



December 13, 2021

Steve Gomez  
City of Aurora  
Public Works - Traffic  
15151 E Alameda Pkwy  
Aurora, CO 80012

Re: **1900 S Chambers Road – Traffic Letter  
Aurora, Colorado**

Dear Steve:

## **INTRODUCTION**

Helena Land Holding is proposing to develop a parcel into 51 multi-family residential units at 1900 South Chambers Road in Aurora, Colorado. This traffic letter, which includes estimated trip generation associated with the project and a traffic operations evaluation of the proposed access to Chambers Road, has been completed to supplement the development application as required by the City of Aurora.

## **PROJECT DESCRIPTION**

The proposed residential development will include up to 51 attached multi-family dwelling units in a three-story building with an associated off-street surface parking lot. A portion of the parking will be covered. Access for the site will be via a right-in/right-out driveway to Chambers Road. Completion of the project is anticipated by fall 2022.

The 2.0-acre project site for the proposed development is currently vacant and borders the Woodrim Tributary floodway. The site is bound by Chambers Road to the west, the floodway to the east and a single-family house and storage units to the north. and residential uses on all other sides. Chambers Road is lined with a mix of residential and commercial uses in the vicinity of the site.

The site is less than 1,000' south of Mexico Avenue. Chambers Road provides a north-south connection through Aurora, paralleling I-225. Interstate 225 is accessed by Mississippi Avenue north of the site or Iliff Avenue south of the site. A vicinity map is included as **Exhibit 1** and the current site plan is included as **Exhibit 2** at the end of this document. An aerial of the immediate vicinity is included as **Exhibit 3**.

## **TRIP GENERATION**

The proposed project will include up to 51 residential dwelling units that will be three stories. The *Trip Generation Manual, 10<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE) was used to determine the number of trips generated by

the proposed land use. The purpose of the Trip Generation Manual (TGM) is to compile and quantify empirical trip generation rates for specific land uses within the US, UK and Canada. Generally, the Trip Generation Manual is the industry standard accepted reference for estimating trip generation. The proposed attached multifamily housing falls within the TGM land use category 221, “Multifamily Housing (Mid-Rise).” This land use category includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and are three to ten stories tall. The trip generation estimate for the site based on this land use category is shown in the table below.

**Table 1 - Project Trip Generation (unadjusted)**

Land Use	ITE			Daily Trips	AM Peak Hour			PM Peak Hour		
	Code	Size	Units		In	Out	Total	In	Out	Total
Multifamily Housing (Mid-Rise)	221	51	DU	278	5	13	18	13	9	22

DU = Dwelling Units

As shown in the table above, the project is anticipated to generate 18 AM peak hour trips, 22 PM peak hour trips and 278 average daily trips.

### ***Trip Types***

Nearly all developments are made up of the following six trip types: new (destination) trips, pass-by trips, diverted trips, shared (internal) trips, multi-modal (non-vehicular) trips, and transit-oriented trips. To better understand the trip types available for land access and how they relate to this project, a description of each specific type follows.

**New (Destination) Trips** – These types of trips occur to access a specific land use such as a new retail development or a new residential subdivision. These types of trips will travel to and from the new site and a single other destination such as home or work. This is the only trip type that will result in a net increase in the total amount of traffic within the study area. The reason primarily is that these trips represent planned trips to a specific destination that never took trips to that part of the City prior to the development being constructed and occupied. This project will develop new trips.

**Pass-by Trips** – These trips represent vehicles which currently use adjacent roadways providing primary access to new land uses or projects. These trips, however, have an ultimate destination other than the project in question. They should be viewed as drop-in customers who stop in on their way home from work. A good example is a quick stop at the grocery store to pick up an ingredient for dinner on the way home from work or at a latte stand to grab a coffee on the way to work. This can make this trip pre-determined, but the stop is still on the way by. Another example would be on payday, where an individual generally drives by their bank every day without stopping, except on payday. On that day, this driver would drive into the bank, perform the prerequisite banking and then continue home. In this example, the trip started from work with a destination of home, however on the way, the driver stopped at the grocery store/latte stand and/or bank directly adjacent to their path. Pass-by trips are most always associated with commercial/retail types of developments. Therefore, no pass-by trips are anticipated for this project.

**Diverted (Linked) Trips** - Diverted trips are like pass-by trips, but diverted trips occur from

roadways that do not provide direct access to the site. Instead, one or more streets must be utilized to get to and from the site. For this project, diverted trips could occur from Mexico Avenue, Iliff Avenue, Mississippi Avenue or I-225 or any other street that does not provide direct access for the site. Due to the multiple routes that could be taken and the inability to verify this type of trip, diverted trips were not accounted for within this analysis.

**Shared (Internal) Trips** - Internal trips are the portion of trips generated by a mixed-use development that both begin and end within the development. When estimating trip generation for a development with several uses, each use will generate its own trips. If those trips occur between two of the onsite uses without using the external roadway system, it is considered a shared or internal trip. This trip type reduces the number of new trips generated on the public road system and is most commonly used for commercial or mix-use developments. Determining these trip types is more difficult to quantify and without specific guidance are usually determined by engineering judgment on a project-by-project basis. For this project, the residences are the only use on site and no shared trips will occur.

**Multi-Modal (Non-Vehicular) Trips** - These are non-vehicular trips to and from the site, mostly comprised of pedestrian and bicycle trips. Generally, they are local trips from the surrounding neighborhood or adjacent businesses. If a development is in an area with a high amount of bicycle and pedestrian activity, such as a downtown setting or college campus, a reduction of vehicular trips would be anticipated. Pedestrian and bicycle trips are anticipated to occur with this development, but are not anticipated to comprise a significant portion of the overall trips.

**Transit Trip** - The Denver Metro area is served by Regional Transportation District (RTD) with public bus and light rail. The nearest bus route is along Chambers Road with stops in the vicinity of Mexico Avenue. The nearest light rail station is approximately two miles away at Aurora Metro Center Station along the R-Line. With the proximity of bus stops and a light-rail station, transit is readily available for this site to utilize. This may result in a slight decrease in vehicular trips for the site, but is not anticipated to be significant.

Based on the various trip types listed above, there are not anticipated to be significant numbers of alternate mode trips to and from the site. Therefore, no reduction in trips to the values shown in Table 1 was implemented.

## **TRIP DISTRIBUTION**

As shown on the site plan, the site will be accessed by a single driveway to Chambers Road, which is a north-south major arterial providing connections to other major east-west arterials (Mississippi, Iliff, etc.) in the vicinity of the site. Mississippi Avenue and Iliff Avenue provide the closest connections to Interstate 225, the nearest freeway. Since the site access is proposed to be right-in / right-out, distribution of trips at the driveway will be 100% from the south for ingress and 100% to the north for egress.

Once trips reach other collectors or arterials (Mexico Avenue, Mississippi Avenue, Iliff Avenue), traffic is generally anticipated to distribute similar to existing traffic patterns.

## SITE ACCESS EVALUATION

A traffic operations analysis has been completed for the proposed site driveway to Chambers Road. The following describes the methodology associated with this capacity analysis, the background traffic data collected and the resulting level of service anticipated for the site driveway.

### Analysis Methodology

The analyses described in this report were performed in accordance with the procedures in the *Highway Capacity Manual (HCM)*, 6<sup>th</sup> edition and as described below. The analyses were conducted for the AM and PM peak hour traffic conditions. Therefore, during all other times, drivers are most likely to experience traffic conditions better than those described within this document.

Level of Service (LOS) is an empirical premise developed by the transportation profession to quantify driver perception for such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles afforded to drivers who utilize the transportation network. LOS has been defined by the Transportation Research Board in the *Highway Capacity Manual, 6<sup>th</sup> Edition*. This document has quantified level of service into a range from “A” which indicates little, if any, vehicle delay, to “F” which indicates significant vehicle delay and traffic congestion that may lead to system breakdown due to volumes that may far exceed capacity.

The *Highway Capacity Manual* defines the level of service for a signalized intersection as the average delay per vehicle (amount of time a vehicle must spend at the intersection) for the overall intersection. For unsignalized intersections that include both stop-controlled and uncontrolled approaches (known as through/stop controlled), the *Highway Capacity Manual* defines the level of service as the average delay per vehicle for the worst approach, not the overall intersection.

The level of service letter grades as defined by the Transportation Research Board and the associated amount of delay in seconds per vehicle, as well as a brief description of the operating condition, for both signalized and unsignalized intersections are included for reference in **Table 2** on the next page.

**Table 2 – Level of Service Descriptions and Ranges**  
**Unsignalized Intersection Level of Service Criteria**

Level of Service	Delay Range (seconds/vehicle)	Expected Delay to Minor Street Traffic
A	≤ 10	Little or no conflicting traffic for minor street approach.
B	> 10 and ≤ 15	Minor street approach begins to notice absence of available gaps.
C	> 15 and ≤ 25	Minor street approach begins experiencing delays for available gaps.
D	> 25 and ≤ 35	Minor street approach experiences queuing due to a reduction in available gaps.
E	> 35 and ≤ 50	Extensive minor street queuing due to insufficient gaps.
F	> 50	Insufficient gaps of suitable size to allow minor street traffic demand to cross safely through a major traffic stream.

Source: *Highway Capacity Manual (Transportation Research Board, 2000)*.

The City of Aurora has established level of service D as the minimum acceptable intersection operating condition. Analysis results indicating operations worse than the minimum acceptable level were considered for mitigation measures.

### **Traffic Volumes and Peak Hour Operations**

A 24-hour traffic count was collected of Chambers Road along the site frontage by All Traffic Data Inc. under the direction of CivTrans Engineering on Tuesday, September 14, 2021.

The counts were collected during the COVID-19 pandemic, which continues to result in lower traffic volumes as compared to pre-pandemic conditions. Historic counts for the intersection were obtained from the City of Aurora, which shows the AM peak hour traffic volumes are approximately 23% lower than 2018 and PM peak hour traffic volumes are approximately 15% lower than 2018.

There is a certain level of uncertainty with what the future will hold regarding traffic volumes. Traffic may return to a pre-pandemic state or with an increased trend towards telecommuting may have a permanent effect on the commuter traffic going forward. The general traffic engineering industry trend for traffic studies is to apply a pandemic impact factor to existing traffic counts or utilize pre-pandemic data to evaluate current and future conditions assuming traffic volumes will return to a pre-pandemic state. For this evaluation, a pandemic factor of 1.30 was applied to AM counts and a factor of 1.17 was applied to PM counts.

The raw (traffic count), adjusted existing peak hour volumes, project trips and future estimated traffic volumes used for the analysis are shown in **Exhibit 4**. The raw count data is provided in the Technical Appendix.

### **Ambient Traffic Growth**

The Denver Regional Council of Governments (DRCOG) has produced 2015 and 2040 traffic volume models for the Denver metropolitan area, which includes the study area. DRCOG projects a 0.80% annual growth along this segment on Chambers Road. Therefore, an ambient annual growth rate of 1.0% was used for forecasting future background traffic volumes. For year 2023, one year after the completion of the project, a growth factor of 1.02 was applied to the pandemic-adjusted traffic volumes.

### **Level of Service and Traffic Analysis**

The levels of service at the site access driveway intersection were calculated using the methods from the *Highway Capacity Manual, 6<sup>th</sup> Edition*, as implemented in Synchro, *Version 10*. The levels of service (LOS) for the site access intersection are summarized on the following table. The “Year 2023 with Project” traffic volumes used for this report are shown on Exhibit 4.

**Table 3 – Year 2023 with Project Levels of Service**

INTERSECTION (U)nsignalized		Overall or Approach	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
Chambers Road & Site Access	U	WB	16.6	C	17.0	C

As shown in the table above, the proposed right-in / right-out site driveway is anticipated to operate at LOS C or better during the AM and PM peak hours, which is an acceptable level. The Synchro output for the level of service output is attached to this letter for reference.

### CONCLUSIONS/RECOMMENDATIONS

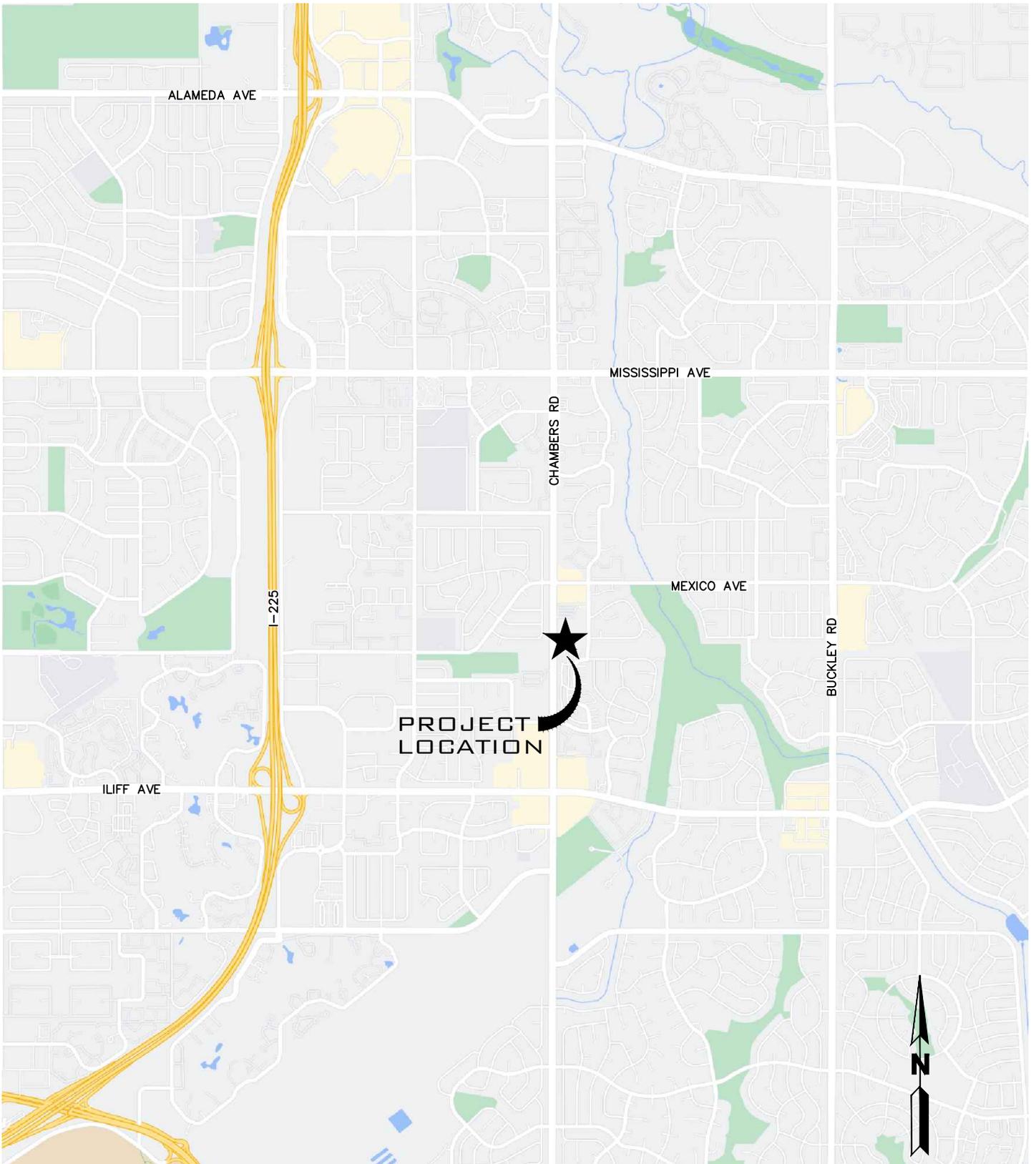
It is anticipated that this project will generate 18 AM peak hour vehicular trips, 22 PM peak hour vehicular trips and 278 ADT. The site is proposing to access Chambers Road with a right-in / right-out driveway. Level of service calculations were conducted for the proposed access, which show the access is anticipated to operate at LOS C or better during peak hours. The City of Aurora has a threshold of LOS D for intersections and approaches before requiring mitigation. Therefore, the site driveway is anticipated to operate at acceptable levels and no roadway improvements are necessary to accommodate the site traffic.

Should you have any questions regarding this document or the information contained herein, please do not hesitate to contact me at 303-653-9200 or via email at [craig@civtrans.com](mailto:craig@civtrans.com).

Sincerely,



Craig A. MacPhee, PE, PTOE



NOT TO SCALE  
DECEMBER 13, 2021

**EXHIBIT 1**  
VICINITY MAP

**CivTRANS**  
Engineering Inc.   
P.O. BOX 150335 • LAKEWOOD, CO 80215 • 303-653-9200





NOT TO SCALE  
DECEMBER 13, 2021

**EXHIBIT 3**  
SITE AERIAL

**CIVTRANS**

Engineering Inc.

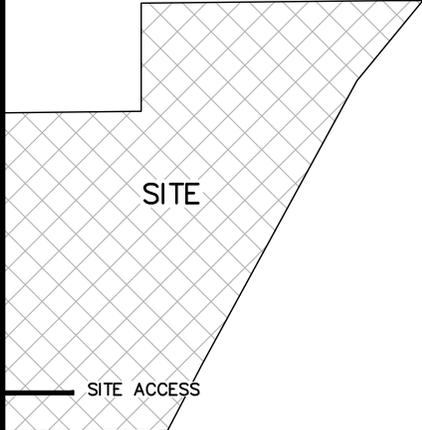
P.O. BOX 150335 • LAKEWOOD, CO 80215 • 303-653-9200

815/1,133  
985/1,199

0/0

0/0

CHAMBERS RD



SITE

SITE ACCESS

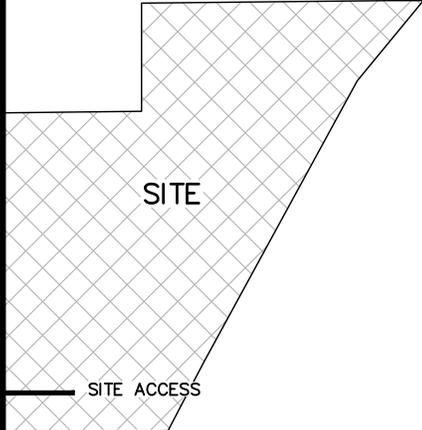
2021 Traffic Count

1,060/1,326  
1,281/1,403

0/0

0/0

CHAMBERS RD



SITE

SITE ACCESS

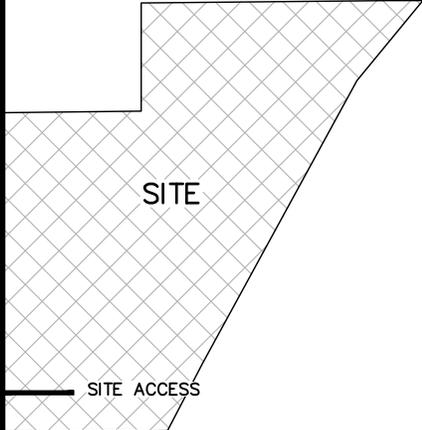
2021 Traffic Volumes (Pandemic Adjusted)

1,081/1,353  
1,307/1,431

0/0

0/0

CHAMBERS RD



SITE

SITE ACCESS

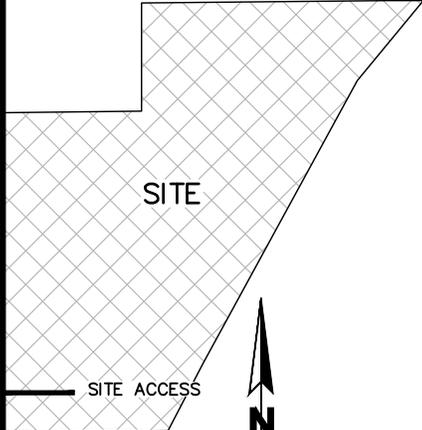
Year 2023 Background Traffic Volumes

1,081/1,353  
1,307/1,431

13/9

5/13

CHAMBERS RD



SITE

SITE ACCESS



NOT TO SCALE  
DECEMBER 13, 2021

Year 2023 Build Traffic Volumes

12/34 - AM Peak Hour/PM Peak Hour

**EXHIBIT 4**  
**TRAFFIC VOLUMES**

**CIVTRANS**  
Engineering Inc.

P.O. BOX 150335 • LAKEWOOD, CO 80215 • 303-653-9200



		NB	SB	comb	hourly						
9/14/2021	12:00 PM	206	195	401	1643						
9/14/2021	12:15 PM	217	168	385	1641						
9/14/2021	12:30 PM	211	228	439	1682						
9/14/2021	12:45 PM	212	206	418	1642						
9/14/2021	01:00 PM	218	181	399	1630						
9/14/2021	01:15 PM	230	196	426	1604						
9/14/2021	01:30 PM	225	174	399	1602						
9/14/2021	01:45 PM	218	188	406	1661						
9/14/2021	02:00 PM	195	178	373	1736						
9/14/2021	02:15 PM	222	202	424	1809						
9/14/2021	02:30 PM	245	213	458	1891						
9/14/2021	02:45 PM	259	222	481	1947						
9/14/2021	03:00 PM	230	216	446	2011						
9/14/2021	03:15 PM	258	248	506	2085						
9/14/2021	03:30 PM	260	254	514	2109						
9/14/2021	03:45 PM	301	244	545	2130						
9/14/2021	04:00 PM	278	242	520	2166						
9/14/2021	04:15 PM	253	277	530	2220						
9/14/2021	04:30 PM	279	256	535	2283	NB	SB	PHF			
9/14/2021	04:45 PM	298	283	581	2332	1199	1133	0.983			
9/14/2021	05:00 PM	296	278	574	2275						
9/14/2021	05:15 PM	315	278	593	2219						
9/14/2021	05:30 PM	290	294	584	2162						
9/14/2021	05:45 PM	262	262	524	2070						
9/14/2021	06:00 PM	264	254	518	2038						
9/14/2021	06:15 PM	306	230	536	1881						
9/14/2021	06:30 PM	272	220	492	1733						
9/14/2021	06:45 PM	272	220	492	1576						
9/14/2021	07:00 PM	193	168	361	1376						
9/14/2021	07:15 PM	204	184	388	1318						
9/14/2021	07:30 PM	161	174	335	1171						
9/14/2021	07:45 PM	162	130	292	1067						
9/14/2021	08:00 PM	148	155	303	1014						
9/14/2021	08:15 PM	120	121	241	918						
9/14/2021	08:30 PM	116	115	231	867						
9/14/2021	08:45 PM	132	107	239	802						
9/14/2021	09:00 PM	97	110	207	704						
9/14/2021	09:15 PM	90	100	190	622						
9/14/2021	09:30 PM	70	96	166	542						
9/14/2021	09:45 PM	56	85	141	492						
9/14/2021	10:00 PM	55	70	125	433						
9/14/2021	10:15 PM	66	44	110	396						
9/14/2021	10:30 PM	68	48	116	351						
9/14/2021	10:45 PM	46	36	82	286						
9/14/2021	11:00 PM	56	32	88	250						
9/14/2021	11:15 PM	27	38	65							
9/14/2021	11:30 PM	27	24	51							
9/14/2021	11:45 PM	20	26	46							

HCM 6th TWSC  
1: Chambers Road & Site Access

11/04/2021

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↑↑↑	↗ ↑↑↑			↗ ↑↑↑
Traffic Vol, veh/h	0	13	1307	5	0	1081
Future Vol, veh/h	0	13	1307	5	0	1081
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	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	14	1405	5	0	1162

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	-	705	0	0	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-	-
Pot Cap-1 Maneuver	0	325	-	-	0	-
Stage 1	0	-	-	-	0	-
Stage 2	0	-	-	-	0	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	-	325	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.6	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	325
HCM Lane V/C Ratio	-	-	0.043
HCM Control Delay (s)	-	-	16.6
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.1

HCM 6th TWSC  
 1: Chambers Road & Site Access

11/04/2021

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↗ ↑↑↑	↑↑↑			↑↑↑
Traffic Vol, veh/h	0	9	1431	13	0	1353
Future Vol, veh/h	0	9	1431	13	0	1353
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	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	1460	13	0	1381

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	-	737	0	0	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	7.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.92	-	-	-
Pot Cap-1 Maneuver	0	310	-	-	0
Stage 1	0	-	-	-	0
Stage 2	0	-	-	-	0
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	-	310	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBT
Capacity (veh/h)	-	-	310
HCM Lane V/C Ratio	-	-	0.03
HCM Control Delay (s)	-	-	17
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	0.1