)=	0.1031		
P(13)=	0.0832		
P(14)=	0.0623		
P(15)=	0.0436		
P(16)=	0.0286		
P(17)=	0.0176		
P(18)=	0.0103		
P(19)=	0.0057		
P(20)=	0.0030		
		P(21)=	0.0015
		P(22)=	0.0007
		P(23)=	0.0003
		P(24)=	0.0001
		P(25)=	0.0001
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

16 vehicles @ 25'/vehicle = 400' Storage Length/2 lanes @ 200' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

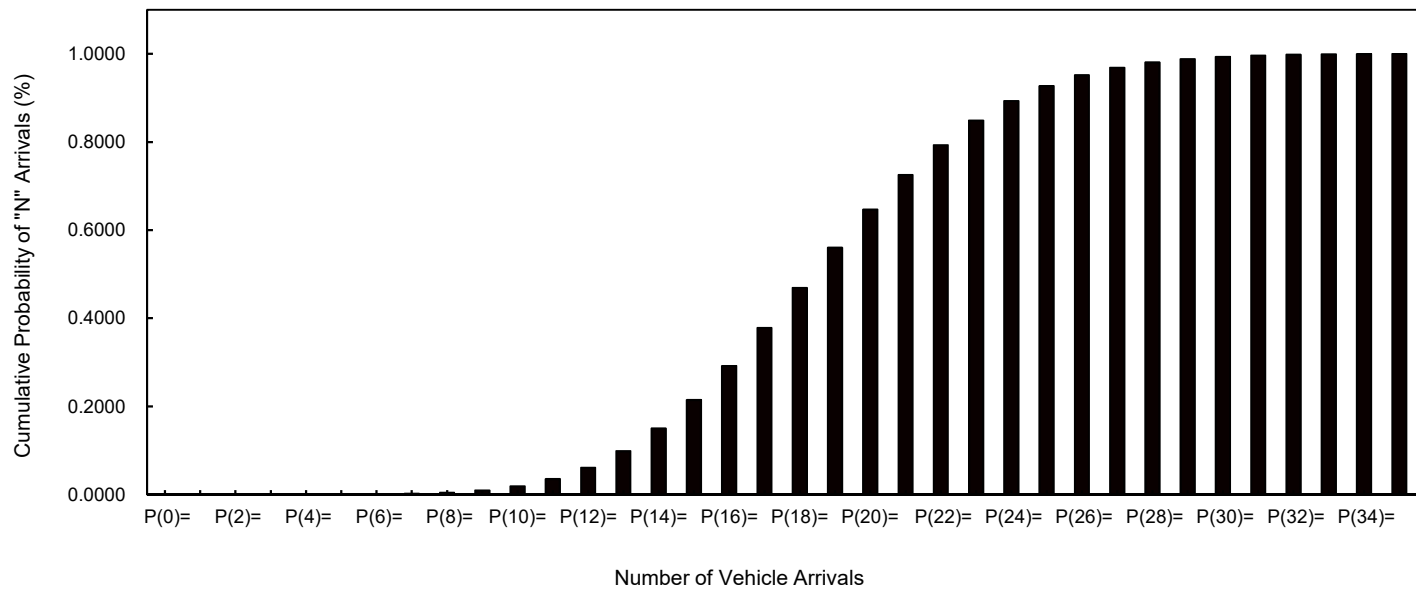
DATE: 13-Nov-19

104	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
658	PEAK HOUR VOLUME
19.01	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0000		
P(3)=	0.0000		
P(4)=	0.0000		
P(5)=	0.0001		
P(6)=	0.0004		
P(7)=	0.0010		
P(8)=	0.0023		
P(9)=	0.0050		
P(10)=	0.0094		
P(11)=	0.0163		
P(12)=	0.0258		
P(13)=	0.0377		
P(14)=	0.0512		
P(15)=	0.0649		
P(16)=	0.0771		
P(17)=	0.0862		
P(18)=	0.0911		
P(19)=	0.0911		
P(20)=	0.0866		
		P(21)=	0.0784
		P(22)=	0.0677
		P(23)=	0.0560
		P(24)=	0.0443
		P(25)=	0.0337
		P(26)=	0.0246
		P(27)=	0.0174
		P(28)=	0.0118
		P(29)=	0.0077
		P(30)=	0.0049
		P(31)=	0.0030
		P(32)=	0.0018
		P(33)=	0.0010
		P(34)=	0.0006
		P(35)=	0.0003
		P(36)=	0.0002
		P(37)=	0.0001
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

26 vehicles @ 25'/vehicle = 650' Storage Length/2 lanes @ 325' each

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Pk Hr - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

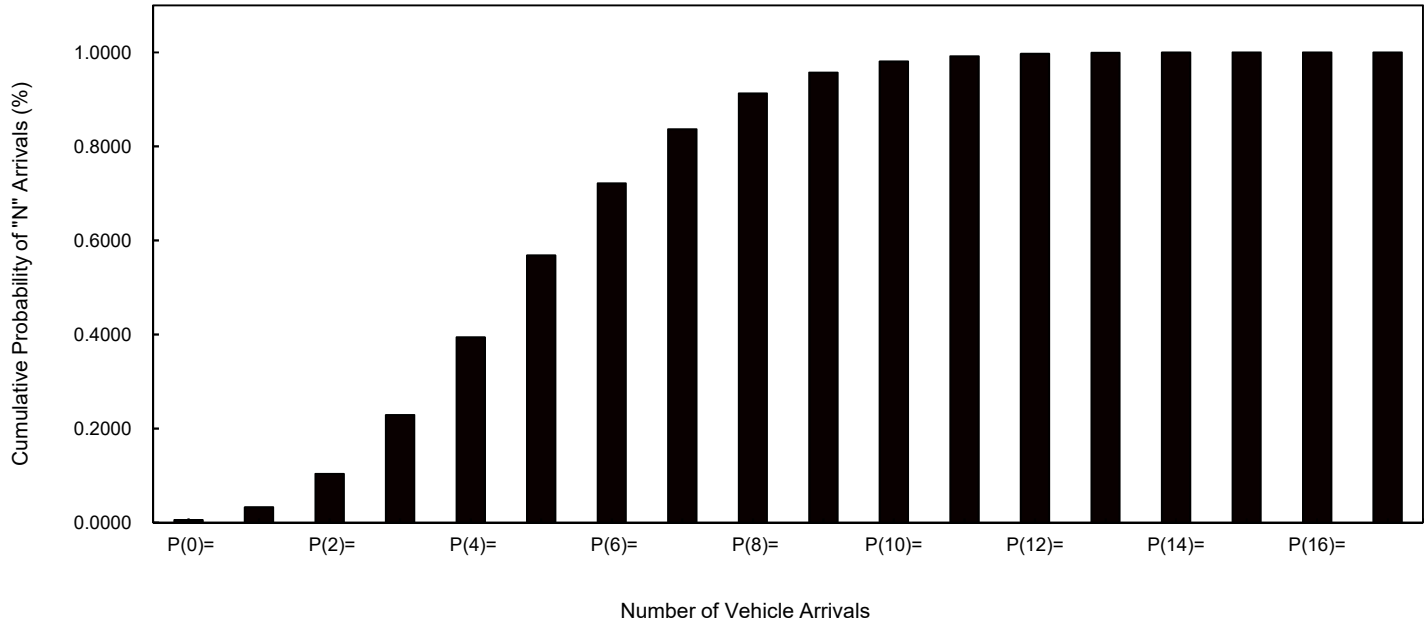
DATE: 13-Nov-19

94	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
202	PEAK HOUR VOLUME
5.27	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0051	0.0051			
P(1)=	0.0270	0.0321	P(21)=	0.0000	1.0000
P(2)=	0.0712	0.1034	P(22)=	0.0000	1.0000
P(3)=	0.1252	0.2286	P(23)=	0.0000	1.0000
P(4)=	0.1651	0.3937	P(24)=	0.0000	1.0000
P(5)=	0.1742	0.5679	P(25)=	0.0000	1.0000
P(6)=	0.1531	0.7211	P(26)=	0.0000	1.0000
P(7)=	0.1154	0.8364	P(27)=	0.0000	1.0000
P(8)=	0.0761	0.9125	P(28)=	0.0000	1.0000
P(9)=	0.0446	0.9571	P(29)=	0.0000	1.0000
P(10)=	0.0235	0.9806	P(30)=	0.0000	1.0000
P(11)=	0.0113	0.9919	P(31)=	0.0000	1.0000
P(12)=	0.0050	0.9968	P(32)=	0.0000	1.0000
P(13)=	0.0020	0.9989	P(33)=	0.0000	1.0000
P(14)=	0.0008	0.9996	P(34)=	0.0000	1.0000
P(15)=	0.0003	0.9999	P(35)=	0.0000	1.0000
P(16)=	0.0001	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

9 vehicles @ 25'/vehicle = 225' Storage Length

Alternative 4 and 5 - Existing AM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Right-Turn Alton @ Culver



Appendix C-2
Existing Volumes
(150-sec cycle)
PM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

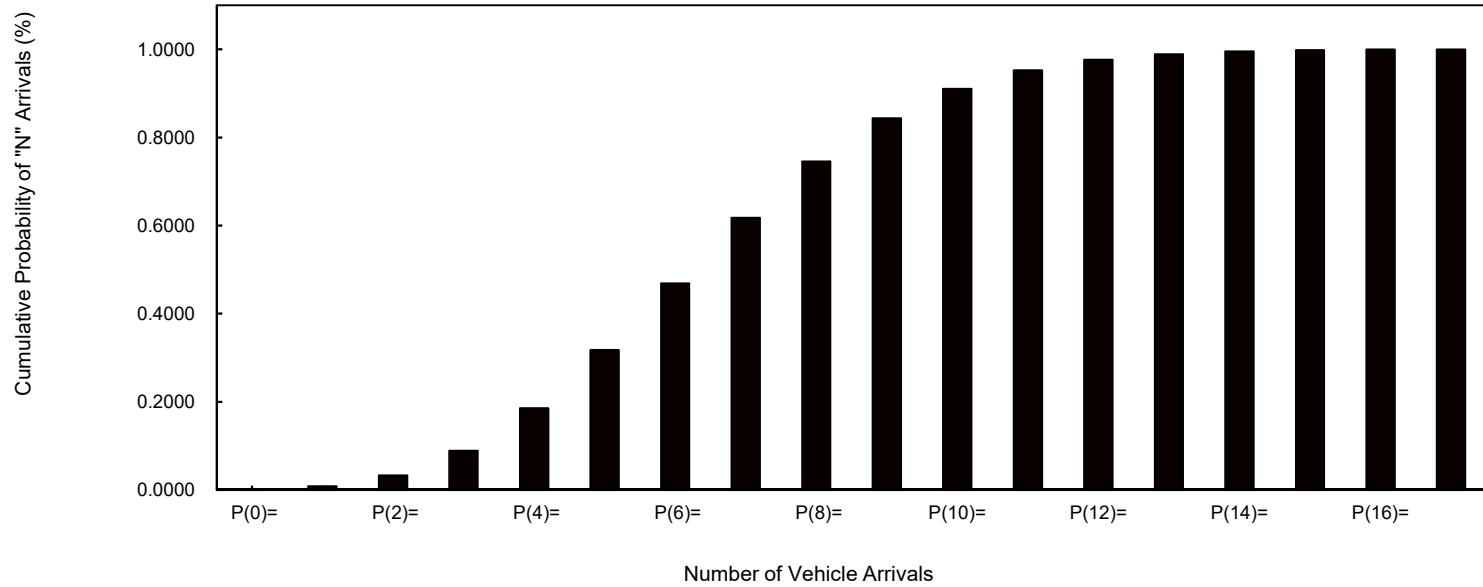
CONDITION PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle) DATE: 13-Nov-19

139	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
178	PEAK HOUR VOLUME
6.87	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0010	0.0010	P(21)=	0.0000	1.0000
P(1)=	0.0071	0.0082	P(22)=	0.0000	1.0000
P(2)=	0.0245	0.0326	P(23)=	0.0000	1.0000
P(3)=	0.0560	0.0886	P(24)=	0.0000	1.0000
P(4)=	0.0963	0.1849	P(25)=	0.0000	1.0000
P(5)=	0.1323	0.3173	P(26)=	0.0000	1.0000
P(6)=	0.1516	0.4688	P(27)=	0.0000	1.0000
P(7)=	0.1488	0.6177	P(28)=	0.0000	1.0000
P(8)=	0.1279	0.7455	P(29)=	0.0000	1.0000
P(9)=	0.0976	0.8432	P(30)=	0.0000	1.0000
P(10)=	0.0671	0.9103	P(31)=	0.0000	1.0000
P(11)=	0.0419	0.9522	P(32)=	0.0000	1.0000
P(12)=	0.0240	0.9762	P(33)=	0.0000	1.0000
P(13)=	0.0127	0.9889	P(34)=	0.0000	1.0000
P(14)=	0.0062	0.9951	P(35)=	0.0000	1.0000
P(15)=	0.0029	0.9980	P(36)=	0.0000	1.0000
P(16)=	0.0012	0.9992	P(37)=	0.0000	1.0000
P(17)=	0.0005	0.9997	P(38)=	0.0000	1.0000
P(18)=	0.0002	0.9999	P(39)=	0.0000	1.0000
P(19)=	0.0001	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

11 vehicles @ 25'/vehicle = 275' Storage Length/2 lanes @ 140' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

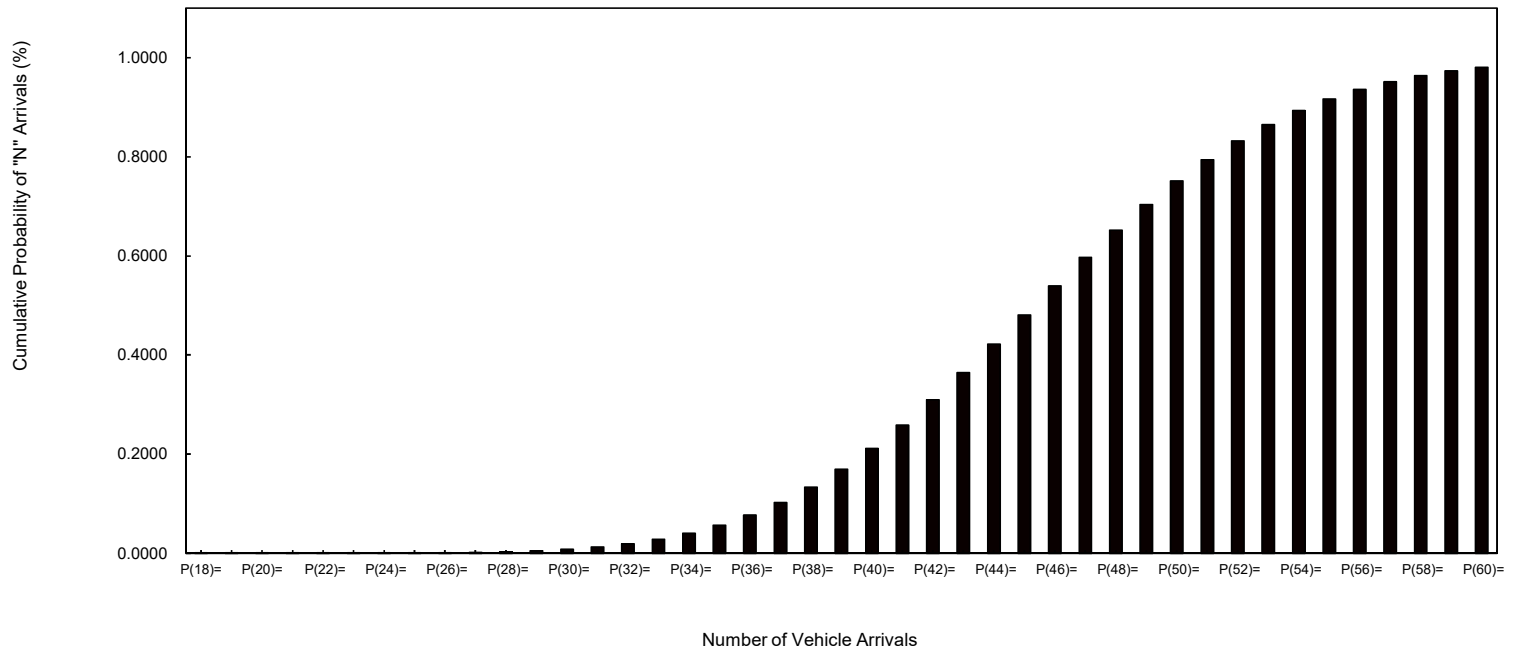
DATE: 13-Nov-19

85	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1948	PEAK HOUR VOLUME
45.99	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0045	0.0125
P(2)=	0.0000	0.0000	P(32)=	0.0065	0.0190
P(3)=	0.0000	0.0000	P(33)=	0.0090	0.0280
P(4)=	0.0000	0.0000	P(34)=	0.0122	0.0402
P(5)=	0.0000	0.0000	P(35)=	0.0160	0.0563
P(6)=	0.0000	0.0000	P(36)=	0.0205	0.0768
P(7)=	0.0000	0.0000	P(37)=	0.0255	0.1022
P(8)=	0.0000	0.0000	P(38)=	0.0308	0.1331
P(9)=	0.0000	0.0000	P(39)=	0.0364	0.1695
P(10)=	0.0000	0.0000	P(40)=	0.0418	0.2113
P(11)=	0.0000	0.0000	P(41)=	0.0469	0.2582
P(12)=	0.0000	0.0000	P(42)=	0.0514	0.3096
P(13)=	0.0000	0.0000	P(43)=	0.0550	0.3645
P(14)=	0.0000	0.0000	P(44)=	0.0575	0.4220
P(15)=	0.0000	0.0000	P(45)=	0.0587	0.4807
P(16)=	0.0000	0.0000	P(46)=	0.0587	0.5394
P(17)=	0.0000	0.0000	P(47)=	0.0575	0.5969
P(18)=	0.0000	0.0000	P(48)=	0.0551	0.6519
P(19)=	0.0000	0.0000	P(49)=	0.0517	0.7036
P(20)=	0.0000	0.0000	P(50)=	0.0475	0.7512
P(21)=	0.0000	0.0000	P(51)=	0.0429	0.7940
P(22)=	0.0000	0.0001	P(52)=	0.0379	0.8320
P(23)=	0.0001	0.0001	P(53)=	0.0329	0.8649
P(24)=	0.0001	0.0003	P(54)=	0.0280	0.8929
P(25)=	0.0003	0.0005	P(55)=	0.0234	0.9163
P(26)=	0.0004	0.0010	P(56)=	0.0193	0.9356
P(27)=	0.0008	0.0017	P(57)=	0.0155	0.9511
P(28)=	0.0012	0.0030	P(58)=	0.0123	0.9635
P(29)=	0.0020	0.0050	P(59)=	0.0096	0.9731
P(30)=	0.0030	0.0080	P(60)=	0.0074	0.9804

57 vehicles @ 25'/vehicle = 1425' Storage Length/4 lanes @ 360' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
 NB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

CONDITION: 'M Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

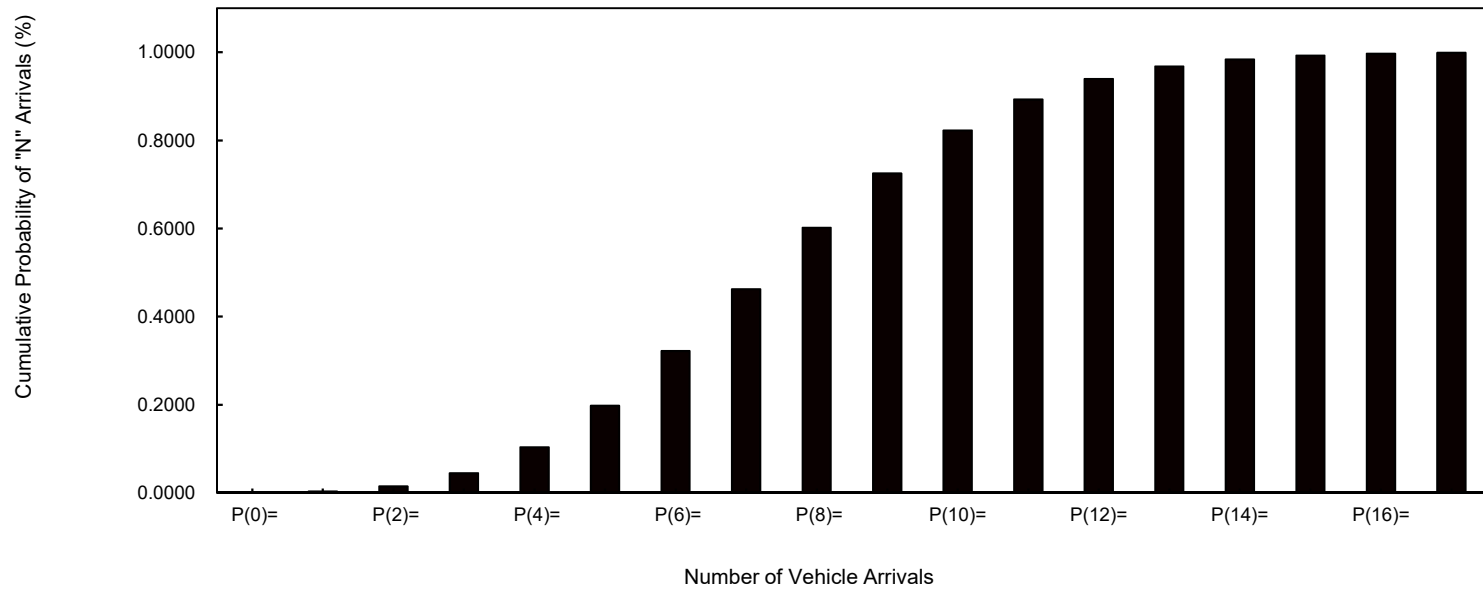
DATE: 13-Nov-19

74	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
386	PEAK HOUR VOLUME
7.93	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0004	0.0004	P(21)=	0.0001	1.0000
P(1)=	0.0028	0.0032	P(22)=	0.0000	1.0000
P(2)=	0.0113	0.0145	P(23)=	0.0000	1.0000
P(3)=	0.0298	0.0443	P(24)=	0.0000	1.0000
P(4)=	0.0592	0.1034	P(25)=	0.0000	1.0000
P(5)=	0.0939	0.1973	P(26)=	0.0000	1.0000
P(6)=	0.1241	0.3214	P(27)=	0.0000	1.0000
P(7)=	0.1407	0.4621	P(28)=	0.0000	1.0000
P(8)=	0.1395	0.6017	P(29)=	0.0000	1.0000
P(9)=	0.1230	0.7247	P(30)=	0.0000	1.0000
P(10)=	0.0976	0.8223	P(31)=	0.0000	1.0000
P(11)=	0.0704	0.8928	P(32)=	0.0000	1.0000
P(12)=	0.0466	0.9393	P(33)=	0.0000	1.0000
P(13)=	0.0284	0.9677	P(34)=	0.0000	1.0000
P(14)=	0.0161	0.9838	P(35)=	0.0000	1.0000
P(15)=	0.0085	0.9923	P(36)=	0.0000	1.0000
P(16)=	0.0042	0.9966	P(37)=	0.0000	1.0000
P(17)=	0.0020	0.9985	P(38)=	0.0000	1.0000
P(18)=	0.0009	0.9994	P(39)=	0.0000	1.0000
P(19)=	0.0004	0.9998	P(40)=	0.0000	1.0000
P(20)=	0.0001	0.9999			

13 vehicles @ 25'/vehicle = 325' Storage Length

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

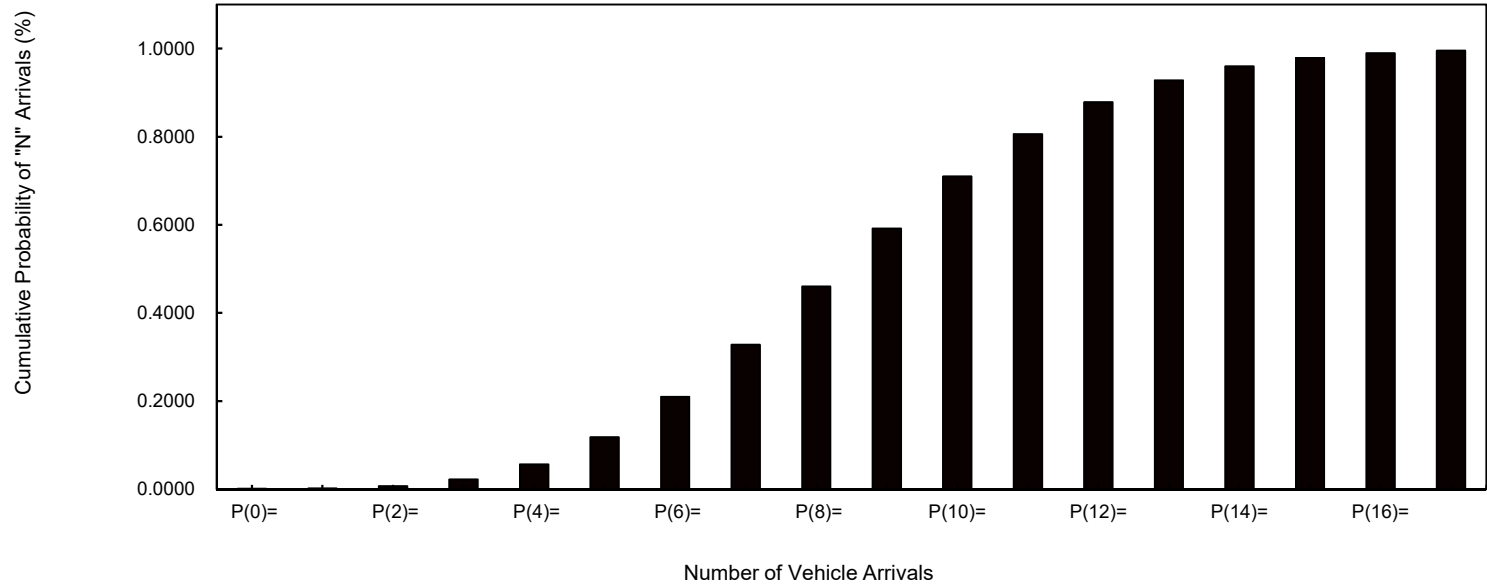
DATE: 13-Nov-19

134	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
241	PEAK HOUR VOLUME
8.97	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)= 0.0001	0.0001	P(21)= 0.0003	0.9998
P(1)= 0.0011	0.0013	P(22)= 0.0001	0.9999
P(2)= 0.0051	0.0064	P(23)= 0.0000	1.0000
P(3)= 0.0153	0.0217	P(24)= 0.0000	1.0000
P(4)= 0.0343	0.0560	P(25)= 0.0000	1.0000
P(5)= 0.0615	0.1175	P(26)= 0.0000	1.0000
P(6)= 0.0920	0.2095	P(27)= 0.0000	1.0000
P(7)= 0.1179	0.3274	P(28)= 0.0000	1.0000
P(8)= 0.1322	0.4595	P(29)= 0.0000	1.0000
P(9)= 0.1317	0.5913	P(30)= 0.0000	1.0000
P(10)= 0.1182	0.7095	P(31)= 0.0000	1.0000
P(11)= 0.0964	0.8059	P(32)= 0.0000	1.0000
P(12)= 0.0720	0.8779	P(33)= 0.0000	1.0000
P(13)= 0.0497	0.9276	P(34)= 0.0000	1.0000
P(14)= 0.0319	0.9595	P(35)= 0.0000	1.0000
P(15)= 0.0191	0.9785	P(36)= 0.0000	1.0000
P(16)= 0.0107	0.9892	P(37)= 0.0000	1.0000
P(17)= 0.0056	0.9948	P(38)= 0.0000	1.0000
P(18)= 0.0028	0.9977	P(39)= 0.0000	1.0000
P(19)= 0.0013	0.9990	P(40)= 0.0000	1.0000
P(20)= 0.0006	0.9996		

14 vehicles @ 25'/vehicle = 350' Storage Length/2 lanes @ 175' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle)

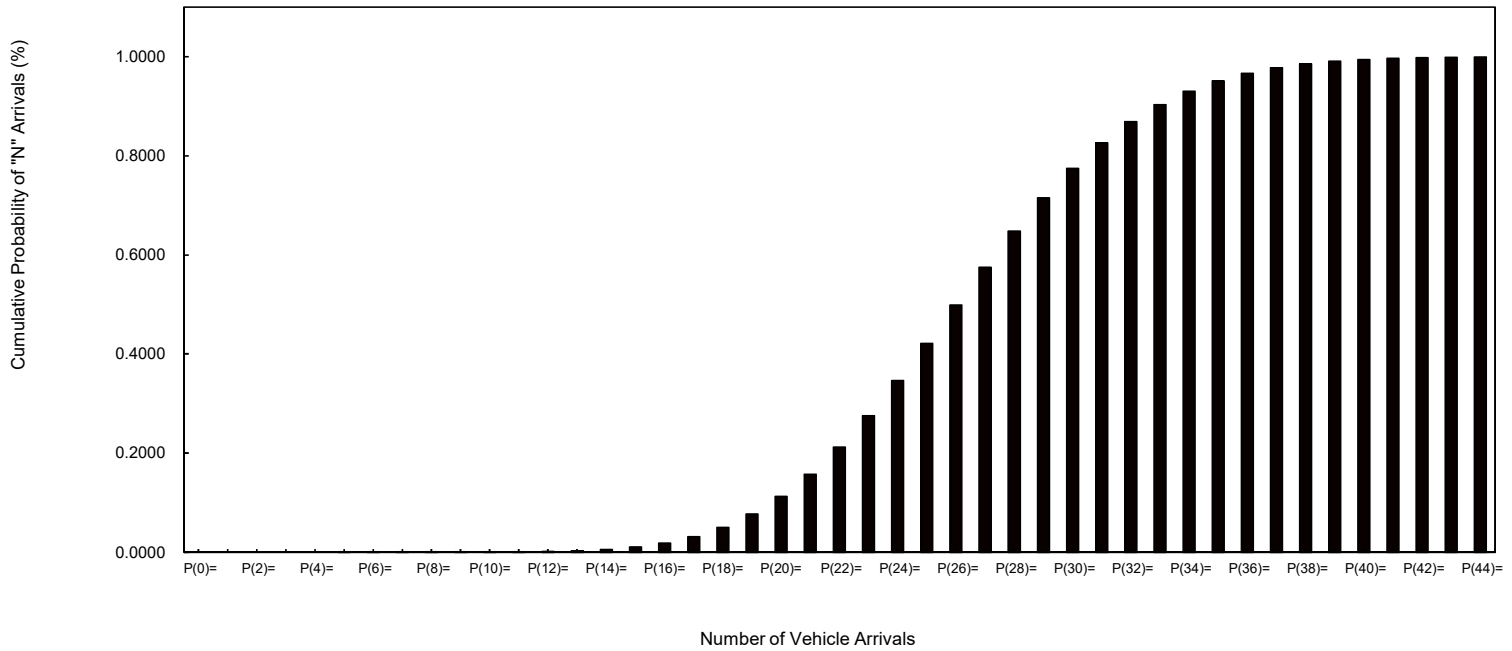
DATE: 13-Nov-19

81	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1186	PEAK HOUR VOLUME
26.69	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0513	0.8257
P(2)=	0.0000	0.0000	P(32)=	0.0428	0.8685
P(3)=	0.0000	0.0000	P(33)=	0.0346	0.9031
P(4)=	0.0000	0.0000	P(34)=	0.0272	0.9303
P(5)=	0.0000	0.0000	P(35)=	0.0207	0.9510
P(6)=	0.0000	0.0000	P(36)=	0.0153	0.9663
P(7)=	0.0000	0.0000	P(37)=	0.0111	0.9774
P(8)=	0.0000	0.0000	P(38)=	0.0078	0.9851
P(9)=	0.0000	0.0001	P(39)=	0.0053	0.9905
P(10)=	0.0001	0.0002	P(40)=	0.0035	0.9940
P(11)=	0.0003	0.0005	P(41)=	0.0023	0.9963
P(12)=	0.0007	0.0012	P(42)=	0.0015	0.9978
P(13)=	0.0014	0.0027	P(43)=	0.0009	0.9987
P(14)=	0.0027	0.0054	P(44)=	0.0006	0.9992
P(15)=	0.0049	0.0103	P(45)=	0.0003	0.9996
P(16)=	0.0081	0.0184	P(46)=	0.0002	0.9998
P(17)=	0.0128	0.0312	P(47)=	0.0001	0.9999
P(18)=	0.0189	0.0501	P(48)=	0.0001	0.9999
P(19)=	0.0266	0.0767	P(49)=	0.0000	1.0000
P(20)=	0.0355	0.1122	P(50)=	0.0000	1.0000
P(21)=	0.0451	0.1573	P(51)=	0.0000	1.0000
P(22)=	0.0547	0.2120	P(52)=	0.0000	1.0000
P(23)=	0.0635	0.2755	P(53)=	0.0000	1.0000
P(24)=	0.0706	0.3460	P(54)=	0.0000	1.0000
P(25)=	0.0753	0.4213	P(55)=	0.0000	1.0000
P(26)=	0.0773	0.4986			
P(27)=	0.0764	0.5750			
P(28)=	0.0728	0.6478			
P(29)=	0.0670	0.7148			
P(30)=	0.0596	0.7744			

35 vehicles @ 25'/vehicle = 875' Storage Length/3 lanes @ 290' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
 SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 5 Improvements (150-sec cycle)

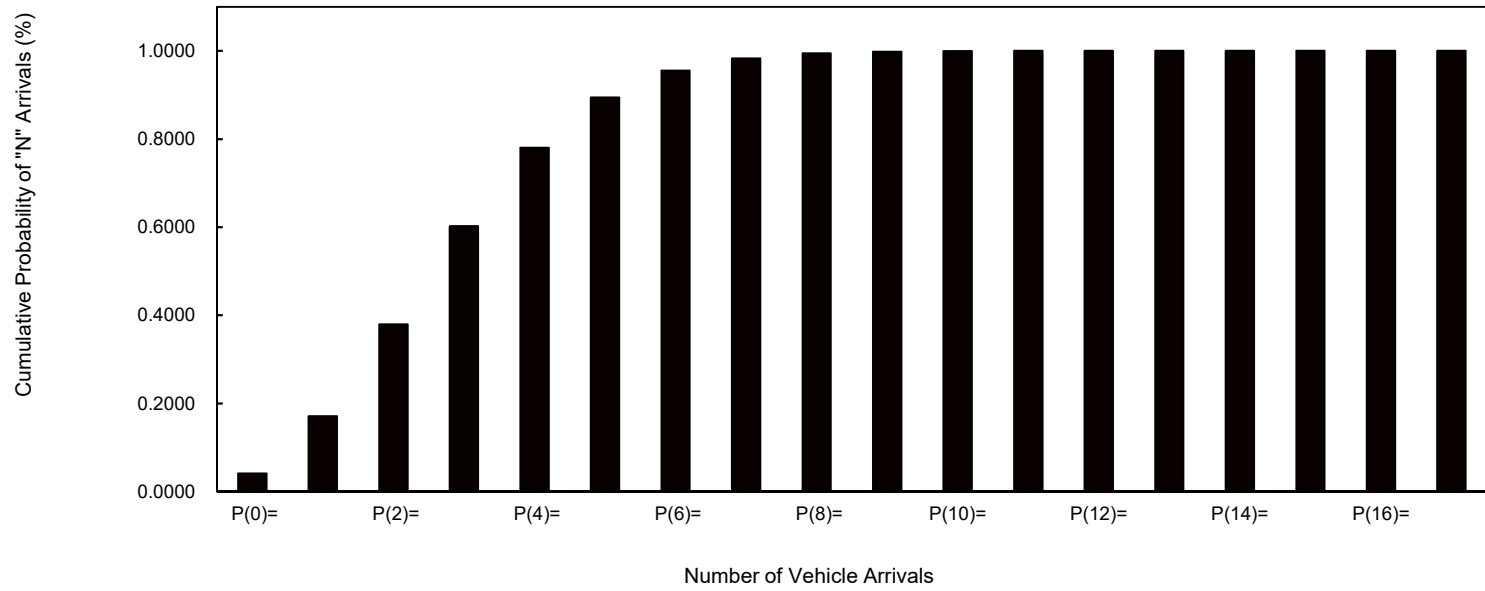
DATE: 13-Nov-19

63	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
183	PEAK HOUR VOLUME
3.20	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0407	0.0407	P(21)=	0.0000	1.0000
P(1)=	0.1302	0.1709	P(22)=	0.0000	1.0000
P(2)=	0.2085	0.3794	P(23)=	0.0000	1.0000
P(3)=	0.2226	0.6020	P(24)=	0.0000	1.0000
P(4)=	0.1782	0.7802	P(25)=	0.0000	1.0000
P(5)=	0.1141	0.8943	P(26)=	0.0000	1.0000
P(6)=	0.0609	0.9552	P(27)=	0.0000	1.0000
P(7)=	0.0279	0.9831	P(28)=	0.0000	1.0000
P(8)=	0.0112	0.9943	P(29)=	0.0000	1.0000
P(9)=	0.0040	0.9982	P(30)=	0.0000	1.0000
P(10)=	0.0013	0.9995	P(31)=	0.0000	1.0000
P(11)=	0.0004	0.9999	P(32)=	0.0000	1.0000
P(12)=	0.0001	1.0000	P(33)=	0.0000	1.0000
P(13)=	0.0000	1.0000	P(34)=	0.0000	1.0000
P(14)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

6 vehicles @ 25'/vehicle =150' Storage Length

Alternative 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: 'M Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

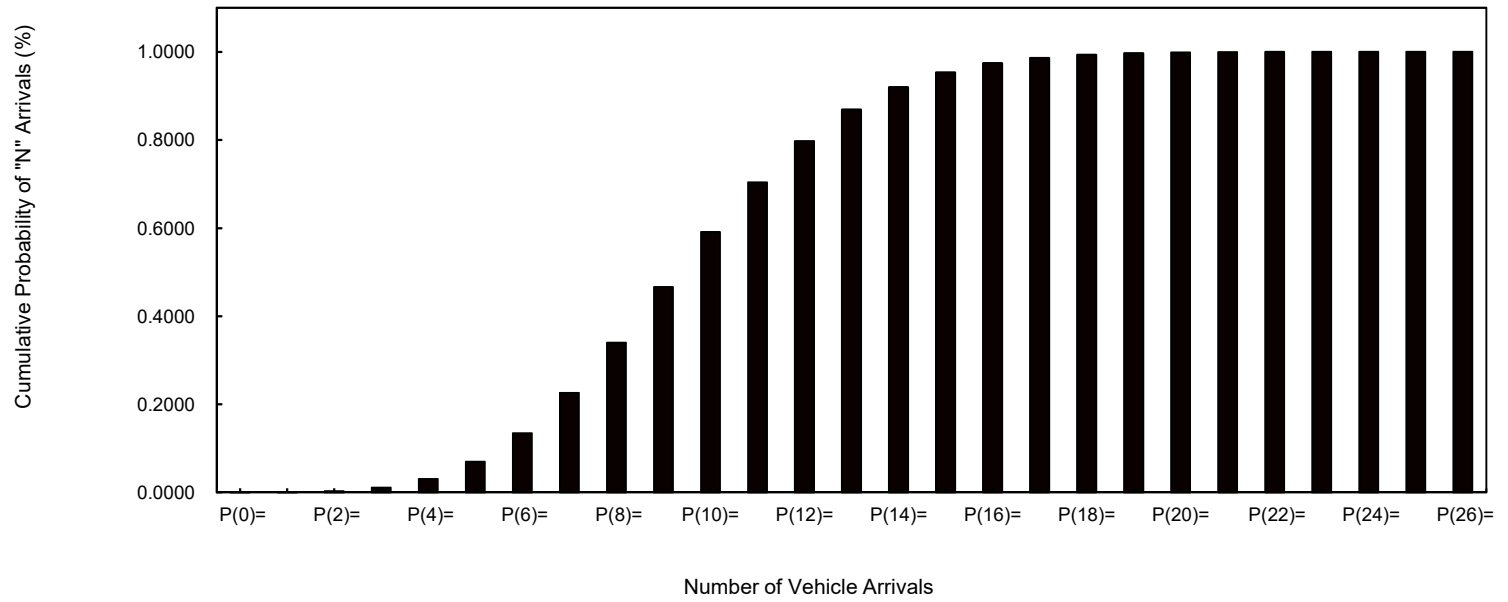
DATE: 13-Nov-19

132	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
271	PEAK HOUR VOLUME
9.94	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0005	0.0005	P(21)=	0.0008	0.9994
P(2)=	0.0024	0.0029	P(22)=	0.0004	0.9997
P(3)=	0.0079	0.0108	P(23)=	0.0002	0.9999
P(4)=	0.0196	0.0305	P(24)=	0.0001	1.0000
P(5)=	0.0390	0.0695	P(25)=	0.0000	1.0000
P(6)=	0.0647	0.1342	P(26)=	0.0000	1.0000
P(7)=	0.0918	0.2260	P(27)=	0.0000	1.0000
P(8)=	0.1140	0.3400	P(28)=	0.0000	1.0000
P(9)=	0.1259	0.4659	P(29)=	0.0000	1.0000
P(10)=	0.1251	0.5910	P(30)=	0.0000	1.0000
P(11)=	0.1130	0.7040	P(31)=	0.0000	1.0000
P(12)=	0.0936	0.7975	P(32)=	0.0000	1.0000
P(13)=	0.0715	0.8690	P(33)=	0.0000	1.0000
P(14)=	0.0508	0.9198	P(34)=	0.0000	1.0000
P(15)=	0.0336	0.9534	P(35)=	0.0000	1.0000
P(16)=	0.0209	0.9743	P(36)=	0.0000	1.0000
P(17)=	0.0122	0.9865	P(37)=	0.0000	1.0000
P(18)=	0.0067	0.9933	P(38)=	0.0000	1.0000
P(19)=	0.0035	0.9968	P(39)=	0.0000	1.0000
P(20)=	0.0018	0.9985	P(40)=	0.0000	1.0000

15 vehicles @ 25'/vehicle = 375' Storage Length/2 lanes @ 190' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: M Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

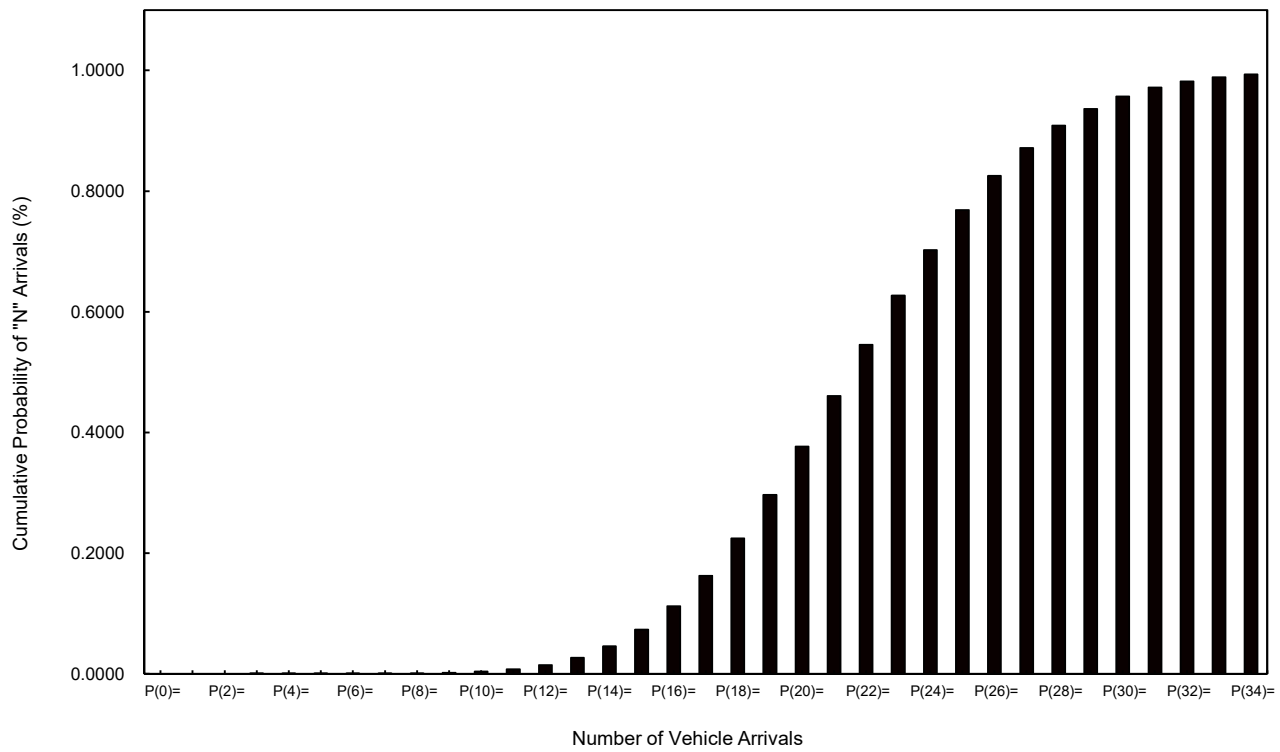
DATE: 13-Nov-19

96	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
830	PEAK HOUR VOLUME
22.13	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(21)=	0.0842	0.4604
P(2)=	0.0000	0.0000	P(22)=	0.0847	0.5451
P(3)=	0.0000	0.0000	P(23)=	0.0815	0.6266
P(4)=	0.0000	0.0000	P(24)=	0.0752	0.7018
P(5)=	0.0000	0.0000	P(25)=	0.0665	0.7683
P(6)=	0.0000	0.0001	P(26)=	0.0567	0.8250
P(7)=	0.0001	0.0002	P(27)=	0.0464	0.8714
P(8)=	0.0003	0.0005	P(28)=	0.0367	0.9081
P(9)=	0.0009	0.0014	P(29)=	0.0280	0.9361
P(10)=	0.0019	0.0033	P(30)=	0.0207	0.9568
P(11)=	0.0038	0.0071	P(31)=	0.0148	0.9716
P(12)=	0.0070	0.0141	P(32)=	0.0102	0.9818
P(13)=	0.0120	0.0261	P(33)=	0.0068	0.9886
P(14)=	0.0190	0.0451	P(34)=	0.0045	0.9931
P(15)=	0.0280	0.0731	P(35)=	0.0028	0.9959
P(16)=	0.0387	0.1118	P(36)=	0.0017	0.9976
P(17)=	0.0504	0.1622	P(37)=	0.0010	0.9987
P(18)=	0.0620	0.2241	P(38)=	0.0006	0.9993
P(19)=	0.0722	0.2963	P(39)=	0.0003	0.9996
P(20)=	0.0799	0.3762	P(40)=	0.0002	0.9998
			P(41)=	0.0001	0.9999
			P(42)=	0.0001	0.9999
			P(43)=	0.0000	1.0000
			P(44)=	0.0000	1.0000
			P(45)=	0.0000	1.0000

30 vehicles @ 25'/vehicle = 750' Storage Length/2 lanes @ 375' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: M Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

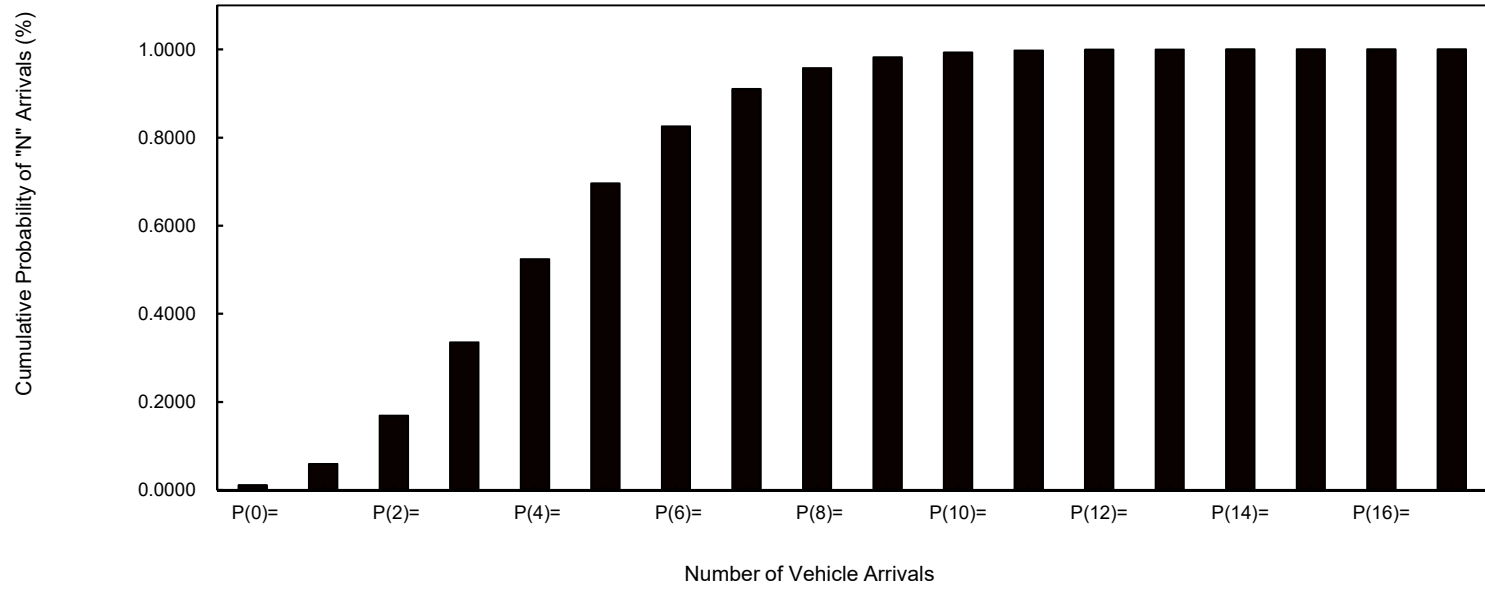
DATE: 13-Nov-19

87	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
188	PEAK HOUR VOLUME
4.54	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0106	0.0106	P(21)=	0.0000	1.0000
P(1)=	0.0483	0.0590	P(22)=	0.0000	1.0000
P(2)=	0.1098	0.1688	P(23)=	0.0000	1.0000
P(3)=	0.1663	0.3350	P(24)=	0.0000	1.0000
P(4)=	0.1889	0.5239	P(25)=	0.0000	1.0000
P(5)=	0.1716	0.6955	P(26)=	0.0000	1.0000
P(6)=	0.1299	0.8255	P(27)=	0.0000	1.0000
P(7)=	0.0843	0.9098	P(28)=	0.0000	1.0000
P(8)=	0.0479	0.9577	P(29)=	0.0000	1.0000
P(9)=	0.0242	0.9819	P(30)=	0.0000	1.0000
P(10)=	0.0110	0.9929	P(31)=	0.0000	1.0000
P(11)=	0.0045	0.9974	P(32)=	0.0000	1.0000
P(12)=	0.0017	0.9991	P(33)=	0.0000	1.0000
P(13)=	0.0006	0.9997	P(34)=	0.0000	1.0000
P(14)=	0.0002	0.9999	P(35)=	0.0000	1.0000
P(15)=	0.0001	1.0000	P(36)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

8 vehicles @ 25'/vehicle = 200' Storage Length

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

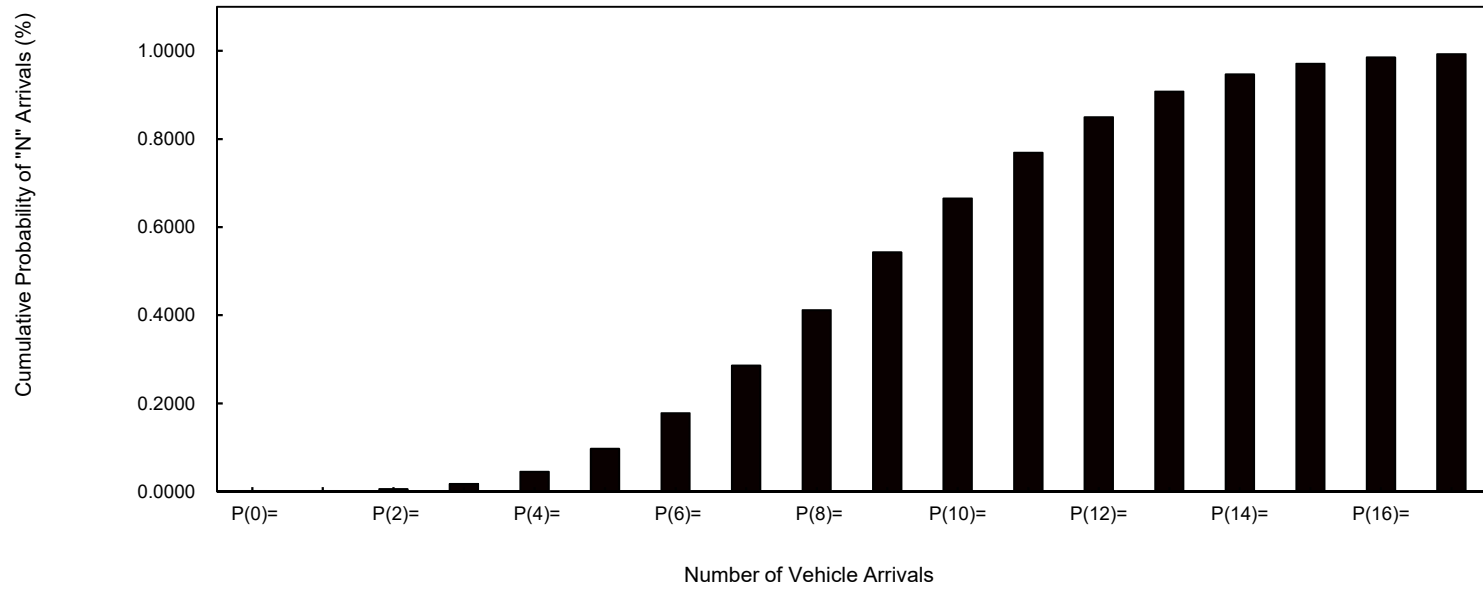
DATE: 13-Nov-19

134	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
251	PEAK HOUR VOLUME
9.34	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			PROBABILITY OF N ARRIVALS		
		CUMULATIVE			CUMULATIVE
P(0)=	0.0001	0.0001	P(21)=	0.0004	0.9997
P(1)=	0.0008	0.0009	P(22)=	0.0002	0.9999
P(2)=	0.0038	0.0047	P(23)=	0.0001	1.0000
P(3)=	0.0119	0.0166	P(24)=	0.0000	1.0000
P(4)=	0.0278	0.0444	P(25)=	0.0000	1.0000
P(5)=	0.0520	0.0964	P(26)=	0.0000	1.0000
P(6)=	0.0809	0.1773	P(27)=	0.0000	1.0000
P(7)=	0.1080	0.2853	P(28)=	0.0000	1.0000
P(8)=	0.1261	0.4114	P(29)=	0.0000	1.0000
P(9)=	0.1309	0.5423	P(30)=	0.0000	1.0000
P(10)=	0.1223	0.6647	P(31)=	0.0000	1.0000
P(11)=	0.1039	0.7685	P(32)=	0.0000	1.0000
P(12)=	0.0809	0.8494	P(33)=	0.0000	1.0000
P(13)=	0.0581	0.9076	P(34)=	0.0000	1.0000
P(14)=	0.0388	0.9463	P(35)=	0.0000	1.0000
P(15)=	0.0242	0.9705	P(36)=	0.0000	1.0000
P(16)=	0.0141	0.9846	P(37)=	0.0000	1.0000
P(17)=	0.0078	0.9924	P(38)=	0.0000	1.0000
P(18)=	0.0040	0.9964	P(39)=	0.0000	1.0000
P(19)=	0.0020	0.9984	P(40)=	0.0000	1.0000
P(20)=	0.0009	0.9993			

15 vehicles @ 25'/vehicle =375' Storage Length/2 lanes @ 190' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: 'M Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

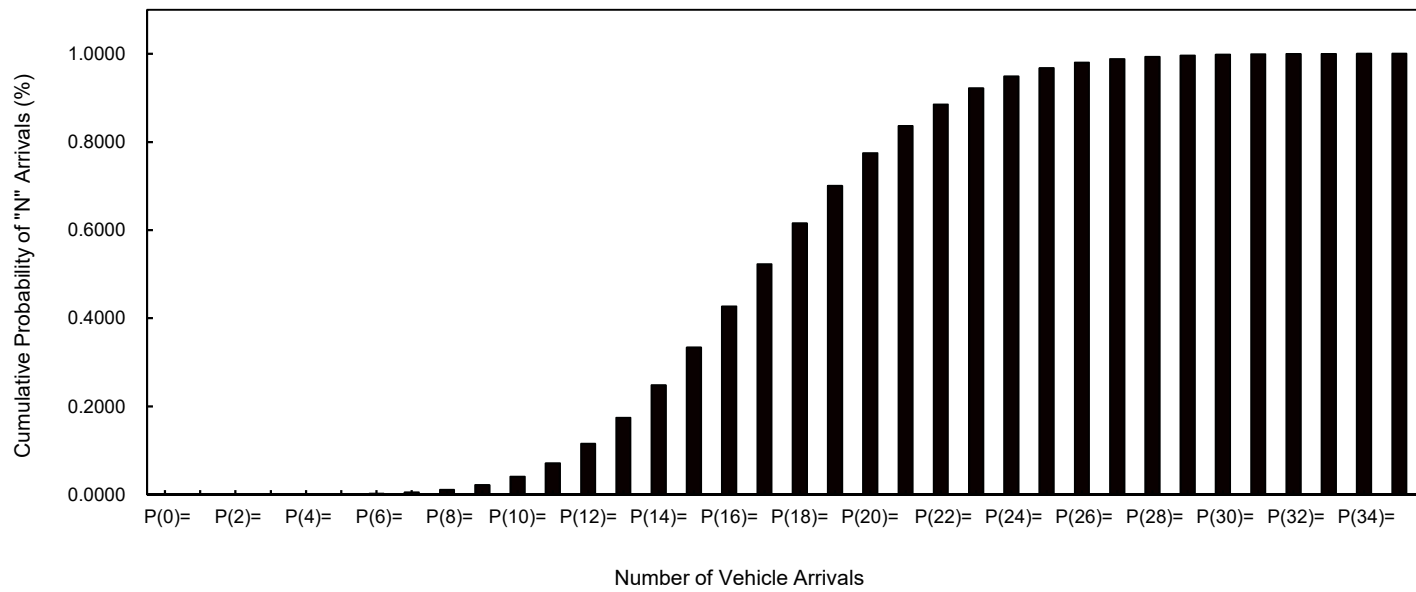
DATE: 13-Nov-19

99	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
634	PEAK HOUR VOLUME
17.44	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(21)=	0.0616	0.8359
P(2)=	0.0000	0.0000	P(22)=	0.0488	0.8847
P(3)=	0.0000	0.0000	P(23)=	0.0370	0.9217
P(4)=	0.0001	0.0001	P(24)=	0.0269	0.9486
P(5)=	0.0004	0.0005	P(25)=	0.0187	0.9673
P(6)=	0.0010	0.0015	P(26)=	0.0126	0.9799
P(7)=	0.0026	0.0041	P(27)=	0.0081	0.9880
P(8)=	0.0057	0.0098	P(28)=	0.0051	0.9931
P(9)=	0.0110	0.0208	P(29)=	0.0030	0.9961
P(10)=	0.0192	0.0400	P(30)=	0.0018	0.9979
P(11)=	0.0304	0.0704	P(31)=	0.0010	0.9989
P(12)=	0.0441	0.1145	P(32)=	0.0005	0.9994
P(13)=	0.0592	0.1737	P(33)=	0.0003	0.9997
P(14)=	0.0737	0.2474	P(34)=	0.0001	0.9999
P(15)=	0.0857	0.3331	P(35)=	0.0001	0.9999
P(16)=	0.0934	0.4265	P(36)=	0.0000	1.0000
P(17)=	0.0958	0.5222	P(37)=	0.0000	1.0000
P(18)=	0.0928	0.6150	P(38)=	0.0000	1.0000
P(19)=	0.0851	0.7001	P(39)=	0.0000	1.0000
P(20)=	0.0742	0.7743	P(40)=	0.0000	1.0000

25 vehicles @ 25'/vehicle = 625' Storage Length/2 lanes @ 315' each

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: PM Peak Hour - Ex. Vols. - Alt. 4 and 5 Improvements (150-sec cycle

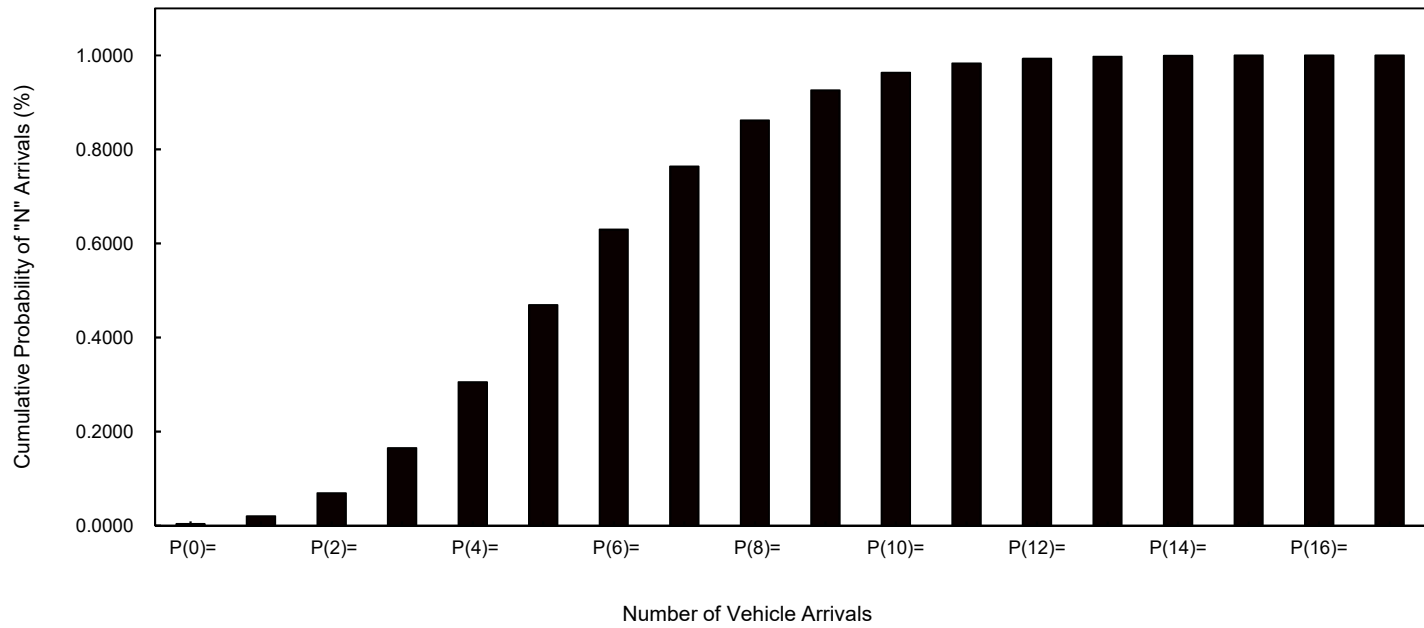
DATE: 13-Nov-19

83	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
254	PEAK HOUR VOLUME
5.86	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			PROBABILITY OF N ARRIVALS		
	CUMULATIVE			CUMULATIVE	
P(0)=	0.0029	0.0029	P(21)=	0.0000	1.0000
P(1)=	0.0168	0.0196	P(22)=	0.0000	1.0000
P(2)=	0.0491	0.0687	P(23)=	0.0000	1.0000
P(3)=	0.0958	0.1645	P(24)=	0.0000	1.0000
P(4)=	0.1403	0.3048	P(25)=	0.0000	1.0000
P(5)=	0.1643	0.4691	P(26)=	0.0000	1.0000
P(6)=	0.1603	0.6294	P(27)=	0.0000	1.0000
P(7)=	0.1341	0.7635	P(28)=	0.0000	1.0000
P(8)=	0.0982	0.8617	P(29)=	0.0000	1.0000
P(9)=	0.0639	0.9256	P(30)=	0.0000	1.0000
P(10)=	0.0374	0.9630	P(31)=	0.0000	1.0000
P(11)=	0.0199	0.9830	P(32)=	0.0000	1.0000
P(12)=	0.0097	0.9927	P(33)=	0.0000	1.0000
P(13)=	0.0044	0.9971	P(34)=	0.0000	1.0000
P(14)=	0.0018	0.9989	P(35)=	0.0000	1.0000
P(15)=	0.0007	0.9996	P(36)=	0.0000	1.0000
P(16)=	0.0003	0.9999	P(37)=	0.0000	1.0000
P(17)=	0.0001	1.0000	P(38)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

10 vehicles @ 25'/vehicle =250' Storage Length

Alternative 4 and 5 - Existing PM Peak Hour
Queueing Analysis (150-sec. cycle)
WB Right-Turn Alton @ Culver



Appendix C-3

Buildout

(120-sec cycle)

AM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

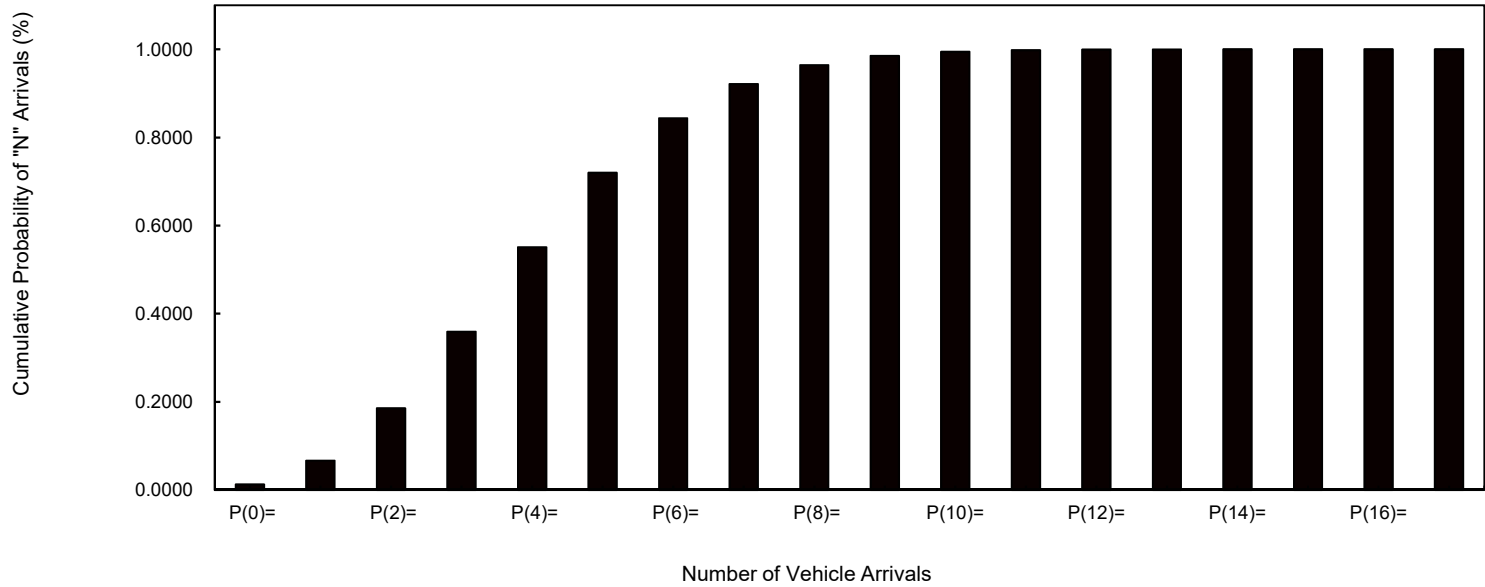
DATE: 14-Nov-19

114	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
139	PEAK HOUR VOLUME
4.40	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE		
P(0)=	0.0123	0.0123			
P(1)=	0.0540	0.0662	P(21)=	0.0000	1.0000
P(2)=	0.1187	0.1849	P(22)=	0.0000	1.0000
P(3)=	0.1742	0.3592	P(23)=	0.0000	1.0000
P(4)=	0.1917	0.5509	P(24)=	0.0000	1.0000
P(5)=	0.1688	0.7196	P(25)=	0.0000	1.0000
P(6)=	0.1238	0.8434	P(26)=	0.0000	1.0000
P(7)=	0.0779	0.9213	P(27)=	0.0000	1.0000
P(8)=	0.0428	0.9641	P(28)=	0.0000	1.0000
P(9)=	0.0209	0.9851	P(29)=	0.0000	1.0000
P(10)=	0.0092	0.9943	P(30)=	0.0000	1.0000
P(11)=	0.0037	0.9980	P(31)=	0.0000	1.0000
P(12)=	0.0014	0.9993	P(32)=	0.0000	1.0000
P(13)=	0.0005	0.9998	P(33)=	0.0000	1.0000
P(14)=	0.0001	0.9999	P(34)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

8 vehicles @ 25'/vehicle = 200' Storage Length/2 lanes @ 100' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

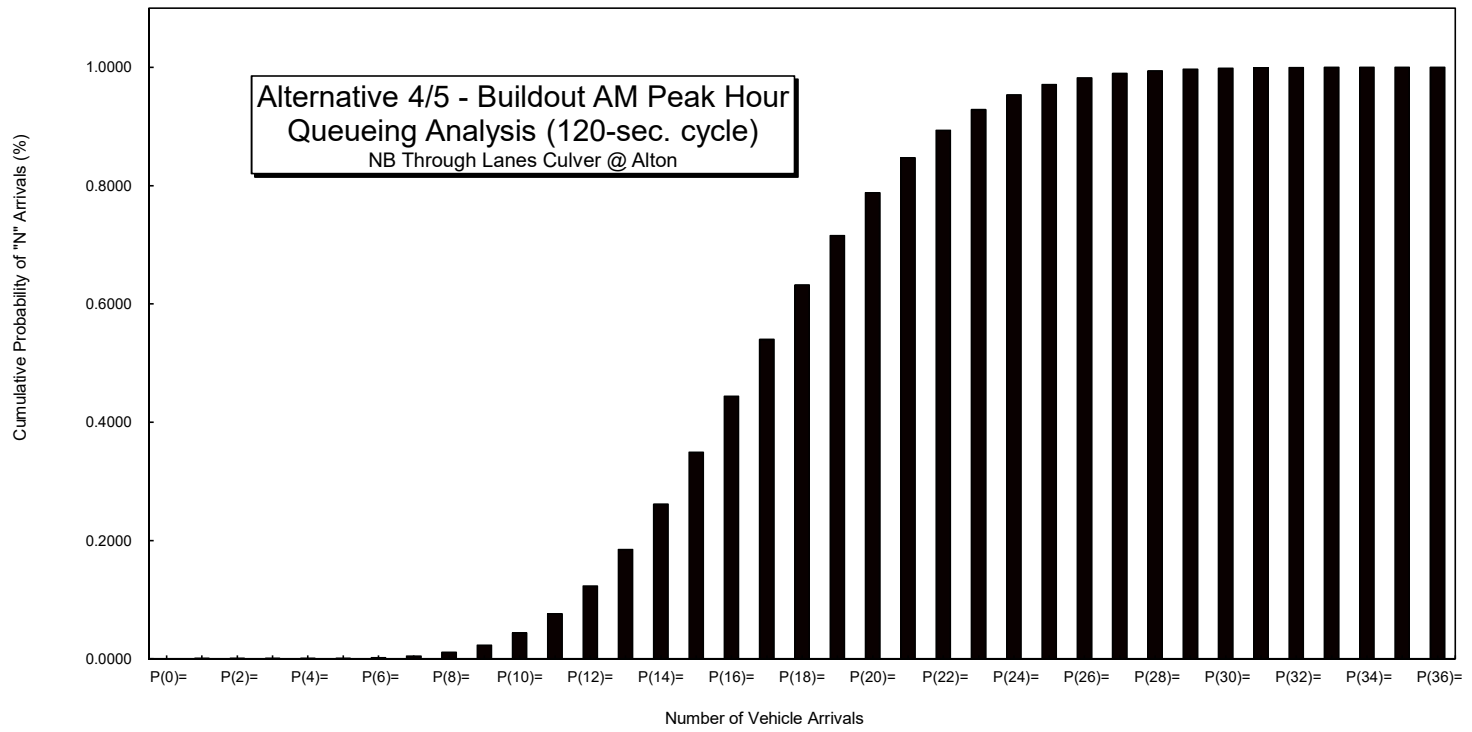
LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle) DATE: 14-Nov-19

56	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1109	PEAK HOUR VOLUME
17.25	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0593
P(2)=	0.0000	P(22)=	0.0465
P(3)=	0.0000	P(23)=	0.0349
P(4)=	0.0001	P(24)=	0.0251
P(5)=	0.0004	P(25)=	0.0173
P(6)=	0.0012	P(26)=	0.0115
P(7)=	0.0029	P(27)=	0.0073
P(8)=	0.0063	P(28)=	0.0045
P(9)=	0.0120	P(29)=	0.0027
P(10)=	0.0207	P(30)=	0.0015
P(11)=	0.0325	P(31)=	0.0009
P(12)=	0.0467	P(32)=	0.0005
P(13)=	0.0620	P(33)=	0.0002
P(14)=	0.0764	P(34)=	0.0001
P(15)=	0.0878	P(35)=	0.0001
P(16)=	0.0947	P(36)=	0.0000
P(17)=	0.0961	P(37)=	0.0000
P(18)=	0.0921	P(38)=	0.0000
P(19)=	0.0836	P(39)=	0.0000
P(20)=	0.0721	P(40)=	0.0000

24 vehicles @ 25'/vehicle = 600' Storage Length/4 lanes @ 150' each



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

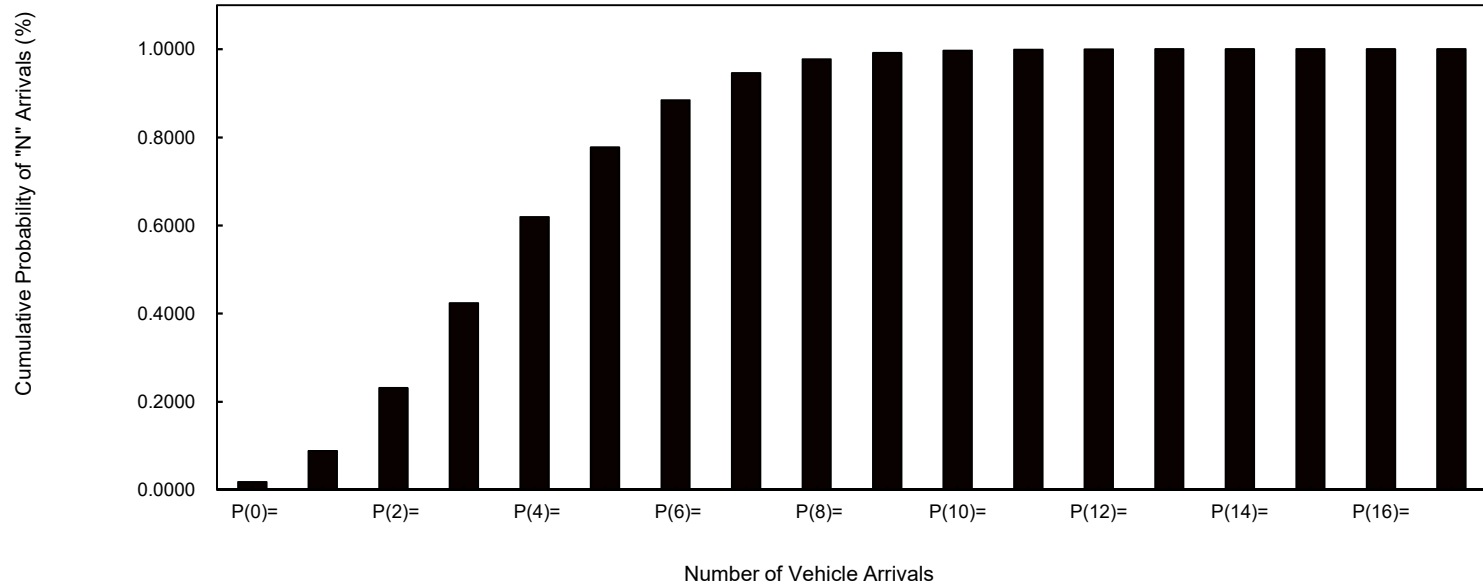
DATE: 14-Nov-19

46	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
317	PEAK HOUR VOLUME
4.05	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>		
P(0)=	0.0174	0.0174			
P(1)=	0.0705	0.0879	P(21)=	0.0000	1.0000
P(2)=	0.1428	0.2308	P(22)=	0.0000	1.0000
P(3)=	0.1929	0.4237	P(23)=	0.0000	1.0000
P(4)=	0.1953	0.6190	P(24)=	0.0000	1.0000
P(5)=	0.1582	0.7772	P(25)=	0.0000	1.0000
P(6)=	0.1068	0.8840	P(26)=	0.0000	1.0000
P(7)=	0.0618	0.9458	P(27)=	0.0000	1.0000
P(8)=	0.0313	0.9771	P(28)=	0.0000	1.0000
P(9)=	0.0141	0.9912	P(29)=	0.0000	1.0000
P(10)=	0.0057	0.9969	P(30)=	0.0000	1.0000
P(11)=	0.0021	0.9990	P(31)=	0.0000	1.0000
P(12)=	0.0007	0.9997	P(32)=	0.0000	1.0000
P(13)=	0.0002	0.9999	P(33)=	0.0000	1.0000
P(14)=	0.0001	1.0000	P(34)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

7 vehicles @ 25'/vehicle = 175' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

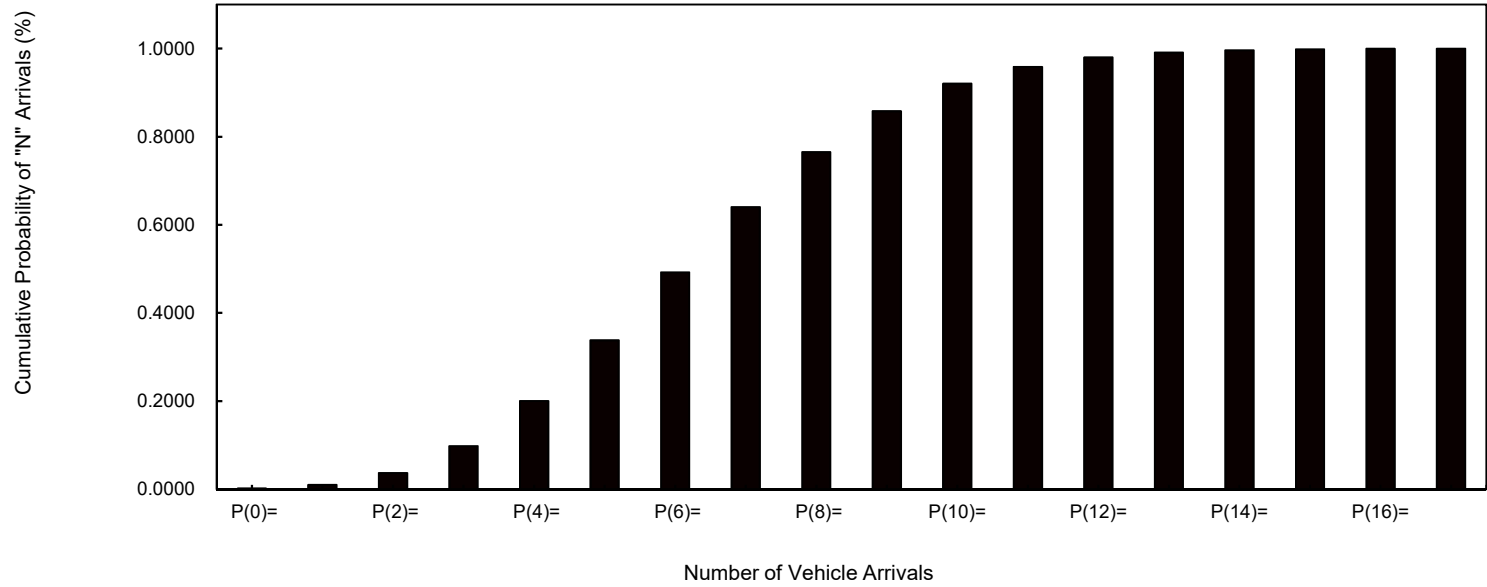
CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle) DATE: 14-Nov-19

109	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
222	PEAK HOUR VOLUME
6.72	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0012		
P(1)=	0.0081		
P(2)=	0.0272		
P(3)=	0.0610		
P(4)=	0.1025		
P(5)=	0.1377		
P(6)=	0.1543		
P(7)=	0.1482		
P(8)=	0.1245		
P(9)=	0.0930		
P(10)=	0.0625		
P(11)=	0.0382		
P(12)=	0.0214		
P(13)=	0.0111		
P(14)=	0.0053		
P(15)=	0.0024		
P(16)=	0.0010		
P(17)=	0.0004		
P(18)=	0.0001		
P(19)=	0.0001		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

11 vehicles @ 25'/vehicle = 275' Storage Length/2 lanes @ 140' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

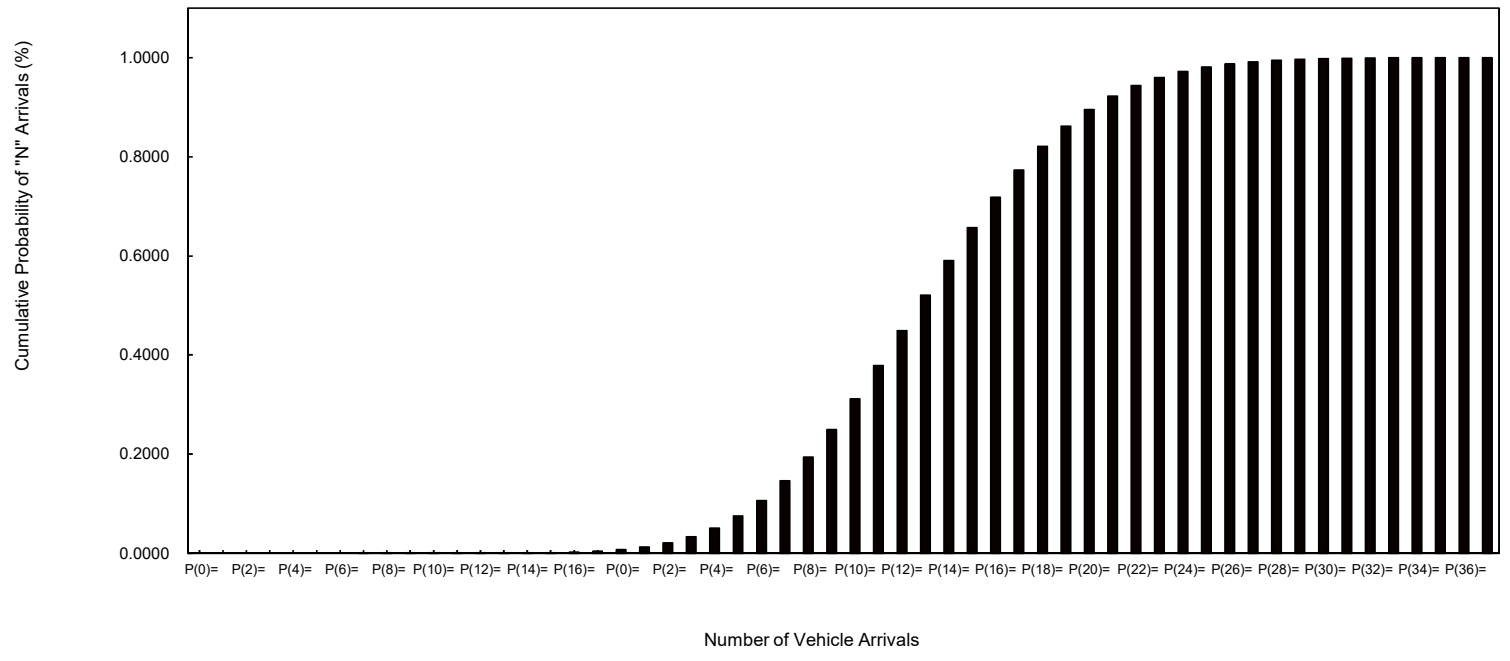
CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle) DATE: 14-Nov-19

51	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
2215	PEAK HOUR VOLUME
31.38	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0713	0.5205
P(2)=	0.0000	0.0000	P(32)=	0.0699	0.5904
P(3)=	0.0000	0.0000	P(33)=	0.0665	0.6569
P(4)=	0.0000	0.0000	P(34)=	0.0614	0.7182
P(5)=	0.0000	0.0000	P(35)=	0.0550	0.7732
P(6)=	0.0000	0.0000	P(36)=	0.0479	0.8212
P(7)=	0.0000	0.0000	P(37)=	0.0407	0.8619
P(8)=	0.0000	0.0000	P(38)=	0.0336	0.8954
P(9)=	0.0000	0.0000	P(39)=	0.0270	0.9225
P(10)=	0.0000	0.0000	P(40)=	0.0212	0.9436
P(11)=	0.0000	0.0000	P(41)=	0.0162	0.9599
P(12)=	0.0000	0.0001	P(42)=	0.0121	0.9720
P(13)=	0.0001	0.0002	P(43)=	0.0088	0.9808
P(14)=	0.0002	0.0004	P(44)=	0.0063	0.9871
P(15)=	0.0005	0.0009	P(45)=	0.0044	0.9915
P(16)=	0.0010	0.0019	P(46)=	0.0030	0.9945
P(17)=	0.0018	0.0038	P(47)=	0.0020	0.9965
P(18)=	0.0032	0.0070	P(48)=	0.0013	0.9978
P(19)=	0.0053	0.0123	P(49)=	0.0008	0.9987
P(20)=	0.0083	0.0205	P(50)=	0.0005	0.9992
P(21)=	0.0124	0.0329	P(51)=	0.0003	0.9995
P(22)=	0.0177	0.0506	P(52)=	0.0002	0.9997
P(23)=	0.0241	0.0748	P(53)=	0.0001	0.9998
P(24)=	0.0315	0.1063	P(54)=	0.0001	0.9999
P(25)=	0.0396	0.1459	P(55)=	0.0000	1.0000
P(26)=	0.0478	0.1937			
P(27)=	0.0555	0.2492			
P(28)=	0.0622	0.3114			
P(29)=	0.0673	0.3788			
P(30)=	0.0704	0.4492			

41 vehicles @ 25'/vehicle = 1025' Storage Length/3 lanes @ 345' each

Alternative 4/5 - Buildout AM Peak Hour
 Queueing Analysis (120-sec. cycle)
 SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

CONDITION: AM Peak Hour - Buildout - Alt. 5 Imps. (120-sec. cycle)

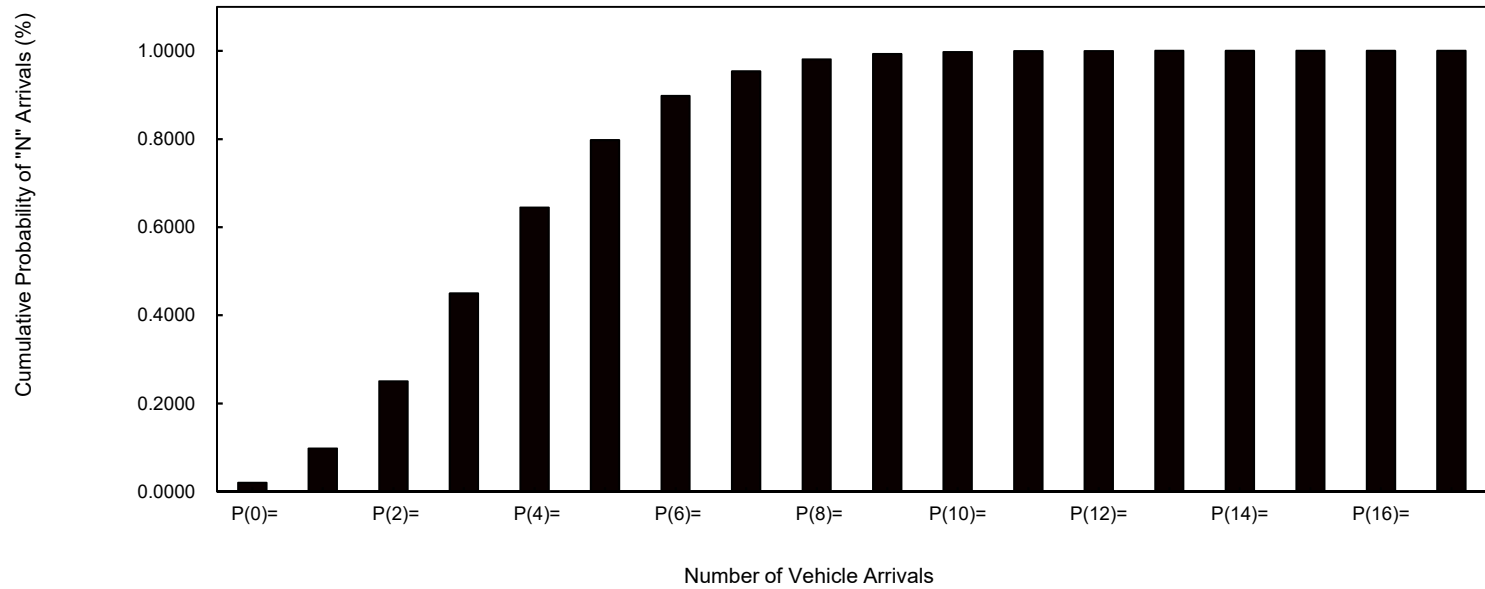
DATE: 14-Nov-19

42	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
336	PEAK HOUR VOLUME
3.92	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			PROBABILITY OF N ARRIVALS		
		CUMULATIVE			CUMULATIVE
P(0)=	0.0198	0.0198	P(21)=	0.0000	1.0000
P(1)=	0.0778	0.0976	P(22)=	0.0000	1.0000
P(2)=	0.1524	0.2501	P(23)=	0.0000	1.0000
P(3)=	0.1992	0.4493	P(24)=	0.0000	1.0000
P(4)=	0.1952	0.6445	P(25)=	0.0000	1.0000
P(5)=	0.1530	0.7975	P(26)=	0.0000	1.0000
P(6)=	0.1000	0.8975	P(27)=	0.0000	1.0000
P(7)=	0.0560	0.9535	P(28)=	0.0000	1.0000
P(8)=	0.0274	0.9809	P(29)=	0.0000	1.0000
P(9)=	0.0120	0.9929	P(30)=	0.0000	1.0000
P(10)=	0.0047	0.9976	P(31)=	0.0000	1.0000
P(11)=	0.0017	0.9992	P(32)=	0.0000	1.0000
P(12)=	0.0005	0.9998	P(33)=	0.0000	1.0000
P(13)=	0.0002	0.9999	P(34)=	0.0000	1.0000
P(14)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

7 vehicles @ 25'/vehicle =175' Storage Length

Alternative 5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

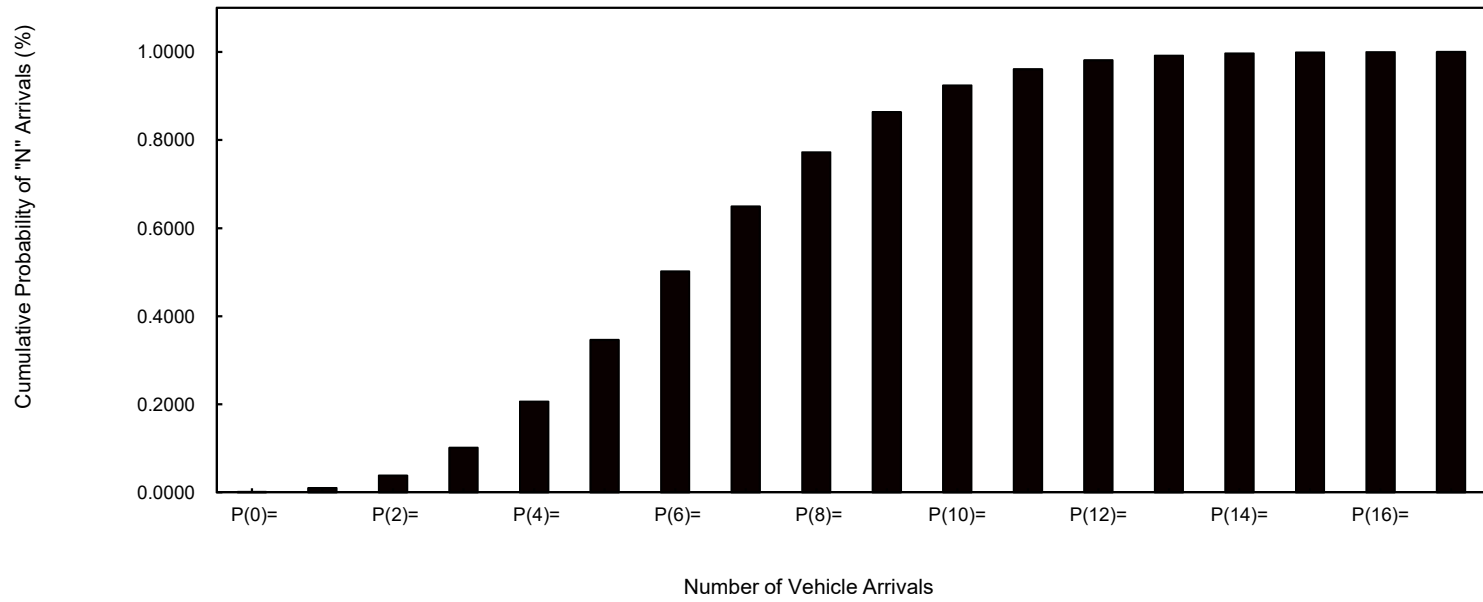
DATE: 14-Nov-19

110	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
218	PEAK HOUR VOLUME
6.66	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			PROBABILITY OF N ARRIVALS		
		CUMULATIVE			CUMULATIVE
P(0)=	0.0013	0.0013	P(21)=	0.0000	1.0000
P(1)=	0.0085	0.0098	P(22)=	0.0000	1.0000
P(2)=	0.0284	0.0382	P(23)=	0.0000	1.0000
P(3)=	0.0630	0.1012	P(24)=	0.0000	1.0000
P(4)=	0.1050	0.2062	P(25)=	0.0000	1.0000
P(5)=	0.1399	0.3461	P(26)=	0.0000	1.0000
P(6)=	0.1553	0.5013	P(27)=	0.0000	1.0000
P(7)=	0.1477	0.6491	P(28)=	0.0000	1.0000
P(8)=	0.1230	0.7721	P(29)=	0.0000	1.0000
P(9)=	0.0910	0.8631	P(30)=	0.0000	1.0000
P(10)=	0.0606	0.9238	P(31)=	0.0000	1.0000
P(11)=	0.0367	0.9605	P(32)=	0.0000	1.0000
P(12)=	0.0204	0.9809	P(33)=	0.0000	1.0000
P(13)=	0.0104	0.9913	P(34)=	0.0000	1.0000
P(14)=	0.0050	0.9963	P(35)=	0.0000	1.0000
P(15)=	0.0022	0.9985	P(36)=	0.0000	1.0000
P(16)=	0.0009	0.9994	P(37)=	0.0000	1.0000
P(17)=	0.0004	0.9998	P(38)=	0.0000	1.0000
P(18)=	0.0001	0.9999	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

11 vehicles @ 25'/vehicle = 275' Storage Length/2 lanes @ 140' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

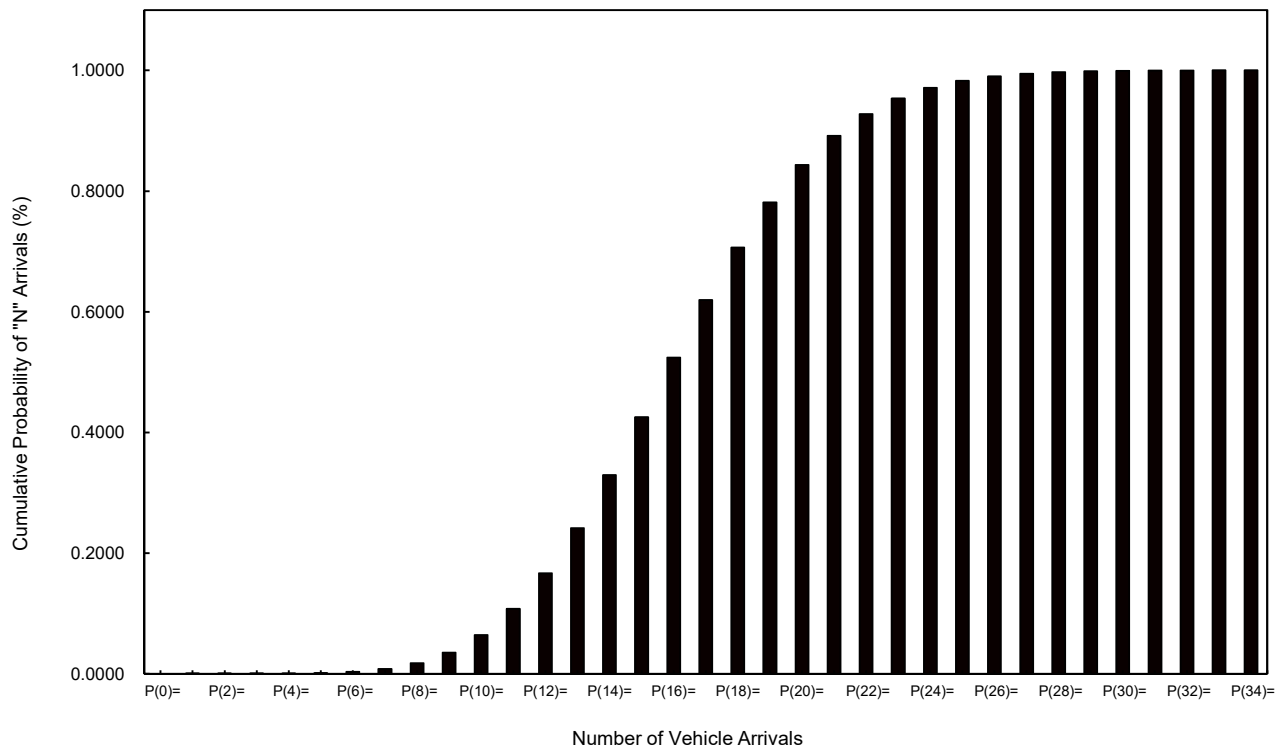
DATE: 14-Nov-19

88	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
672	PEAK HOUR VOLUME
16.43	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0483
P(2)=	0.0000	P(22)=	0.0361
P(3)=	0.0001	P(23)=	0.0258
P(4)=	0.0002	P(24)=	0.0176
P(5)=	0.0007	P(25)=	0.0116
P(6)=	0.0020	P(26)=	0.0073
P(7)=	0.0047	P(27)=	0.0045
P(8)=	0.0097	P(28)=	0.0026
P(9)=	0.0176	P(29)=	0.0015
P(10)=	0.0290	P(30)=	0.0008
P(11)=	0.0432	P(31)=	0.0004
P(12)=	0.0592	P(32)=	0.0002
P(13)=	0.0748	P(33)=	0.0001
P(14)=	0.0878	P(34)=	0.0001
P(15)=	0.0961	P(35)=	0.0000
P(16)=	0.0987	P(36)=	0.0000
P(17)=	0.0953	P(37)=	0.0000
P(18)=	0.0870	P(38)=	0.0000
P(19)=	0.0752	P(39)=	0.0000
P(20)=	0.0618	P(40)=	0.0000

23 vehicles @ 25'/vehicle = 575' Storage Length/2 lanes @ 290' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

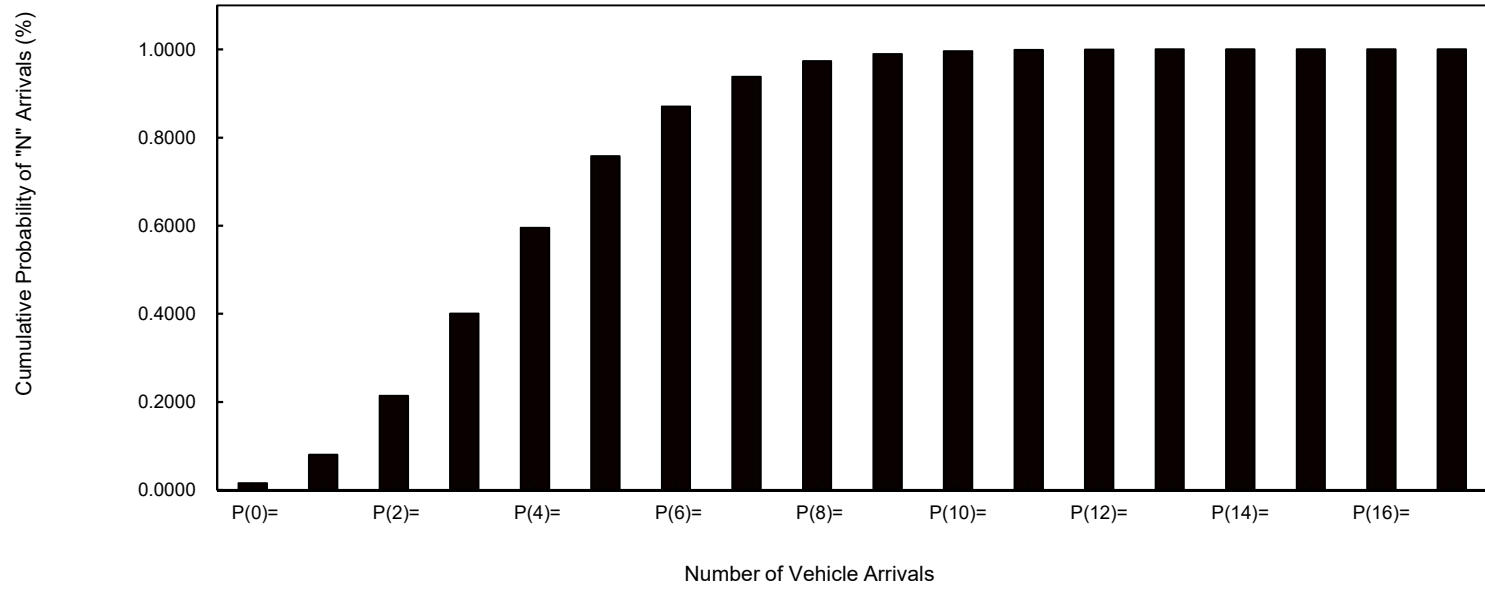
DATE: 14-Nov-19

83	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
181	PEAK HOUR VOLUME
4.17	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0154		
P(1)=	0.0643		
P(2)=	0.1341		
P(3)=	0.1866		
P(4)=	0.1947		
P(5)=	0.1625		
P(6)=	0.1130		
P(7)=	0.0674		
P(8)=	0.0351		
P(9)=	0.0163		
P(10)=	0.0068		
P(11)=	0.0026		
P(12)=	0.0009		
P(13)=	0.0003		
P(14)=	0.0001		
P(15)=	0.0000		
P(16)=	0.0000		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

8 vehicles @ 25'/vehicle = 200' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

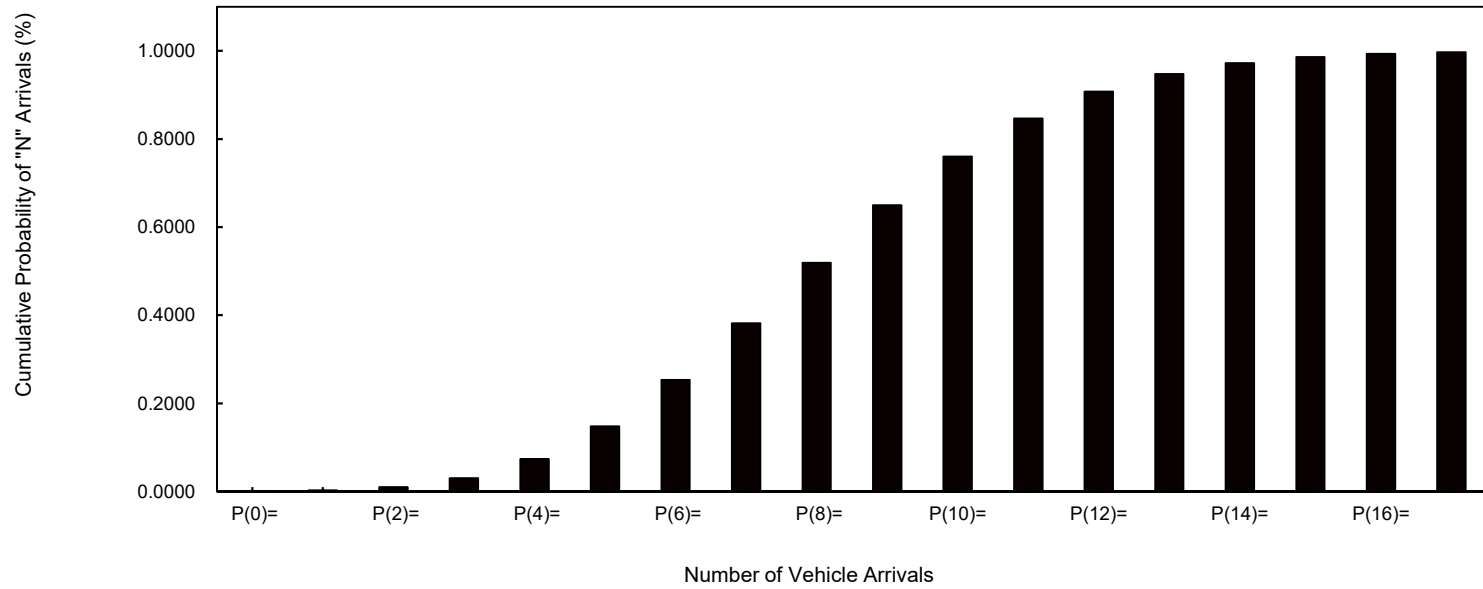
DATE: 14-Nov-19

107	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
287	PEAK HOUR VOLUME
8.53	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF</u> <u>N ARRIVALS</u>			<u>PROBABILITY OF</u> <u>N ARRIVALS</u>		
		<u>CUMULATIVE</u>			<u>CUMULATIVE</u>
P(0)=	0.0002	0.0002	P(21)=	0.0001	0.9999
P(1)=	0.0017	0.0019	P(22)=	0.0001	1.0000
P(2)=	0.0072	0.0091	P(23)=	0.0000	1.0000
P(3)=	0.0204	0.0295	P(24)=	0.0000	1.0000
P(4)=	0.0436	0.0730	P(25)=	0.0000	1.0000
P(5)=	0.0743	0.1473	P(26)=	0.0000	1.0000
P(6)=	0.1056	0.2530	P(27)=	0.0000	1.0000
P(7)=	0.1287	0.3817	P(28)=	0.0000	1.0000
P(8)=	0.1373	0.5189	P(29)=	0.0000	1.0000
P(9)=	0.1301	0.6490	P(30)=	0.0000	1.0000
P(10)=	0.1110	0.7600	P(31)=	0.0000	1.0000
P(11)=	0.0861	0.8461	P(32)=	0.0000	1.0000
P(12)=	0.0612	0.9072	P(33)=	0.0000	1.0000
P(13)=	0.0401	0.9474	P(34)=	0.0000	1.0000
P(14)=	0.0245	0.9718	P(35)=	0.0000	1.0000
P(15)=	0.0139	0.9858	P(36)=	0.0000	1.0000
P(16)=	0.0074	0.9932	P(37)=	0.0000	1.0000
P(17)=	0.0037	0.9969	P(38)=	0.0000	1.0000
P(18)=	0.0018	0.9987	P(39)=	0.0000	1.0000
P(19)=	0.0008	0.9994	P(40)=	0.0000	1.0000
P(20)=	0.0003	0.9998			

13 vehicles @ 25'/vehicle =325' Storage Length/2 lanes @ 165' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

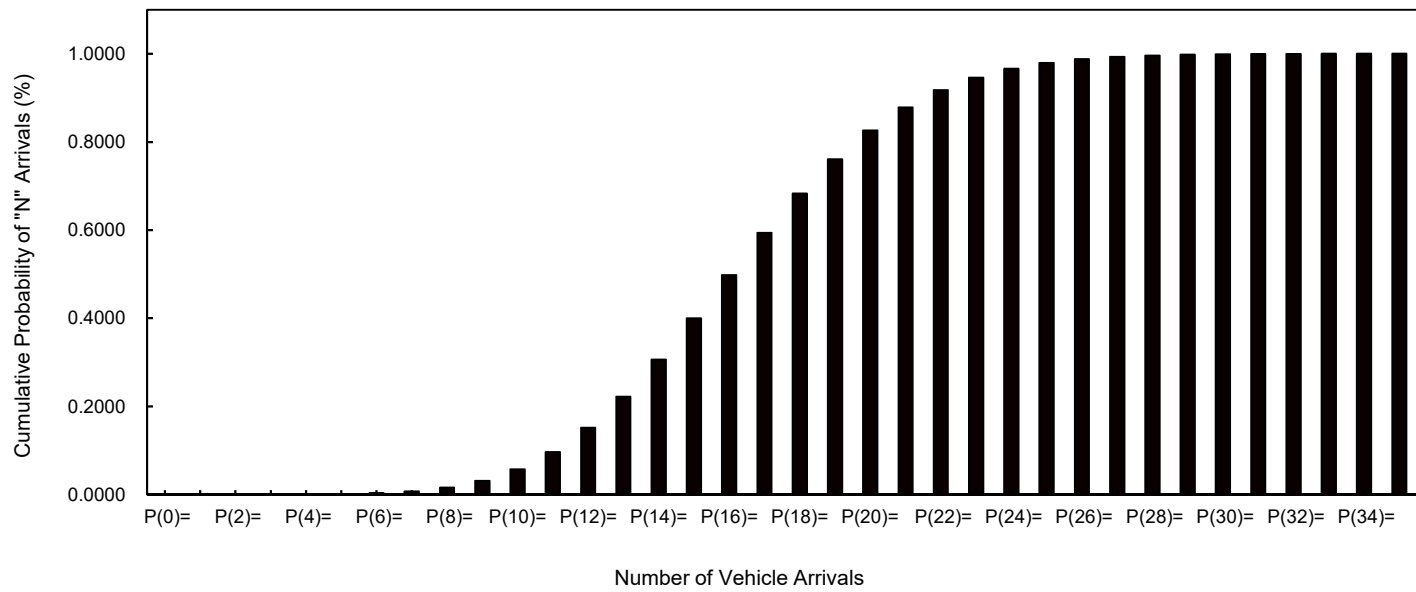
DATE: 14-Nov-19

85	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
707	PEAK HOUR VOLUME
16.69	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0519
P(2)=	0.0000	P(22)=	0.0394
P(3)=	0.0000	P(23)=	0.0286
P(4)=	0.0002	P(24)=	0.0199
P(5)=	0.0006	P(25)=	0.0133
P(6)=	0.0017	P(26)=	0.0085
P(7)=	0.0040	P(27)=	0.0053
P(8)=	0.0084	P(28)=	0.0031
P(9)=	0.0156	P(29)=	0.0018
P(10)=	0.0261	P(30)=	0.0010
P(11)=	0.0395	P(31)=	0.0005
P(12)=	0.0550	P(32)=	0.0003
P(13)=	0.0706	P(33)=	0.0001
P(14)=	0.0842	P(34)=	0.0001
P(15)=	0.0937	P(35)=	0.0000
P(16)=	0.0978	P(36)=	0.0000
P(17)=	0.0960	P(37)=	0.0000
P(18)=	0.0890	P(38)=	0.0000
P(19)=	0.0782	P(39)=	0.0000
P(20)=	0.0653	P(40)=	0.0000

23 vehicles @ 25'/vehicle = 575' Storage Length/2 lanes @ 290' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. cycle)

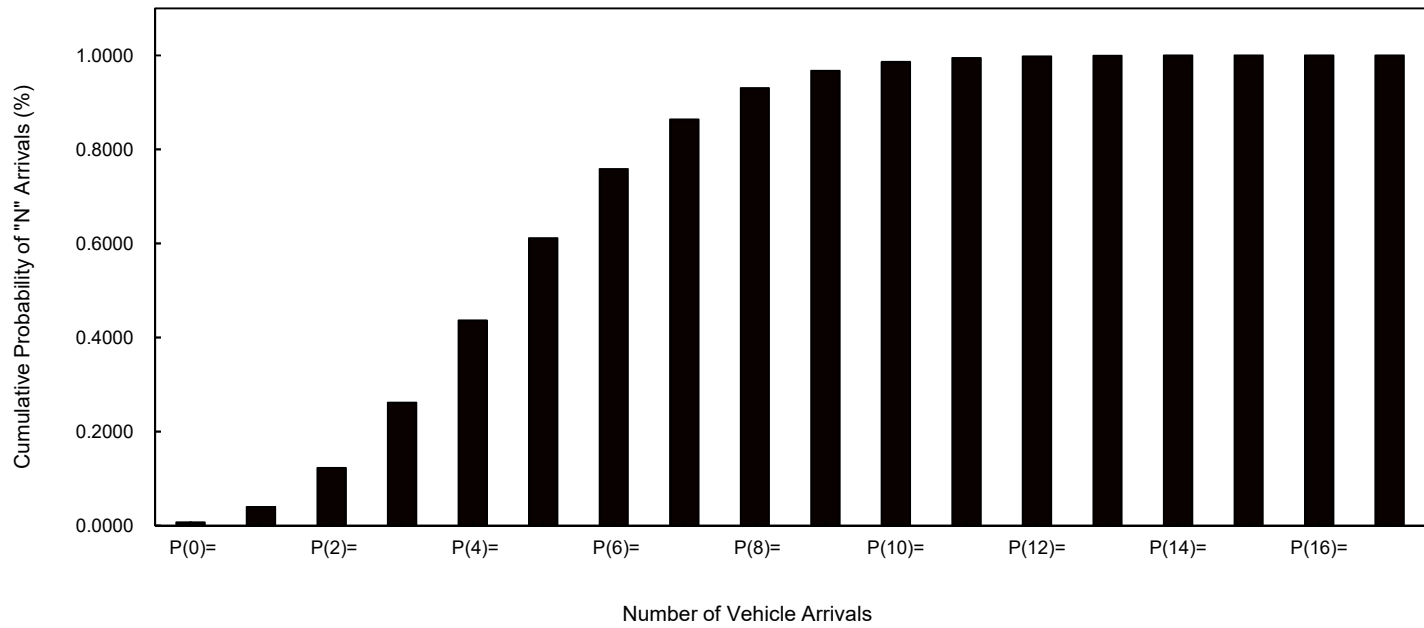
DATE: 14-Nov-19

77	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
235	PEAK HOUR VOLUME
5.03	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0066		
P(1)=	0.0330		
P(2)=	0.0829		
P(3)=	0.1389		
P(4)=	0.1745		
P(5)=	0.1755		
P(6)=	0.1470		
P(7)=	0.1055		
P(8)=	0.0663		
P(9)=	0.0370		
P(10)=	0.0186		
P(11)=	0.0085		
P(12)=	0.0036		
P(13)=	0.0014		
P(14)=	0.0005		
P(15)=	0.0002		
P(16)=	0.0001		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

9 vehicles @ 25'/vehicle = 225' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Right-Turn Alton @ Culver



Appendix C-4
Buildout
(120-sec cycle)
PM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

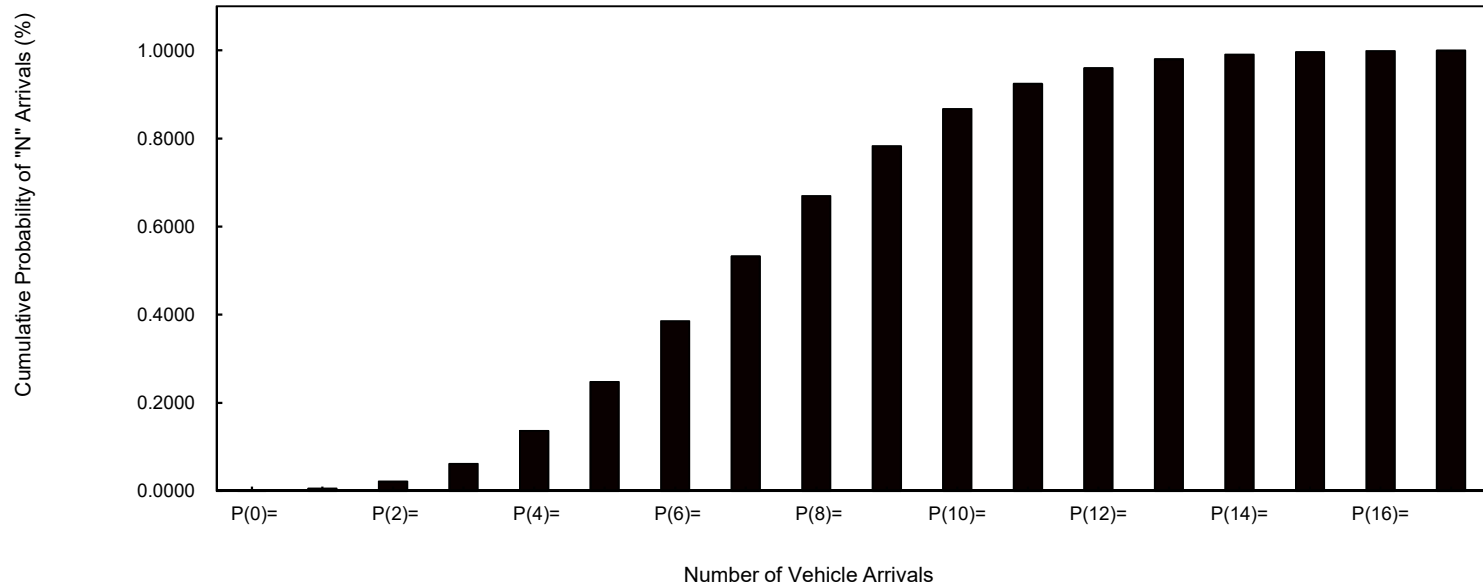
DATE: 14-Nov-19

109	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
246	PEAK HOUR VOLUME
7.45	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0006		
P(1)=	0.0043		
P(2)=	0.0162		
P(3)=	0.0401		
P(4)=	0.0747		
P(5)=	0.1113		
P(6)=	0.1381		
P(7)=	0.1470		
P(8)=	0.1368		
P(9)=	0.1132		
P(10)=	0.0843		
P(11)=	0.0571		
P(12)=	0.0354		
P(13)=	0.0203		
P(14)=	0.0108		
P(15)=	0.0054		
P(16)=	0.0025		
P(17)=	0.0011		
P(18)=	0.0005		
P(19)=	0.0002		
P(20)=	0.0001		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

12 vehicles @ 25'/vehicle = 300' Storage Length/2 lanes @ 150' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

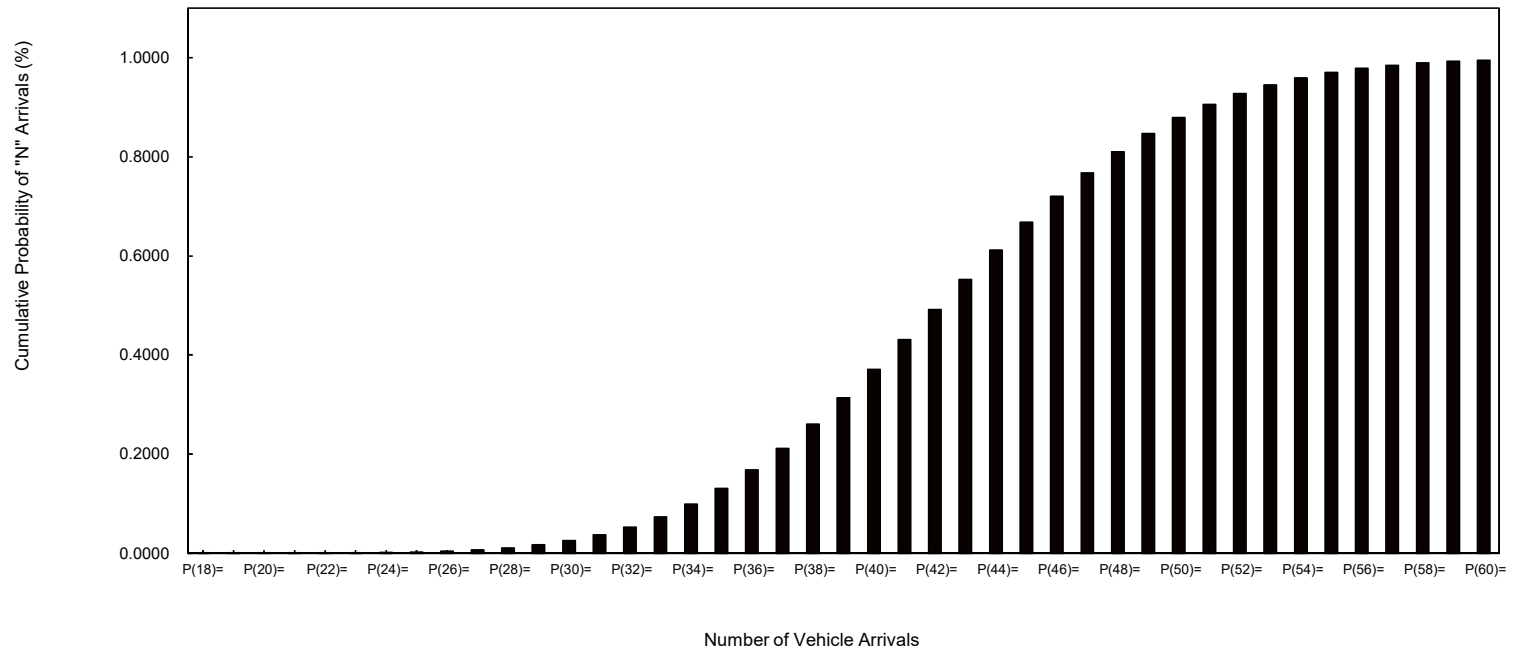
CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle) DATE: 14-Nov-19

68	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
2266	PEAK HOUR VOLUME
42.80	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0118	0.0370
P(2)=	0.0000	0.0000	P(32)=	0.0158	0.0528
P(3)=	0.0000	0.0000	P(33)=	0.0205	0.0732
P(4)=	0.0000	0.0000	P(34)=	0.0258	0.0990
P(5)=	0.0000	0.0000	P(35)=	0.0315	0.1305
P(6)=	0.0000	0.0000	P(36)=	0.0375	0.1680
P(7)=	0.0000	0.0000	P(37)=	0.0433	0.2113
P(8)=	0.0000	0.0000	P(38)=	0.0488	0.2601
P(9)=	0.0000	0.0000	P(39)=	0.0536	0.3136
P(10)=	0.0000	0.0000	P(40)=	0.0573	0.3709
P(11)=	0.0000	0.0000	P(41)=	0.0598	0.4308
P(12)=	0.0000	0.0000	P(42)=	0.0610	0.4918
P(13)=	0.0000	0.0000	P(43)=	0.0607	0.5524
P(14)=	0.0000	0.0000	P(44)=	0.0590	0.6115
P(15)=	0.0000	0.0000	P(45)=	0.0562	0.6676
P(16)=	0.0000	0.0000	P(46)=	0.0523	0.7199
P(17)=	0.0000	0.0000	P(47)=	0.0476	0.7675
P(18)=	0.0000	0.0000	P(48)=	0.0424	0.8099
P(19)=	0.0000	0.0000	P(49)=	0.0371	0.8470
P(20)=	0.0000	0.0001	P(50)=	0.0317	0.8787
P(21)=	0.0001	0.0002	P(51)=	0.0266	0.9053
P(22)=	0.0002	0.0004	P(52)=	0.0219	0.9273
P(23)=	0.0003	0.0007	P(53)=	0.0177	0.9450
P(24)=	0.0006	0.0013	P(54)=	0.0140	0.9590
P(25)=	0.0010	0.0023	P(55)=	0.0109	0.9699
P(26)=	0.0017	0.0040	P(56)=	0.0083	0.9783
P(27)=	0.0027	0.0066	P(57)=	0.0063	0.9845
P(28)=	0.0041	0.0107	P(58)=	0.0046	0.9892
P(29)=	0.0060	0.0167	P(59)=	0.0034	0.9925
P(30)=	0.0085	0.0252	P(60)=	0.0024	0.9949

54 vehicles @ 25'/vehicle = 1350' Storage Length/4 lanes @ 340' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
NB Thourgh Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

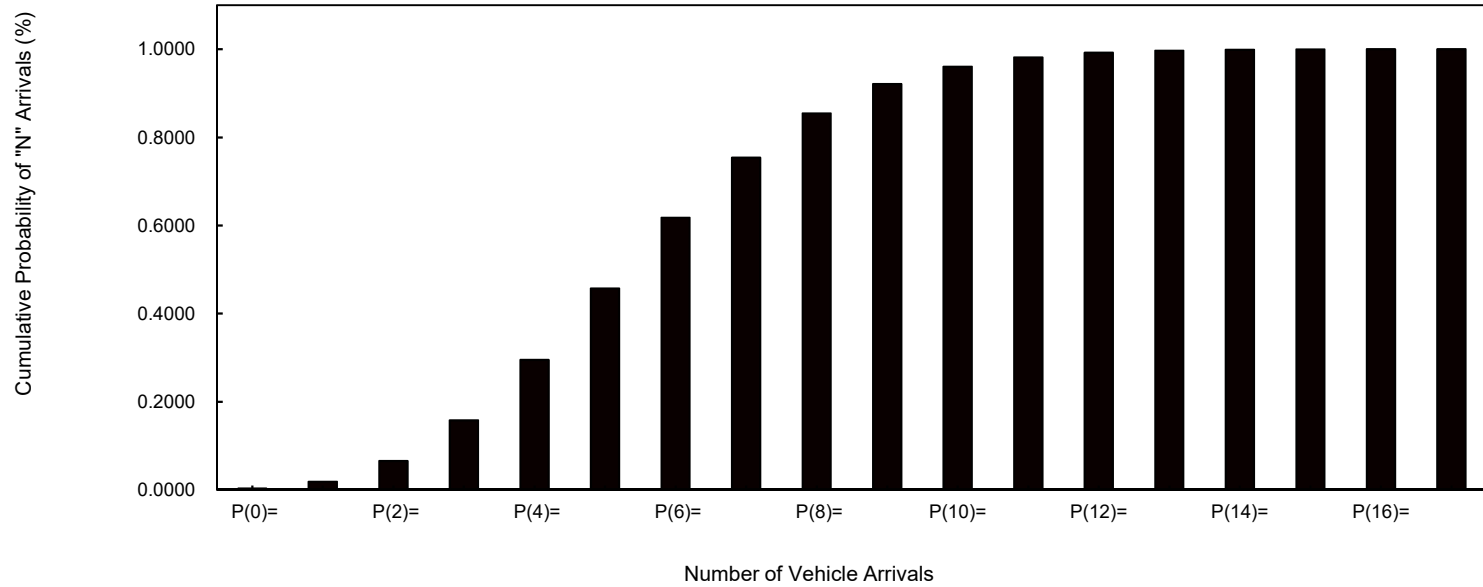
DATE: 14-Nov-19

58	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
368	PEAK HOUR VOLUME
5.93	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0027		
P(1)=	0.0158		
P(2)=	0.0468		
P(3)=	0.0924		
P(4)=	0.1370		
P(5)=	0.1625		
P(6)=	0.1606		
P(7)=	0.1360		
P(8)=	0.1008		
P(9)=	0.0664		
P(10)=	0.0394		
P(11)=	0.0212		
P(12)=	0.0105		
P(13)=	0.0048		
P(14)=	0.0020		
P(15)=	0.0008		
P(16)=	0.0003		
P(17)=	0.0001		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

10 vehicles @ 25'/vehicle = 250' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

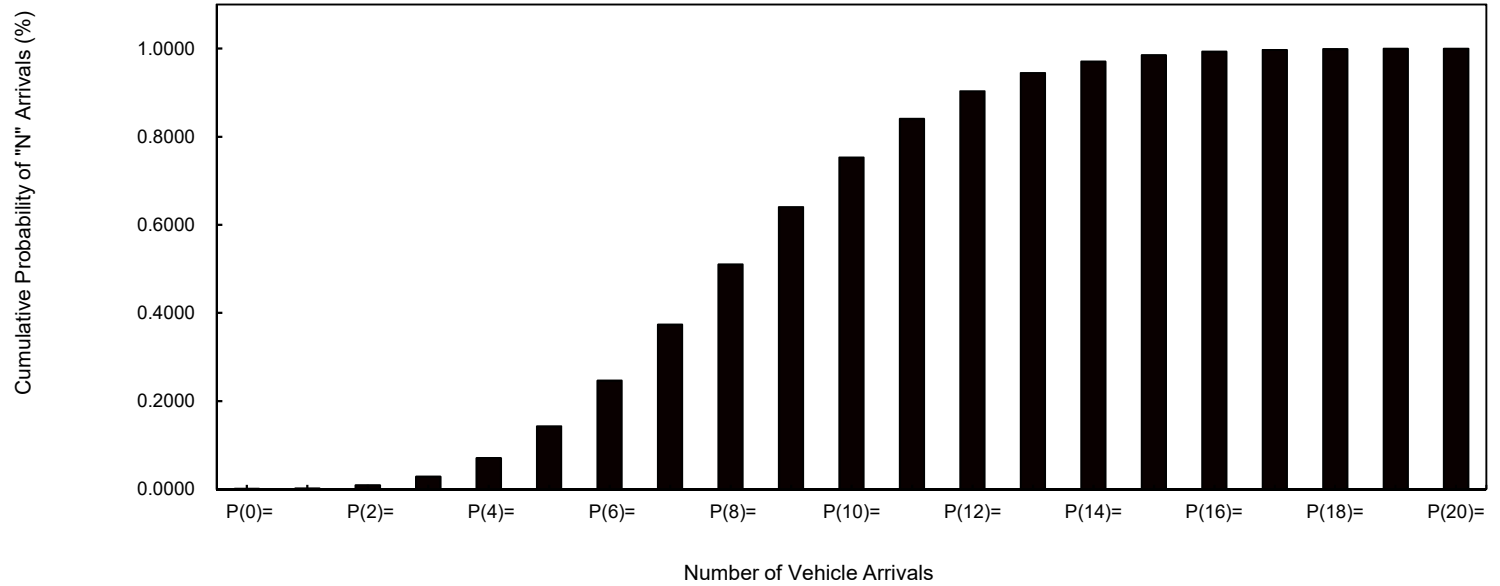
DATE: 14-Nov-19

106	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
292	PEAK HOUR VOLUME
8.60	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0002		
P(1)=	0.0016	P(21)=	0.0002
P(2)=	0.0068	P(22)=	0.0001
P(3)=	0.0195	P(23)=	0.0000
P(4)=	0.0420	P(24)=	0.0000
P(5)=	0.0722	P(25)=	0.0000
P(6)=	0.1035	P(26)=	0.0000
P(7)=	0.1271	P(27)=	0.0000
P(8)=	0.1366	P(28)=	0.0000
P(9)=	0.1305	P(29)=	0.0000
P(10)=	0.1122	P(30)=	0.0000
P(11)=	0.0877	P(31)=	0.0000
P(12)=	0.0629	P(32)=	0.0000
P(13)=	0.0416	P(33)=	0.0000
P(14)=	0.0255	P(34)=	0.0000
P(15)=	0.0146	P(35)=	0.0000
P(16)=	0.0079	P(36)=	0.0000
P(17)=	0.0040	P(37)=	0.0000
P(18)=	0.0019	P(38)=	0.0000
P(19)=	0.0009	P(39)=	0.0000
P(20)=	0.0004	P(40)=	0.0000

14 vehicles @ 25'/vehicle = 350' Storage Length/2 lanes @ 175' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

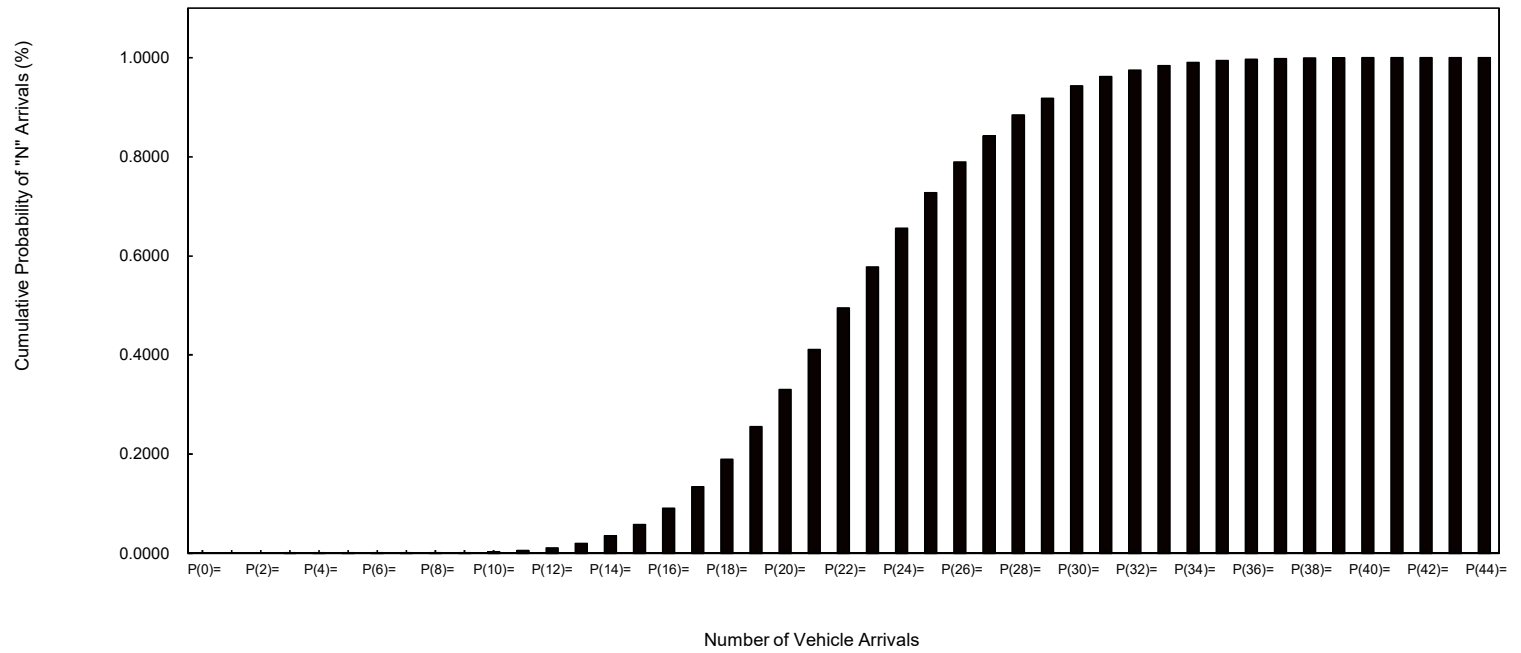
CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle) DATE: 14-Nov-19

65	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1259	PEAK HOUR VOLUME
22.73	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0186	0.9616
P(2)=	0.0000	0.0000	P(32)=	0.0132	0.9748
P(3)=	0.0000	0.0000	P(33)=	0.0091	0.9839
P(4)=	0.0000	0.0000	P(34)=	0.0061	0.9899
P(5)=	0.0000	0.0000	P(35)=	0.0039	0.9939
P(6)=	0.0000	0.0000	P(36)=	0.0025	0.9964
P(7)=	0.0001	0.0001	P(37)=	0.0015	0.9979
P(8)=	0.0002	0.0004	P(38)=	0.0009	0.9988
P(9)=	0.0006	0.0010	P(39)=	0.0005	0.9993
P(10)=	0.0014	0.0023	P(40)=	0.0003	0.9996
P(11)=	0.0028	0.0051	P(41)=	0.0002	0.9998
P(12)=	0.0053	0.0105	P(42)=	0.0001	0.9999
P(13)=	0.0093	0.0198	P(43)=	0.0000	1.0000
P(14)=	0.0151	0.0349	P(44)=	0.0000	1.0000
P(15)=	0.0229	0.0579	P(45)=	0.0000	1.0000
P(16)=	0.0326	0.0905	P(46)=	0.0000	1.0000
P(17)=	0.0436	0.1341	P(47)=	0.0000	1.0000
P(18)=	0.0551	0.1891	P(48)=	0.0000	1.0000
P(19)=	0.0659	0.2550	P(49)=	0.0000	1.0000
P(20)=	0.0749	0.3298	P(50)=	0.0000	1.0000
P(21)=	0.0810	0.4109	P(51)=	0.0000	1.0000
P(22)=	0.0837	0.4946	P(52)=	0.0000	1.0000
P(23)=	0.0828	0.5774	P(53)=	0.0000	1.0000
P(24)=	0.0784	0.6557	P(54)=	0.0000	1.0000
P(25)=	0.0713	0.7270	P(55)=	0.0000	1.0000
P(26)=	0.0623	0.7893			
P(27)=	0.0525	0.8418			
P(28)=	0.0426	0.8844			
P(29)=	0.0334	0.9178			
P(30)=	0.0253	0.9431			

31 vehicles @ 25'/vehicle = 775' Storage Length/3 lanes @ 260' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 5 Imps. (120-sec. Cycle)

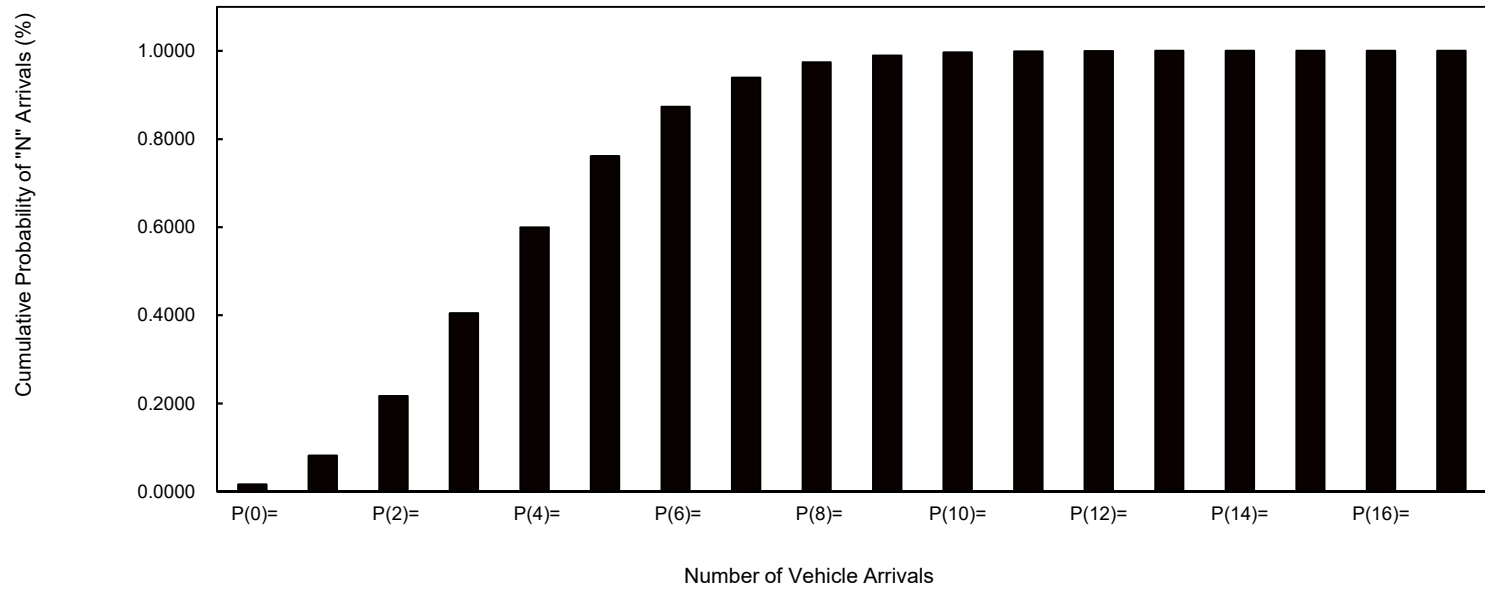
DATE: 14-Nov-19

47	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
318	PEAK HOUR VOLUME
4.15	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE		
P(0)=	0.0157	0.0157			
P(1)=	0.0653	0.0811	P(21)=	0.0000	1.0000
P(2)=	0.1356	0.2167	P(22)=	0.0000	1.0000
P(3)=	0.1877	0.4044	P(23)=	0.0000	1.0000
P(4)=	0.1948	0.5992	P(24)=	0.0000	1.0000
P(5)=	0.1618	0.7610	P(25)=	0.0000	1.0000
P(6)=	0.1119	0.8729	P(26)=	0.0000	1.0000
P(7)=	0.0664	0.9393	P(27)=	0.0000	1.0000
P(8)=	0.0345	0.9738	P(28)=	0.0000	1.0000
P(9)=	0.0159	0.9897	P(29)=	0.0000	1.0000
P(10)=	0.0066	0.9963	P(30)=	0.0000	1.0000
P(11)=	0.0025	0.9988	P(31)=	0.0000	1.0000
P(12)=	0.0009	0.9996	P(32)=	0.0000	1.0000
P(13)=	0.0003	0.9999	P(33)=	0.0000	1.0000
P(14)=	0.0001	1.0000	P(34)=	0.0000	1.0000
P(15)=	0.0000	1.0000	P(35)=	0.0000	1.0000
P(16)=	0.0000	1.0000	P(36)=	0.0000	1.0000
P(17)=	0.0000	1.0000	P(37)=	0.0000	1.0000
P(18)=	0.0000	1.0000	P(38)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(39)=	0.0000	1.0000
P(20)=	0.0000	1.0000	P(40)=	0.0000	1.0000

8 vehicles @ 25'/vehicle =200' Storage Length

Alternative 5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

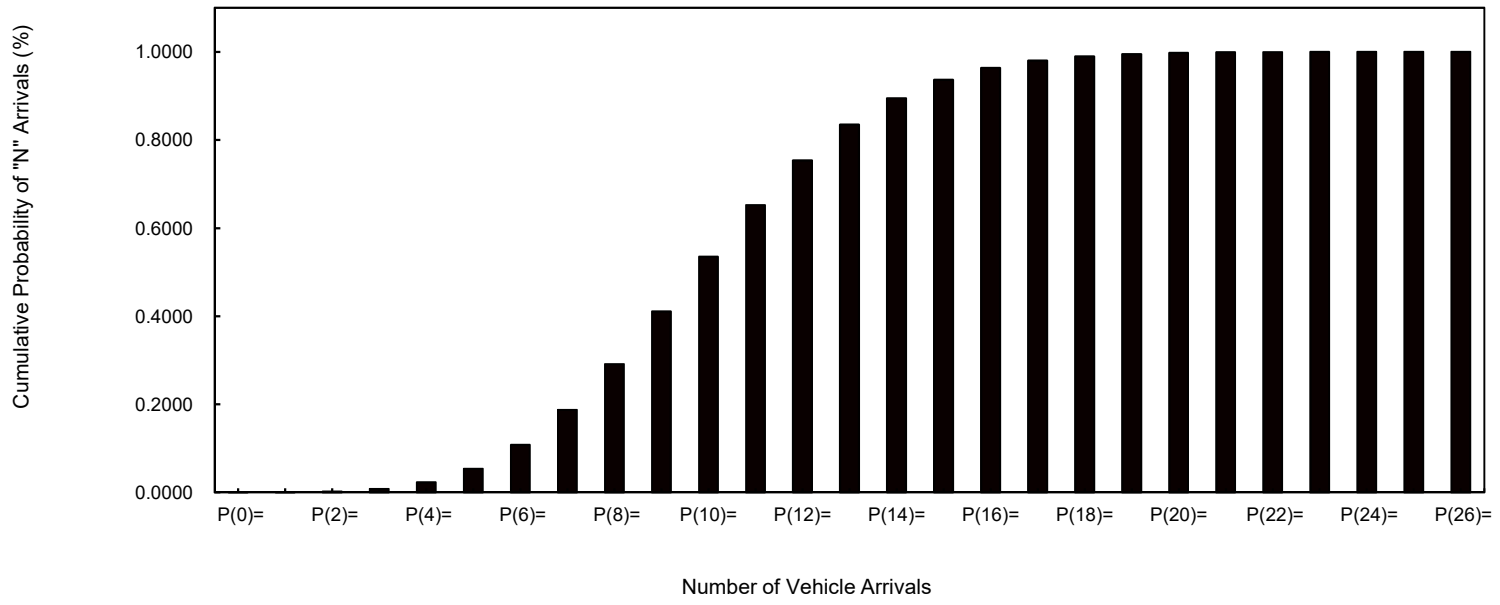
DATE: 14-Nov-19

103	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
363	PEAK HOUR VOLUME
10.39	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0003		
P(2)=	0.0017		
P(3)=	0.0058		
P(4)=	0.0150		
P(5)=	0.0311		
P(6)=	0.0538		
P(7)=	0.0798		
P(8)=	0.1036		
P(9)=	0.1196		
P(10)=	0.1242		
P(11)=	0.1173		
P(12)=	0.1015		
P(13)=	0.0811		
P(14)=	0.0602		
P(15)=	0.0416		
P(16)=	0.0270		
P(17)=	0.0165		
P(18)=	0.0095		
P(19)=	0.0052		
P(20)=	0.0027		
		P(21)=	0.0013
		P(22)=	0.0006
		P(23)=	0.0003
		P(24)=	0.0001
		P(25)=	0.0001
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

16 vehicles @ 25'/vehicle = 400' Storage Length/2 lanes @ 200' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

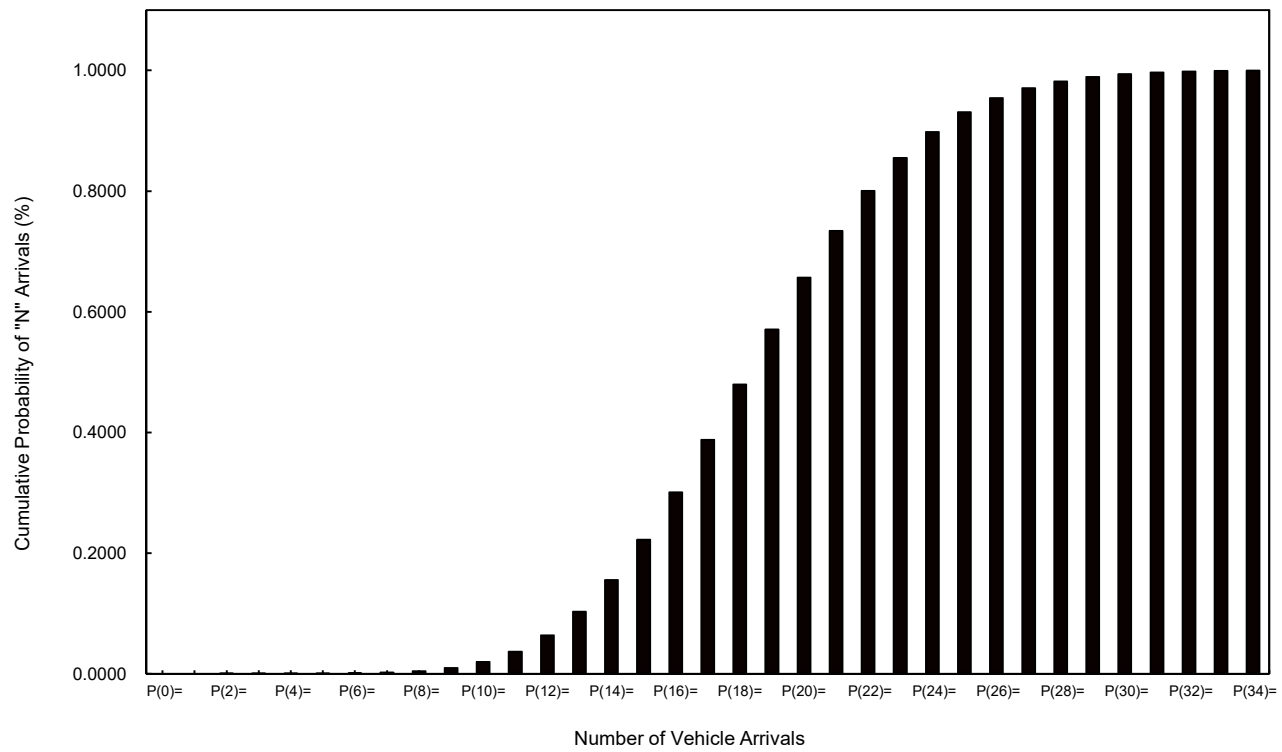
DATE: 14-Nov-19

79	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
861	PEAK HOUR VOLUME
18.89	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0774
P(2)=	0.0000	P(22)=	0.0665
P(3)=	0.0000	P(23)=	0.0546
P(4)=	0.0000	P(24)=	0.0430
P(5)=	0.0001	P(25)=	0.0325
P(6)=	0.0004	P(26)=	0.0236
P(7)=	0.0011	P(27)=	0.0165
P(8)=	0.0025	P(28)=	0.0112
P(9)=	0.0053	P(29)=	0.0073
P(10)=	0.0100	P(30)=	0.0046
P(11)=	0.0171	P(31)=	0.0028
P(12)=	0.0269	P(32)=	0.0016
P(13)=	0.0391	P(33)=	0.0009
P(14)=	0.0528	P(34)=	0.0005
P(15)=	0.0665	P(35)=	0.0003
P(16)=	0.0785	P(36)=	0.0001
P(17)=	0.0873	P(37)=	0.0001
P(18)=	0.0916	P(38)=	0.0000
P(19)=	0.0911	P(39)=	0.0000
P(20)=	0.0861	P(40)=	0.0000

26 vehicles @ 25'/vehicle = 650' Storage Length/2 lanes @ 325' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

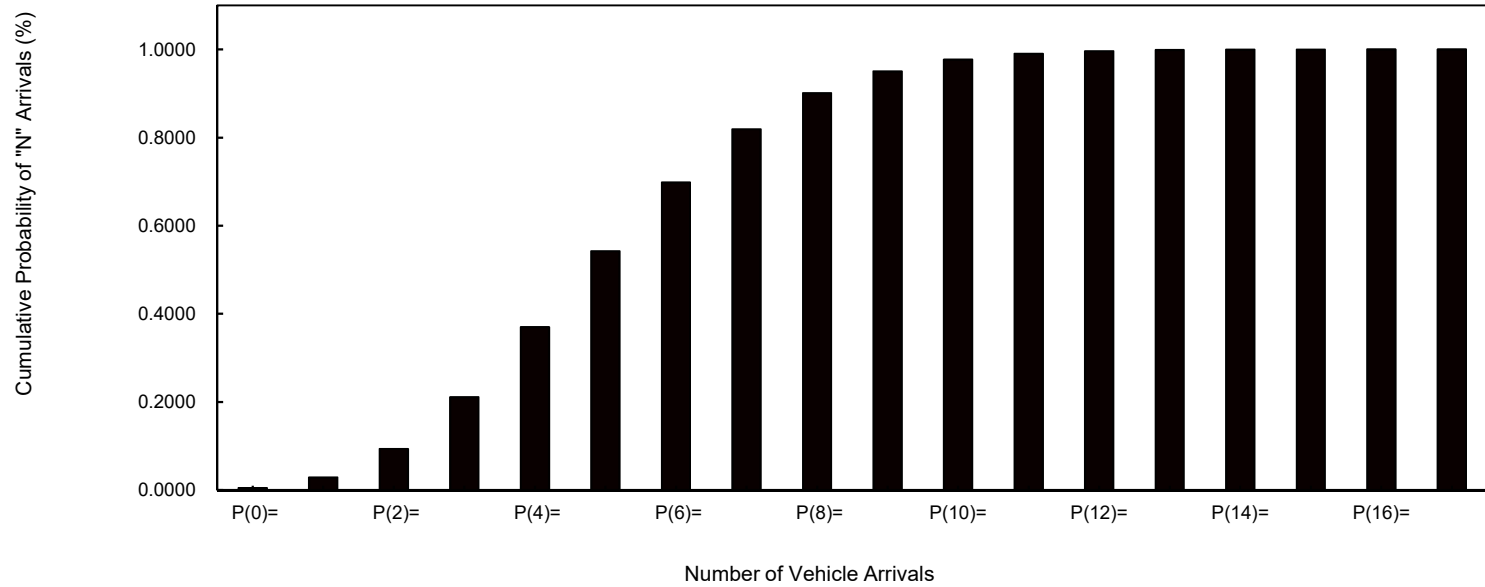
DATE: 14-Nov-19

71	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
275	PEAK HOUR VOLUME
5.42	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0044		
P(1)=	0.0239		
P(2)=	0.0649		
P(3)=	0.1173		
P(4)=	0.1590		
P(5)=	0.1725		
P(6)=	0.1559		
P(7)=	0.1208		
P(8)=	0.0819		
P(9)=	0.0494		
P(10)=	0.0268		
P(11)=	0.0132		
P(12)=	0.0060		
P(13)=	0.0025		
P(14)=	0.0010		
P(15)=	0.0003		
P(16)=	0.0001		
P(17)=	0.0000		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

9 vehicles @ 25'/vehicle = 225' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

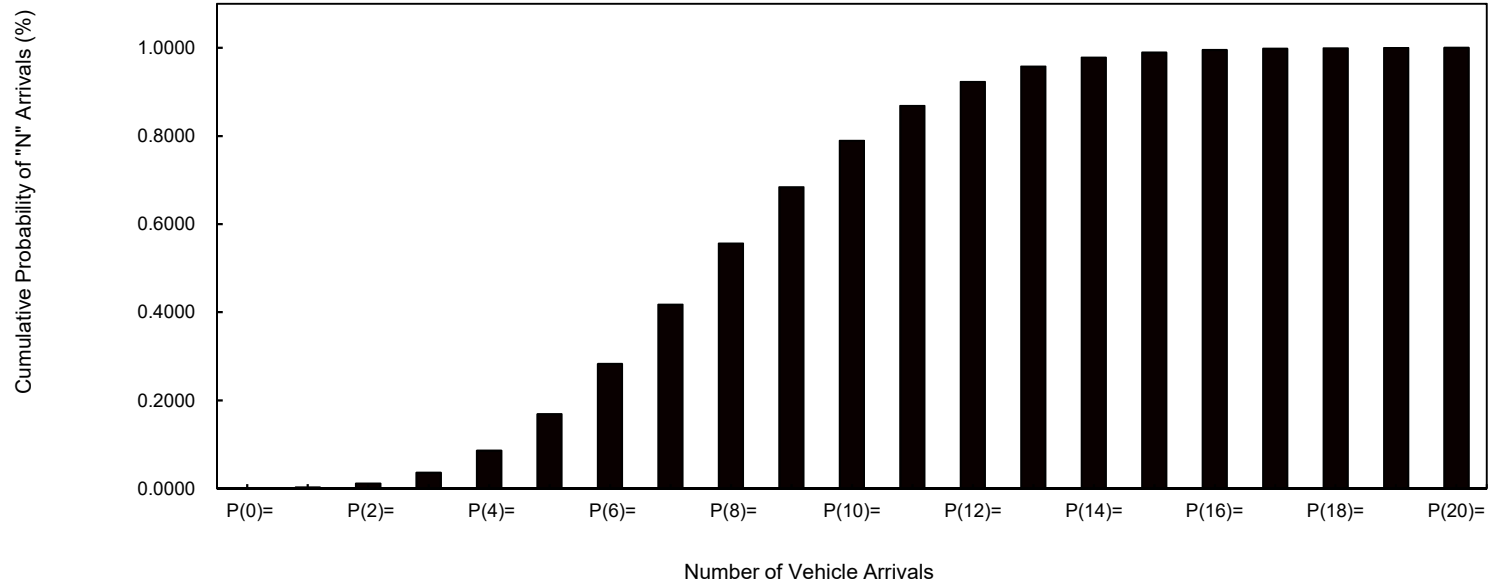
DATE: 14-Nov-19

107	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
278	PEAK HOUR VOLUME
8.26	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0003		
P(1)=	0.0021		
P(2)=	0.0088		
P(3)=	0.0243		
P(4)=	0.0501		
P(5)=	0.0828		
P(6)=	0.1140		
P(7)=	0.1346		
P(8)=	0.1390		
P(9)=	0.1276		
P(10)=	0.1054		
P(11)=	0.0792		
P(12)=	0.0545		
P(13)=	0.0347		
P(14)=	0.0205		
P(15)=	0.0113		
P(16)=	0.0058		
P(17)=	0.0028		
P(18)=	0.0013		
P(19)=	0.0006		
P(20)=	0.0002		
		P(21)=	0.0001
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

13 vehicles @ 25'/vehicle =325' Storage Length/2 lanes @ 165' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

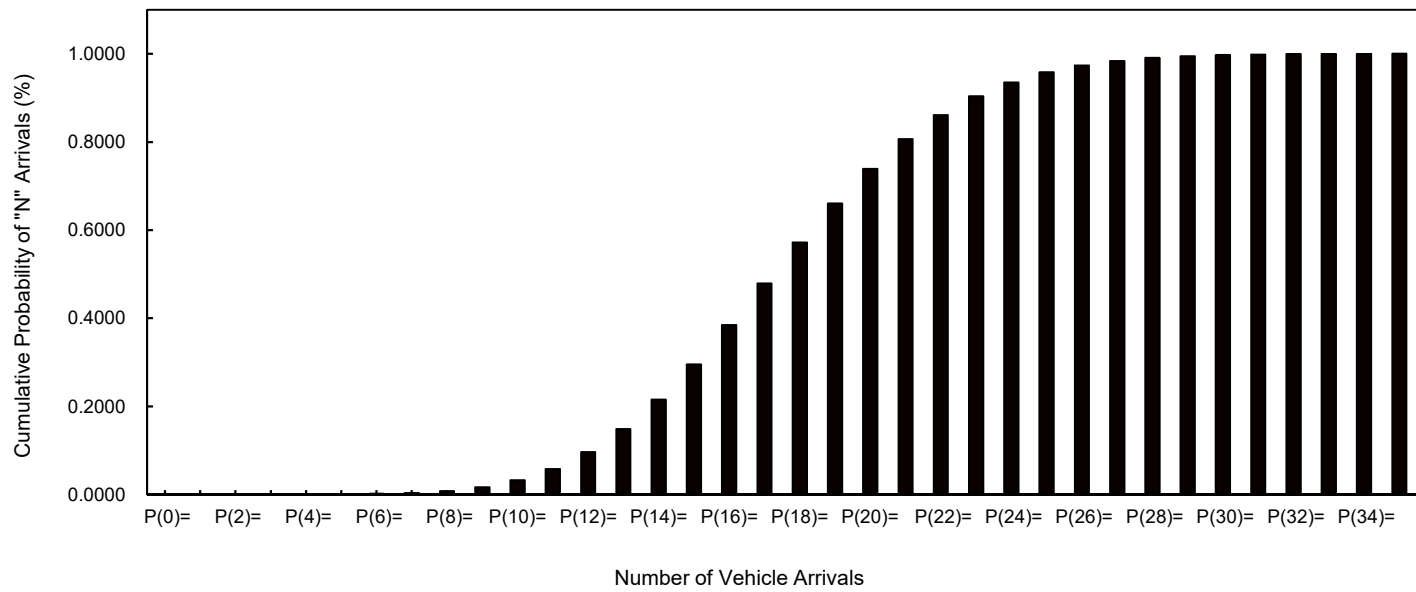
DATE: 14-Nov-19

84	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
767	PEAK HOUR VOLUME
17.90	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0000		
P(3)=	0.0000		
P(4)=	0.0001		
P(5)=	0.0003		
P(6)=	0.0008		
P(7)=	0.0020		
P(8)=	0.0044		
P(9)=	0.0088		
P(10)=	0.0157		
P(11)=	0.0255		
P(12)=	0.0381		
P(13)=	0.0524		
P(14)=	0.0670		
P(15)=	0.0799		
P(16)=	0.0894		
P(17)=	0.0941		
P(18)=	0.0936		
P(19)=	0.0881		
P(20)=	0.0789		
		P(21)=	0.0672
		P(22)=	0.0547
		P(23)=	0.0425
		P(24)=	0.0317
		P(25)=	0.0227
		P(26)=	0.0156
		P(27)=	0.0104
		P(28)=	0.0066
		P(29)=	0.0041
		P(30)=	0.0024
		P(31)=	0.0014
		P(32)=	0.0008
		P(33)=	0.0004
		P(34)=	0.0002
		P(35)=	0.0001
		P(36)=	0.0001
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

25 vehicles @ 25'/vehicle = 625' Storage Length/2 lanes @ 315' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Imps. (120-sec. Cycle)

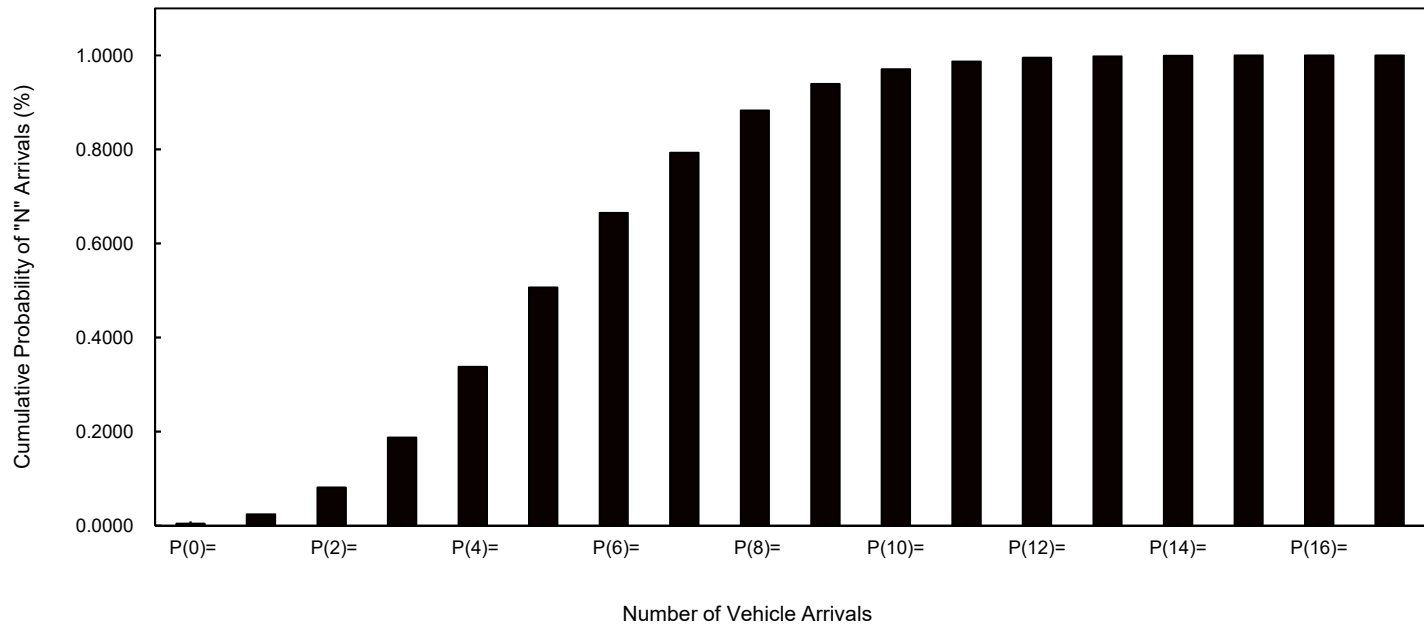
DATE: 14-Nov-19

74	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
274	PEAK HOUR VOLUME
5.63	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0036		
P(1)=	0.0202		
P(2)=	0.0568		
P(3)=	0.1066		
P(4)=	0.1501		
P(5)=	0.1691		
P(6)=	0.1587		
P(7)=	0.1277		
P(8)=	0.0899		
P(9)=	0.0563		
P(10)=	0.0317		
P(11)=	0.0162		
P(12)=	0.0076		
P(13)=	0.0033		
P(14)=	0.0013		
P(15)=	0.0005		
P(16)=	0.0002		
P(17)=	0.0001		
P(18)=	0.0000		
P(19)=	0.0000		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

10 vehicles @ 25'/vehicle = 250' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (120-sec. cycle)
WB Right-Turn Alton @ Culver



Appendix C-5
Buildout
(200-sec cycle)
AM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

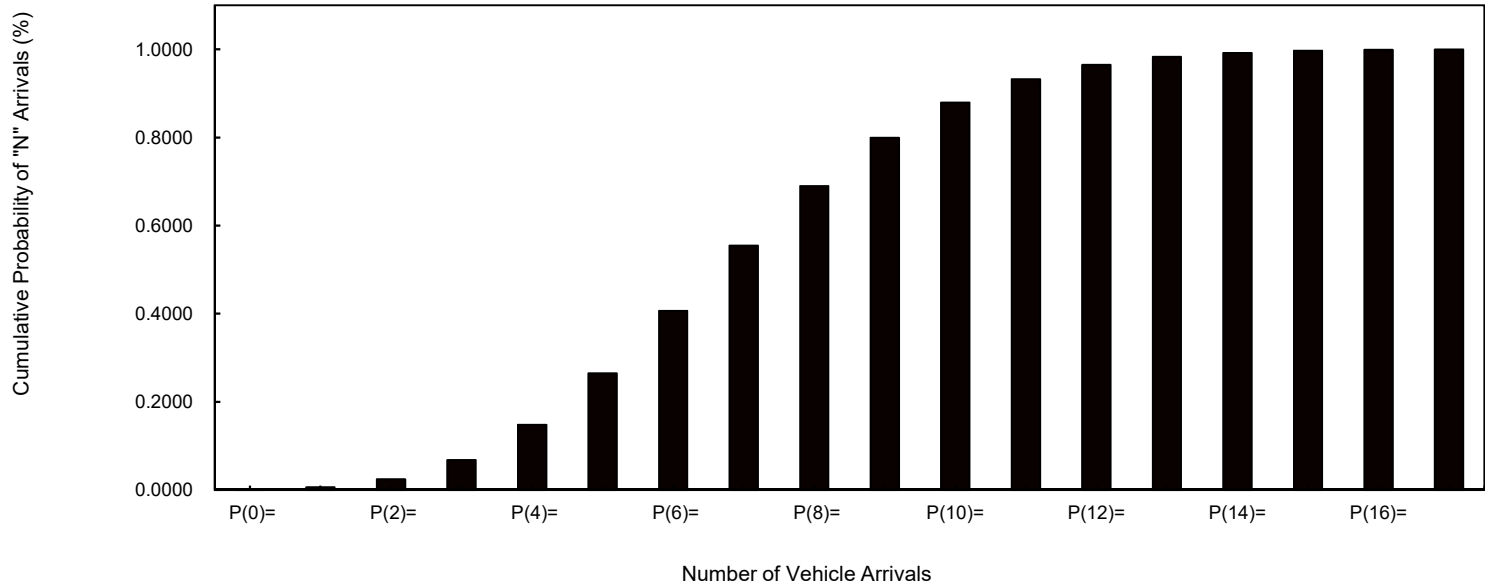
DATE: 14-Nov-19

189	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
139	PEAK HOUR VOLUME
7.30	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			CUMULATIVE	PROBABILITY OF N ARRIVALS			CUMULATIVE
P(0)=	0.0007		0.0007				
P(1)=	0.0049		0.0056		P(21)=	0.0000	1.0000
P(2)=	0.0180		0.0237		P(22)=	0.0000	1.0000
P(3)=	0.0439		0.0675		P(23)=	0.0000	1.0000
P(4)=	0.0800		0.1475		P(24)=	0.0000	1.0000
P(5)=	0.1168		0.2643		P(25)=	0.0000	1.0000
P(6)=	0.1421		0.4064		P(26)=	0.0000	1.0000
P(7)=	0.1481		0.5545		P(27)=	0.0000	1.0000
P(8)=	0.1351		0.6896		P(28)=	0.0000	1.0000
P(9)=	0.1095		0.7991		P(29)=	0.0000	1.0000
P(10)=	0.0799		0.8790		P(30)=	0.0000	1.0000
P(11)=	0.0530		0.9321		P(31)=	0.0000	1.0000
P(12)=	0.0322		0.9643		P(32)=	0.0000	1.0000
P(13)=	0.0181		0.9824		P(33)=	0.0000	1.0000
P(14)=	0.0094		0.9918		P(34)=	0.0000	1.0000
P(15)=	0.0046		0.9964		P(35)=	0.0000	1.0000
P(16)=	0.0021		0.9985		P(36)=	0.0000	1.0000
P(17)=	0.0009		0.9994		P(37)=	0.0000	1.0000
P(18)=	0.0004		0.9998		P(38)=	0.0000	1.0000
P(19)=	0.0001		0.9999		P(39)=	0.0000	1.0000
P(20)=	0.0001		1.0000		P(40)=	0.0000	1.0000

12 vehicles @ 25'/vehicle = 300' Storage Length/2 lanes @ 150' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

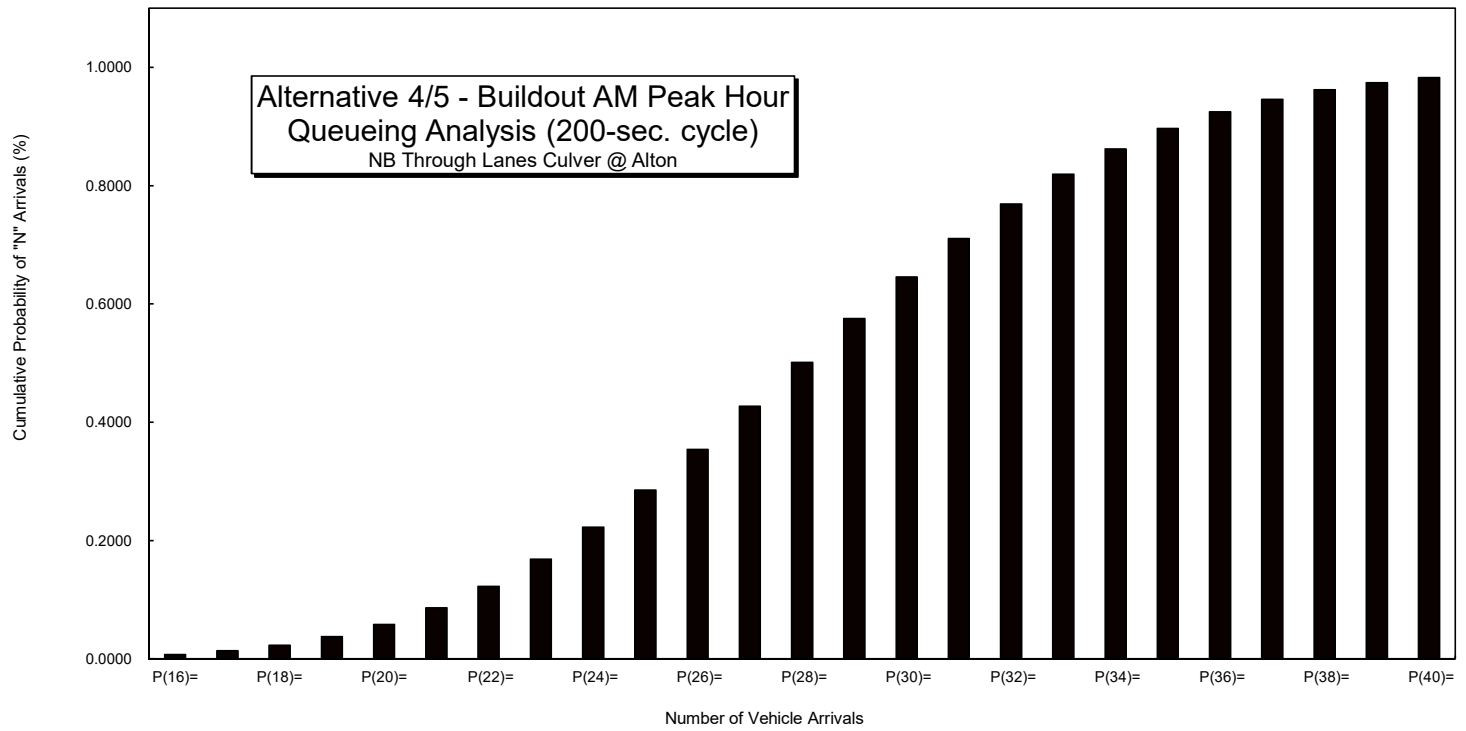
LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle) DATE: 14-Nov-19

93	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1109	PEAK HOUR VOLUME
28.65	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0281
P(2)=	0.0000	P(22)=	0.0366
P(3)=	0.0000	P(23)=	0.0456
P(4)=	0.0000	P(24)=	0.0544
P(5)=	0.0000	P(25)=	0.0624
P(6)=	0.0000	P(26)=	0.0687
P(7)=	0.0000	P(27)=	0.0729
P(8)=	0.0000	P(28)=	0.0746
P(9)=	0.0000	P(29)=	0.0737
P(10)=	0.0000	P(30)=	0.0704
P(11)=	0.0001	P(31)=	0.0651
P(12)=	0.0002	P(32)=	0.0582
P(13)=	0.0005	P(33)=	0.0506
P(14)=	0.0010	P(34)=	0.0426
P(15)=	0.0020	P(35)=	0.0349
P(16)=	0.0036	P(36)=	0.0278
P(17)=	0.0060	P(37)=	0.0215
P(18)=	0.0095	P(38)=	0.0162
P(19)=	0.0144	P(39)=	0.0119
P(20)=	0.0206	P(40)=	0.0085
			0.9827

38 vehicles @ 25'/vehicle = 950' Storage Length/4 lanes @ 240' each



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

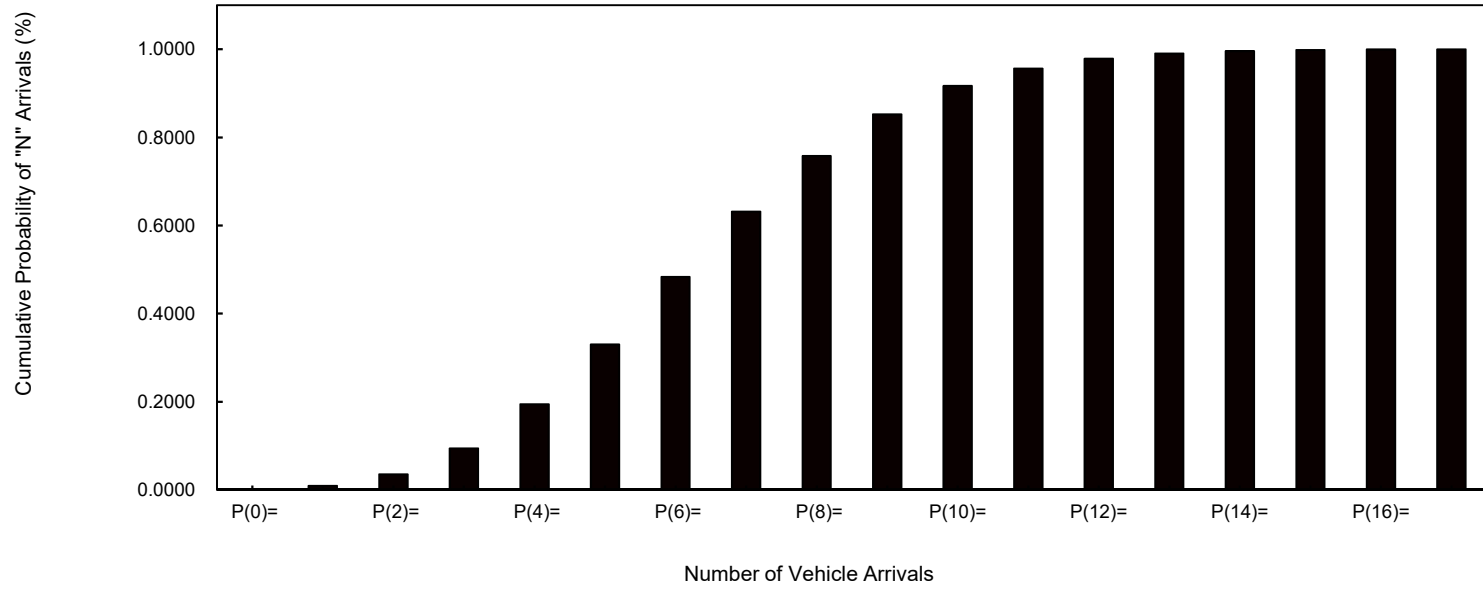
DATE: 14-Nov-19

77	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
317	PEAK HOUR VOLUME
6.78	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0011		
P(1)=	0.0077		
P(2)=	0.0261		
P(3)=	0.0590		
P(4)=	0.1000		
P(5)=	0.1356		
P(6)=	0.1533		
P(7)=	0.1485		
P(8)=	0.1258		
P(9)=	0.0948		
P(10)=	0.0643		
P(11)=	0.0396		
P(12)=	0.0224		
P(13)=	0.0117		
P(14)=	0.0057		
P(15)=	0.0026		
P(16)=	0.0011		
P(17)=	0.0004		
P(18)=	0.0002		
P(19)=	0.0001		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

11 vehicles @ 25'/vehicle = 275' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

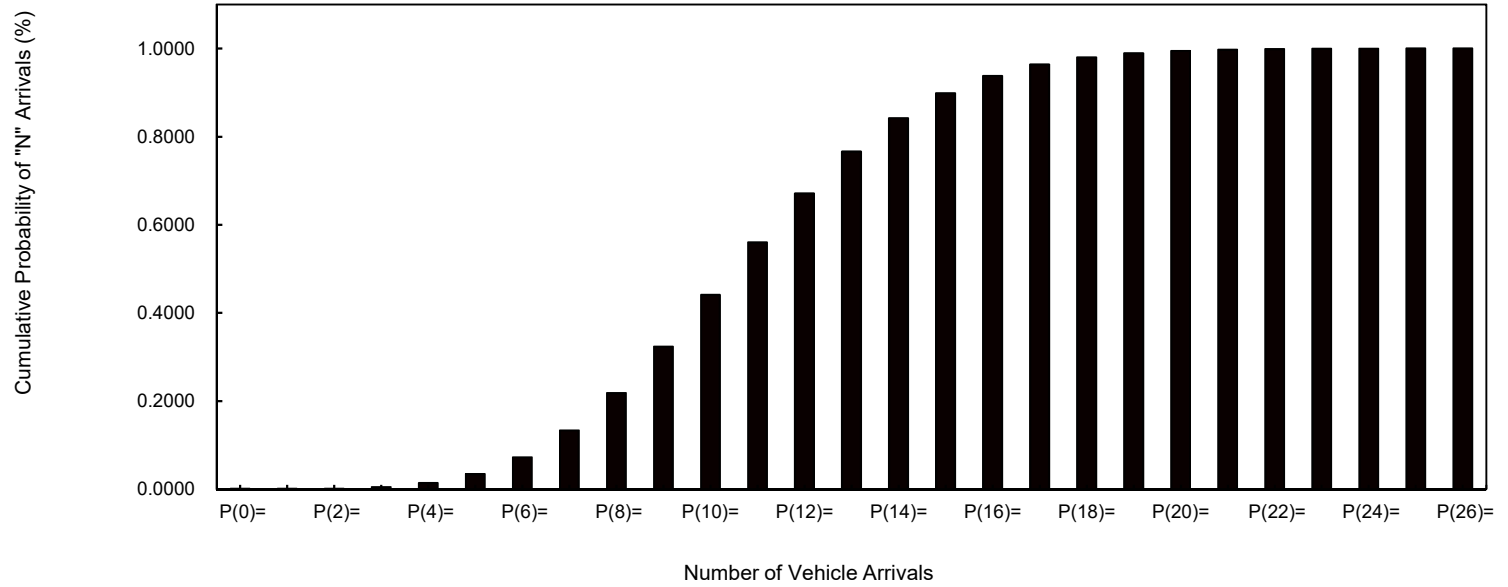
CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle) DATE: 14-Nov-19

181	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
222	PEAK HOUR VOLUME
11.16	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0002	P(21)=	0.0028
P(2)=	0.0009	P(22)=	0.0014
P(3)=	0.0033	P(23)=	0.0007
P(4)=	0.0092	P(24)=	0.0003
P(5)=	0.0205	P(25)=	0.0001
P(6)=	0.0382	P(26)=	0.0001
P(7)=	0.0608	P(27)=	0.0000
P(8)=	0.0849	P(28)=	0.0000
P(9)=	0.1053	P(29)=	0.0000
P(10)=	0.1175	P(30)=	0.0000
P(11)=	0.1192	P(31)=	0.0000
P(12)=	0.1109	P(32)=	0.0000
P(13)=	0.0952	P(33)=	0.0000
P(14)=	0.0759	P(34)=	0.0000
P(15)=	0.0565	P(35)=	0.0000
P(16)=	0.0394	P(36)=	0.0000
P(17)=	0.0259	P(37)=	0.0000
P(18)=	0.0160	P(38)=	0.0000
P(19)=	0.0094	P(39)=	0.0000
P(20)=	0.0053	P(40)=	0.0000

17 vehicles @ 25'/vehicle = 475' Storage Length/2 lanes @ 215' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

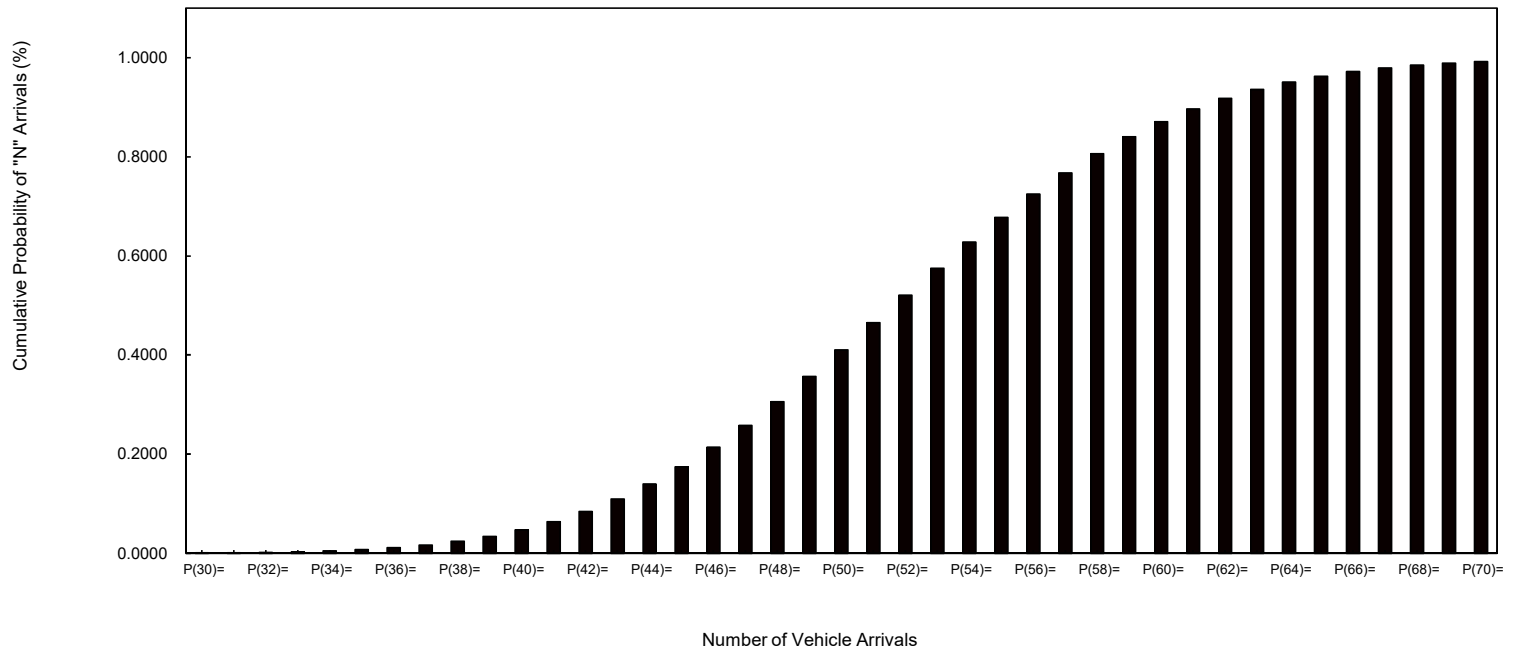
DATE: 14-Nov-19

85	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
2215	PEAK HOUR VOLUME
52.30	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)= 0.0000	0.0000		
P(1)= 0.0000	0.0000	P(36)= 0.0038	0.0111
P(2)= 0.0000	0.0000	P(37)= 0.0054	0.0165
P(3)= 0.0000	0.0000	P(38)= 0.0074	0.0239
P(4)= 0.0000	0.0000	P(39)= 0.0100	0.0339
P(5)= 0.0000	0.0000	P(40)= 0.0130	0.0469
P(6)= 0.0000	0.0000	P(41)= 0.0166	0.0636
P(7)= 0.0000	0.0000	P(42)= 0.0207	0.0842
P(8)= 0.0000	0.0000	P(43)= 0.0252	0.1094
P(9)= 0.0000	0.0000	P(44)= 0.0299	0.1393
P(10)= 0.0000	0.0000	P(45)= 0.0348	0.1741
P(11)= 0.0000	0.0000	P(46)= 0.0395	0.2137
P(12)= 0.0000	0.0000	P(47)= 0.0440	0.2576
P(13)= 0.0000	0.0000	P(48)= 0.0479	0.3056
P(14)= 0.0000	0.0000	P(49)= 0.0512	0.3567
P(15)= 0.0000	0.0000	P(50)= 0.0535	0.4102
P(16)= 0.0000	0.0000	P(51)= 0.0549	0.4651
P(17)= 0.0000	0.0000	P(52)= 0.0552	0.5203
P(18)= 0.0000	0.0000	P(53)= 0.0545	0.5748
P(19)= 0.0000	0.0000	P(54)= 0.0527	0.6275
P(20)= 0.0000	0.0000	P(55)= 0.0502	0.6777
P(21)= 0.0000	0.0000	P(56)= 0.0468	0.7245
P(22)= 0.0000	0.0000	P(57)= 0.0430	0.7675
P(23)= 0.0000	0.0000	P(58)= 0.0387	0.8062
P(24)= 0.0000	0.0000	P(59)= 0.0343	0.8406
P(25)= 0.0000	0.0000	P(60)= 0.0299	0.8705
P(26)= 0.0000	0.0000	P(61)= 0.0257	0.8962
P(27)= 0.0000	0.0001	P(62)= 0.0217	0.9178
P(28)= 0.0001	0.0002	P(63)= 0.0180	0.9358
P(29)= 0.0002	0.0003	P(64)= 0.0147	0.9505
P(30)= 0.0003	0.0006	P(65)= 0.0118	0.9623
P(31)= 0.0004	0.0010	P(66)= 0.0094	0.9717
P(32)= 0.0007	0.0017	P(67)= 0.0073	0.9790
P(33)= 0.0011	0.0029	P(68)= 0.0056	0.9846
P(34)= 0.0018	0.0047	P(69)= 0.0043	0.9889
P(35)= 0.0026	0.0073	P(70)= 0.0032	0.9920

64 vehicles @ 25'/vehicle = 1600' Storage Length/3 lanes @ 535' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

CONDITION: AM Pk Hr - Buildout - Alt. 5 Improvements (200-sec cycle)

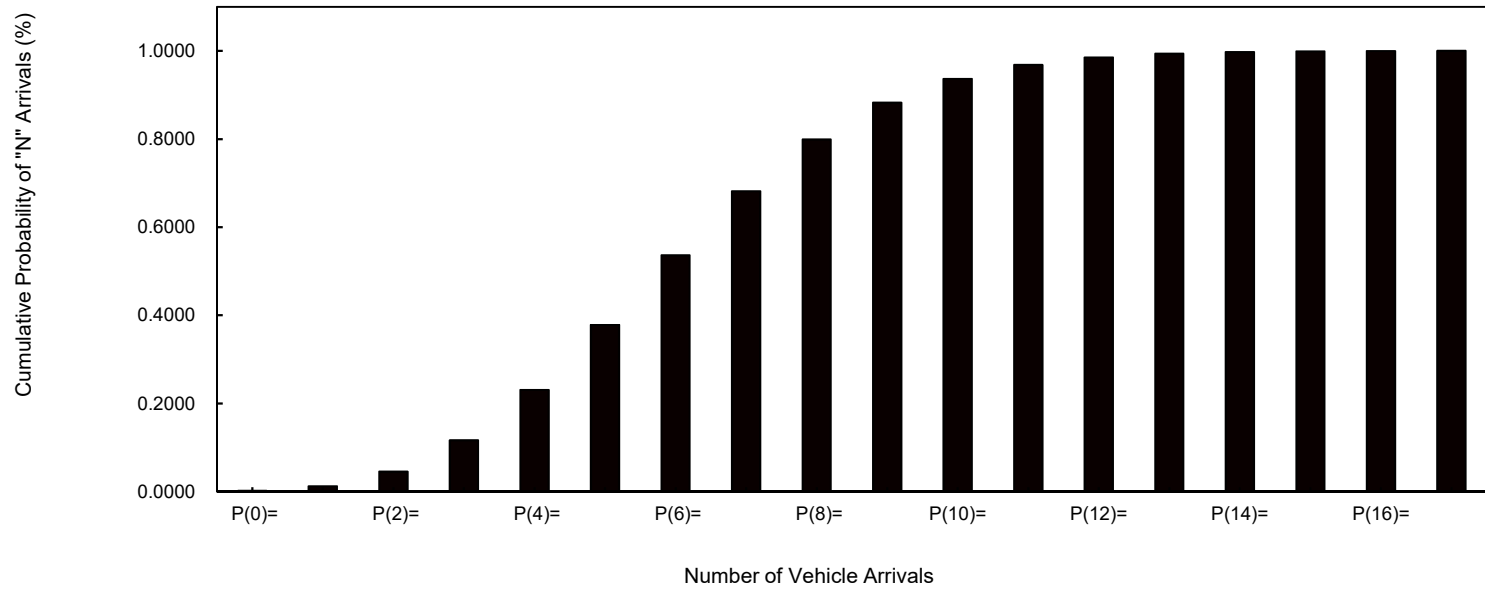
DATE: 14-Nov-19

69	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
336	PEAK HOUR VOLUME
6.44	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>		<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>		<u>CUMULATIVE</u>
P(0)=	0.0016	0.0016	P(21)=	0.0000	1.0000
P(1)=	0.0103	0.0119	P(22)=	0.0000	1.0000
P(2)=	0.0331	0.0450	P(23)=	0.0000	1.0000
P(3)=	0.0711	0.1160	P(24)=	0.0000	1.0000
P(4)=	0.1144	0.2305	P(25)=	0.0000	1.0000
P(5)=	0.1474	0.3778	P(26)=	0.0000	1.0000
P(6)=	0.1582	0.5360	P(27)=	0.0000	1.0000
P(7)=	0.1455	0.6815	P(28)=	0.0000	1.0000
P(8)=	0.1171	0.7987	P(29)=	0.0000	1.0000
P(9)=	0.0838	0.8825	P(30)=	0.0000	1.0000
P(10)=	0.0540	0.9365	P(31)=	0.0000	1.0000
P(11)=	0.0316	0.9681	P(32)=	0.0000	1.0000
P(12)=	0.0170	0.9850	P(33)=	0.0000	1.0000
P(13)=	0.0084	0.9934	P(34)=	0.0000	1.0000
P(14)=	0.0039	0.9973	P(35)=	0.0000	1.0000
P(15)=	0.0017	0.9989	P(36)=	0.0000	1.0000
P(16)=	0.0007	0.9996	P(37)=	0.0000	1.0000
P(17)=	0.0003	0.9999	P(38)=	0.0000	1.0000
P(18)=	0.0001	1.0000	P(39)=	0.0000	1.0000
P(19)=	0.0000	1.0000	P(40)=	0.0000	1.0000
P(20)=	0.0000	1.0000			

11 vehicles @ 25'/vehicle = 275' Storage Length

Alternative 5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

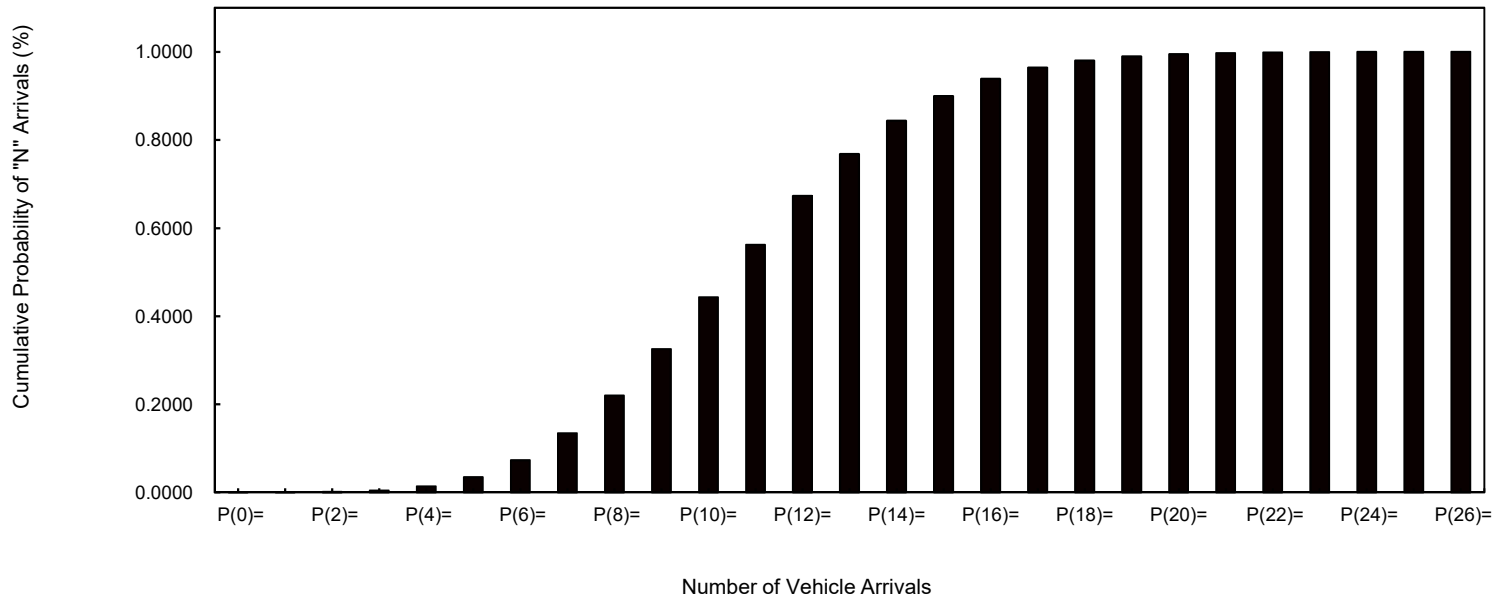
DATE: 14-Nov-19

184	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
218	PEAK HOUR VOLUME
11.14	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS			PROBABILITY OF N ARRIVALS		
		CUMULATIVE			CUMULATIVE
P(0)=	0.0000	0.0000	P(21)=	0.0027	0.9974
P(1)=	0.0002	0.0002	P(22)=	0.0014	0.9988
P(2)=	0.0009	0.0011	P(23)=	0.0007	0.9994
P(3)=	0.0033	0.0044	P(24)=	0.0003	0.9998
P(4)=	0.0093	0.0137	P(25)=	0.0001	0.9999
P(5)=	0.0207	0.0345	P(26)=	0.0001	1.0000
P(6)=	0.0385	0.0730	P(27)=	0.0000	1.0000
P(7)=	0.0613	0.1342	P(28)=	0.0000	1.0000
P(8)=	0.0854	0.2196	P(29)=	0.0000	1.0000
P(9)=	0.1057	0.3253	P(30)=	0.0000	1.0000
P(10)=	0.1177	0.4430	P(31)=	0.0000	1.0000
P(11)=	0.1193	0.5623	P(32)=	0.0000	1.0000
P(12)=	0.1107	0.6730	P(33)=	0.0000	1.0000
P(13)=	0.0949	0.7680	P(34)=	0.0000	1.0000
P(14)=	0.0755	0.8435	P(35)=	0.0000	1.0000
P(15)=	0.0561	0.8996	P(36)=	0.0000	1.0000
P(16)=	0.0391	0.9387	P(37)=	0.0000	1.0000
P(17)=	0.0256	0.9643	P(38)=	0.0000	1.0000
P(18)=	0.0159	0.9802	P(39)=	0.0000	1.0000
P(19)=	0.0093	0.9895	P(40)=	0.0000	1.0000
P(20)=	0.0052	0.9946			

17 vehicles @ 25'/vehicle = 425' Storage Length/2 lanes @ 215' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

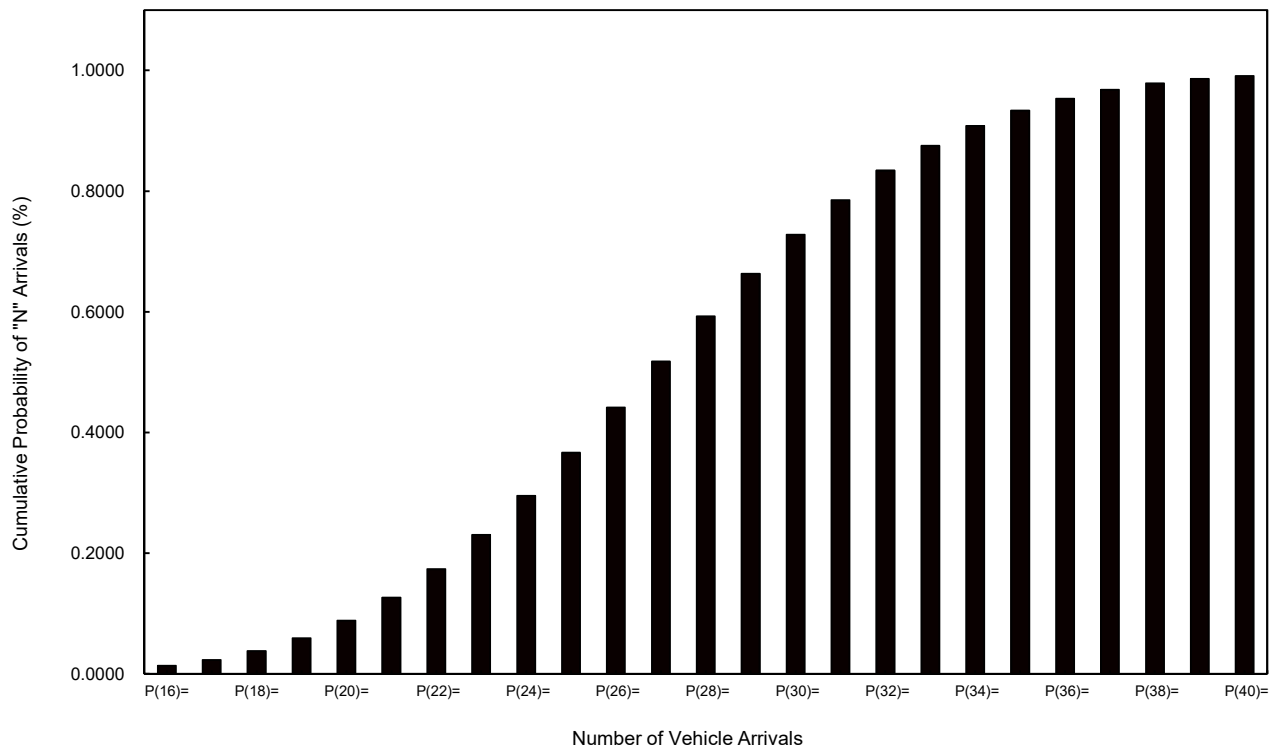
DATE: 14-Nov-19

147	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
672	PEAK HOUR VOLUME
27.44	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0381
P(2)=	0.0000	P(22)=	0.0475
P(3)=	0.0000	P(23)=	0.0567
P(4)=	0.0000	P(24)=	0.0648
P(5)=	0.0000	P(25)=	0.0711
P(6)=	0.0000	P(26)=	0.0750
P(7)=	0.0000	P(27)=	0.0763
P(8)=	0.0000	P(28)=	0.0747
P(9)=	0.0000	P(29)=	0.0707
P(10)=	0.0001	P(30)=	0.0647
P(11)=	0.0002	P(31)=	0.0573
P(12)=	0.0005	P(32)=	0.0491
P(13)=	0.0010	P(33)=	0.0408
P(14)=	0.0019	P(34)=	0.0329
P(15)=	0.0035	P(35)=	0.0258
P(16)=	0.0060	P(36)=	0.0197
P(17)=	0.0096	P(37)=	0.0146
P(18)=	0.0147	P(38)=	0.0105
P(19)=	0.0212	P(39)=	0.0074
P(20)=	0.0291	P(40)=	0.0051
			0.9908

36 vehicles @ 25'/vehicle = 900' Storage Length/2 lanes @ 450' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

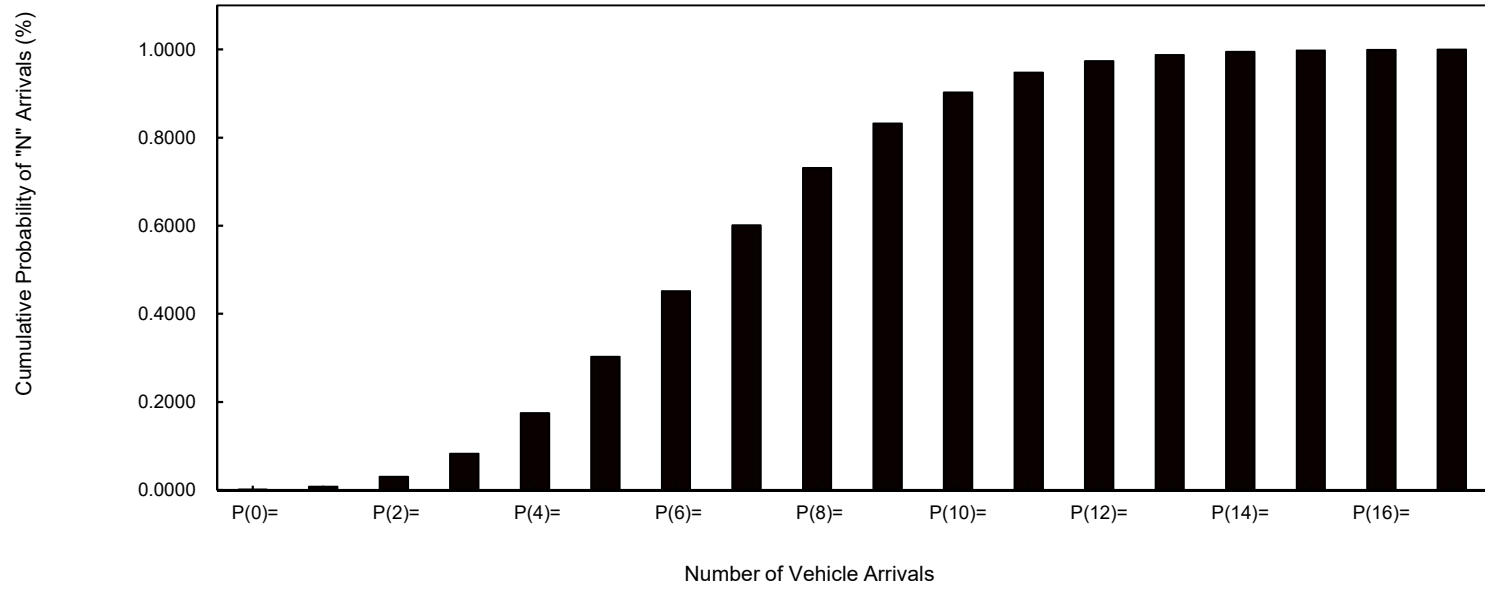
DATE: 14-Nov-19

139	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
181	PEAK HOUR VOLUME
6.99	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0009		
P(1)=	0.0064		
P(2)=	0.0225		
P(3)=	0.0525		
P(4)=	0.0917		
P(5)=	0.1281		
P(6)=	0.1492		
P(7)=	0.1490		
P(8)=	0.1302		
P(9)=	0.1011		
P(10)=	0.0706		
P(11)=	0.0449		
P(12)=	0.0261		
P(13)=	0.0141		
P(14)=	0.0070		
P(15)=	0.0033		
P(16)=	0.0014		
P(17)=	0.0006		
P(18)=	0.0002		
P(19)=	0.0001		
P(20)=	0.0000		
		P(21)=	0.0000
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

12 vehicles @ 25'/vehicle = 300' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

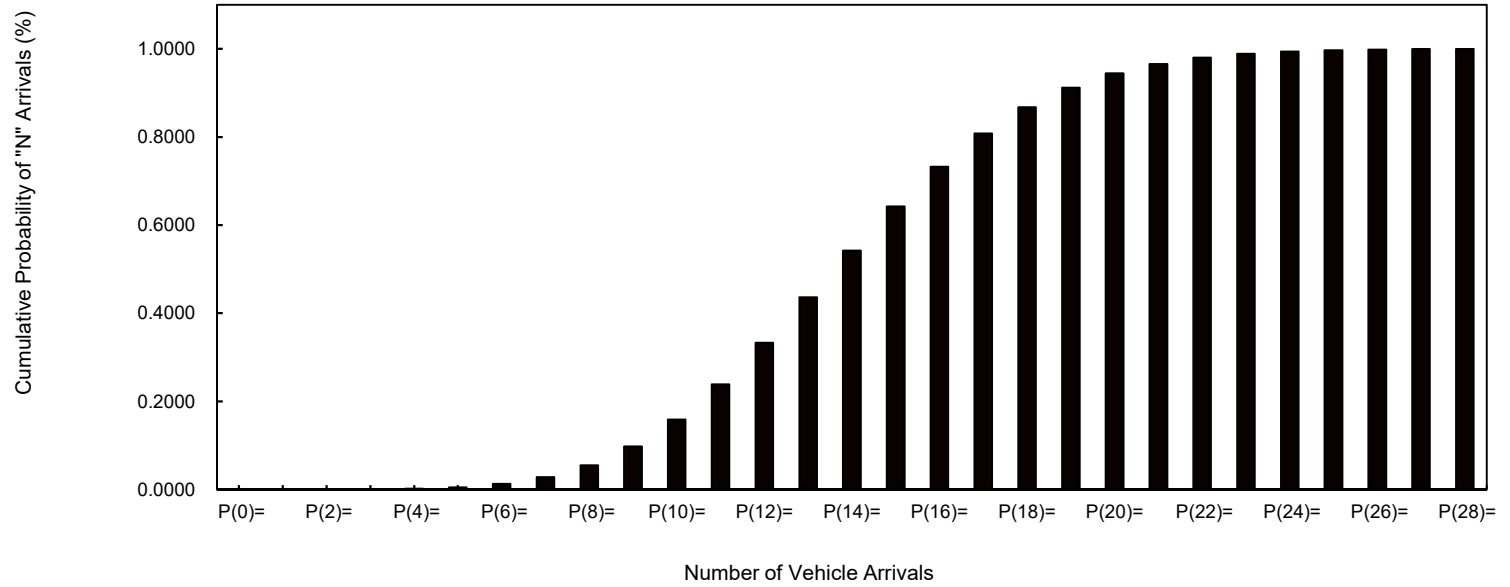
DATE: 14-Nov-19

179	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
287	PEAK HOUR VOLUME
14.27	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0001		
P(3)=	0.0003		
P(4)=	0.0011		
P(5)=	0.0031		
P(6)=	0.0074		
P(7)=	0.0152		
P(8)=	0.0271		
P(9)=	0.0429		
P(10)=	0.0612		
P(11)=	0.0795		
P(12)=	0.0945		
P(13)=	0.1037		
P(14)=	0.1057		
P(15)=	0.1006		
P(16)=	0.0897		
P(17)=	0.0753		
P(18)=	0.0597		
P(19)=	0.0448		
P(20)=	0.0320		
		P(21)=	0.0217
		P(22)=	0.0141
		P(23)=	0.0087
		P(24)=	0.0052
		P(25)=	0.0030
		P(26)=	0.0016
		P(27)=	0.0009
		P(28)=	0.0004
		P(29)=	0.0002
		P(30)=	0.0001
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

21 vehicles @ 25'/vehicle =525' Storage Length/2 lanes @ 265' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

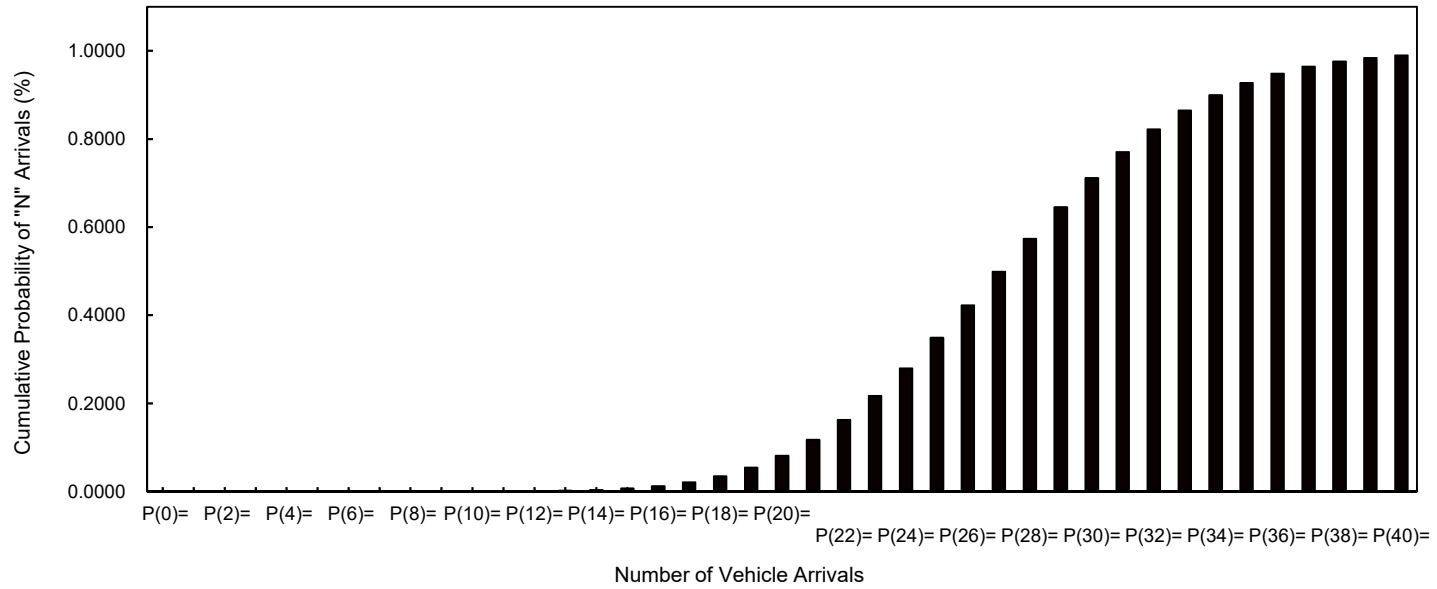
DATE: 14-Nov-19

141	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
707	PEAK HOUR VOLUME
27.69	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0000		
P(3)=	0.0000		
P(4)=	0.0000		
P(5)=	0.0000		
P(6)=	0.0000		
P(7)=	0.0000		
P(8)=	0.0000		
P(9)=	0.0000		
P(10)=	0.0001		
P(11)=	0.0002		
P(12)=	0.0004		
P(13)=	0.0009		
P(14)=	0.0017		
P(15)=	0.0031		
P(16)=	0.0054		
P(17)=	0.0088		
P(18)=	0.0135		
P(19)=	0.0196		
P(20)=	0.0272		
		P(21)=	0.0359
		P(22)=	0.0451
		P(23)=	0.0544
		P(24)=	0.0627
		P(25)=	0.0695
		P(26)=	0.0740
		P(27)=	0.0759
		P(28)=	0.0750
		P(29)=	0.0717
		P(30)=	0.0661
		P(31)=	0.0591
		P(32)=	0.0511
		P(33)=	0.0429
		P(34)=	0.0349
		P(35)=	0.0276
		P(36)=	0.0213
		P(37)=	0.0159
		P(38)=	0.0116
		P(39)=	0.0082
		P(40)=	0.0057

37 vehicles @ 25'/vehicle = 925' Storage Length/2 lanes @ 465' each

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
 WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: AM Pk Hr - Buildout - Alt. 4/5 Improvements (200-sec cycle)

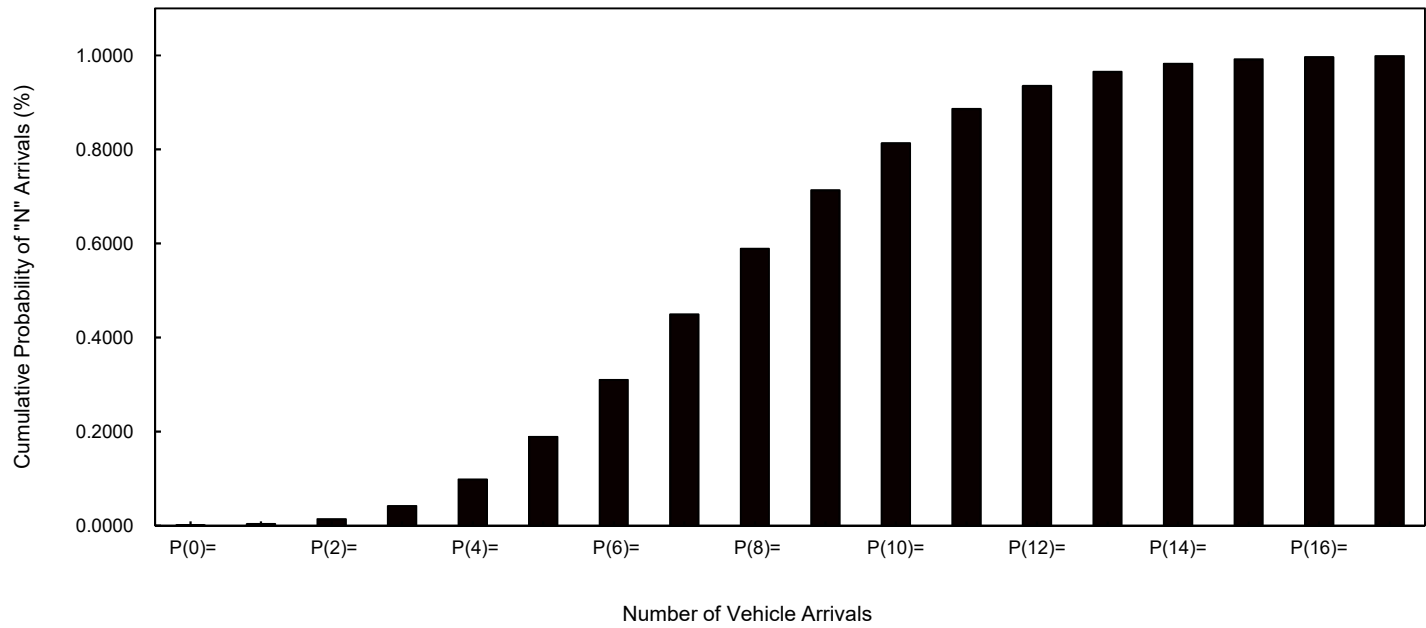
DATE: 14-Nov-19

123	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
235	PEAK HOUR VOLUME
8.03	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0003		
P(1)=	0.0026		
P(2)=	0.0105		
P(3)=	0.0281		
P(4)=	0.0564		
P(5)=	0.0906		
P(6)=	0.1212		
P(7)=	0.1391		
P(8)=	0.1396		
P(9)=	0.1245		
P(10)=	0.1000		
P(11)=	0.0730		
P(12)=	0.0488		
P(13)=	0.0302		
P(14)=	0.0173		
P(15)=	0.0093		
P(16)=	0.0046		
P(17)=	0.0022		
P(18)=	0.0010		
P(19)=	0.0004		
P(20)=	0.0002		
		P(21)=	0.0001
		P(22)=	0.0000
		P(23)=	0.0000
		P(24)=	0.0000
		P(25)=	0.0000
		P(26)=	0.0000
		P(27)=	0.0000
		P(28)=	0.0000
		P(29)=	0.0000
		P(30)=	0.0000
		P(31)=	0.0000
		P(32)=	0.0000
		P(33)=	0.0000
		P(34)=	0.0000
		P(35)=	0.0000
		P(36)=	0.0000
		P(37)=	0.0000
		P(38)=	0.0000
		P(39)=	0.0000
		P(40)=	0.0000

13 vehicles @ 25'/vehicle = 325' Storage Length

Alternative 4/5 - Buildout AM Peak Hour
Queueing Analysis (200-sec. cycle)
WB Right-Turn Alton @ Culver



Appendix C-6

Buildout

(200-sec cycle)

PM Peak Hour

QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Left-turn from Culver Drive to WB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

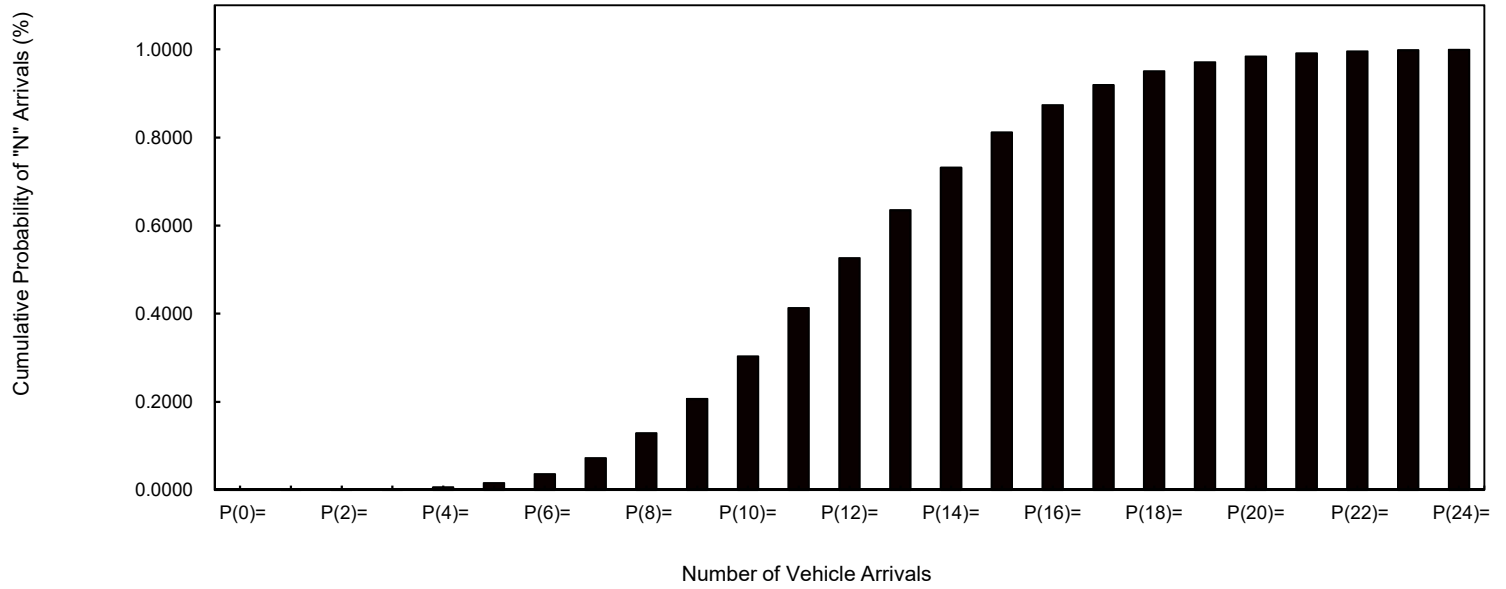
DATE: 14-Nov-19

182	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
246	PEAK HOUR VOLUME
12.44	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0076
P(2)=	0.0003	P(22)=	0.0043
P(3)=	0.0013	P(23)=	0.0023
P(4)=	0.0040	P(24)=	0.0012
P(5)=	0.0098	P(25)=	0.0006
P(6)=	0.0204	P(26)=	0.0003
P(7)=	0.0363	P(27)=	0.0001
P(8)=	0.0564	P(28)=	0.0001
P(9)=	0.0779	P(29)=	0.0000
P(10)=	0.0969	P(30)=	0.0000
P(11)=	0.1095	P(31)=	0.0000
P(12)=	0.1135	P(32)=	0.0000
P(13)=	0.1086	P(33)=	0.0000
P(14)=	0.0964	P(34)=	0.0000
P(15)=	0.0800	P(35)=	0.0000
P(16)=	0.0622	P(36)=	0.0000
P(17)=	0.0455	P(37)=	0.0000
P(18)=	0.0314	P(38)=	0.0000
P(19)=	0.0206	P(39)=	0.0000
P(20)=	0.0128	P(40)=	0.0000

18 vehicles @ 25'/vehicle = 450' Storage Length/2 lanes @ 225' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
NB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Through Lanes on Culver Drive at Alton Parkway

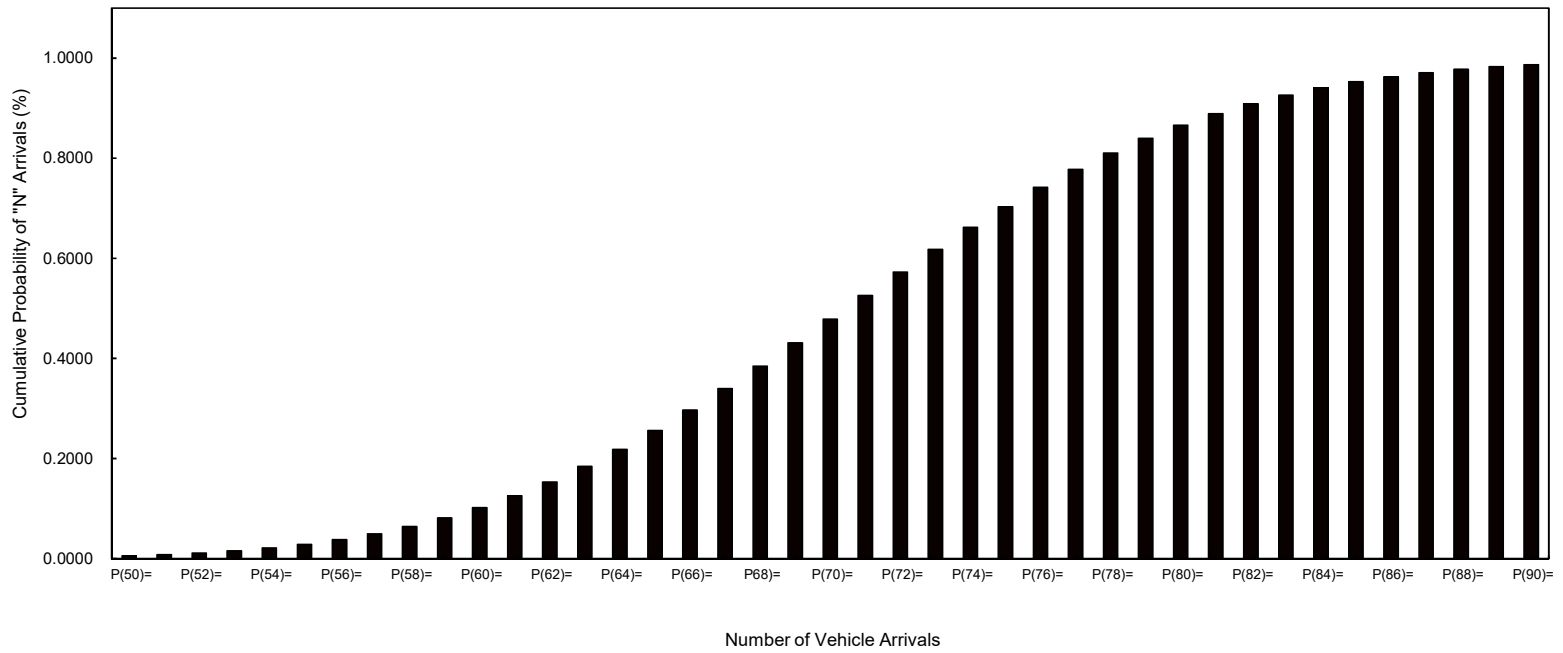
CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle) DATE: 14-Nov-19

113	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
2266	PEAK HOUR VOLUME
71.13	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000	P(31)=	0.0000	0.0000	P(61)=	0.0239	0.1254
P(1)=	0.0000	0.0000	P(32)=	0.0000	0.0000	P(62)=	0.0274	0.1528
P(2)=	0.0000	0.0000	P(33)=	0.0000	0.0000	P(63)=	0.0310	0.1838
P(3)=	0.0000	0.0000	P(34)=	0.0000	0.0000	P(64)=	0.0344	0.2182
P(4)=	0.0000	0.0000	P(35)=	0.0000	0.0000	P(65)=	0.0377	0.2558
P(5)=	0.0000	0.0000	P(36)=	0.0000	0.0000	P(66)=	0.0406	0.2964
P(6)=	0.0000	0.0000	P(37)=	0.0000	0.0000	P(67)=	0.0431	0.3395
P(7)=	0.0000	0.0000	P(38)=	0.0000	0.0000	P(68)=	0.0451	0.3846
P(8)=	0.0000	0.0000	P(39)=	0.0000	0.0000	P(69)=	0.0465	0.4310
P(9)=	0.0000	0.0000	P(40)=	0.0000	0.0000	P(70)=	0.0472	0.4782
P(10)=	0.0000	0.0000	P(41)=	0.0000	0.0001	P(71)=	0.0473	0.5255
P(11)=	0.0000	0.0000	P(42)=	0.0001	0.0001	P(72)=	0.0467	0.5722
P(12)=	0.0000	0.0000	P(43)=	0.0001	0.0002	P(73)=	0.0455	0.6177
P(13)=	0.0000	0.0000	P(44)=	0.0001	0.0004	P(74)=	0.0437	0.6615
P(14)=	0.0000	0.0000	P(45)=	0.0002	0.0006	P(75)=	0.0415	0.7029
P(15)=	0.0000	0.0000	P(46)=	0.0004	0.0010	P(76)=	0.0388	0.7418
P(16)=	0.0000	0.0000	P(47)=	0.0006	0.0015	P(77)=	0.0359	0.7776
P(17)=	0.0000	0.0000	P(48)=	0.0008	0.0023	P(78)=	0.0327	0.8103
P(18)=	0.0000	0.0000	P(49)=	0.0012	0.0035	P(79)=	0.0294	0.8398
P(19)=	0.0000	0.0000	P(50)=	0.0017	0.0052	P(80)=	0.0262	0.8660
P(20)=	0.0000	0.0000	P(51)=	0.0024	0.0076	P(81)=	0.0230	0.8890
P(21)=	0.0000	0.0000	P(52)=	0.0032	0.0108	P(82)=	0.0199	0.9089
P(22)=	0.0000	0.0000	P(53)=	0.0043	0.0152	P(83)=	0.0171	0.9260
P(23)=	0.0000	0.0000	P(54)=	0.0057	0.0209	P(84)=	0.0145	0.9405
P(24)=	0.0000	0.0000	P(55)=	0.0074	0.0282	P(85)=	0.0121	0.9526
P(25)=	0.0000	0.0000	P(56)=	0.0094	0.0376	P(86)=	0.0100	0.9626
P(26)=	0.0000	0.0000	P(57)=	0.0117	0.0493	P(87)=	0.0082	0.9708
P(27)=	0.0000	0.0000	P(58)=	0.0143	0.0637	P(88)=	0.0066	0.9774
P(28)=	0.0000	0.0000	P(59)=	0.0173	0.0810	P(89)=	0.0053	0.9827
P(29)=	0.0000	0.0000	P(60)=	0.0205	0.1015	P(90)=	0.0042	0.9869
P(30)=	0.0000	0.0000						

85 vehicles @ 25'/vehicle = 2125' Storage Length/4 lanes @ 530' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
NB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: NB Right-turn from Culver Drive to EB Alton Parkway

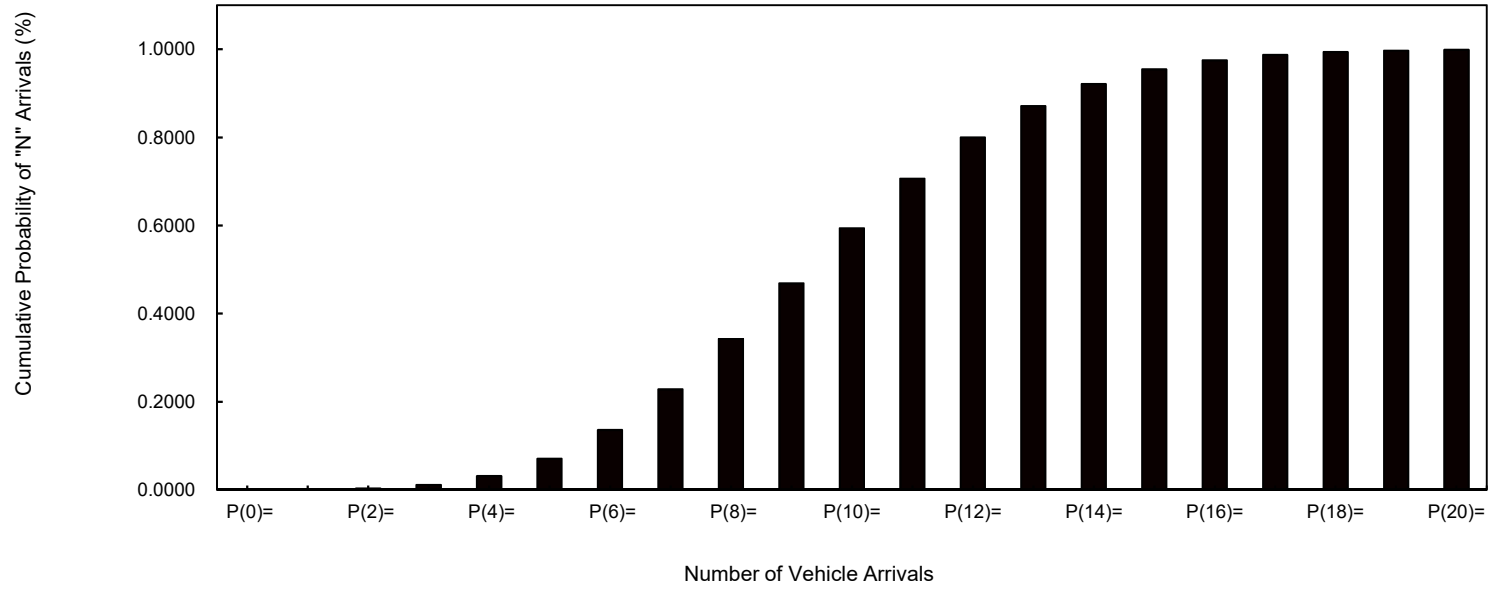
CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle) DATE: 14-Nov-19

97	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
368	PEAK HOUR VOLUME
9.92	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>		<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>		<u>CUMULATIVE</u>
P(0)=	0.0000	0.0000			
P(1)=	0.0005	0.0005	P(21)=	0.0008	0.9994
P(2)=	0.0024	0.0030	P(22)=	0.0004	0.9997
P(3)=	0.0080	0.0110	P(23)=	0.0002	0.9999
P(4)=	0.0199	0.0309	P(24)=	0.0001	1.0000
P(5)=	0.0395	0.0703	P(25)=	0.0000	1.0000
P(6)=	0.0652	0.1356	P(26)=	0.0000	1.0000
P(7)=	0.0924	0.2279	P(27)=	0.0000	1.0000
P(8)=	0.1145	0.3424	P(28)=	0.0000	1.0000
P(9)=	0.1261	0.4685	P(29)=	0.0000	1.0000
P(10)=	0.1251	0.5936	P(30)=	0.0000	1.0000
P(11)=	0.1127	0.7063	P(31)=	0.0000	1.0000
P(12)=	0.0932	0.7995	P(32)=	0.0000	1.0000
P(13)=	0.0711	0.8705	P(33)=	0.0000	1.0000
P(14)=	0.0503	0.9209	P(34)=	0.0000	1.0000
P(15)=	0.0333	0.9541	P(35)=	0.0000	1.0000
P(16)=	0.0206	0.9747	P(36)=	0.0000	1.0000
P(17)=	0.0120	0.9868	P(37)=	0.0000	1.0000
P(18)=	0.0066	0.9934	P(38)=	0.0000	1.0000
P(19)=	0.0035	0.9968	P(39)=	0.0000	1.0000
P(20)=	0.0017	0.9986	P(40)=	0.0000	1.0000

15 vehicles @ 25'/vehicle = 375' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
NB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Left-turn from Culver Drive to EB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

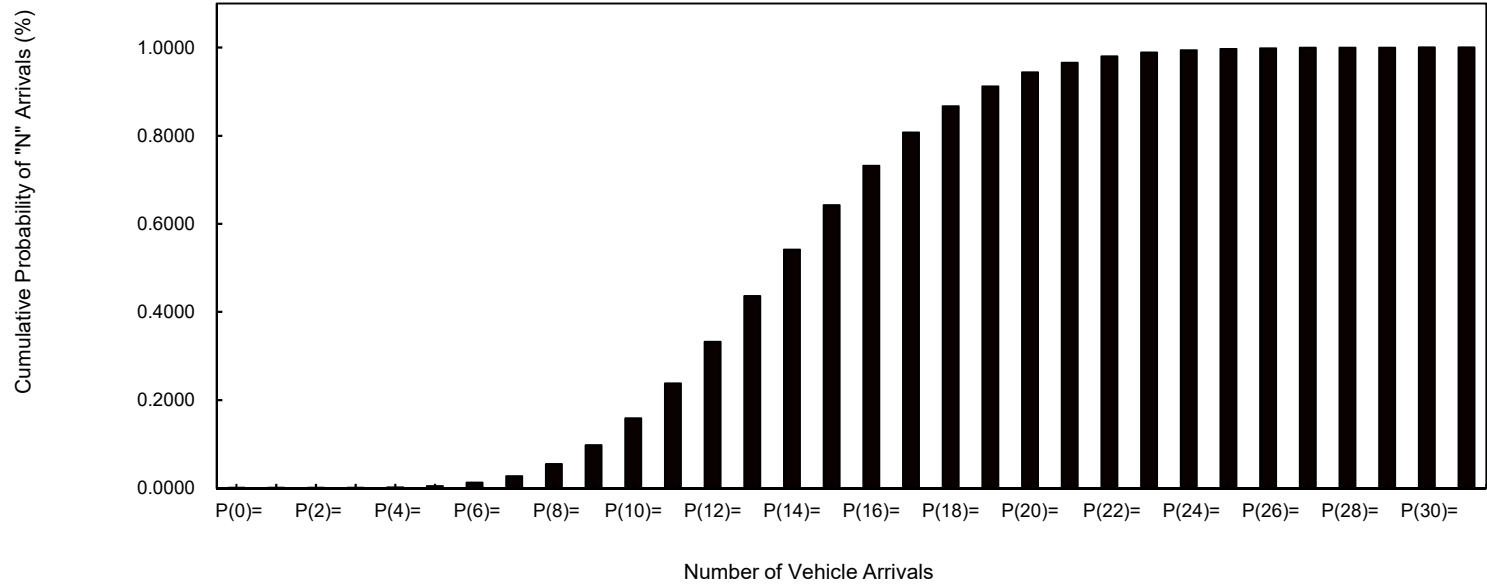
DATE: 14-Nov-19

176	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
292	PEAK HOUR VOLUME
14.28	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)= 0.0000	0.0000	P(21)= 0.0218	0.9655
P(1)= 0.0000	0.0000	P(22)= 0.0141	0.9797
P(2)= 0.0001	0.0001	P(23)= 0.0088	0.9884
P(3)= 0.0003	0.0004	P(24)= 0.0052	0.9937
P(4)= 0.0011	0.0015	P(25)= 0.0030	0.9967
P(5)= 0.0031	0.0046	P(26)= 0.0016	0.9983
P(6)= 0.0074	0.0120	P(27)= 0.0009	0.9992
P(7)= 0.0151	0.0271	P(28)= 0.0004	0.9996
P(8)= 0.0270	0.0541	P(29)= 0.0002	0.9998
P(9)= 0.0428	0.0970	P(30)= 0.0001	0.9999
P(10)= 0.0611	0.1581	P(31)= 0.0000	1.0000
P(11)= 0.0794	0.2375	P(32)= 0.0000	1.0000
P(12)= 0.0944	0.3319	P(33)= 0.0000	1.0000
P(13)= 0.1037	0.4356	P(34)= 0.0000	1.0000
P(14)= 0.1057	0.5413	P(35)= 0.0000	1.0000
P(15)= 0.1006	0.6419	P(36)= 0.0000	1.0000
P(16)= 0.0898	0.7316	P(37)= 0.0000	1.0000
P(17)= 0.0754	0.8070	P(38)= 0.0000	1.0000
P(18)= 0.0598	0.8668	P(39)= 0.0000	1.0000
P(19)= 0.0449	0.9117	P(40)= 0.0000	1.0000
P(20)= 0.0321	0.9437		

21 vehicles @ 25'/vehicle = 525' Storage Length/2 lanes @ 265' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
SB Left-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Through Lanes on Culver Drive at Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

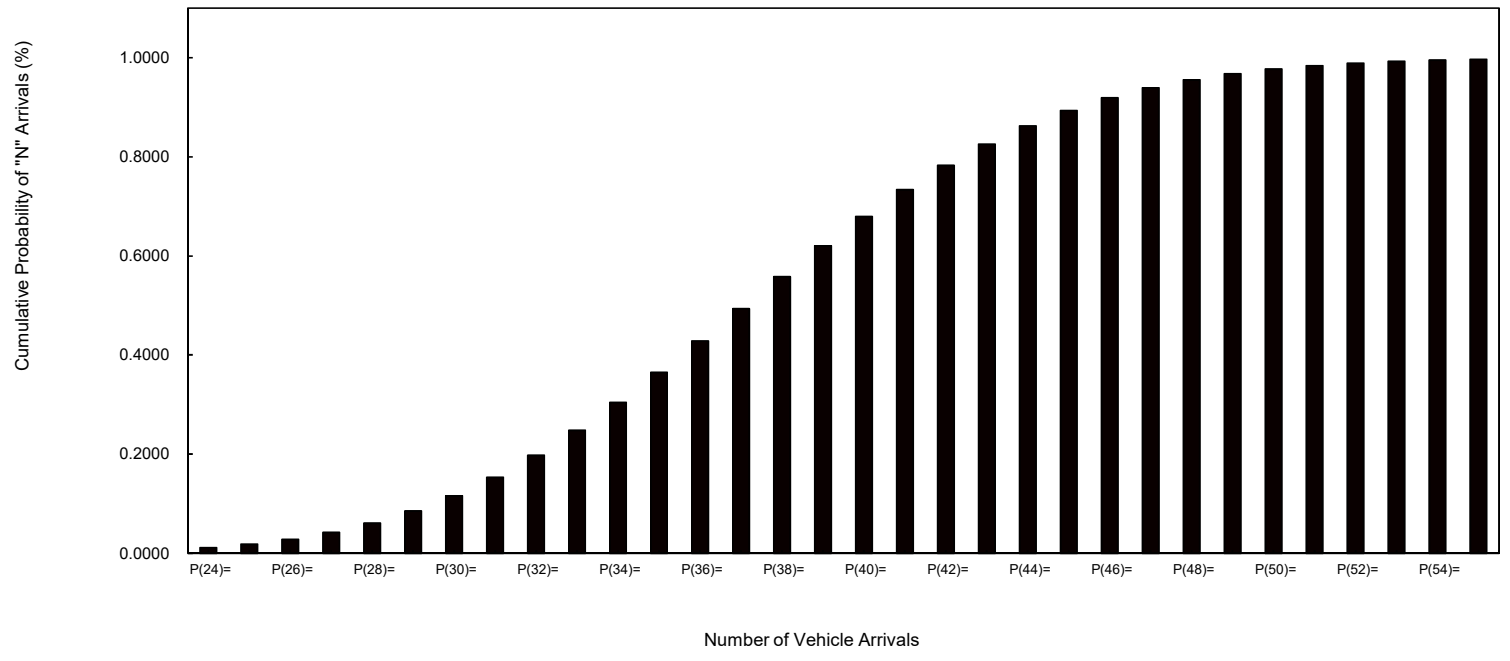
DATE: 14-Nov-19

108	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
1259	PEAK HOUR VOLUME
37.77	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS		CUMULATIVE	PROBABILITY OF N ARRIVALS		CUMULATIVE
P(0)=	0.0000	0.0000			
P(1)=	0.0000	0.0000	P(31)=	0.0374	0.1533
P(2)=	0.0000	0.0000	P(32)=	0.0442	0.1974
P(3)=	0.0000	0.0000	P(33)=	0.0506	0.2480
P(4)=	0.0000	0.0000	P(34)=	0.0562	0.3042
P(5)=	0.0000	0.0000	P(35)=	0.0606	0.3648
P(6)=	0.0000	0.0000	P(36)=	0.0636	0.4284
P(7)=	0.0000	0.0000	P(37)=	0.0649	0.4933
P(8)=	0.0000	0.0000	P(38)=	0.0645	0.5578
P(9)=	0.0000	0.0000	P(39)=	0.0625	0.6203
P(10)=	0.0000	0.0000	P(40)=	0.0590	0.6794
P(11)=	0.0000	0.0000	P(41)=	0.0544	0.7337
P(12)=	0.0000	0.0000	P(42)=	0.0489	0.7826
P(13)=	0.0000	0.0000	P(43)=	0.0429	0.8255
P(14)=	0.0000	0.0000	P(44)=	0.0369	0.8624
P(15)=	0.0000	0.0000	P(45)=	0.0309	0.8933
P(16)=	0.0000	0.0001	P(46)=	0.0254	0.9187
P(17)=	0.0001	0.0001	P(47)=	0.0204	0.9392
P(18)=	0.0002	0.0003	P(48)=	0.0161	0.9552
P(19)=	0.0003	0.0006	P(49)=	0.0124	0.9676
P(20)=	0.0006	0.0011	P(50)=	0.0094	0.9770
P(21)=	0.0010	0.0022	P(51)=	0.0069	0.9839
P(22)=	0.0018	0.0039	P(52)=	0.0050	0.9889
P(23)=	0.0029	0.0068	P(53)=	0.0036	0.9925
P(24)=	0.0045	0.0113	P(54)=	0.0025	0.9950
P(25)=	0.0068	0.0181	P(55)=	0.0017	0.9967
P(26)=	0.0099	0.0281			
P(27)=	0.0139	0.0420			
P(28)=	0.0187	0.0607			
P(29)=	0.0244	0.0851			
P(30)=	0.0307	0.1158			

48 vehicles @ 25'/vehicle = 1200' Storage Length/3 lanes @ 400' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
SB Thorough Lanes Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: SB Right-turn from Culver Drive to WB Alton Parkway

CONDITION: PM Peak Hour - Buildout - Alt. 5 Improvements (200-sec cycle)

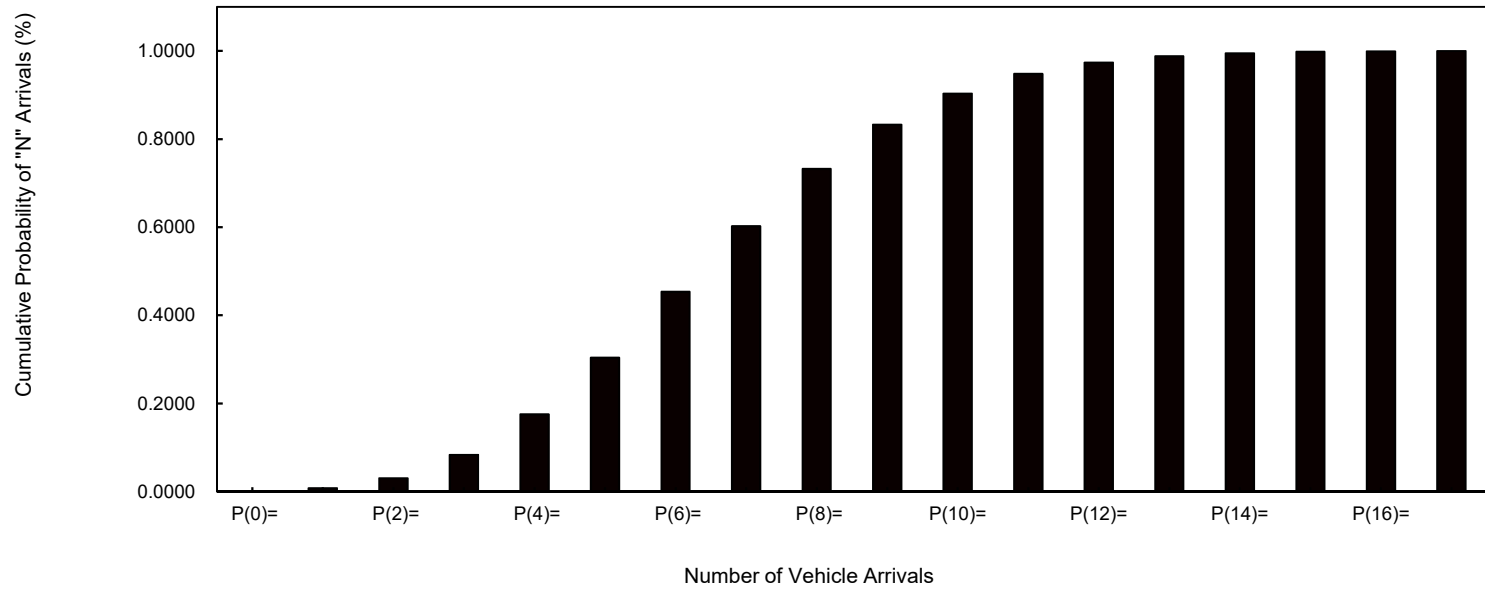
DATE: 14-Nov-19

79	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
318	PEAK HOUR VOLUME
6.98	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0009		
P(1)=	0.0065	P(21)=	0.0000
P(2)=	0.0227	P(22)=	0.0000
P(3)=	0.0528	P(23)=	0.0000
P(4)=	0.0921	P(24)=	0.0000
P(5)=	0.1285	P(25)=	0.0000
P(6)=	0.1495	P(26)=	0.0000
P(7)=	0.1490	P(27)=	0.0000
P(8)=	0.1300	P(28)=	0.0000
P(9)=	0.1008	P(29)=	0.0000
P(10)=	0.0703	P(30)=	0.0000
P(11)=	0.0446	P(31)=	0.0000
P(12)=	0.0259	P(32)=	0.0000
P(13)=	0.0139	P(33)=	0.0000
P(14)=	0.0069	P(34)=	0.0000
P(15)=	0.0032	P(35)=	0.0000
P(16)=	0.0014	P(36)=	0.0000
P(17)=	0.0006	P(37)=	0.0000
P(18)=	0.0002	P(38)=	0.0000
P(19)=	0.0001	P(39)=	0.0000
P(20)=	0.0000	P(40)=	0.0000

12 vehicles @ 25'/vehicle =300' Storage Length

Alternative 5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle length)
SB Right-Turn Culver @ Alton



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Left-turn from Alton Parkway to NB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

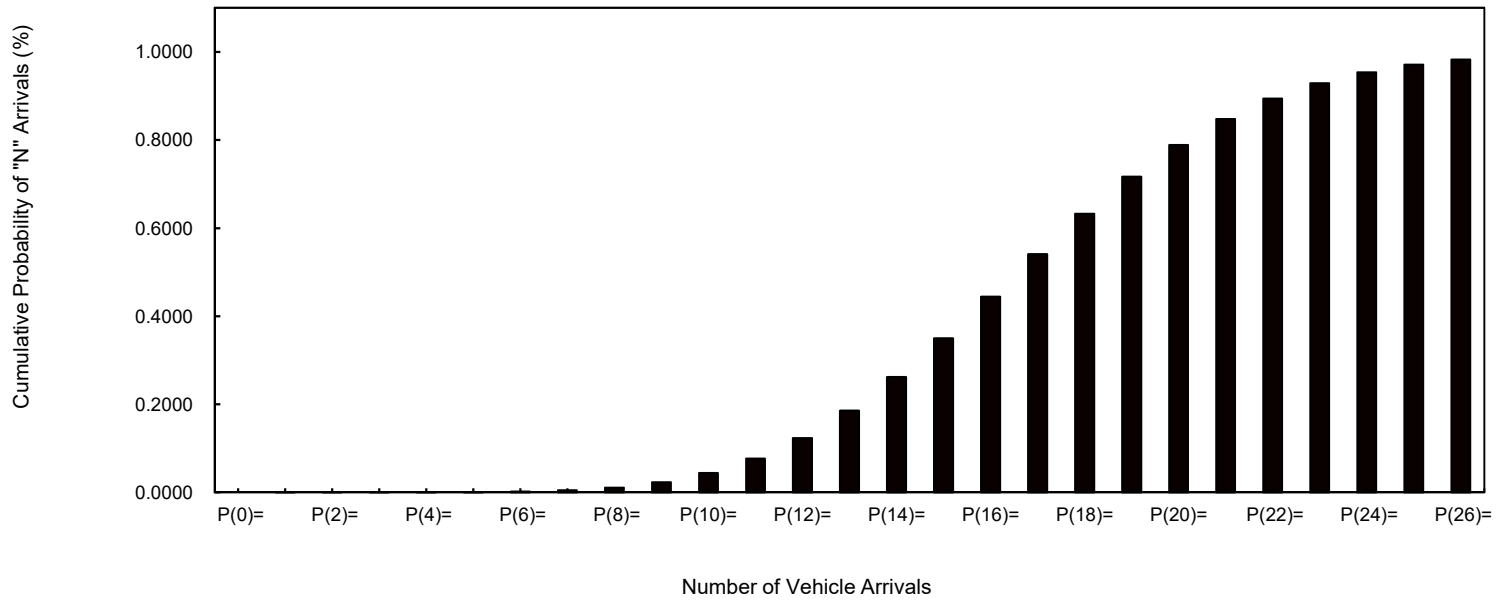
DATE: 14-Nov-19

171	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
363	PEAK HOUR VOLUME
17.24	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0591
P(2)=	0.0000	P(22)=	0.0464
P(3)=	0.0000	P(23)=	0.0348
P(4)=	0.0001	P(24)=	0.0250
P(5)=	0.0004	P(25)=	0.0172
P(6)=	0.0012	P(26)=	0.0114
P(7)=	0.0029	P(27)=	0.0073
P(8)=	0.0063	P(28)=	0.0045
P(9)=	0.0121	P(29)=	0.0027
P(10)=	0.0208	P(30)=	0.0015
P(11)=	0.0326	P(31)=	0.0009
P(12)=	0.0468	P(32)=	0.0005
P(13)=	0.0621	P(33)=	0.0002
P(14)=	0.0765	P(34)=	0.0001
P(15)=	0.0879	P(35)=	0.0001
P(16)=	0.0948	P(36)=	0.0000
P(17)=	0.0961	P(37)=	0.0000
P(18)=	0.0921	P(38)=	0.0000
P(19)=	0.0836	P(39)=	0.0000
P(20)=	0.0720	P(40)=	0.0000

24 vehicles @ 25'/vehicle = 600' Storage Length/2 lanes @ 300' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Through Lanes on Alton Parkway at Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

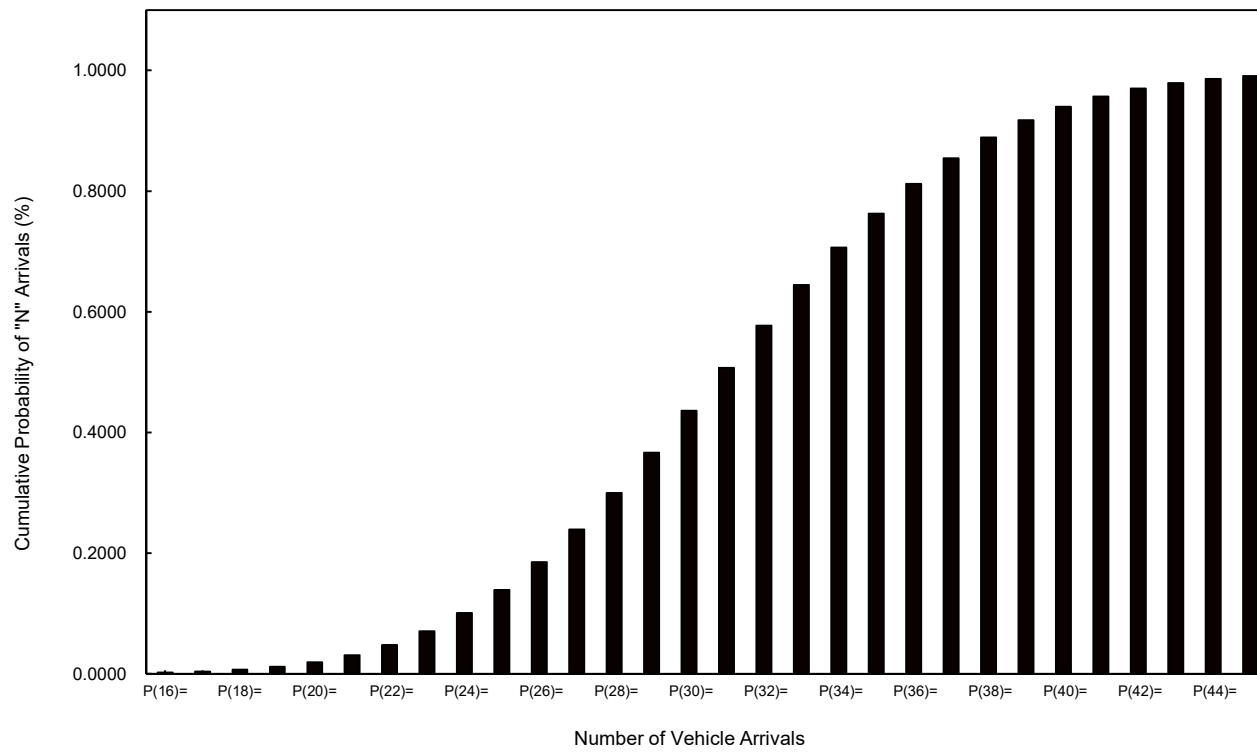
DATE: 14-Nov-19

132	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
861	PEAK HOUR VOLUME
31.57	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0000		
P(3)=	0.0000		
P(4)=	0.0000		
P(5)=	0.0000		
P(6)=	0.0000		
P(7)=	0.0000		
P(8)=	0.0000		
P(9)=	0.0000		
P(10)=	0.0000		
P(11)=	0.0000		
P(12)=	0.0000		
P(13)=	0.0001		
P(14)=	0.0002		
P(15)=	0.0005		
P(16)=	0.0009		
P(17)=	0.0017		
P(18)=	0.0030		
P(19)=	0.0049		
P(20)=	0.0077		
		P(21)=	0.0116
		P(22)=	0.0167
		P(23)=	0.0229
		P(24)=	0.0301
		P(25)=	0.0381
		P(26)=	0.0462
		P(27)=	0.0540
		P(28)=	0.0609
		P(29)=	0.0663
		P(30)=	0.0698
		P(31)=	0.0711
		P(32)=	0.0701
		P(33)=	0.0671
		P(34)=	0.0623
		P(35)=	0.0562
		P(36)=	0.0493
		P(37)=	0.0420
		P(38)=	0.0349
		P(39)=	0.0283
		P(40)=	0.0223
		P(41)=	0.0172
		P(42)=	0.0129
		P(43)=	0.0095
		P(44)=	0.0068
		P(45)=	0.0048

41 vehicles @ 25'/vehicle = 1025' Storage Length/2 lanes @ 515' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: EB Right-turn from Alton Parkway to SB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

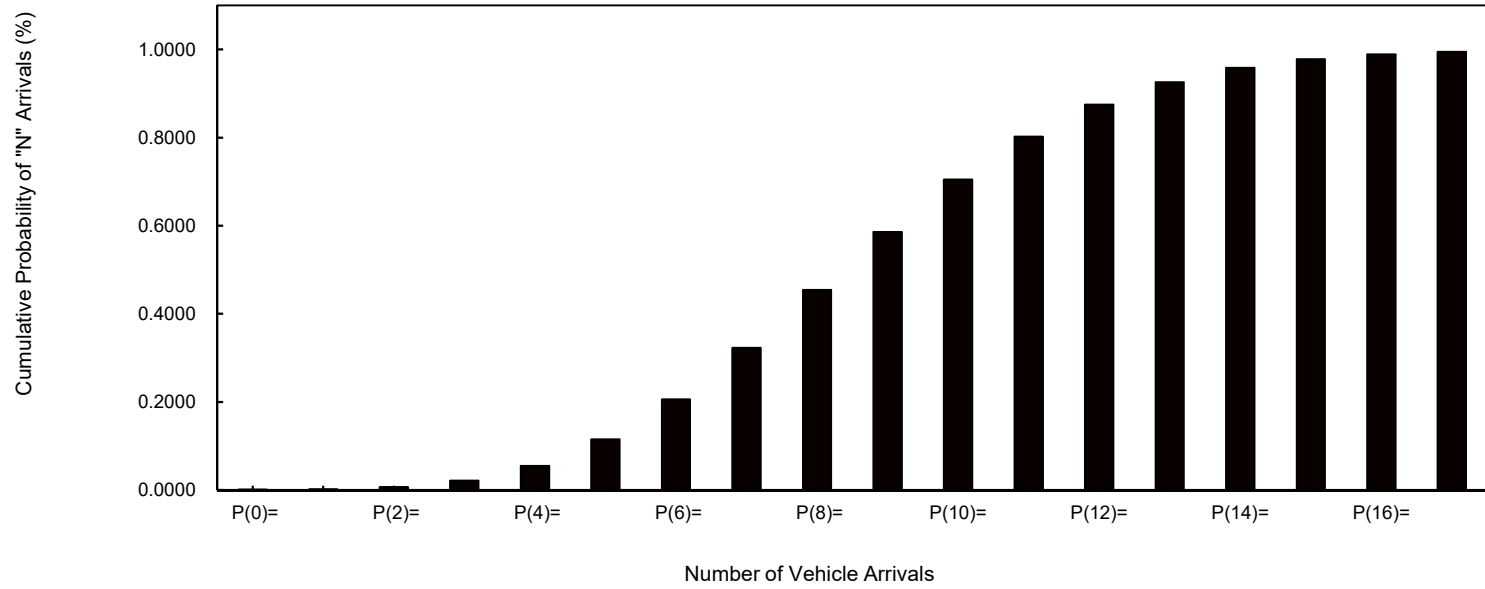
DATE: 14-Nov-19

118	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
275	PEAK HOUR VOLUME
9.01	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0001		
P(1)=	0.0011	P(21)=	0.0003
P(2)=	0.0049	P(22)=	0.0001
P(3)=	0.0149	P(23)=	0.0000
P(4)=	0.0335	P(24)=	0.0000
P(5)=	0.0604	P(25)=	0.0000
P(6)=	0.0907	P(26)=	0.0000
P(7)=	0.1168	P(27)=	0.0000
P(8)=	0.1316	P(28)=	0.0000
P(9)=	0.1318	P(29)=	0.0000
P(10)=	0.1188	P(30)=	0.0000
P(11)=	0.0973	P(31)=	0.0000
P(12)=	0.0731	P(32)=	0.0000
P(13)=	0.0507	P(33)=	0.0000
P(14)=	0.0326	P(34)=	0.0000
P(15)=	0.0196	P(35)=	0.0000
P(16)=	0.0110	P(36)=	0.0000
P(17)=	0.0059	P(37)=	0.0000
P(18)=	0.0029	P(38)=	0.0000
P(19)=	0.0014	P(39)=	0.0000
P(20)=	0.0006	P(40)=	0.0000

14 vehicles @ 25'/vehicle = 350' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
EB Right-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Left-turn from Alton Parkway to SB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

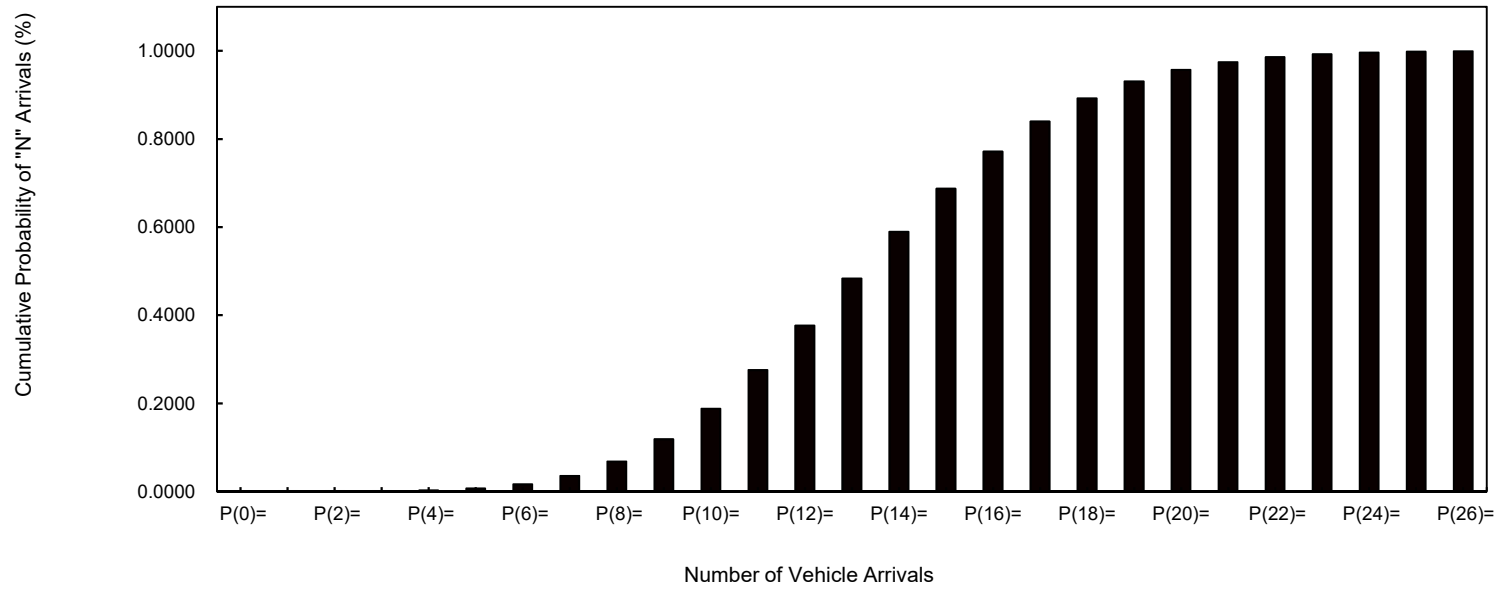
DATE: 14-Nov-19

179	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
278	PEAK HOUR VOLUME
13.82	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000	P(21)=	0.0174
P(2)=	0.0001	P(22)=	0.0109
P(3)=	0.0004	P(23)=	0.0066
P(4)=	0.0015	P(24)=	0.0038
P(5)=	0.0042	P(25)=	0.0021
P(6)=	0.0096	P(26)=	0.0011
P(7)=	0.0190	P(27)=	0.0006
P(8)=	0.0328	P(28)=	0.0003
P(9)=	0.0504	P(29)=	0.0001
P(10)=	0.0697	P(30)=	0.0001
P(11)=	0.0875	P(31)=	0.0000
P(12)=	0.1008	P(32)=	0.0000
P(13)=	0.1072	P(33)=	0.0000
P(14)=	0.1059	P(34)=	0.0000
P(15)=	0.0976	P(35)=	0.0000
P(16)=	0.0843	P(36)=	0.0000
P(17)=	0.0685	P(37)=	0.0000
P(18)=	0.0526	P(38)=	0.0000
P(19)=	0.0383	P(39)=	0.0000
P(20)=	0.0265	P(40)=	0.0000

20 vehicles @ 25'/vehicle =500' Storage Length/2 lanes @ 250' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
WB Left-Turn Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Through Lanes on Alton Parkway at Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

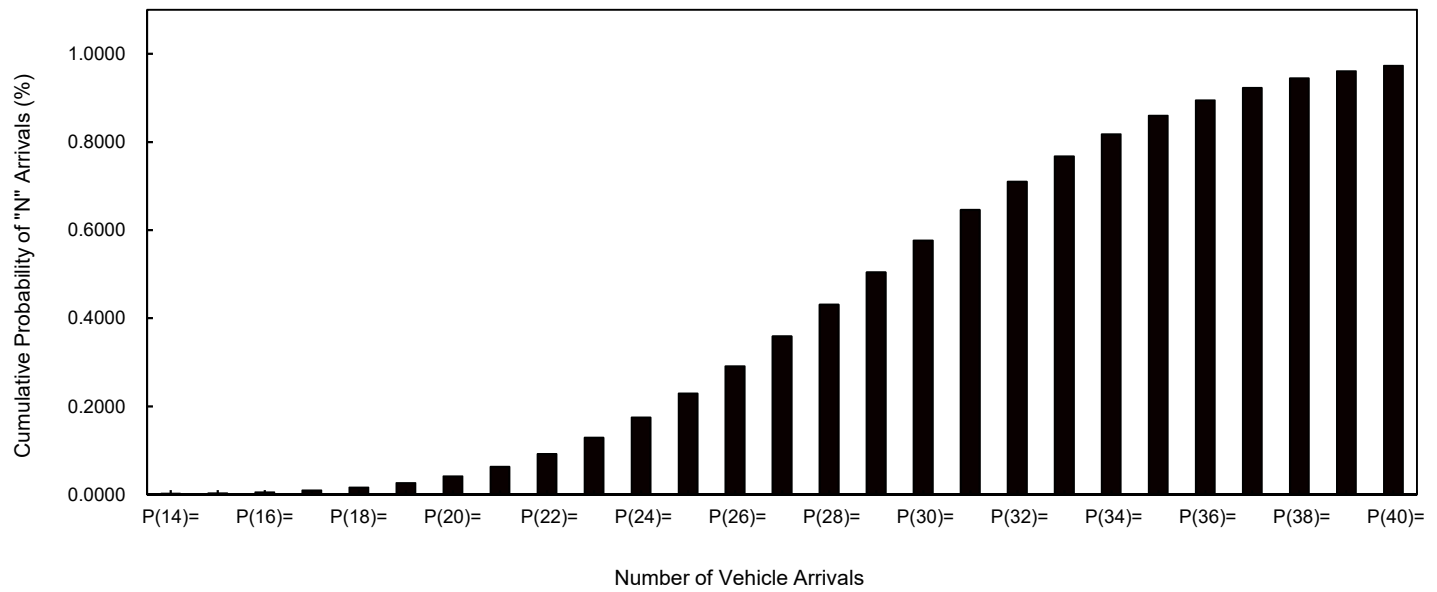
DATE: 14-Nov-19

139	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
767	PEAK HOUR VOLUME
29.61	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

PROBABILITY OF N ARRIVALS	CUMULATIVE	PROBABILITY OF N ARRIVALS	CUMULATIVE
P(0)=	0.0000		
P(1)=	0.0000		
P(2)=	0.0000		
P(3)=	0.0000		
P(4)=	0.0000		
P(5)=	0.0000		
P(6)=	0.0000		
P(7)=	0.0000		
P(8)=	0.0000		
P(9)=	0.0000		
P(10)=	0.0000		
P(11)=	0.0001		
P(12)=	0.0001		
P(13)=	0.0003		
P(14)=	0.0006		
P(15)=	0.0012		
P(16)=	0.0023		
P(17)=	0.0040		
P(18)=	0.0066		
P(19)=	0.0103		
P(20)=	0.0152		
		P(21)=	0.0215
		P(22)=	0.0289
		P(23)=	0.0372
		P(24)=	0.0459
		P(25)=	0.0544
		P(26)=	0.0620
		P(27)=	0.0680
		P(28)=	0.0719
		P(29)=	0.0734
		P(30)=	0.0725
		P(31)=	0.0692
		P(32)=	0.0641
		P(33)=	0.0575
		P(34)=	0.0501
		P(35)=	0.0424
		P(36)=	0.0349
		P(37)=	0.0279
		P(38)=	0.0217
		P(39)=	0.0165
		P(40)=	0.0122

39 vehicles @ 25'/vehicle = 975' Storage Length/2 lanes @ 490' each

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
WB Through Lanes Alton @ Culver



QUEUEING ANALYSIS (POISSON DISTRIBUTION)

LOCATION: WB Right-turn from Alton Parkway to NB Culver Drive

CONDITION: PM Peak Hour - Buildout - Alt. 4/5 Improvements (200-sec cycle)

DATE: 14-Nov-19

116	LENGTH OF RED SIGNAL INTERVAL (IN SECONDS)
274	PEAK HOUR VOLUME
8.83	AVERAGE NUMBER OF ARRIVALS DURING RED INTERVAL

<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>	<u>PROBABILITY OF N ARRIVALS</u>	<u>CUMULATIVE</u>
P(0)=	0.0001		
P(1)=	0.0013	P(21)=	0.0002
P(2)=	0.0057	P(22)=	0.0001
P(3)=	0.0168	P(23)=	0.0000
P(4)=	0.0371	P(24)=	0.0000
P(5)=	0.0655	P(25)=	0.0000
P(6)=	0.0963	P(26)=	0.0000
P(7)=	0.1215	P(27)=	0.0000
P(8)=	0.1341	P(28)=	0.0000
P(9)=	0.1315	P(29)=	0.0000
P(10)=	0.1161	P(30)=	0.0000
P(11)=	0.0932	P(31)=	0.0000
P(12)=	0.0686	P(32)=	0.0000
P(13)=	0.0466	P(33)=	0.0000
P(14)=	0.0294	P(34)=	0.0000
P(15)=	0.0173	P(35)=	0.0000
P(16)=	0.0095	P(36)=	0.0000
P(17)=	0.0050	P(37)=	0.0000
P(18)=	0.0024	P(38)=	0.0000
P(19)=	0.0011	P(39)=	0.0000
P(20)=	0.0005	P(40)=	0.0000

14 vehicles @ 25'/vehicle =350' Storage Length

Alternative 4/5 - Buildout PM Peak Hour
Queueing Analysis (200-sec. cycle)
WB Right-Turn Alton @ Culver

