



September 15, 2021

Mr. Mark A. Perrino
MAPCM
6415 Cherokee Drive
Sedalia, Colorado 80135

SUBJECT: DOUGLAS 234, FILING NO. 6, GAS STATION AND CAR WASH ON LOTS 1&2, TRAFFIC COMPLIANCE LETTER (RICK ENGINEERING COMPANY JOB NUMBER 18633A)

Dear Mr. Perrino:

[INTRODUCTION/PROJECT DESCRIPTION](#)

This traffic compliance letter has been prepared to provide a trip generation comparison and on-site queuing evaluation based on the proposed changes to Lots 1&2 of Douglas 234, Filing No. 6 and identify compliance with the original approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020. The project proposes to construct a gas station with 12 vehicle fueling positions (VFP) and a convenience store, as well as an automated carwash with a single car wash tunnel (CWT) on Lots 1&2 of the Chambers and Hess Development. On the same lots, the original TIS assumed 16 VFP gas station with convenience store and a single CWT automated car wash. The project is located at the southeast corner of S. Chambers Road and S. Red Sky Drive in the Town of Parker, Colorado.

Exhibit 1 shows the project vicinity map. **Exhibit 2** shows the project site plan. **Appendix A** contains excerpts from approved TIS.

[SITE TRIP GENERATION](#)

The project traffic volumes anticipated to be generated by the proposed development for Lots 1&2 were estimated using the nationally published trip generation rates from the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. The project is anticipated to generate 2,045 daily weekday trips, of which 125 trips (64 inbound and 61 outbound) are anticipated to be generated during the A.M. peak hour, and 234 trips (119 inbound and 115 outbound) during the P.M. peak hour. These trips account for internal capture trip reductions, as explained in the original TIS. In comparison, the trips estimated for Lots 1&2 in the original TIS were expected to generate 3,110 daily weekday trips, of which 198 trips (101 inbound and 97 outbound) were anticipated to be generated during the A.M. peak hour, and 287 trips (145 inbound and 142 outbound) during the P.M. peak hour. As shown in **Table 1** below, the proposed development is expected to generate 1,065 fewer daily weekday trips, 73 fewer A.M. peak hour trips and 53 fewer P.M. peak hour trips than the original development assumed in the TIS.

**TABLE 1
PROJECT TRIP GENERATION SUMMARY**

LAND USE	QUANTITY			ITE Trip Gen. 10th Edition Code	ADT	AM PEAK HOUR			PM PEAK HOUR		
						VOLUMES			VOLUMES		
						IN	OUT	TOTAL	IN	OUT	TOTAL
ORIGINAL DEVELOPMENT FOR LOTS 1 & 2 PER TIS											
Gasoline/Service Station with Convenience Market	16	VFP	945	3,134	106	101	207	114	110	224	
Automated Car Wash ²	1	CWT	948	See Footnote ²			39	39	78		
Sub Total				3,134	106	101	207	153	149	302	
Internal Capture				24	5	4	9	8	7	15	
TOTAL PROJECT TRIPS				3,110	101	97	198	145	142	287	
PROPOSED DEVELOPMENT FOR LOTS 1 & 2											
Gasoline/Service Station with Convenience Market	12	VFP	945	2,061	67	64	131	86	82	168	
Automated Car Wash ²	1	CWT	948	See Footnote ²			39	39	78		
Sub Total				2,061	67	64	131	125	121	246	
Internal Capture				16	3	3	6	6	6	12	
TOTAL PROJECT TRIPS				2,045	64	61	125	119	115	234	
TOTAL NET NEW PROJECT TRIPS				-1,065	-37	-35	-73	-27	-27	-53	

VFP = Vehicle Fueling Position

CWT = Car Wash Tunnels

¹ITE Trip Generation Manual does not publish Weekday Daily Trips for Auto Care Centers. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

²ITE Trip Generation Manual does not publish Weekday Daily Trips or AM peak hour for Automated Car Wash. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

SITE CIRCULATION/QUEUING

Access to the project is provided by one right-in only driveway at S. Red Sky Drive and a full access driveway at Sliceroo Drive, as proposed in the approved TIS. As shown in Exhibit 2, the gas station and convenience store are located on the northern side of the lot (Lot 1) and the carwash on the southern side (Lot 2). The carwash is proposed with one lane and approximately 320 feet of available vehicle queuing storage, while keeping clear of the two pedestrian crossings proposed along the bay. Per the ITE Summer 2012, *Drive-Through Queue Generation, 1st Edition by Counting Cars* publication (see **Appendix B**), the recommended vehicle design queue is 140 feet for a drive-through carwash.

CONCLUSIONS/RECOMMENDATIONS

The project does not propose any significant changes to the site from the original TIS, with the exception of 4 fewer vehicle fueling positions for the gas station. Based on the findings of this traffic compliance letter, the proposed development is anticipated to generate 1,065 fewer daily weekday trips, 73 fewer A.M. peak hour trips and 53 fewer P.M. peak hour trips than the original development assumed in the TIS. Therefore, the proposed development is in conformance with the approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020.

Based on the queuing analysis for the on-site carwash, the proposed available storage of approximately 320 feet (16 vehicles), is higher than the recommended design queue of 140 feet (7 vehicles) and can sufficiently accommodate the anticipated queues at the carwash.

Mr. Perrino
September 15, 2021

Sincerely,

RICK ENGINEERING COMPANY



Brian R. Stephenson, PE, PTOE
Associate Principal



Attachments

Exhibit 1 Project vicinity map.

Exhibit 2 Project site plan.

Appendix A contains excerpts from approved *Chambers and Hess Development Traffic Impact Study (TIS)*, dated September 14, 2020.

Appendix B contains ITE Summer 2012, *Drive-Through Queue Generation*

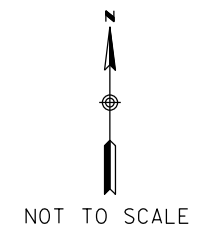
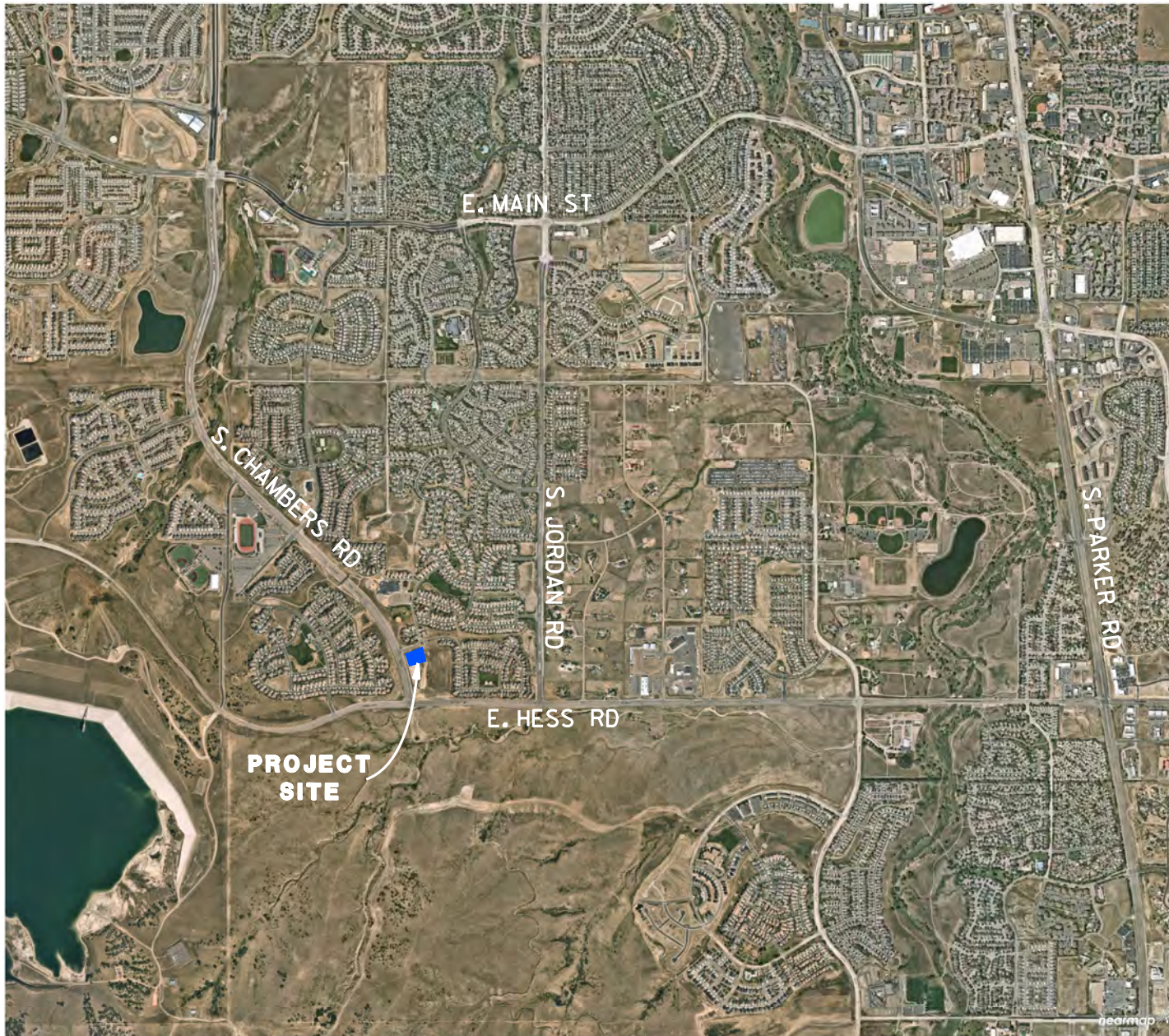
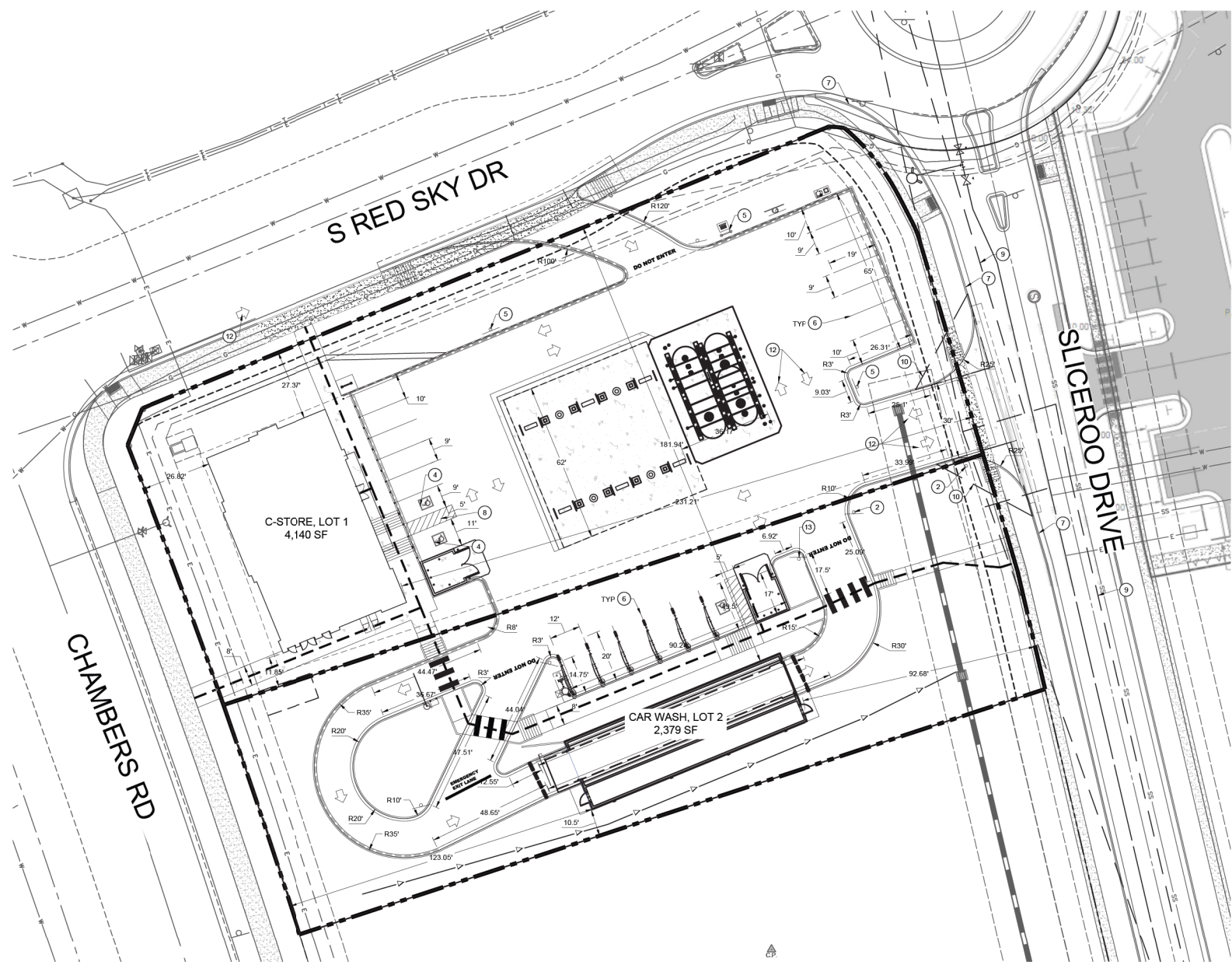


EXHIBIT 1
VICINITY MAP

CHAMBERS AND HESS MAPCM (GAS STATION AND CAR WASH)



NOT TO SCALE



EXHIBIT 2
PROJECT SITE PLAN

CHAMBERS AND HESS MAPCM (GAS STATION AND CAR WASH)

APPENDIX A

CHAMBERS AND HESS DEVELOPMENT

TRAFFIC IMPACT STUDY, SEPTEMBER 14, 2020

CHAMBERS AND HESS DEVELOPMENT

TRAFFIC IMPACT STUDY (TIS)

TOWN OF PARKER, CO

SEPTEMBER 14, 2020

JOB NUMBER: 18633

RICK

RICK ENGINEERING COMPANY



rickengineering.com

**CHAMBERS AND HESS DEVELOPMENT
TRAFFIC IMPACT STUDY (TIS)
TOWN OF PARKER, CO**

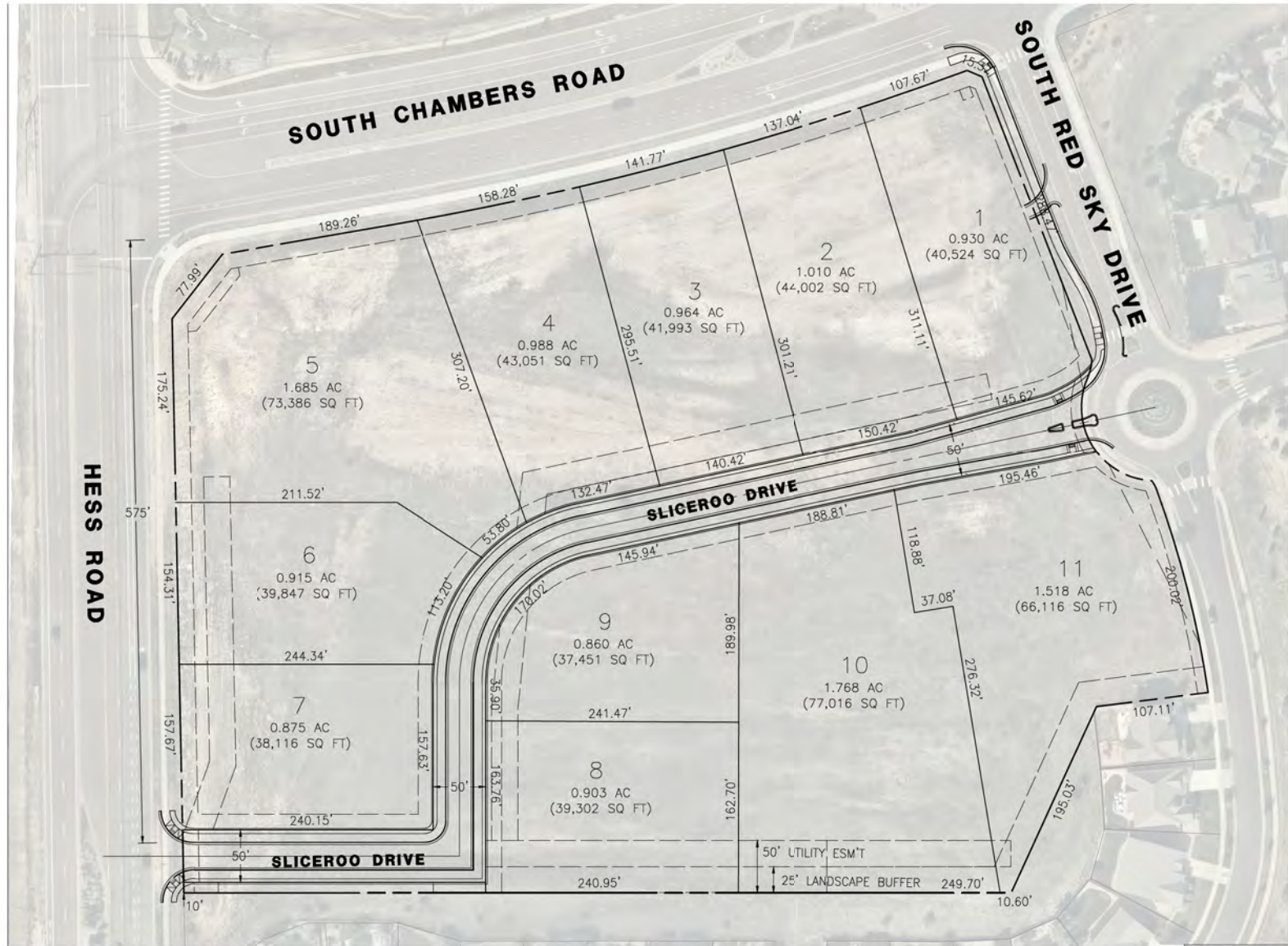
**ORIGINAL JANUARY 23, 2020
REVISED SEPTEMBER 14, 2020**

**PREPARED FOR:
VENTANA CAPITAL
9801 EAST EASTER AVENUE
CENTENNIAL, CO 80112**



Brian R. Stephens

PREPARED BY:



NOT TO SCALE



EXHIBIT 2

PROJECT SITE PLAN

CHAMBERS AND HESS DEVELOPMENT

**TABLE 3
PROJECT TRIP GENERATION SUMMARY
CHAMBERS AND HESS DEVELOPMENT**

LAND USE	QUANTITY		ITE Trip Gen. 10th Edition Code	ADT	AM PEAK HOUR			PM PEAK HOUR		
					VOLUMES			VOLUMES		
					IN	OUT	TOTAL	IN	OUT	TOTAL
Day Care Center	13	TSF	565	619	76	67	143	68	77	145
General Office Building	15	TSF	710	168	35	6	41	3	16	19
Pharmacy/Drugstore With a Drive-Through Window	12	TSF	881	1310	24	22	46	61	62	123
Drive-in Bank	3	TSF	912	324	14	10	24	26	26	51
Fast-Food Restaurant with Drive-Through Window	2.5	TSF	934	1177	51	49	100	43	39	82
Fast-Food Restaurant with Drive-Through Window	2	TSF	934	942	41	39	80	34	31	65
Coffee/Donut Shop with Drive-Through Window	2	TSF	937	1641	91	87	178	44	44	87
Quick Lubrication Vehicle Shop	3	TSF	941	209	13	4	17	11	15	26
Automobile Care Center ¹	6	TSF	942	See Footnote 1	9	5	14	12	14	26
Gasoline/Service Station with Convenience Market	16	VFP	945	3134	106	101	207	114	110	224
Automated Car Wash ²	1	CWT	948	See Footnote 2			39	39	78	
Sub Total				9,524	460	390	850	455	473	926
Internal Capture				74	21	17	38	23	22	44
External Walk, Bike				79	4	4	8	3	4	7
TOTAL NET NEW PROJECT TRIPS				9,371	435	369	804	429	446	875

Source : *Fehr and Peers MXD + Methodology and Validation Technical Memorandum, Dated May 06, 2020* - with revisions based on Town's Comments on July 16, 2020, and further coordination with the Town on August 7, 2020

TSF = Thousand Square Feet

VFP = Vehicle Fueling Position

CWT = Car Wash Tunnels

¹ITE Trip Generation Manual does not publish Weekday Daily Trips for Auto Care Centers. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

²ITE Trip Generation Manual does not publish Weekday Daily Trips or AM peak hour for Automated Car Wash. Instead, weekend (Saturday/Sunday) trips are provided in ITE to depict realistic use and hours of operation.

for all movements and the closely spaced intersections (less than half a mile) along the corridor in long-term conditions, the green time allowed for each movement is limited and the 40 second minimum bandwidth is unachievable. Based on the results, the long-term scenarios showed bandwidth between 22 – 56 seconds.

Appendix H contains the time space diagrams.

5.6 SAFETY

The traffic pattern proposed with this project presents few safety hazards. This project proposes three access locations, as mentioned in the previous sections where the entrances have approach grades meeting the Town's criteria and will be constructed with standard pedestrian crossings with appropriate signage and markings. In addition, each intersection has been reviewed for appropriate sight distance. Conflicts are also minimized at the driveways along Hess Road and S. Red Sky Drive, as the driveways are proposed to be right-in/right-out onto Hess Road and right-in only onto S. Red Sky Drive, with less conflict points than a full-access intersection. These movements typically cause few traffic incidents, and therefore, are not anticipated to have any significant or unusual safety concerns at these driveways. The S. Red Sky Dr. access will connect to the existing roundabout. Roundabouts are by nature safer than a standard four-way intersection due to reduced conflict points and a reduction in the severity of conflicts in the intersection. Additionally, the project proposes to install a traffic signal and an additional westbound left turn lane to mitigate the S. Chambers Road and S. Red Sky Drive intersection in the future. This will invariably improve the safety of traffic movements at the S. Red Sky Drive and S. Chambers Road intersection. As a result, it is assumed that this project will improve the overall safety of the traffic patterns in this area in the future.

6.0- CONCLUSION AND MITIGATIONS/RECOMMENDATIONS

Based on the analysis and results contained within this report, the traffic study evaluated any potential traffic impacts due to the proposed construction of the Chambers and Hess Development. In coordination with the Town of Parker, the study analyzed the nearby intersections and roadways based on the operational capabilities for the different study scenarios with and without the project generated traffic.

Recommendations are made in accordance with the Town of Parker's benchmark for overall intersection to operate at LOS C or better for each peak period of every study year and that no approach or movement of an intersection shall fall below LOS E, and maintaining LOS D for all roadway segments. Based on the traffic generated by the project, and access roads requirements for the project site, the following are recommendations at the study area intersections and roadway segments:

- S. Chambers Road/E. Hess Road – Modify the traffic signal to allow for westbound U-turn movements for the short-term scenario, until the ultimate four-legged intersection is installed (by others) in the future. However, due to the high volumes proposed by the near-by Anthology development assumed to be opened by 2041; this intersection operates at LOS F. The recommendations provided by the Anthology study to install free-right turns for the westbound and eastbound directions have minimal improvements to the level of service and the intersection is anticipated to continue to operate at LOS F in the long-term.

- S. Chambers Road/S. Red Sky Drive - Install a traffic signal as warranted in the existing scenario. The traffic signal will help mitigate this intersection to operate at an acceptable level of service (LOS C or better). To further mitigate queuing for the long-term scenario with project conditions, install an additional westbound left turn lane at this intersection.
- S. Red Sky Drive/S. Swift Fox Way-Future Project Dwy - Install a yield controlled fourth-leg to provide a full northerly project access driveway at the existing roundabout, with a shared left-through-right lane for the northbound approach.
- E. Hess Road/Future Project Dwy – Install a right-in/right-out driveway with stop control for the southbound approach to provide a southerly access to the project.
- S. Red Sky Drive/ Future Project Dwy - Install a right-in only driveway along S. Red Sky Drive to provide a secondary northerly access to the project, west of the existing roundabout. This will also alleviate project trips from the roundabout.

The following are additional monitoring and coordination recommendations related to the nearby study area intersections to be installed by others:

- E. Hess Road/Fire Fly Lane – the installation of a traffic signal would mitigate this intersection to operate at acceptable levels of service.

APPENDIX B

ITE SUMMER 2012, DRIVE-THROUGH QUEUE GENERATION

Drive-Through Queue Generation

Mike Spack, PE, PTOE, Max Moreland, EIT, Lindsay de Leeuw, Nate Hood

1.0 Introduction

This report provides queuing data for businesses with drive-through services. It is intended to be an aid for site designers and reviewers, similar to the Institute of Transportation Engineers' *Trip Generation* and *Parking Generation* reports. The data presentation is modeled on the *Parking Generation* report and data is provided based on at least six sites, similar to data sets marked as statistically significant in *Trip Generation*.

Businesses with drive-through lanes are very common in the United States and having data that gives usage information for drive-through lanes will assist designers as well as cities in determining the appropriate amount of storage needed for proposed drive-through businesses. Data for drive-through queues was published by the ITE Technical Council Committee 5D-10 in 1995 based on information collected between the late 1960's and the 1990's. A paper was also published in 2009 by Mark Stuecheli, PTP giving updated information for bank and coffee shop drive-through lanes. The results from the 2009 study are incorporated into this paper (thank you Mark for your assistance).

2.0 Data Collection

Data was collected using COUNTcam video recording systems at a total of 30 drive-through locations in Minneapolis, MN and several surrounding suburbs between 2010 and 2012 (26 of the 30 videos were recorded in February of 2012, which should represent peak usage in the cold Minnesota winter). Videos of drive-through lanes were collected at banks, car washes, coffee shops, fast food restaurants and pharmacies. A total of six locations were selected for each of the five different land uses. Each location was recorded for between one and five days where the majority of locations were recorded for two consecutive days. The days of the week that each video was recorded on varies.

The 24-hour videos were watched at high speeds with the PC-TAS counting software and maximum queues throughout the day were noted. Most of the COUNTcams were set up such that the entire queue lane could be seen, but at a few locations the drive-through lanes wrapped around the building in a way that the entire queue length would not be able to be seen. For these situations, the COUNTcams were set up so that the ordering window and back of the queue could be seen and it was noted how many vehicles could fit between the ordering window and the front of the queue. For drive-through locations with multiple lanes, the number of lanes was noted but the maximum queue is defined as the sum of the queues at each lane for any given point in time, not the queue per lane. This approach provides overall demand, which may assist designers in determining how many drive through lanes are appropriate in addition to determining how long they should be.

Once the maximum queue for each day at each location was determined, the data was compiled and statistics for each land use were calculated. The average maximum queue, standard deviation, coefficient of variation, range, 85th percentile and 33rd percentile were calculated for each land use.

Data for drive-through coffee shops and banks from the Kansas City, Kansas metropolitan area was published in the 2009 paper New Drive-Through Stacking Information for Banks and Coffee Shops by Mark Stuecheli. This data is included in the analysis.

3.0 Data Analysis

Based on the peak queue lengths, it is apparent that each land use will require a different minimum drive through stacking distance. The results for each land use can be found below. The peak queue lengths for each location, broken down by land use and day of the week, can be found in the Appendix.

3.1 Banks

Data collection was done at six banks with drive-through services (including one credit union) in August 2011 and February 2012. Twelve days of data were collected. The banks were located in the cities of Minneapolis, Robbinsdale and St. Louis Park, MN.

All of the locations had a lane with a drive-through ATM and at least two other lanes. Though service times may differ for ATM lanes compared to the regular lanes, the maximum queues were counted together. This is because based upon what was observed, vehicles would occasionally switch the lane they were in. For example, a vehicle waiting in the ATM line with a queue of three vehicles may move over to a regular line with a queue of only one vehicle. Much of what can be done at the bank's drive-through lane can also be accomplished at that bank's ATM and vice versa. Vehicles being served were counted as being in the queue.

Nine days of data from the Kansas City, Kansas area is also included. This data does not factor in vehicles in ATM lanes.

Table 3.1 – Drive-Through Bank Maximum Queue Statistics

	Minnesota Data	Minnesota + Kansas Data
Number of Data Points	12	21
Average Maximum Queue (Vehicles)	5.83	5.76
Standard Deviation (Vehicles)	1.85	2.21
Coefficient of Variation	32%	38%
Range (Vehicles)	3 to 8	1 to 10
85th Percentile (Vehicles)	8.00	8.00
33rd Percentile (Vehicles)	5.00	5.00

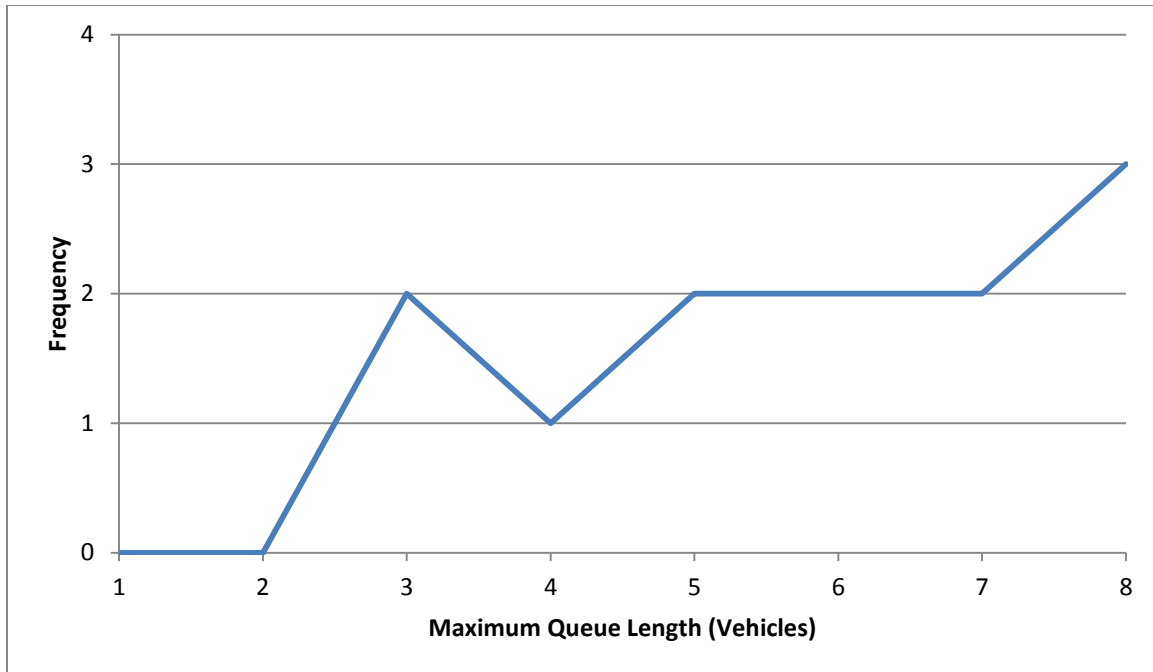


Figure 3.1.1 – Drive-Through Bank Maximum Queue Frequency – Minnesota Data



Figure 3.1.2 – Drive-Through Bank Maximum Queue Frequency – Minnesota + Kansas Data

The data for Kansas banks was collected between 4:30pm and 6:00pm. While many of the maximum queues for the data collected in Minnesota were between these times, maximum queues occurred between 8:30am and 5:30pm so it is possible that some of the Kansas data does not capture the actual maximum queues for the day.

The number of available lanes at banks, not including the ATM lane, ranged from two to seven lanes (though the most open at one time was five lanes). Even though plenty of lanes were available, cars often stacked at the lane closest to the building, thus additional lanes may not result in shorter queues. With an 85th percentile maximum queue of eight vehicles, the data suggests that banks with drive-through lanes should be able to accommodate 160 feet of vehicle stacking.

3.2 Car Washes

Data collection was done at six car washes with drive-through services (including one full-service car wash) in February 2012. Twelve days of data were collected. The car washes were located in the cities of Falcon Heights, Hopkins, Minneapolis, Roseville and St. Louis Park, MN. Five of the six car washes (excluding the full-service car wash) were located at gas stations. Only the vehicles waiting in line were counted; vehicles being washed were not added to the queue.

Table 3.2 – Drive-Through Car Wash Maximum Queue Statistics

Number of Data Points	12
Average Maximum Queue (Vehicles)	4.42
Standard Deviation (Vehicles)	2.31
Coefficient of Variation	52%
Range (Vehicles)	1 to 10
85th Percentile (Vehicles)	6.20
33rd Percentile (Vehicles)	3.00

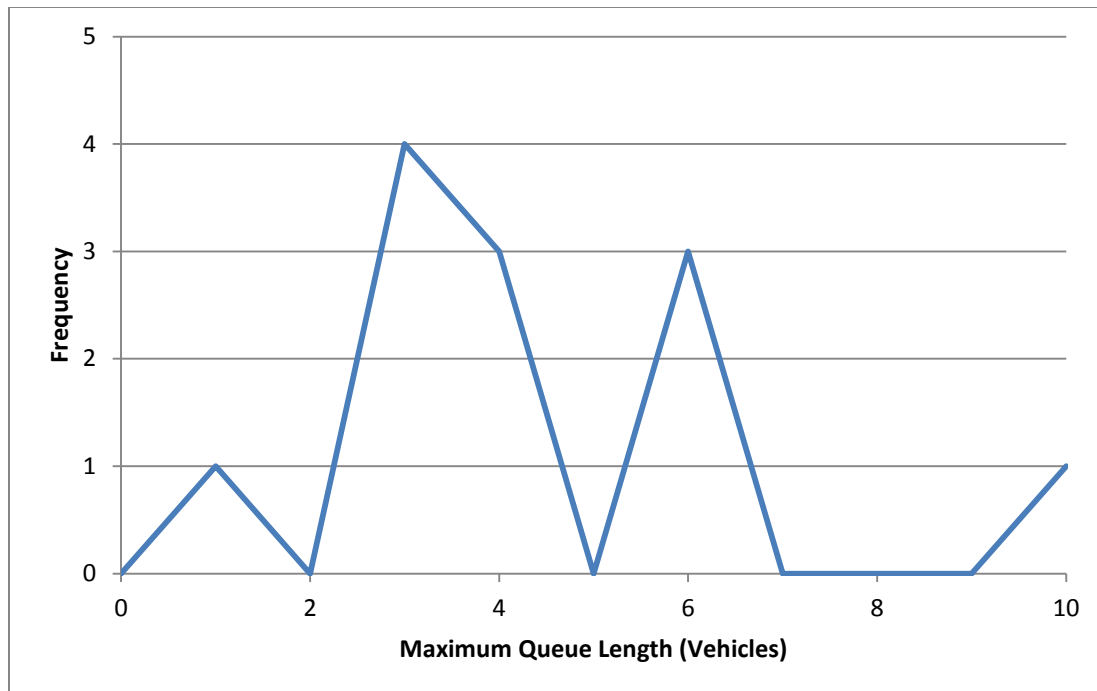


Figure 3.2 – Drive-Through Car Wash Maximum Queue Frequency

Two of the car washes had two lanes while the other four were one lane car washes. The full-service car wash had two lanes and also produced the highest maximum queue of 10 vehicles. The maximum queues for car washes were spread throughout the afternoon from 12:30pm to 8:30pm. With an 85th percentile maximum queue of more than six vehicles, the data suggests that car washes with drive-through lanes should be able to accommodate 140 feet of vehicle stacking throughout the day.

3.3 Coffee Shops

Data collection was done at six coffee shops with drive-through services in November 2010, August 2011 and February 2012. Fourteen days of data were collected. The coffee shops were located in the cities of Edina, Hopkins, Minneapolis, Roseville and St. Louis Park, MN. Vehicles being served were counted as being in the queue. Twelve days of data from the Kansas City, Kansas area is also included.

Table 3.3 – Drive-Through Coffee Shop Maximum Queue Statistics

	Minnesota Data	Minnesota + Kansas Data
Number of Data Points	14	26
Average Maximum Queue (Vehicles)	11.00	10.23
Standard Deviation (Vehicles)	2.25	2.76
Coefficient of Variation	20%	27%
Range (Vehicles)	7 to 16	3 to 16
85th Percentile (Vehicles)	13.50	13.00
33rd Percentile (Vehicles)	10.00	9.91

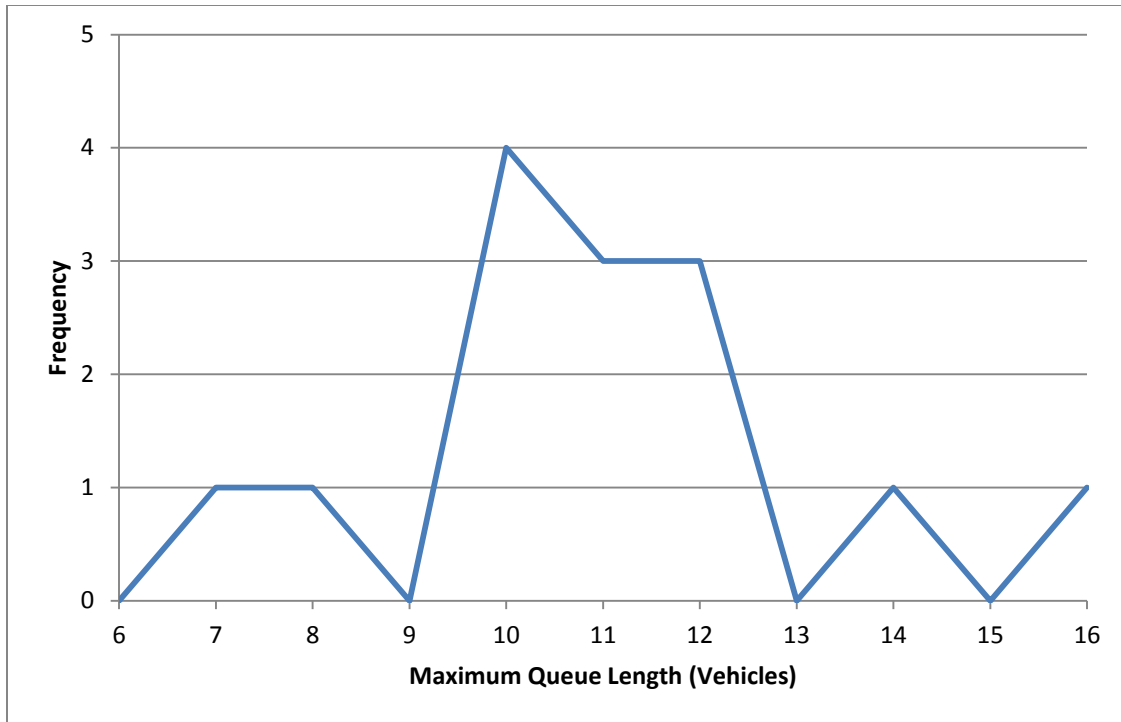


Figure 3.3.1 – Drive-Through Coffee Shop Maximum Queue Frequency – Minnesota Data

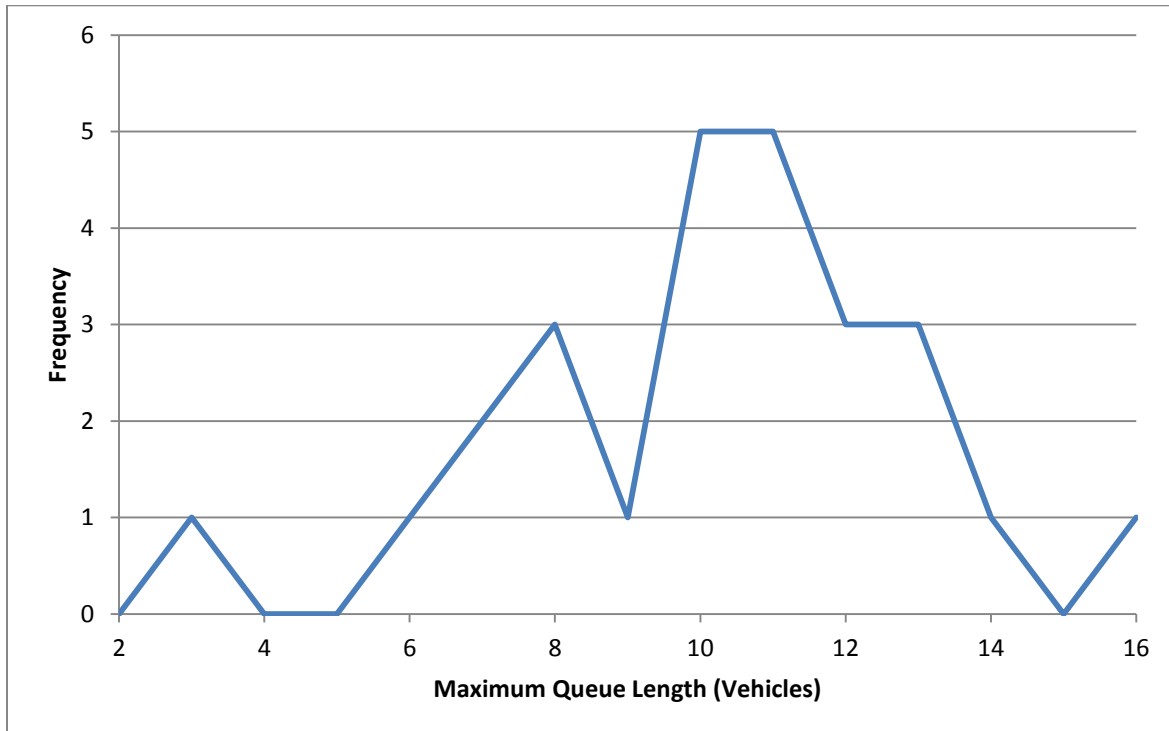


Figure 3.3.2 – Drive-Through Coffee Shop Maximum Queue Frequency – MN + KS Data

Coffee shops produced the longest maximum queues of any of the land uses in this study with all of the maximum queues occurring in the morning. In four of the six cases, the queues spilled out of the parking lot and into the street. These spillovers would typically only happen once or twice a day and last only a few minutes, however, one location had stacking into the street for about 15 minutes in addition to multiple periods of several minutes where cars would queue in the street.

With an 85th percentile maximum queue of 13 vehicles, the data suggests that coffee shops with drive-through lanes should be able to accommodate at least 260 feet of vehicle stacking during morning hours.

3.4 Fast Food Restaurants

Data collection was done at six fast food restaurants with drive-through services in August 2011 and February 2012. Fourteen days of data were collected. The restaurants were located in the cities of Golden Valley, Hopkins, Minneapolis and St. Louis Park, MN. Vehicles being served were counted as being in the queue.

Table 3.4 – Drive-Through Fast Food Restaurant Maximum Queue Statistics

Number of Data Points	14
Average Maximum Queue (Vehicles)	8.50
Standard Deviation (Vehicles)	2.68
Coefficient of Variation	32%
Range (Vehicles)	5-13
85th Percentile (Vehicles)	12.00
33rd Percentile (Vehicles)	7.90

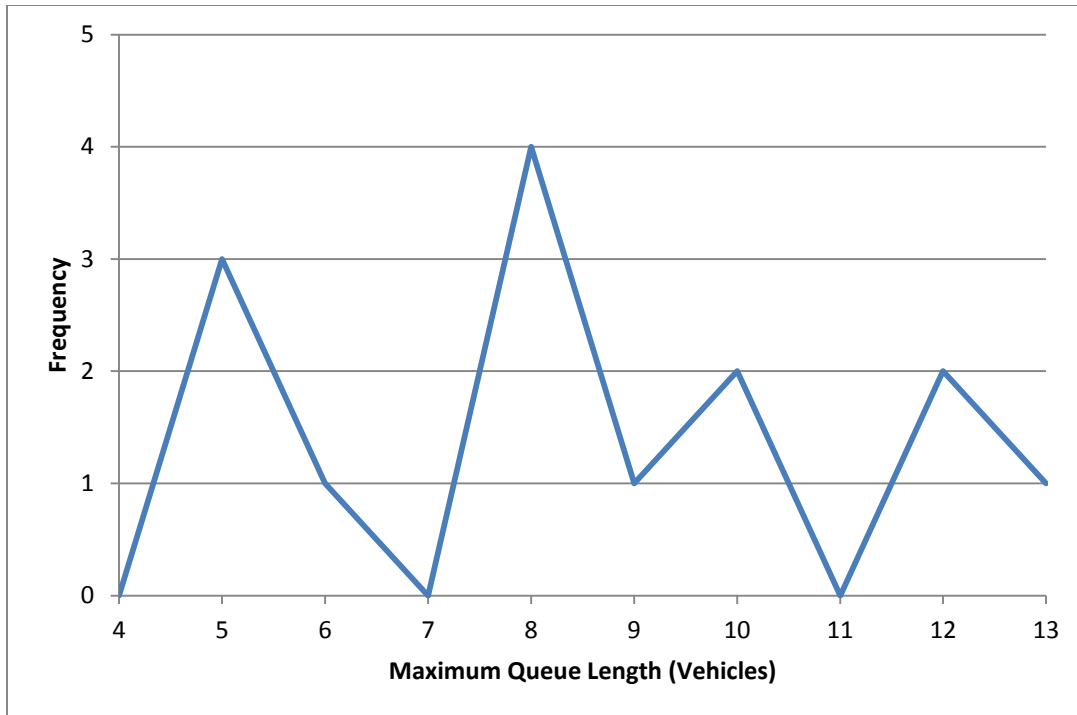


Figure 3.4 – Drive-Through Fast Food Restaurant Maximum Queue Frequency

The maximum queues for fast food restaurants were spread throughout the day from 8:00am to 10:00pm. With an 85th percentile maximum queue of 12 vehicles, the data suggests that fast food restaurants with drive-through lanes should be able to accommodate 240 feet of vehicle stacking throughout the day.

3.5 Pharmacies

Data collection was done at six pharmacies with drive-through services in February 2012. Twelve days of data were collected. The pharmacies were located in the cities of Hopkins, Minneapolis, New Hope and Robbinsdale, MN. Vehicles being served were counted as being in the queue.

Table 3.5 – Drive-Through Pharmacy Maximum Queue Statistics

Number of Data Points	12
Average Maximum Queue (Vehicles)	2.92
Standard Deviation (Vehicles)	1.16
Coefficient of Variation	40%
Range (Vehicles)	1-5
85th Percentile (Vehicles)	4.05
33rd Percentile (Vehicles)	2.00

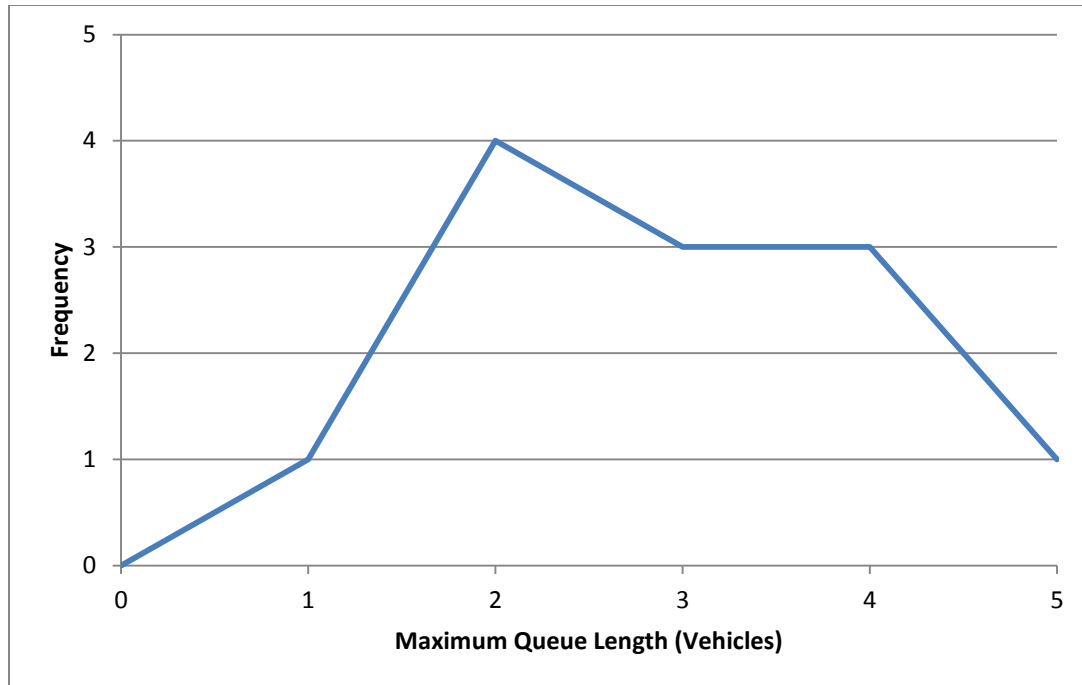


Figure 3.5 – Drive-Through Pharmacy Maximum Queue Frequency

The maximum queues for pharmacies were spread throughout the day from 8:00am to 10:00pm. With an 85th percentile maximum queue of more than 4 vehicles, the data suggests that pharmacies with drive-through lanes should be able to accommodate 100 feet of vehicle stacking throughout the day.

4.0 Conclusions

The 85th percentile maximum queue lengths for each land use are: 160 feet for banks (eight vehicles), 140 feet for car washes (seven vehicles), 260 feet for coffee shops (13 vehicles), 240 feet for fast food restaurants (12 vehicles) and 100 feet for pharmacies (five vehicles).

While some of the locations observed have an excess of space dedicated to drive-through lanes (i.e. some banks and pharmacies), others could occasionally use additional space for drive-through lanes (i.e. coffee shops in the morning).

Fast food restaurants and coffee shops have the longest maximum queues of the five land uses observed. Coffee shops have a tendency for the morning queues to build so long that they spill out onto the street, though, as is expected, their afternoon and evening queues are minimal. Fast food restaurants also have large queues, but they tended to have enough dedicated space that stacking did not go beyond the designated queuing area.

The data collected for this paper along with the data from the papers by Mark Stuecheli and the ITE Technical Committee 5D-10 (see Appendix for both of these) will hopefully provide useful data for traffic engineers and others trying to analyze drive-through queuing storage areas.

5.0 Labor Savings of the COUNTkit

Deploying people in the field to perform this data collection would not have been feasible. Using the COUNTcam video system made it possible to observe the drive through lanes 24 hours a day and the PC-TAS software made the data reduction practical. One location was recorded in November 2010 for 6 hours, three locations were recorded in August 2011 for a total of 202 hours and 26 locations were recorded in February 2012 for a total of 1012 hours. These 1220 hours of video were counted with a total of 120 hours of labor, meaning the videos were watched at approximately 10x speed. Installation of a COUNTcam takes approximately 10 minutes and retrieval takes approximately 5 minutes. This whole project was completed in approximately 3 weeks.

6.0 References

1. Stuecheli, M. (2009). New Drive-Through Stacking Information for Banks and Coffee Shops. *ITE 2009 Annual Meeting and Exhibit*. Print.
2. ITE Technical Committee 5D-10. "Queuing Areas for Drive-Thru Facilities." *ITE Journal* (May 1995): 38-42. Print.
3. Institute of Transportation Engineers. *Parking Generation*. 4th ed. Washington, DC: Institute of Transportation Engineers, 2010. Print.
4. Institute of Transportation Engineers. *Trip Generation*. 8th ed. Washington, DC: Institute of Transportation Engineers, 2008. Print.

7.0 Appendix

- A – Day of Week Maximum Queues
- B – New Drive-Through Stacking Information for Banks and Coffee Shops
- C – ITE Technical Committee 5D-10: Queuing Areas for Drive-Thru Facilities
- D – Drive-Through Data Forms