

LOCAL TRANSPORTATION ANALYSIS

FOR

8695 GREENBACK LANE
Orangevale, Sacramento County, CA

Prepared For:

PETROVICH DEVELOPMENT COMPANY
825 K Street
Sacramento, CA 95814

Prepared By:

KD Anderson & Associates
3853 Taylor Road, Suite G
Loomis, California 95650
(916) 660-1555

September 30, 2022

5250-28

0 8695 Greenback Lane 9-30-2022.rpt



**LOCAL TRANSPORTATION ANALYSIS FOR
8695 GREENBACK LANE
Orangevale, Sacramento County, CA**

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
INTRODUCTION.....	1
Study Purpose and Objectives	1
Project Description.....	1
METHODOLOGY	5
Intersection Level of Service and Signal Warrants.....	5
SIGNIFICANCE THRESHOLDS.....	7
Level of Service Impact Criteria.....	7
EXISTING SETTING	8
Study Area	8
Study Area Intersections	8
Public Transit.....	9
Bicycle and Pedestrian Facilities	9
Existing Conditions.....	9
EXISTING PLUS PROJECT IMPACTS.....	12
Trip Generation.....	12
Trip Distribution	13
Trip Assignment	14
Existing Plus Project Conditions	14
SITE DESIGN REVIEW	19
FINDINGS / RECOMMENDATIONS / IMPROVEMENTS.....	21
REFERENCES.....	23
APPENDICES	24

KDA

8695 GREENBACK LANE LOCAL TRANSPORTATION ANALYSIS

EXECUTIVE SUMMARY

- **Project Description.** The site is located at 8695 Greenback Lane. The project includes a zoning ordinance amendment to include a convenience store / gas station (C-store) adjacent to Greenback Lane with 12 vehicle fueling positions and a 2,900 square foot convenience store with a self-storage facility located north of the C-store and including 46,900 square feet.

Access to the C-store portion of the site will include full access along Hickory Avenue and right-in, right-out movements along Greenback Lane. Access to the mini-storage site will include full access along Hickory Avenue. The project is expected to generate approximately 3,249 mid-week daily trips, 197 a.m. peak hour trips and 228 p.m. peak hour trips. After accounting for pass-by trips the project is expected to generate 1,366 new mid-week daily trips, 77 new a.m. peak hour trips and 104 new p.m. peak hour trips.

- **Recommendations for Existing Conditions.** The study intersection currently operates within acceptable Sacramento County threshold levels, at LOS D or better. Queues in the northbound right turn lane, eastbound left turn lane and westbound left turn lane exceed the available lane storage.

The following recommendations are made:

Northbound Right Turn Lane – The right turn lane requires lengthening to about 160 feet. At the end of the existing right turn lane Illinois Avenue begins to narrow. The northbound approach has about a 24-foot-wide width. To accommodate the shared left-through lane, bike lane and right turn lane, the travel lanes would need to be reduced to 10-foot lanes while the bike lanes would be narrowed to a four feet width.

Eastbound Left Turn Lane - The eastbound left turn lane requires lengthening to about 200 feet. At the end of the existing left turn lane, a raised median exists, separating the left turn lane from a two-way-left-turn-lane (TWLTL) present along the mid-block of Greenback Lane. To accommodate the existing queue length the left turn lane would need to be extended to the TWLTL. This would require removal of the raised median island and include a transition between the TWLTL and the left turn lane.

Westbound Left Turn Lane - The westbound left turn lane requires lengthening to about 220 feet. As noted in the analysis, this length may be related to school children being driven to Andrew Carnegie Middle School. A raised median separates the left turn lane with an eastbound left turn lane providing access to the WinCo supermarket. Extending the westbound left turn lane to about 220 feet would require removal of the median island and replacing it with a reverse curve raised curb separating the back-to-back left turn lanes.

- **Significant Transportation Effects for Existing plus Project Conditions.** All intersections will continue to operate within acceptable Sacramento County threshold levels, at LOS D or better. Driveway queues are less than one vehicle. Queues in the northbound right turn lane and westbound left turn lane are projected to decrease compared to the Existing conditions.

The following traffic improvements are recommended:

Eastbound Left Turn Lane - The eastbound left turn lane will lengthen from the 198-foot queue to a 255-foot queue. The left turn lane should be extended to 260 feet by restriping the existing TWLTL with left turn lane striping. A transition between the left turn lane and the TWLTL should be included. Raised median curb should be extended to 50 feet west of the driveway so as not to allow left turn movements from eastbound Greenback Lane into the project driveway.

Install Bicycle Lanes - A bicycle lane along the Hickory Avenue project frontage should be installed to replace the existing bike lane that will become part of the added motor vehicle travel lanes. Greenback Lane should be widened along the project frontage to include the ultimate County cross section including a future Class 2 bike lane. Bike Lane striping should occur with installation of a longer segment of bike lane.

Install Sidewalk/Pathway from Greenback Lane - A sidewalk or pathway should be provided from Greenback Lane into the site to provide pedestrian access to the C-store from the west.

Confirm Sight Distance Standards – Section 4 of the County standards regarding sight distance shall be maintained at each driveway. Landscaping and retaining walls shall be adjusted as necessary to conform to the visibility requirements.

8695 GREENBACK LANE LOCAL TRANSPORTATION ANALYSIS

INTRODUCTION

Study Purpose and Objectives

This study evaluates the traffic impact associated with the proposed zoning ordinance amendment proposed for the lot at 8695 Greenback Lane in Orangevale. The proposed project includes a convenience store / gas station (C-store) adjacent to Greenback Lane with 12 vehicle fueling positions and a 2,900 square foot convenience store with a self-storage facility located north of the C-store and including 46,900 square feet. Figure 1 presents the project location in the northwest quadrant of the Greenback Lane / Hickory Avenue – Illinois Avenue intersection.

This study addresses the following scenarios:

1. Existing Traffic Conditions
2. Existing Plus Project Conditions
3. Existing Plus Project Conditions with Improvements (if needed)

The objective of this study is to identify any impacts in the project vicinity, at the Greenback Lane / Hickory Avenue – Illinois Avenue intersection. Strategies will be suggested for mitigating any impacts of this project. In addition, the report will provide a review of the site layout.

A VMT analysis has been determined to not be required as the C-store is considered local serving retail. The self-storage portion can be screened out from analysis as it generates less than the 237 “small project” threshold.

Project Description

The site is located at 8695 Greenback Lane. The project is an infill property in the northwest quadrant of the Greenback Lane / Hickory Avenue intersection in Orangevale. The project is within the Greenback Lane SPA.

The project includes two uses. A 12-pump / 2,900 square foot gasoline / convenience store (C-store) will be constructed adjacent to the Greenback Lane / Hickory Avenue intersection while a 46,900 square foot self-storage building will be constructed north of the C-store site. A right-in, right-out driveway along Greenback Lane and a full access driveway along Hickory Avenue will be provided for the C-store. The self-storage site includes a full access driveway along Hickory Avenue about 100 feet north of the C-store. A secondary access will be provided for the self-storage site along the north side of the site where an access easement exists; this secondary access is expected to be minimally used with use primarily by storage renters who live north of the site. Access between the gas station / C-store and self-storage site is not proposed.

It is expected that the proposed project will complete frontage improvements along Hickory Avenue and Greenback Lane. A right turn only lane on Hickory Avenue, similar to the configuration on Illinois Avenue, is assumed as part of the project. Greenback Lane will be widened based on a 96-foot standard throughfare based on the Greenback Lane SPA and the Sacramento County Improvements Standards. The County has indicated that a bus turnout will also be provided along Greenback Lane. The projected site access locations and frontage improvements are shown in Figure 2.



VICINITY MAP

METHODOLOGY

The methodology used in the preparation of this traffic impact study is consistent with guidance provided in *Transportation Analysis Guidelines – County of Sacramento – September 2020* (County of Sacramento 2020), and consultation with County of Sacramento staff (Shew pers. comm.). The following is a description of technical analysis methods applied in this traffic impact study.

Intersection Level of Service and Signal Warrants

The characterization of traffic operating conditions is based on an analysis of level of service (LOS). Analyses of LOS and signal warrants are used to evaluate the impacts of the proposed project. The following is a description of LOS and signal warrants analysis.

Level of Service. Circulation systems are typically evaluated based on a comparison of the system’s capacity and the projected level of traffic volumes. The operating conditions experienced by motorists are described in terms of LOS. LOS is a qualitative measure, reflecting a number of quantitative factors, including speed and travel time, traffic interruptions, freedom to maneuver, and driving comfort and convenience. LOS is designated on a scale from LOS A to LOS F, with LOS A representing the best performance and LOS F the worst. LOS is quantified using the average delay per vehicle approaching the intersection. Table 1 presents the ranges of vehicle delay associated with each LOS.

As specified by the *Transportation Analysis Guidelines (TAG)*, the most recent version (6th Edition) of the Highway Capacity Manual (HCM) should be used. For unsignalized intersections, a peak hour signal warrant analysis will also be prepared for unsignalized intersections where the LOS exceeds the County’s acceptable threshold. At signalized intersections, the County identifies Synchro software to be used to calculate LOS conditions. Relevant assumptions to be assumed for the *Synchro* analysis are identified in the TAG. To ensure valid comparisons between scenarios without and with the project, any signal timing for Existing and / or Cumulative conditions was “locked” (i.e., held constant) and applied to all similar scenarios analyzed.

Signal timing data used in the LOS analysis of signalized intersections were provided by Sacramento County staff. The signal timing data are for Existing conditions. To ensure a valid comparison between scenarios and a valid identification of project-related impacts, the signal timing for Existing conditions was “locked” (i.e., held constant) and applied to all scenarios analyzed in this traffic impact study.

**TABLE 1
LEVEL OF SERVICE DEFINITIONS - INTERSECTIONS**

Level of Service	Signalized Intersection	Unsignalized Intersection	Roadway (Daily)
"A"	Uncongested operations, all queues clear in a single-signal cycle. Delay ≤ 10.0 sec	Little or no delay. Delay ≤ 10 sec/veh	Completely free flow.
"B"	Uncongested operations, all queues clear in a single cycle. Delay > 10.0 sec and ≤ 20.0 sec	Short traffic delays. Delay > 10 sec/veh and ≤ 15 sec/veh	Free flow, presence of other vehicles noticeable.
"C"	Light congestion, occasional backups on critical approaches. Delay > 20.0 sec and ≤ 35.0 sec	Average traffic delays. Delay > 15 sec/veh and ≤ 25 sec/veh	Ability to maneuver and select operating speed affected.
"D"	Significant congestion of critical approaches but intersection functional. Cars required to wait through more than one cycle during short peaks. No long queues formed. Delay > 35.0 sec and ≤ 55.0 sec	Long traffic delays. Delay > 25 sec/veh and ≤ 35 sec/veh	Unstable flow, speeds and ability to maneuver restricted.
"E"	Severe congestion with some long standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersection(s) upstream of critical approach(es). Delay > 55.0 sec and ≤ 80.0 sec	Very long traffic delays, failure, extreme congestion. Delay > 35 sec/veh and ≤ 50 sec/veh	At or near capacity, flow quite unstable.
"F"	Total breakdown, stop-and-go operation. Delay > 80.0 sec	Intersection blocked by external causes. Delay > 50 sec/veh	Forced flow, breakdown.

Sources: Highway Capacity Manual, 6th Edition, Transportation Research Board (TRB).

Signal Warrants. Traffic signal warrants are a series of standards which provide guidelines for determining if a traffic signal is appropriate. Signal warrant analyses are typically conducted at intersections of uncontrolled major streets and stop sign-controlled minor streets. If one or more signal warrants are met, signalization of the intersection may be appropriate. However, a signal should not be installed if none of the warrants are met, since the installation of signals would increase delays on the previously uncontrolled major street, resulting in an undesirable increase in overall vehicle delay at the intersection. Signalization may also increase the occurrence of particular types of accidents. Therefore, if signals are installed where signal warrants are not met, the detriment of increased accidents and overall delay may be greater than the benefit in traffic operating conditions on the single worst movement at the intersection. Signal warrants, then, provide an industry-standard basis for identifying when the adverse effect on the worst movement is substantial enough to warrant signalization.

For the traffic analysis conducted for this traffic study, available data are limited to a.m. and p.m. peak hour volumes. Thus, unsignalized intersections were evaluated using the Peak Hour Warrant (Warrant Number 3) from the California Department of Transportation document *California Manual on Uniform Traffic Control Devices* (California Department of Transportation 2014). A warrant analysis was conducted only for an intersection(s) where the LOS exceeds the County standard.

Even if the Peak Hour Warrant is met, a more detailed signal warrant study is recommended before a signal is installed. The more detailed study should consider volumes during the highest eight hours of the day, volumes during the highest four hours of the day, pedestrian traffic, and accident histories.

SIGNIFICANCE THRESHOLDS

Local agencies adopt minimum LOS standards for their roadway facilities. Analysis of LOS and signal warrants is used to evaluate the effects of the proposed project.

Level of Service Impact Criteria

The *TAG* defines the minimum acceptable operation level for intersections to be LOS D for rural areas and LOS E for urban areas. The study area for this traffic impact study is in an urban area. Therefore, LOS E is considered the minimum acceptable LOS. The County recognizes a project-specific impact if the Project would meet any of the following criteria:

Signalized Intersections

- result in a signalized intersection operating at an acceptable LOS to deteriorate to an unacceptable LOS;
- increase the average delay by more than 5 seconds at a signalized intersection that is operating at an unacceptable LOS without the project;

Unsignalized Intersections

- result in an unsignalized intersection movement/approach operating at an acceptable LOS to deteriorate to an unacceptable LOS, and also cause the intersection to meet a traffic signal warrant; or
- for an unsignalized intersection that meets a signal warrant, increase the delay by more than 5 seconds at a movement/approach that is operating at an unacceptable LOS without the project.

Bicycle and Pedestrian Facilities

As specified in *TAG* a project is considered to have a significant impact on bicycle or pedestrian facilities if it would:

- eliminate or adversely affect an existing bikeway or pedestrian facility in a way that would discourage its use;

- interfere with the implementation of a planned bikeway as shown in the Bicycle Master Plan, or be in conflict with the Pedestrian Master Plan; or
- fail to provide adequate access for bicyclists and pedestrians, resulting in unsafe conditions, including unsafe bicycle/pedestrian, bicycle/motor vehicle, or pedestrian/motor vehicle conflicts.

Transit

A project is considered to have a significant effect if it would:

- eliminate or adversely affect existing transit access, service, or operations; or
- interfere with the implementation of transit service as planned in the Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS); or
- substantially increase transit demand and fail to provide adequate transit service.

Safety

A project is considered to have a significant effect if it would:

- substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

EXISTING SETTING

Study Area

This study addresses traffic conditions at the Greenback Lane / Hickory Avenue – Illinois Avenue intersection. The limits of the study area were identified by the County of Sacramento Department of Transportation staff memorandum dated January 27, 2017. The text that follows describes the facilities included in this analysis.

Study Area Intersections

The quality of traffic flow is typically governed by the operation of major intersections. For this study, one existing intersection was identified for evaluation. A peak hour count was conducted at the intersection in April 2017. Existing volumes are still considered below average conditions due to the Covid-19 pandemic. Based on discussion with County staff historical traffic volumes along Greenback Lane were reviewed. The available data east of Kenneth Avenue indicated a 2% annual growth rate along Greenback Lane in the area, and this rate was applied to all movements of the study intersection.

The **Greenback Lane / Hickory Avenue – Illinois Avenue intersection** is a signal-controlled intersection. The eastbound Greenback Lane approach includes a left turn lane, a through lane and a shared through-right turn lane. The westbound Greenback Lane approach includes a left turn

lane, two through lanes and a right turn lane. Northbound Illinois Avenue includes a shared through-left turn lane and a right turn lane while the southbound Hickory Avenue approach includes a shared left-through-right lane. The intersection is a 6-phase signal with protected left turn movements along Greenback Lane and split phasing along the Hickory Avenue – Illinois Avenue approaches. Crosswalks are present along all the north, south and east approaches and U-turns are prohibited for eastbound Greenback Lane traffic. Bike lanes are present on Hickory Avenue and Illinois Avenue but are intermittent along Greenback Lane. Within the project area bike lanes are not present.

Public Transit

Sacramento Regional Transit (RT) operates buses throughout the Sacramento area and operates one route, the #124, the “Sunrise Commuter” along Greenback Lane past the project site. This route operates between the Madison Avenue / Greenback Lane intersection and the Rancho Cordova VA Hospital. Buses operate from about 5:42 a.m. to 8:30 a.m. Monday through Friday from Orangevale to Rancho Cordova with the return trip operating from 4:13 p.m. to 7:03 p.m. There are five runs each day and no Saturday or Sunday service.

Bicycle and Pedestrian Facilities

Class 2 bike lanes are present along Hickory Avenue and Illinois Avenue. These bike lanes approach and depart the intersection. Along Greenback Lane bike lanes are not present east and west of the intersection, however, the eastbound and westbound departures include variable width shoulders.

Sidewalk is present in the following locations:

- East side of Hickory Avenue
- North side of Greenback Lane, east of Hickory Avenue
- South side of Greenback Lane, west of Illinois Avenue
- West side of Illinois Avenue
- East side of Illinois Avenue
- South side of Greenback Lane, east of Hickory Avenue

All sidewalk extends to the limits of the properties that have been improved in these areas. In addition, sidewalk is present on the north side of Greenback Lane directly adjacent to the project site. It is expected that the project will extend this sidewalk to the Greenback Lane / Hickory Avenue - Illinois Avenue intersection.

Existing Conditions

Intersection Levels of Service. Figure 3 presents the existing lane configurations at the study intersection of Greenback Lane and Hickory Avenue – Illinois Avenue. For this analysis, Level of Service E is the minimum acceptable condition. Table 2 summarizes current Levels of Service during the a.m. and p.m. peak hours. The signalized intersections will operate at LOS D or better.

**TABLE 2
EXISTING PEAK HOUR LEVELS OF SERVICE AT INTERSECTIONS**

Location	Control	AM Peak Hour		PM Peak Hour	
		LOS	Average Delay	LOS	Average Delay
1. Greenback Lane / Hickory Ave – Illinois Ave	Signal	D	36.3	C	32.8

Average Delay in seconds per vehicle

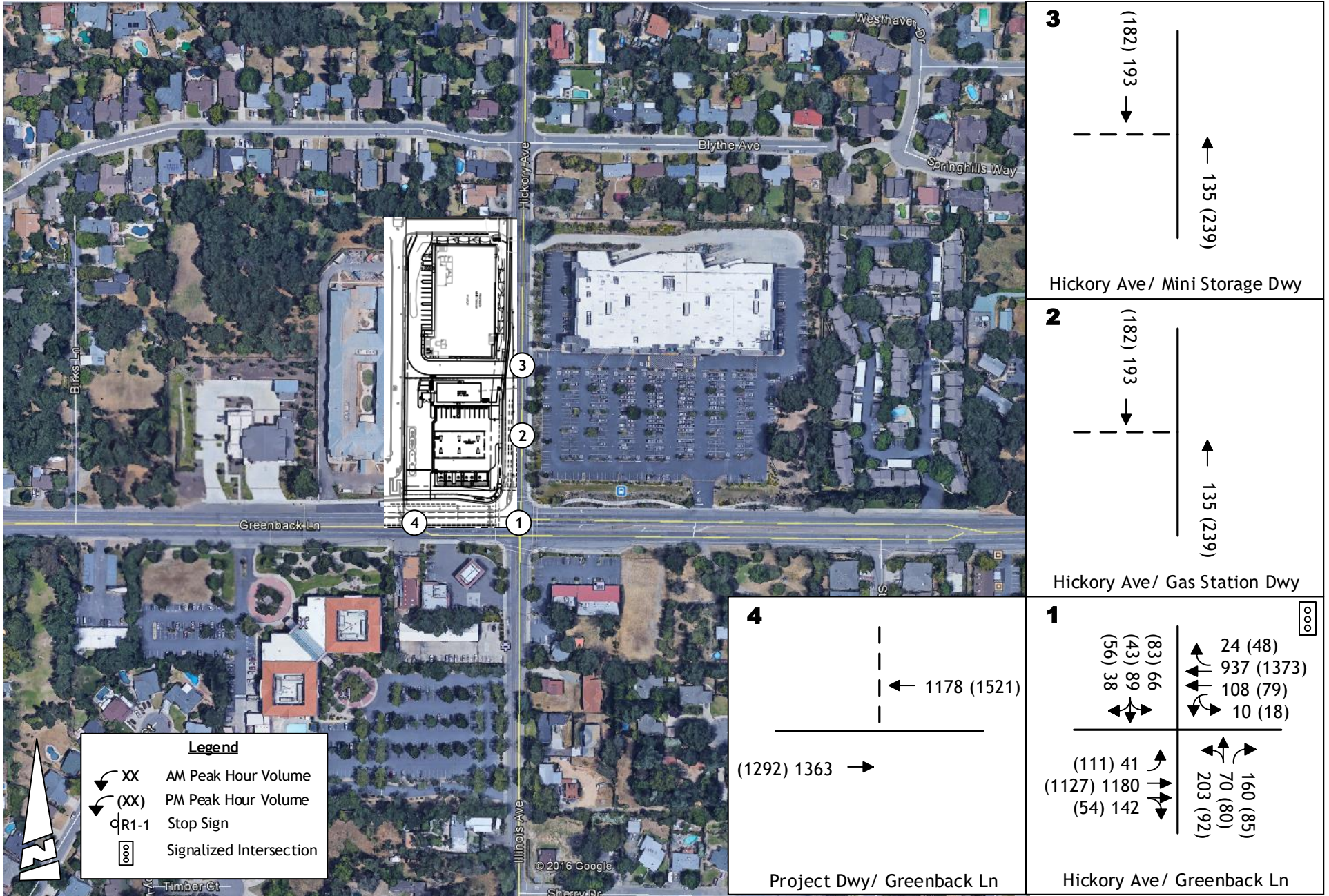
Intersection Queuing Analysis. The quality of traffic flow can also be affected by queuing at signalized and unsignalized intersections. For this study, the lengths of peak period queues have been identified and compared to available storage in order to determine whether spillover from turn lanes can affect adjoining travel or extend through adjacent intersections. 95th percentile queue lengths were calculated as a byproduct of the Synchro analysis. Table 3 presents the queues. During the a.m. peak hour queues exceed the available storage in the northbound right turn lane and the westbound left turn lane. This may be a result of parents dropping children off at Andrew Carnegie Middle School located on Illinois Avenue about ½ mile south of the project site. In the p.m. peak hour the queues exceed the available storage in the eastbound and westbound left turn lanes.

**TABLE 3
EXISTING PEAK HOUR QUEUES AT INTERSECTIONS**

Location	Storage Length (feet)	AM Peak Hour		PM Peak Hour	
		VPH	Queue (feet)	VPH	Queue (feet)
1. Greenback Lane / Hickory Ave – Illinois Ave					
NB left-through	---	273	560	172	278
NB right turn	100	160	158	85	53
SB left-through-right	---	193	311	182	284
EB left turn	130	41	96	111	198
WB left turn	130	118	214	97	178
WB right turn	130†	24	<25	48	<25

Bold indicates turn lane length exceeded

†length of striped lane; road width can support turn lane to adjacent driveway (300')



EXISTING TRAFFIC VOLUMES AND LANE CONFIGURATIONS

EXISTING PLUS PROJECT IMPACTS

Trip Generation

The proposed project includes a 12-fueling position, 2,900 square foot gas station / convenience store (C-store) and a 46,900 square foot mini-warehouse. The development of this project will attract new traffic to the project vicinity. The amount of additional traffic on a particular section of the street network is dependent upon two factors:

- Trip Generation, the number of new trips generated by the project, and
- Trip Distribution and Assignment, the specific routes that the new traffic takes.

Trip generation is determined by identifying the type and size of land use being developed. Recognized sources of trip generation data may then be used to calculate the total number of trip ends.

The trip generation of the project was computed using trip generation rates published in *Trip Generation* (Institute of Transportation Engineers, 11th Edition, 2021) based on the projected uses described above. The C-store trip rate uses the convenience store subcategory in developing trips based on the number of fueling positions. The project is expected to generate 3,249 mid-week daily trips, 197 a.m. peak hour trips and 228 p.m. peak hour trips.

Trips generated by commercial projects fit into two categories. Some trips will be made by patrons who would not otherwise be on the local street system and who go out of their way to reach the site. These are "new" trips. Other trips will be made by patrons who are already in the roadway network and are therefore not adding "new" trips to the overall system.

"Pass-by" trips would be made by motorists who are already driving by the site as part of another trip. Peak hour pass-by trips are common on commuter routes as motorists stop inbound and outbound. They are made by patrons who are already driving by the site and simply interrupt a trip already being made to other destinations. An example of this type of trip would be stopping to refuel a vehicle. **"Internally Captured"** trips are made by patrons visiting multiple land uses on the site. For example, a motorist may visit a retail store in a shopping center and the QSR in one visit. Internally captured trips were not considered for this project.

ITE research has suggested typical "pass-by" percentages for various land uses where appreciable background traffic occurs. The share of project trips falling into each category varies over the day. Table 4 presents the "pass-by" reductions used for this study. The gas station/C-store rate is based upon data from the ITE *Trip Generation Handbook*, 3rd Edition while a 10% pass-by was assumed for the mini-storage site. Application of these rates yields a total of 1,877 'pass-by' trips, 120 'pass-by' a.m. peak hour trips and 124 'pass-by' p.m. peak hour trips. After accounting for pass-by traffic, the project is expected to generate 1,366 'new' daily trips, 77 'new' a.m. peak hour trips and 104 'new' p.m. peak hour trips.

**TABLE 4
PROJECT TRIP GENERATION¹**

Land Use	Amount	Trip Rate				Trips ¹							
		Daily	AM Peak Hour		PM Peak Hour		Daily	AM Peak Hour		PM Peak Hour			
			In	Out	In	Out		In	Out	In	Out		
Gas Station with Convenience Store (LU 945)	12 VFP	265.12			16.06			18.42			3,181	193	221
Mini-Storage (LU 151)	46.90 KSF	1.45			0.09			0.15			68	4	7
Gas Station with Convenience Store (LU 945)			50%	50%	50%	50%			96	96	111	111	
Mini-Storage (LU 151)			59%	41%	47%	53%			2	2	3	4	
Sub Total - Trips									3,249	99	98	114	114
<i>Pass-By Trip Reduction – Gas Station / C-Store²</i>									(1,877)	(60)	(60)	(62)	(62)
<i>Pass-By Trip Reduction – Mini-Storage³</i>									(7)	(0)	(0)	(0)	(1)
Net New Trips									1,366	39	38	52	52

¹ Numbers may not match due to rounding

² Pass-by rates – 59% Daily, 62% AM, 56% PM

³ Pass-by rates – 10% Daily, 10% AM, 10% PM

Trip Distribution

The distribution of project traffic was determined based on review of the existing traffic counts at the local intersection, as well as the travel patterns in the area. Greenback Lane serves as a major east-west corridor through Orangevale while Hickory Avenue and Illinois Avenue provide access to residential areas north and south of Greenback Lane.

The distribution of project traffic was developed based on existing traffic counts, the travel patterns in the area and the proximity to residential housing and employment centers. New project trips are expected to be oriented equally in all directions while pass-by trips are primarily oriented along Greenback Lane. Table 5 presents the projected trip distribution percentages for the project.

**TABLE 5
PROJECT TRIP DISTRIBUTION**

Route	% of Total Trips
	AM
To / from Hickory Avenue - north	25%
To / from Illinois Avenue - south	25%
To / from Greenback Lane - east	25%
To / from Greenback Lane - west	25%
Total	100%

Trip Assignment

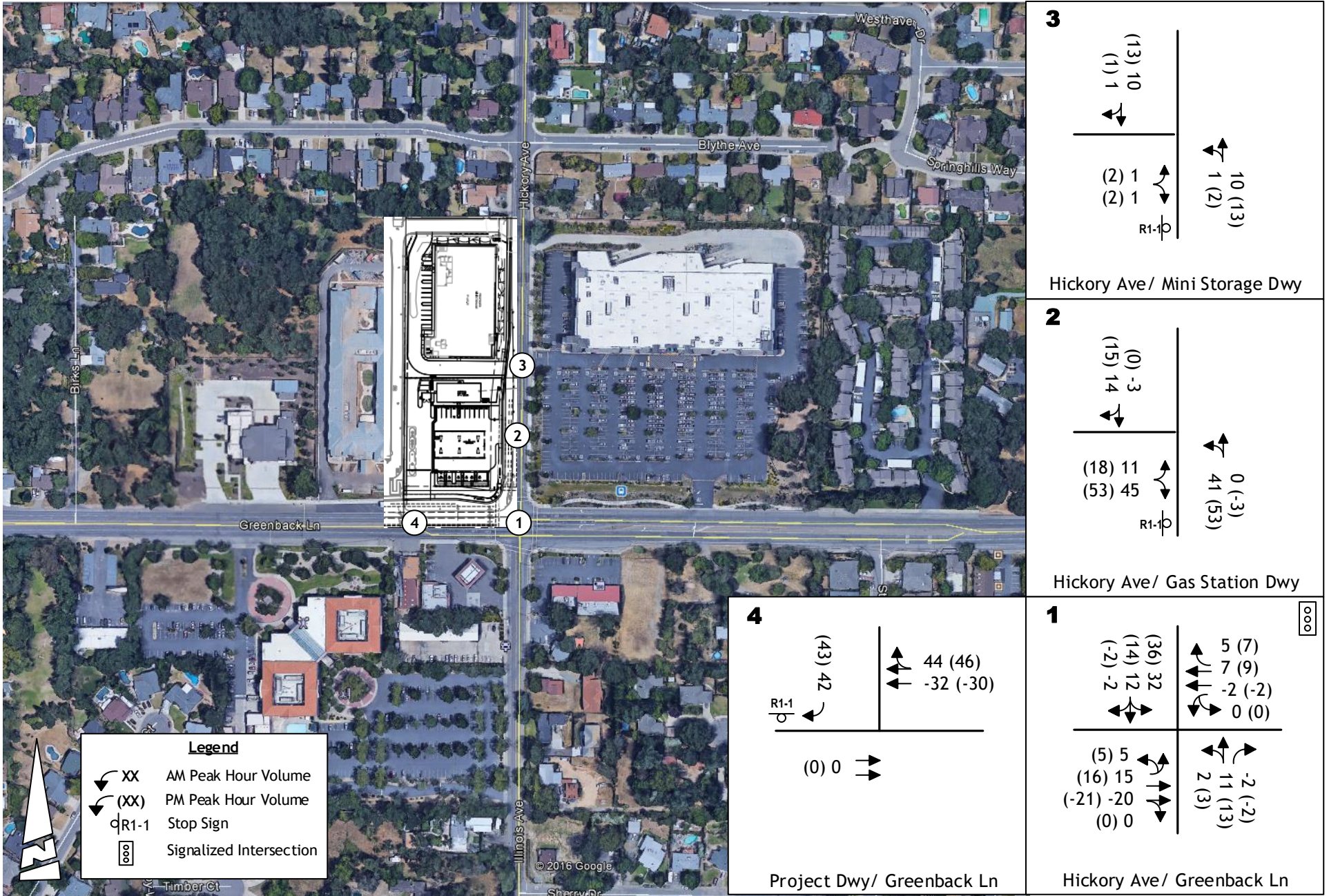
Traffic generated by the project is shown in Figure 4. This traffic was then added to existing peak hour volumes based on the distribution percentages. Figure 5 displays the Existing plus Project generated traffic anticipated for each study intersection in the a.m. and p.m. peak hours. The mini-storage secondary access at the north side of the site provides a secondary driveway for the Almond Heights Senior Living. An access easement provides project access to this driveway, and it is expected to be minimally used by project traffic. Given the trip generation of the mini-storage site no peak hour trips were projected to use this driveway.

Existing Plus Project Conditions

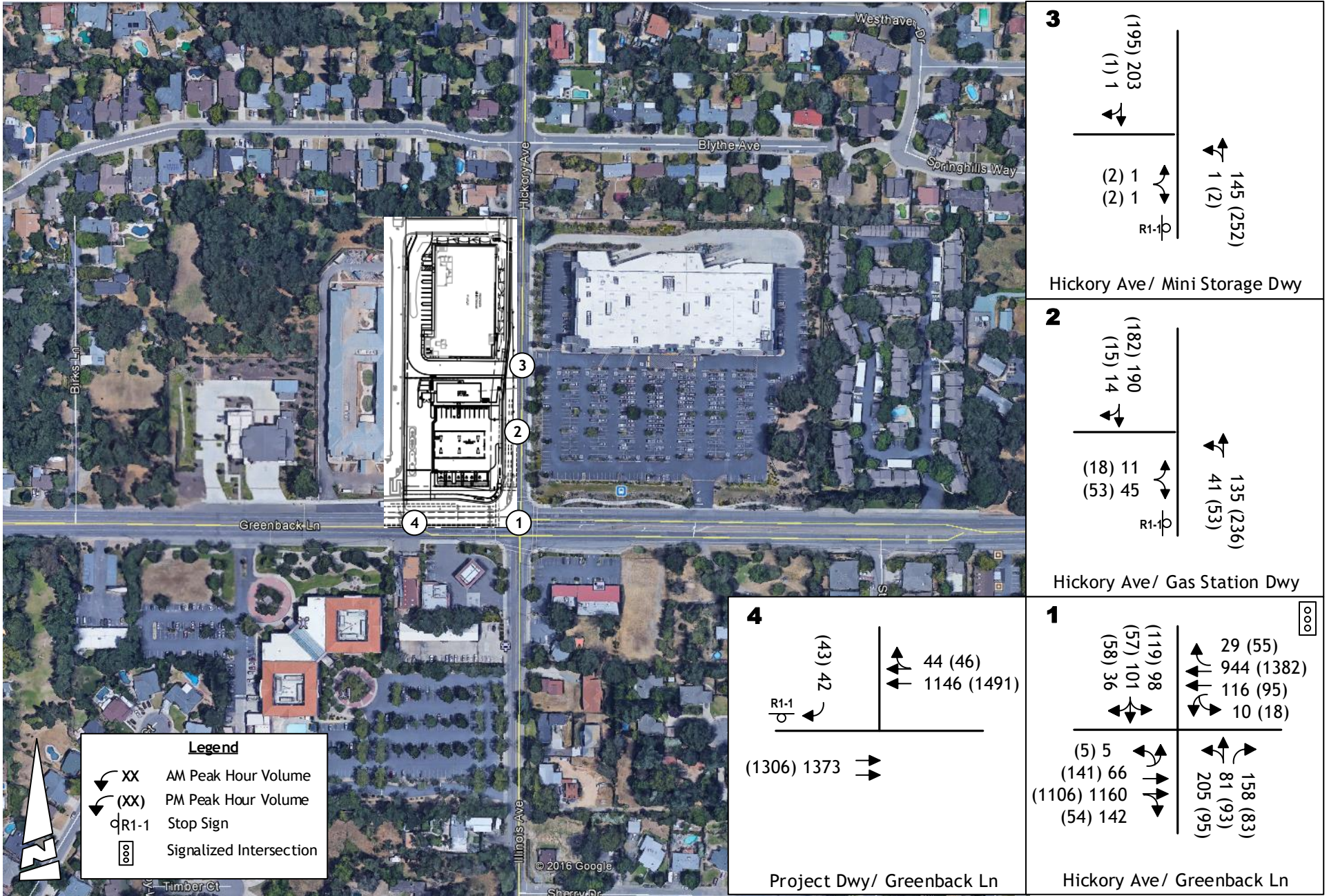
The impacts of developing the project have been identified by superimposing project traffic onto background conditions. Resulting intersection Levels of Service were then calculated and used as the basis for evaluating potential project impacts.

Project Frontage Improvements. The project frontage along the southbound approach to the intersection will be widened as a condition of the project. The modification to the approach includes widening the approach to match the Illinois Avenue side of the intersection. This includes a shared left-through lane, a bike lane and a right turn lane. The traffic signal will continue to operate under existing phasing.

In addition to the additional lanes along the southbound approach to the intersection the modifications to the northwest quadrant will also include installation of new signal equipment in their ultimate locations based on the “6x2” standard intersection according to County Improvement Standards (CIS). Additionally, frontage improvements along Greenback Lane will be completed which includes the addition of a third westbound through lane; however, the third through lane will not be striped until Greenback Lane is widened in the future. The existing eastbound left turn lane currently prohibits U-turns. With installation of the third through lane, this prohibition will be removed. A crosswalk across the west leg of the intersection, ADA ramps and pedestrian signals will be installed as part of the project. Interim striping on the southbound approach and westbound departure will be installed by the project proponent to conform to the existing striping on southbound departure and westbound approach. The Greenback Lane ultimate striping will conform to CIS 4-13 while the Hickory Lane ultimate striping will conform to CIS 4-9.



PROJECT ONLY TRAFFIC VOLUMES AND LANE CONFIGURATIONS



EXISTING PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

figure 5

Intersection Levels of Service. Table 6 displays the a.m. and p.m. peak hour Levels of Service at each study intersection with and without the project. The Greenback Lane / Hickory Avenue – Illinois Avenue intersection will continue to operate at acceptable levels of service, at LOS D in both a.m. and p.m. peak hour periods. The project driveways will also operate at LOS C or better in the a.m. and p.m. peak hours.

Intersection Queuing Analysis. 95th percentile queue lengths were calculated as a byproduct of the Synchro analysis under Existing plus Project conditions. Table 7 presents the projected 95th percentile queues for each study intersection. In the a.m. peak hour the northbound shared through-left lane queue will lengthen by about 35 feet as a result of new and pass-by traffic added to the lane. The eastbound left turn lane is projected to lengthen by 49 feet, about two car lengths. The remaining left turn lanes or shared lanes are projected to increase by less than 25 feet. During the p.m. peak hour the northbound shared through-left lane queue will lengthen by 26 feet, one car length, while the eastbound left turn lane will lengthen by about 57 feet, about two car lengths. The remaining left turn lanes or shared lanes are projected to increase by less than 10 feet.

**TABLE 6
PEAK HOUR INTERSECTION LEVELS OF SERVICE
EXISTING PLUS PROJECT CONDITIONS**

Location	Control	AM Peak Hour					PM Peak Hour				
		Existing		Existing Plus Project			Existing		Existing Plus Project		
		LOS	Average Delay	LOS	Average Delay	Change In Delay	LOS	Average Delay	LOS	Average Delay	Change In Delay
1. Greenback Lane / Hickory Ave – Illinois Ave	Signal	D	36.3	D	37.4	1.1	C	32.8	C	35.0	2.2
2. Hickory Ave / Gas Station Driveway	SSSC	---	---	A	7.7	7.7	---	---	A	7.7	7.7
NB Left				B	10.0	10.0			B	10.6	10.6
3. Hickory Ave / Mini-Storage Driveway	SSSC	---	---	A	7.6	7.6	---	---	A	7.6	7.6
NB Left				B	10.0	10.0			B	10.4	10.4
4. Greenback Lane / Project Driveway	SSSC	---	---	B	13.9	13.9	---	---	C	17.0	17.0
SB Right											

SSSC side street stop control

Average Delay in seconds per vehicle

**TABLE 7
EXISTING PLUS PROJECT PEAK HOUR QUEUES AT INTERSECTIONS**

Location	Storage Length (feet)	AM Peak Hour		PM Peak Hour	
		VPH	Queue (feet)	VPH	Queue (feet)
1. Greenback Lane / Hickory Ave – Illinois Ave					
NB left-through	---	286	595	188	304
NB right	100	158	155	83	51
SB left-through	---	199	326	176	293
SB right	100	36	<25	58	<25
EB left turn	130	71	145	146	255
WB left	130	116	212	95	178
WB right	130†	29	<25	55	<25
2. Hickory Ave / Project Driveway - Gas					
NB Left	---	41	<25	53	<25
EB		56	<25	71	<25
3. Hickory Ave / Project Driveway – Mini Storage					
NB Left	---	1	<25	2	<25
EB		2	<25	4	<25
4. Greenback Lane / Project Driveway - Gas					
SB Right	---	42	<25	43	<25

Bold indicates turn lane length exceeded

†length of striped lane; road width can support turn lane to adjacent driveway (300')

SITE DESIGN REVIEW

Project Access. Project access from the public streets is projected to include a full access driveway along Hickory Avenue and a right-out movement along Greenback Lane for the gas station site while the mini-storage site will have a new full access driveway north of the gas station driveway; additionally, a shared access easement with the Almond Heights retirement center will provide a second full access.

It is expected that most gas station inbound traffic from the north, south and west will use the Hickory Avenue access with westbound Greenback Lane traffic entering from the Greenback Lane driveway. All outbound traffic heading north, south or east will use the Hickory Avenue driveway while most traffic heading west along Greenback Lane is expected to use the along Greenback Lane driveway. The gas station driveway is situated about 120 feet from the projected crosswalk location along the north approach. The mini-storage driveway is located about 110 feet north of the gas station driveway and about 100 feet from the WinCo supermarket driveway on the east side of the street. It is projected that almost all traffic will use the driveway north of the gas station.

Throat Depth. The throat depth at the three intersections was reviewed relative to the projected queues shown in the queueing analysis. The available queue depth at the mini-storage extends to the west side of the building, over 100 feet while the throat depths for the gas station driveways are about 60 feet at the Greenback Lane driveway and about 25 feet along Hickory Avenue. The queues are projected to be 25 feet or less at each of the driveways.

Parking Lot Layout. The gas station site is oriented with the C-store at the north side of the parcel, farthest away from the Greenback Lane / Hickory Avenue intersection. Ten parking spaces are provided facing the store while seven parking stalls, six reserved for EV charging are sited on the south side of the site, fronting Greenback Lane. Two employee parking spaces are located adjacent to the C-store, behind the trash enclosure on the west side of the building. The fueling positions are oriented north-south with a drive-aisle between the fueling positions and both parking fields. This layout will maximize queuing for the fueling positions while allowing motorists to enter or exit the parking stalls.

Emergency Vehicle / Truck Access. Access into the project site should conform to Sacramento County Design Improvement Standards to provide emergency vehicle access and fuel truck access, as appropriate, into the site. Two access driveways to the C-store will be provided for fuel tankers and emergency vehicles, along Hickory Avenue and Greenback Lane. The mini-storage site will have a public driveway along Hickory Avenue and an entry along the access easement on the north side of the mini-storage property. This analysis has been completed by the project civil engineer.

Pedestrian and Bicycle Access. The project will provide sidewalk along the project frontage along both Greenback Lane and Hickory Avenue. Internally, a sidewalk connection is provided along Hickory Avenue on the north side of the gas station driveway and provides direct access to the C-store building. On-site access to the C-store from the west along Greenback Lane requires pedestrians to walk along the driveway as a sidewalk is not present on-site.

The project will widen Greenback Lane and Hickory Avenue along the project frontage with bike lanes provided along Hickory Avenue. The County's Bicycle Master Plan identifies a Class 2 bicycle lane facility along Greenback Lane. The portion of the network in the project vicinity has not yet been installed. It is expected that the lane width will be provided as part of the project but remain unstriped until it can connect to the larger network.

Sight Distance. The site is located along Hickory Avenue which has about a +4% grade from Greenback Lane to the north. Based on the preliminary improvement plans retaining walls will be constructed along portions of the mini-storage site. This includes along the building pad and along the south side of the site, separating the gas station from the mini-storage site. This retaining wall is shown to extend to the sidewalk along Hickory Avenue. It appears that the height of the wall will be just above the planter strip separating the mini-storage driveway from the adjacent C-store / gas station and thus, should not impact sight distance to the south.

The proposed landscape plan shows a variety of street trees along the Greenback Lane and Hickory Avenue perimeter. Additionally, a variety of grasses, vines and shrubs are proposed along both streets.

FINDINGS / RECOMMENDATIONS / IMPROVEMENTS

The preceding analysis has identified project impacts that may occur without identifying any recommendations or improvements. The text that follows identifies a strategy for recommendations to the 'No Project' conditions or improvements to the 'Plus Project' conditions.

Existing Conditions

Recommendations. The study intersection currently operates within acceptable Sacramento County threshold levels, at LOS D or better. Queues in the northbound right turn lane, eastbound left turn lane and westbound left turn lane exceed the available lane storage.

The following recommendations are made:

Northbound Right Turn Lane - The right turn lane requires lengthening to about 160 feet. At the end of the existing right turn lane Illinois Avenue begins to narrow. The northbound approach has about a 24-foot-wide width. To accommodate the shared left-through lane, bike lane and right turn lane, the travel lanes would need to be reduced to 10-foot lanes while the bike lanes would be narrowed to a four feet width.

Eastbound Left Turn Lane - The eastbound left turn lane requires lengthening to about 260 feet. At the end of the existing left turn lane, a raised median exists, separating the left turn lane from a two-way-left-turn-lane (TWLTL) present along the mid-block of Greenback Lane. To accommodate the existing queue length the left turn lane would need to be extended to the TWLTL. This would require removal of the raised median island and include a transition between the TWLTL and the left turn lane.

Westbound Left Turn Lane - The westbound left turn lane requires lengthening to about 220 feet. As noted in the analysis, this length may be related to school children being driven to Andrew Carnegie Middle School. A raised median separates the left turn lane with an eastbound left turn lane providing access to the WinCo supermarket. Extending the westbound left turn lane to about 220 feet would require removal of the median island and replacing it with a reverse curve raised curb separating the back-to-back left turn lanes.

Significant Transportation Effects for Existing plus Project Conditions

All intersections will continue to operate within acceptable Sacramento County threshold levels, at LOS D or better. Driveway queues are less than one vehicle. Queues in the northbound right turn lane and westbound left turn lane are projected to decrease compared to the Existing conditions.

The following traffic improvements are recommended:

Eastbound Left Turn Lane - The eastbound left turn lane will lengthen from the 198-foot queue to a 255-foot queue. The left turn lane should be extended to 260 feet by restriping the existing TWLTL with left turn lane striping. A transition between the left turn lane and the TWLTL

should be included. Raised median curb should be extended to 50 feet west of the driveway so as not to allow left turn movements from eastbound Greenback Lane into the project driveway.

Install Bicycle Lanes – A bicycle lane along the Hickory Avenue project frontage should be installed to replace the existing bike lane that will become part of the added motor vehicle travel lanes. Greenback Lane should be widened along the project frontage to include the ultimate County cross section including a future Class 2 bike lane. Bike Lane striping should occur with installation of a longer segment of bike lane.

Install Sidewalk/Pathway from Greenback Lane – A sidewalk or pathway should be provided from Greenback Lane into the site to provide pedestrian access to the C-store from the west.

Confirm Sight Distance Standards – Section 4 of the County standards regarding sight distance shall be maintained at each driveway. Landscaping and retaining walls shall be adjusted as necessary to conform to the visibility requirements.

No additional improvements are recommended.

REFERENCES

1. Sacramento County Department of Transportation, *Traffic Impact Guidelines*, September, 2020
2. Transportation Research Board, *Highway Capacity Manual*, 6th Edition
3. California MUTCD, September, 2014
4. Shew, Cameron, Senior Civil Engineer. Sacramento County, Department of Transportation. December, 2021 E-mail messages and Telephone conversations with Jonathan Flecker
5. Sacramento County Bicycle Master Plan, April 2011
<https://sacdot.saccounty.net/Pages/BikewayMasterPlan.aspx>
6. Sacramento County, *Improvement Standards*, April 1, 2018
<https://engineering.saccounty.net/Pages/ImprovementStandards.aspx>

APPENDICES

ON_STREET	DIR	X_STREET	TYPE	DATE	DAY	NB	SB	EB	WB	TOT_24	FID
GREENBACK LN	E	FAIR OAKS BLVD	24 HOUR COUNT	2017/08/01 07:00:00+00	T			17339	16905	34244	1445
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2019/08/21 07:00:00+00	W			19265	18736	38001	255
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2019/08/20 07:00:00+00	T			19119	18264	37383	272
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2018/04/19 07:00:00+00	Th			19860	19419	39279	1141
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2017/06/29 07:00:00+00	Th			19810	19733	39543	1348
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2016/05/19 07:00:00+00	Th			20006	19151	39157	2306
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2015/04/22 07:00:00+00	W			18851	19404	38255	2523
GREENBACK LN	W	FOLSOM BLVD	24 HOUR COUNT	2015/04/21 07:00:00+00	T			18668	18511	37179	2671
GREENBACK LN	W	GARFIELD AVE	24 HOUR COUNT	2018/06/05 07:00:00+00	T			41145	36490	77635	828
GREENBACK LN	E	GARFIELD AVE	24 HOUR COUNT	2018/06/05 07:00:00+00	T			28275	29715	57990	830
GREENBACK LN	W	GARFIELD AVE	24 HOUR COUNT	2018/06/06 07:00:00+00	W			39888	35085	74973	1118
GREENBACK LN	E	GARFIELD AVE	24 HOUR COUNT	2018/06/06 07:00:00+00	W			27536	27920	55456	1119
GREENBACK LN	E	GARFIELD AVE	24 HOUR COUNT	2017/06/13 07:00:00+00	T			28203	29250	57453	1561
GREENBACK LN	E	GARFIELD AVE	24 HOUR COUNT	2016/08/02 07:00:00+00	T			28142	28506	56648	1814
GREENBACK LN	W	GARFIELD AVE	24 HOUR COUNT	2015/06/30 07:00:00+00	T			37649	36801	74450	2609
GREENBACK LN	E	GARFIELD AVE	24 HOUR COUNT	2015/06/30 07:00:00+00	T			27198	27646	54844	2610
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2019/07/31 07:00:00+00	W			14356	15072	29428	145
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2019/07/30 07:00:00+00	T			14203	14749	28952	315
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2018/02/07 08:00:00+00	W			14927	15499	30426	1084
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2018/02/06 08:00:00+00	T			14641	15347	29988	1086
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2017/06/29 07:00:00+00	Th			15358	15905	31263	1349
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2016/07/27 07:00:00+00	W			14564	14587	29151	1673
GREENBACK LN	E	HAZEL AVE	24 HOUR COUNT	2015/07/07 07:00:00+00	T			14901	15134	30035	2464
GREENBACK LN	E	KENNETH AVE	24 HOUR COUNT	2018/04/18 07:00:00+00	W			16559	16673	33232	868
GREENBACK LN	E	KENNETH AVE	24 HOUR COUNT	2016/05/19 07:00:00+00	Th			17100	14815	31915	2307
GREENBACK LN	E	MAIN AVE	24 HOUR COUNT	2018/04/19 07:00:00+00	Th			10932	10624	21556	1142
GREENBACK LN	E	MAIN AVE	24 HOUR COUNT	2015/04/22 07:00:00+00	W			11202	10668	21870	2524
GREENBACK LN	E	MAIN AVE	24 HOUR COUNT	2015/04/21 07:00:00+00	T			11064	11549	22613	2708

National Data and Surveying Services

City of Orangevale
 All Vehicles & Uturns On Unshifted
 Bikes & Peds On Bank 1
 Nothing On Bank 2

(323) 782-0090
info@ndsdata.com

File Name : 17-7295-003 Hickory Ave & Greenback Ln
 Date : 4/20/2017

Unshifted Count = All Vehicles & Uturns

START TIME	Hickory Ave Southbound					Greenback Ln Westbound					Hickory Ave Northbound					Greenback Ln Eastbound					Total	Uturns Total
	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL		
7:00	12	29	9	0	50	26	162	4	2	194	40	14	33	0	87	7	207	47	0	261	592	2
7:15	11	32	6	0	49	21	210	10	2	243	79	16	62	0	157	6	233	89	0	328	777	2
7:30	23	22	9	0	54	28	218	4	2	252	87	27	52	0	166	7	292	23	0	322	794	2
7:45	13	17	8	0	38	22	246	7	3	278	11	11	19	0	41	13	318	10	0	341	698	3
Total	59	100	32	0	191	97	836	25	9	967	217	68	166	0	451	33	1050	169	0	1252	2861	9
8:00	16	15	14	0	45	33	227	2	3	265	18	13	21	0	52	13	291	15	0	319	681	3
8:15	7	11	15	0	33	22	204	6	4	236	32	17	17	0	66	10	262	8	0	280	615	4
8:30	10	4	6	0	20	21	195	5	3	224	5	11	20	0	36	6	218	5	0	229	509	3
8:45	16	8	8	0	32	12	173	7	0	192	14	8	15	0	37	9	240	8	0	257	518	0
Total	49	38	43	0	130	88	799	20	10	917	69	49	73	0	191	38	1011	36	0	1085	2323	10
16:00	19	11	17	0	47	25	302	9	2	338	25	28	15	0	68	13	243	12	0	268	721	2
16:15	14	22	14	0	50	15	299	13	5	332	17	29	26	0	72	19	229	9	1	258	712	6
16:30	16	20	8	0	44	18	337	13	7	375	14	16	20	0	50	19	258	8	0	285	754	7
16:45	11	16	11	0	38	19	296	5	7	327	14	20	16	0	50	24	241	8	0	273	688	7
Total	60	69	50	0	179	77	1234	40	21	1372	70	93	77	0	240	75	971	37	1	1084	2875	22
17:00	17	7	18	0	42	24	314	11	2	351	27	19	24	0	70	27	298	8	0	333	796	2
17:15	25	12	11	0	48	20	358	10	1	389	21	23	20	0	64	32	286	13	1	332	833	2
17:30	22	10	7	0	39	17	339	12	7	375	18	25	12	0	55	16	258	18	0	292	761	7
17:45	16	12	18	0	46	15	309	13	7	344	22	10	26	0	58	31	241	13	0	285	733	7
Total	80	41	54	0	175	76	1320	46	17	1459	88	77	82	0	247	106	1083	52	1	1242	3123	18
Grand Total	248	248	179	0	675	338	4189	131	57	4715	444	287	398	0	1129	252	4115	294	2	4663	11182	59
Apprch %	36.7%	36.7%	26.5%	0.0%		7.2%	88.8%	2.8%	1.2%		39.3%	25.4%	35.3%	0.0%		5.4%	88.2%	6.3%	0.0%			
Total %	2.2%	2.2%	1.6%	0.0%	6.0%	3.0%	37.5%	1.2%	0.5%	42.2%	4.0%	2.6%	3.6%	0.0%	10.1%	2.3%	36.8%	2.6%	0.0%	41.7%	100.0%	

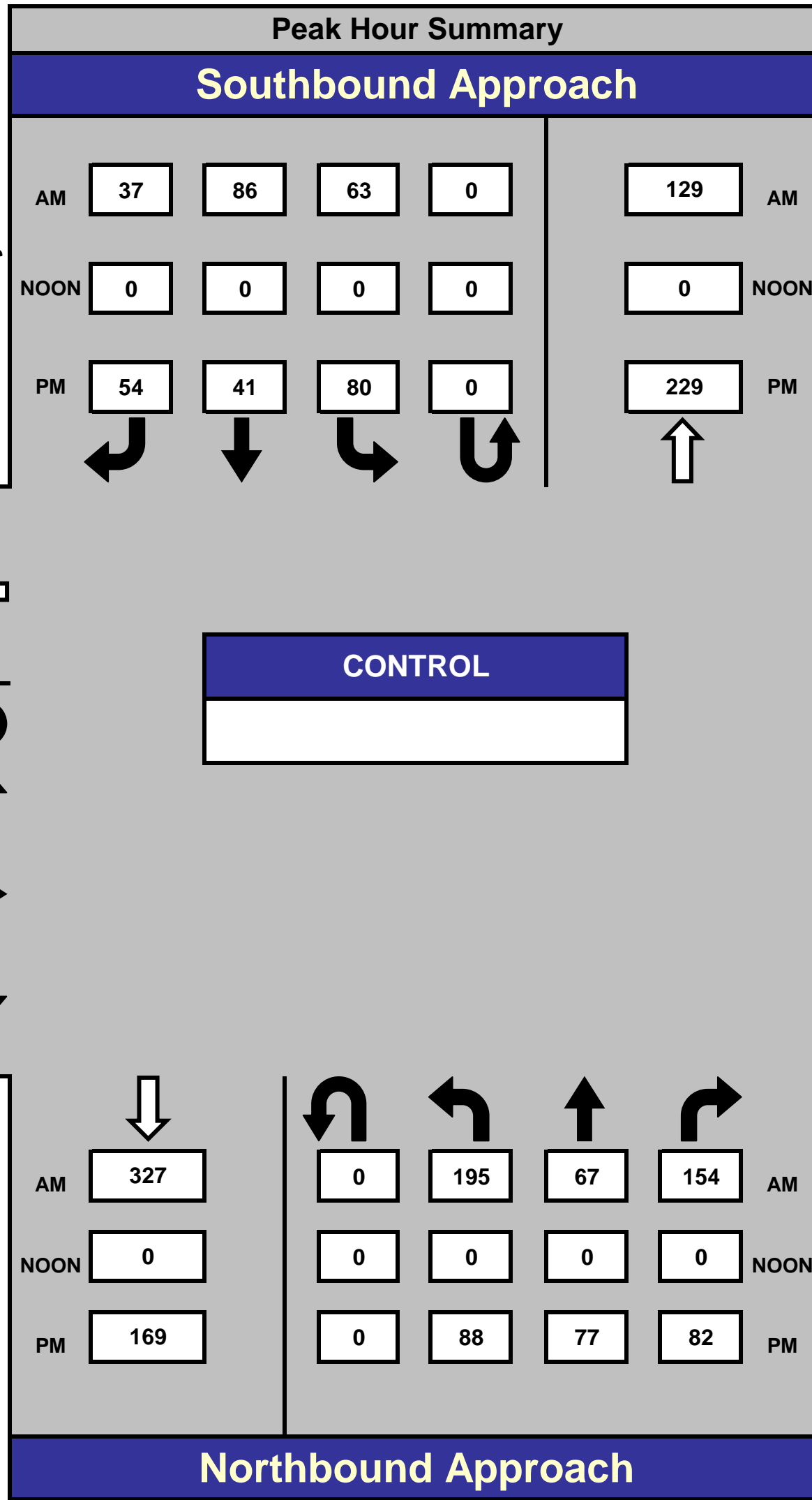
AM PEAK HOUR	Hickory Ave Southbound					Greenback Ln Westbound					Hickory Ave Northbound					Greenback Ln Eastbound					Total
	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	
Peak Hour Analysis From 07:15 to 08:15																					
Peak Hour For Entire Intersection Begins at 07:15																					
7:15	11	32	6	0	49	21	210	10	2	243	79	16	62	0	157	6	233	89	0	328	777
7:30	23	22	9	0	54	28	218	4	2	252	87	27	52	0	166	7	292	23	0	322	794
7:45	13	17	8	0	38	22	246	7	3	278	11	11	19	0	41	13	318	10	0	341	698
8:00	16	15	14	0	45	33	227	2	3	265	18	13	21	0	52	13	291	15	0	319	681
Total Volume	63	86	37	0	186	104	901	23	10	1038	195	67	154	0	416	39	1134	137	0	1310	2950
% App Total	33.9%	46.2%	19.9%	0.0%		10.0%	86.8%	2.2%	1.0%		46.9%	16.1%	37.0%	0.0%		3.0%	86.6%	10.5%	0.0%		
PHF	.685	.672	.661	.000	.861	.788	.916	.575	.833	.933	.560	.620	.621	.000	.627	.750	.892	.385	.000	.960	.929

PM PEAK HOUR	Hickory Ave Southbound					Greenback Ln Westbound					Hickory Ave Northbound					Greenback Ln Eastbound					Total
	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	LEFT	THRU	RIGHT	UTURNS	APP.TOTAL	
Peak Hour Analysis From 17:00 to 18:00																					
Peak Hour For Entire Intersection Begins at 17:00																					
17:00	17	7	18	0	42	24	314	11	2	351	27	19	24	0	70	27	298	8	0	333	796
17:15	25	12	11	0	48	20	358	10	1	389	21	23	20	0	64	32	286	13	1	332	833
17:30	22	10	7	0	39	17	339	12	7	375	18	25	12	0	55	16	258	18	0	292	761
17:45	16	12	18	0	46	15	309	13	7	344	22	10	26	0	58	31	241	13	0	285	733
Total Volume	80	41	54	0	175	76	1320	46	17	1459	88	77	82	0	247	106	1083	52	1	1242	3123
% App Total	45.7%	23.4%	30.9%	0.0%		5.2%	90.5%	3.2%	1.2%		35.6%	31.2%	33.2%	0.0%		8.5%	87.2%	4.2%	0.1%		
PHF	.800	.854	.750	.000	.911	.792	.922	.885	.607	.938	.815	.770	.788	.000	.882	.828	.909	.722	.250	.932	.937

Hickory Ave & Greenback Ln

Date: 4/20/2017
 Day: Thursday

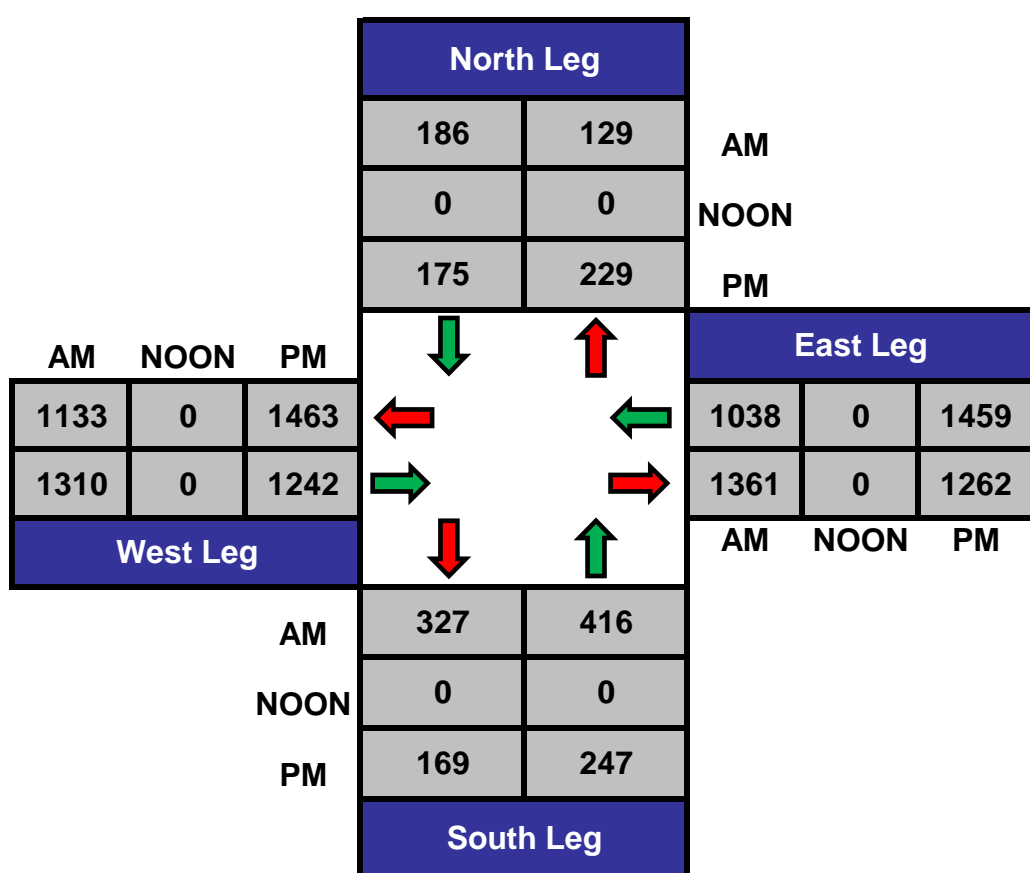
Project #: 17-7295-003



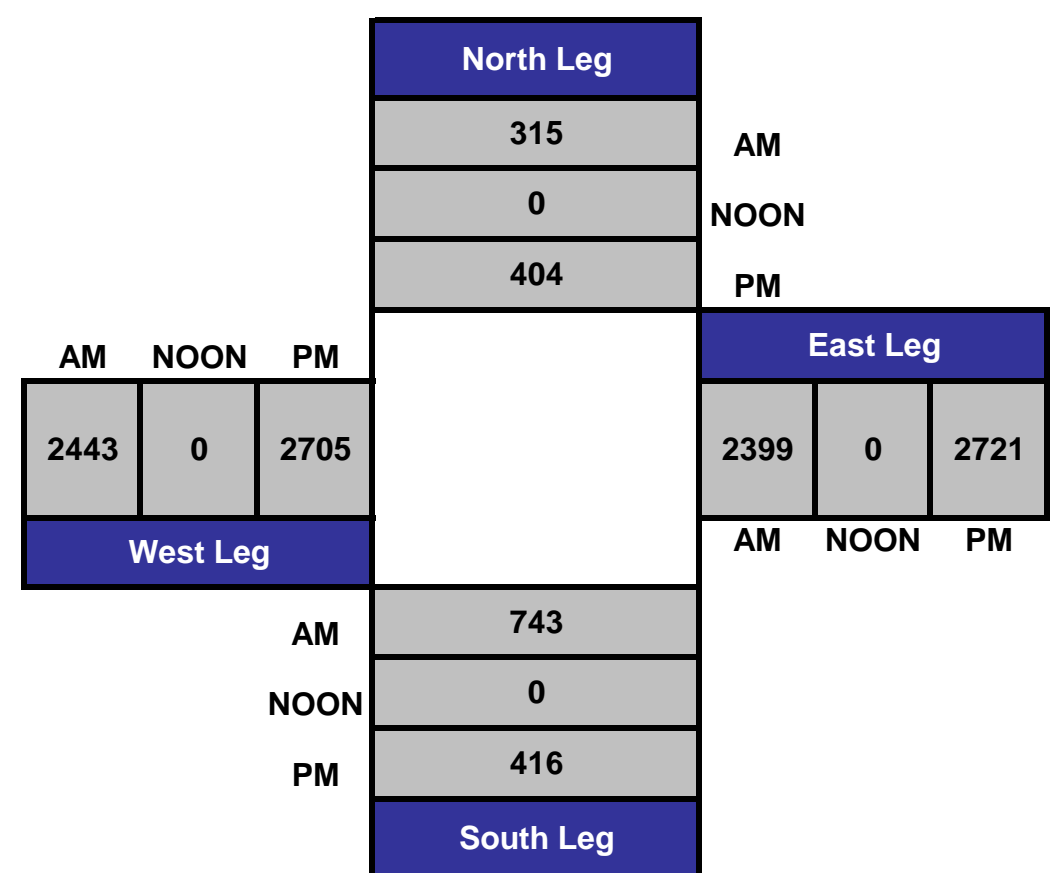
AM Peak Hour	07:15 - 08:15
NOON Peak Hour	
PM Peak Hour	17:00 - 18:00

Count Periods	Start	End
AM	7:00 AM	9:00 AM
NOON	NONE	NONE
PM	4:00 PM	6:00 PM

Total Ins & Outs



Total Volume Per Leg



HCM 6th Signalized Intersection Summary
 1: Illinois Avenue/Hickory Avenue & Greenback Lane

Existing AM
 01/14/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	1180	142	118	937	24	203	70	160	66	89	38
Future Volume (veh/h)	41	1180	142	118	937	24	203	70	160	66	89	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	41	1180	142	118	937	24	203	70	160	66	89	38
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	52	1283	154	145	1616	703	238	82	277	77	104	45
Arrive On Green	0.03	0.40	0.40	0.08	0.45	0.45	0.18	0.18	0.18	0.13	0.13	0.13
Sat Flow, veh/h	1781	3186	382	1781	3554	1547	1341	462	1561	606	817	349
Grp Volume(v), veh/h	41	656	666	118	937	24	273	0	160	193	0	0
Grp Sat Flow(s),veh/h/ln	1781	1777	1792	1781	1777	1547	1803	0	1561	1772	0	0
Q Serve(g_s), s	2.6	39.0	39.4	7.3	21.8	1.0	16.4	0.0	10.5	11.9	0.0	0.0
Cycle Q Clear(g_c), s	2.6	39.0	39.4	7.3	21.8	1.0	16.4	0.0	10.5	11.9	0.0	0.0
Prop In Lane	1.00		0.21	1.00		1.00	0.74		1.00	0.34		0.20
Lane Grp Cap(c), veh/h	52	716	722	145	1616	703	320	0	277	226	0	0
V/C Ratio(X)	0.78	0.92	0.92	0.81	0.58	0.03	0.85	0.00	0.58	0.85	0.00	0.00
Avail Cap(c_a), veh/h	367	1099	1109	383	2199	957	631	0	546	619	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	53.8	31.5	31.6	50.4	22.5	16.8	44.5	0.0	42.0	47.6	0.0	0.0
Incr Delay (d2), s/veh	9.0	6.2	6.6	4.2	1.1	0.1	2.5	0.0	0.7	3.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	17.5	17.9	3.4	9.2	0.4	7.5	0.0	4.1	5.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	62.8	37.7	38.2	54.6	23.7	16.9	47.0	0.0	42.8	51.1	0.0	0.0
LnGrp LOS	E	D	D	D	C	B	D	A	D	D	A	A
Approach Vol, veh/h		1363			1079			433				193
Approach Delay, s/veh		38.7			26.9			45.4				51.1
Approach LOS		D			C			D				D
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.8	57.7		19.8	14.6	51.9		25.3				
Change Period (Y+Rc), s	5.5	* 7		5.5	5.5	7.0		5.5				
Max Green Setting (Gmax), s	23.0	* 69		39.0	24.0	69.0		39.0				
Max Q Clear Time (g_c+I1), s	4.6	23.8		13.9	9.3	41.4		18.4				
Green Ext Time (p_c), s	0.0	21.0		0.4	0.0	3.6		1.3				

Intersection Summary






















HCM 6th Ctrl Delay	36.3
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 2010 Signalized Intersection Summary
 1: Illinois Avenue/Hickory Avenue & Greenback Lane

Existing PM
 01/14/2022

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	111	1127	54	97	1373	48	92	80	85	83	43	56
Future Volume (veh/h)	111	1127	54	97	1373	48	92	80	85	83	43	56
Number	1	6	16	5	2	12	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1900	1863	1863	1900	1863	1900
Adj Flow Rate, veh/h	111	1127	54	97	1373	48	92	80	85	83	43	56
Adj No. of Lanes	1	2	0	1	2	1	0	1	1	0	1	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	135	1751	84	120	1774	775	113	98	181	96	50	65
Arrive On Green	0.08	0.51	0.51	0.07	0.50	0.50	0.12	0.12	0.12	0.12	0.12	0.12
Sat Flow, veh/h	1774	3435	165	1774	3539	1546	970	844	1557	785	407	530
Grp Volume(v), veh/h	111	580	601	97	1373	48	172	0	85	182	0	0
Grp Sat Flow(s),veh/h/ln	1774	1770	1830	1774	1770	1546	1814	0	1557	1721	0	0
Q Serve(g_s), s	7.9	30.5	30.5	6.9	40.3	2.0	11.8	0.0	6.5	13.2	0.0	0.0
Cycle Q Clear(g_c), s	7.9	30.5	30.5	6.9	40.3	2.0	11.8	0.0	6.5	13.2	0.0	0.0
Prop In Lane	1.00		0.09	1.00		1.00	0.53		1.00	0.46		0.31
Lane Grp Cap(c), veh/h	135	902	933	120	1774	775	210	0	181	210	0	0
V/C Ratio(X)	0.82	0.64	0.64	0.81	0.77	0.06	0.82	0.00	0.47	0.86	0.00	0.00
Avail Cap(c_a), veh/h	320	958	991	334	1916	837	555	0	477	527	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	58.0	22.8	22.8	58.6	25.9	16.4	55.0	0.0	52.7	54.9	0.0	0.0
Incr Delay (d2), s/veh	4.7	1.0	1.0	4.8	2.9	0.1	3.0	0.0	0.7	4.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	15.1	15.6	3.5	20.4	0.9	6.1	0.0	2.8	6.6	0.0	0.0
LnGrp Delay(d),s/veh	62.7	23.8	23.8	63.4	28.8	16.5	58.0	0.0	53.4	59.0	0.0	0.0
LnGrp LOS	E	C	C	E	C	B	E		D	E		
Approach Vol, veh/h		1292			1518			257				182
Approach Delay, s/veh		27.1			30.6			56.5				59.0
Approach LOS		C			C			E				E
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.2	70.9		21.1	14.1	72.0		20.3				
Change Period (Y+Rc), s	5.5	* 7		5.5	5.5	7.0		5.5				
Max Green Setting (Gmax), s	23.0	* 69		39.0	24.0	69.0		39.0				
Max Q Clear Time (g_c+I1), s	9.9	42.3		15.2	8.9	32.5		13.8				
Green Ext Time (p_c), s	0.0	21.6		0.4	0.0	3.0		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			32.8									
HCM 2010 LOS			C									
Notes												

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
 1: Illinois Avenue/Hickory Avenue & Greenback Lane

Existing plus Project AM
 01/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	71	1160	142	116	944	29	205	81	158	98	101	36
Future Volume (veh/h)	71	1160	142	116	944	29	205	81	158	98	101	36
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	71	1160	142	116	944	29	205	81	158	98	101	36
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	91	1262	154	143	1514	659	239	94	288	115	119	200
Arrive On Green	0.05	0.40	0.40	0.08	0.43	0.43	0.18	0.18	0.18	0.13	0.13	0.13
Sat Flow, veh/h	1781	3179	388	1781	3554	1547	1294	511	1562	899	926	1563
Grp Volume(v), veh/h	71	647	655	116	944	29	286	0	158	199	0	36
Grp Sat Flow(s),veh/h/ln	1781	1777	1791	1781	1777	1547	1806	0	1562	1825	0	1563
Q Serve(g_s), s	4.4	38.6	38.9	7.2	23.2	1.2	17.1	0.0	10.3	11.9	0.0	2.3
Cycle Q Clear(g_c), s	4.4	38.6	38.9	7.2	23.2	1.2	17.1	0.0	10.3	11.9	0.0	2.3
Prop In Lane	1.00		0.22	1.00		1.00	0.72		1.00	0.49		1.00
Lane Grp Cap(c), veh/h	91	705	711	143	1514	659	333	0	288	234	0	200
V/C Ratio(X)	0.78	0.92	0.92	0.81	0.62	0.04	0.86	0.00	0.55	0.85	0.00	0.18
Avail Cap(c_a), veh/h	367	1098	1106	383	2195	955	630	0	545	637	0	546
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	52.4	31.9	32.0	50.6	25.1	18.8	44.2	0.0	41.3	47.6	0.0	43.5
Incr Delay (d2), s/veh	5.3	5.9	6.3	4.2	1.5	0.1	2.5	0.0	0.6	3.3	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	17.3	17.6	3.3	9.9	0.5	7.9	0.0	4.0	5.6	0.0	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.7	37.9	38.3	54.7	26.5	18.8	46.7	0.0	41.9	51.0	0.0	43.6
LnGrp LOS	E	D	D	D	C	B	D	A	D	D	A	D
Approach Vol, veh/h		1373			1089			444				235
Approach Delay, s/veh		39.1			29.3			45.0				49.9
Approach LOS		D			C			D				D
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.2	54.6		19.8	14.4	51.3		26.1				
Change Period (Y+Rc), s	5.5	* 7		5.5	5.5	7.0		5.5				
Max Green Setting (Gmax), s	23.0	* 69		39.0	24.0	69.0		39.0				
Max Q Clear Time (g_c+I1), s	6.4	25.2		13.9	9.2	40.9		19.1				
Green Ext Time (p_c), s	0.0	21.0		0.4	0.0	3.5		1.3				

Intersection Summary

HCM 6th Ctrl Delay	37.4
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T		T		T	
Traffic Vol, veh/h	11	45	41	135	190	14
Future Vol, veh/h	11	45	41	135	190	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	45	41	135	190	14

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	414	197	204	0	0
Stage 1	197	-	-	-	-
Stage 2	217	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	595	844	1368	-	-
Stage 1	836	-	-	-	-
Stage 2	819	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	576	844	1368	-	-
Mov Cap-2 Maneuver	576	-	-	-	-
Stage 1	809	-	-	-	-
Stage 2	819	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	773	-	-
HCM Lane V/C Ratio	0.03	-	0.072	-	-
HCM Control Delay (s)	7.7	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			L		R
Traffic Vol, veh/h	1	1	1	145	203	1
Future Vol, veh/h	1	1	1	145	203	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	1	1	145	203	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	351	204	204	0	0
Stage 1	204	-	-	-	-
Stage 2	147	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	646	837	1368	-	-
Stage 1	830	-	-	-	-
Stage 2	880	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	645	837	1368	-	-
Mov Cap-2 Maneuver	645	-	-	-	-
Stage 1	829	-	-	-	-
Stage 2	880	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1368	-	729	-	-
HCM Lane V/C Ratio	0.001	-	0.003	-	-
HCM Control Delay (s)	7.6	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1373	1146	44	0	42
Future Vol, veh/h	0	1373	1146	44	0	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1373	1146	44	0	42

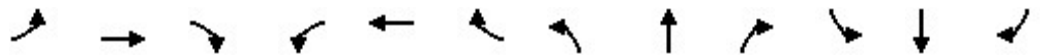
Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	-	0	-
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	0	-	-
Stage 1	0	-	-
Stage 2	0	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	447
HCM Lane V/C Ratio	-	-	-	0.094
HCM Control Delay (s)	-	-	-	13.9
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.3

HCM 6th Signalized Intersection Summary
 1: Illinois Avenue/Hickory Avenue & Greenback Lane

Existing plus Project PM
 01/25/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	146	1106	54	95	1382	55	95	93	83	119	57	58
Future Volume (veh/h)	146	1106	54	95	1382	55	95	93	83	119	57	58
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	146	1106	54	95	1382	55	95	93	83	119	57	58
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	171	1790	87	117	1741	758	114	111	193	139	66	177
Arrive On Green	0.10	0.52	0.52	0.07	0.49	0.49	0.12	0.12	0.12	0.11	0.11	0.11
Sat Flow, veh/h	1781	3445	168	1781	3554	1547	922	902	1559	1223	586	1563
Grp Volume(v), veh/h	146	570	590	95	1382	55	188	0	83	176	0	58
Grp Sat Flow(s),veh/h/ln	1781	1777	1836	1781	1777	1547	1824	0	1559	1809	0	1563
Q Serve(g_s), s	10.7	30.1	30.1	7.0	43.0	2.5	13.3	0.0	6.5	12.6	0.0	4.5
Cycle Q Clear(g_c), s	10.7	30.1	30.1	7.0	43.0	2.5	13.3	0.0	6.5	12.6	0.0	4.5
Prop In Lane	1.00		0.09	1.00		1.00	0.51		1.00	0.68		1.00
Lane Grp Cap(c), veh/h	171	923	954	117	1741	758	225	0	193	205	0	177
V/C Ratio(X)	0.86	0.62	0.62	0.81	0.79	0.07	0.83	0.00	0.43	0.86	0.00	0.33
Avail Cap(c_a), veh/h	310	926	957	323	1853	807	538	0	460	533	0	461
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	58.9	22.5	22.5	61.0	28.2	17.9	56.7	0.0	53.7	57.6	0.0	54.0
Incr Delay (d2), s/veh	4.7	0.9	0.9	4.9	3.3	0.1	3.1	0.0	0.6	4.0	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	12.6	13.1	3.3	18.8	0.9	6.3	0.0	2.6	6.0	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	63.6	23.4	23.4	65.9	31.5	18.0	59.8	0.0	54.3	61.6	0.0	54.4
LnGrp LOS	E	C	C	E	C	B	E	A	D	E	A	D
Approach Vol, veh/h		1306			1532			271			234	
Approach Delay, s/veh		27.9			33.2			58.1			59.8	
Approach LOS		C			C			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.2	71.8		20.5	14.2	75.8		21.8				
Change Period (Y+Rc), s	5.5	* 7		5.5	5.5	7.0		5.5				
Max Green Setting (Gmax), s	23.0	* 69		39.0	24.0	69.0		39.0				
Max Q Clear Time (g_c+I1), s	12.7	45.0		14.6	9.0	32.1		15.3				
Green Ext Time (p_c), s	0.0	19.9		0.4	0.0	2.9		0.8				

Intersection Summary

HCM 6th Ctrl Delay	35.0
HCM 6th LOS	C

Notes

User approved ignoring U-Turning movement.
 * HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T		T		T	
Traffic Vol, veh/h	18	53	53	236	182	15
Future Vol, veh/h	18	53	53	236	182	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	53	53	236	182	15

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	532	190	197	0	0
Stage 1	190	-	-	-	-
Stage 2	342	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	508	852	1376	-	-
Stage 1	842	-	-	-	-
Stage 2	719	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	486	852	1376	-	-
Mov Cap-2 Maneuver	486	-	-	-	-
Stage 1	805	-	-	-	-
Stage 2	719	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.6	1.4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1376	-	715	-	-
HCM Lane V/C Ratio	0.039	-	0.099	-	-
HCM Control Delay (s)	7.7	0	10.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.3	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		
Traffic Vol, veh/h	2	2	2	252	195	1
Future Vol, veh/h	2	2	2	252	195	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	2	2	252	195	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	452	196	196	0	0
Stage 1	196	-	-	-	-
Stage 2	256	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	565	845	1377	-	-
Stage 1	837	-	-	-	-
Stage 2	787	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	564	845	1377	-	-
Mov Cap-2 Maneuver	564	-	-	-	-
Stage 1	835	-	-	-	-
Stage 2	787	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.4	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1377	-	676	-	-
HCM Lane V/C Ratio	0.001	-	0.006	-	-
HCM Control Delay (s)	7.6	0	10.4	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			↑
Traffic Vol, veh/h	0	1306	1491	46	0	43
Future Vol, veh/h	0	1306	1491	46	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1306	1491	46	0	43

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	-	0	-	0	769
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	-	344
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	344
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17
HCM LOS			C

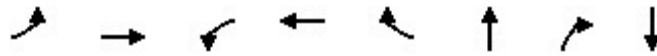
Minor Lane/Major Mvmt	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	-	344
HCM Lane V/C Ratio	-	-	-	0.125
HCM Control Delay (s)	-	-	-	17
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	0.4

Queues

Existing AM

1: Illinois Avenue/Hickory Avenue & Greenback Lane

01/14/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	41	1322	118	937	24	273	160	193
v/c Ratio	0.53	0.92	0.77	0.56	0.03	0.95	0.37	0.84
Control Delay	104.9	57.9	105.8	35.2	0.1	104.7	29.6	99.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	104.9	57.9	105.8	35.2	0.1	104.7	29.6	99.7
Queue Length 50th (ft)	45	715	129	394	0	298	68	204
Queue Length 95th (ft)	96	#1019	214	533	0	#560	158	311
Internal Link Dist (ft)		1036		1253		660		1141
Turn Bay Length (ft)	130		130		130		100	
Base Capacity (vph)	243	1438	254	1662	753	287	428	419
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.92	0.46	0.56	0.03	0.95	0.37	0.46

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Queues

Existing PM

1: Illinois Avenue/Hickory Avenue & Greenback Lane

01/14/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBT
Lane Group Flow (vph)	111	1181	97	1373	48	172	85	182
v/c Ratio	0.72	0.70	0.69	0.83	0.06	0.80	0.27	0.80
Control Delay	93.3	36.6	93.7	41.6	1.9	88.3	13.1	86.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	93.3	36.6	93.7	41.6	1.9	88.3	13.1	86.5
Queue Length 50th (ft)	105	461	92	592	0	161	1	163
Queue Length 95th (ft)	198	757	178	#1016	9	278	53	284
Internal Link Dist (ft)		1036		1253		660		556
Turn Bay Length (ft)	130		130		130		100	
Base Capacity (vph)	277	1676	289	1693	766	365	476	469
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.70	0.34	0.81	0.06	0.47	0.18	0.39

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Queues

Existing plus Project AM

1: Illinois Avenue/Hickory Avenue & Greenback Lane

01/25/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	71	1302	116	944	29	286	158	199	36
v/c Ratio	0.66	0.91	0.76	0.61	0.04	0.99	0.37	0.84	0.13
Control Delay	107.2	57.0	106.3	39.5	0.1	114.2	29.4	101.1	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	107.2	57.0	106.3	39.5	0.1	114.2	29.4	101.1	1.0
Queue Length 50th (ft)	78	701	127	415	0	317	66	217	0
Queue Length 95th (ft)	145	#998	212	565	0	#595	155	326	0
Internal Link Dist (ft)		291		1253		660		157	
Turn Bay Length (ft)	130		130		130		100		130
Base Capacity (vph)	242	1433	253	1549	707	288	426	422	427
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.91	0.46	0.61	0.04	0.99	0.37	0.47	0.08

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Queues
1: Illinois Avenue/Hickory Avenue & Greenback Lane

Existing plus Project PM
01/25/2022



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	146	1160	95	1382	55	188	83	176	58
v/c Ratio	0.79	0.69	0.69	0.86	0.08	0.82	0.25	0.80	0.22
Control Delay	97.8	36.6	97.9	46.3	3.0	90.2	12.2	92.8	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	97.8	36.6	97.9	46.3	3.0	90.2	12.2	92.8	5.9
Queue Length 50th (ft)	144	465	94	647	0	184	0	174	0
Queue Length 95th (ft)	255	747	178	#1068	17	304	51	293	20
Internal Link Dist (ft)		291		1253		660		157	
Turn Bay Length (ft)	130		130		130		100		130
Base Capacity (vph)	268	1688	279	1636	742	359	462	462	463
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.69	0.34	0.84	0.07	0.52	0.18	0.38	0.13

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.