

Traffic Impact Study

2024-10-03 (DJK) reviewed, comments include:

- Fig 2 storage length discrepancies
- Fig 6 trip distribution discrepancies
- Fig 7 & 8 pass-by trip distribution questions
- Fig 11 & 12 traffic volume differences compared to Background volumes
- pg 27 statements questioned
- pg 28 turn lane issue
- Table 5 values compared to Fig 2
- Sect 5.6, Appendix G sentence needs to be removed
- Figs 13 & 14 chk storage lengths
- Appendix G and tables need to be removed

Thank you for your review and comments provided to the QT 4263 traffic study. Please see individual responses on the following pages that align to each one of these summarized comments.

QuikTrip 4263

Aurora, Colorado

Prepared for:

QuikTrip Corporation

Kimley»Horn

T R A F F I C I M P A C T S T U D Y

QuikTrip 4263

Aurora, Colorado

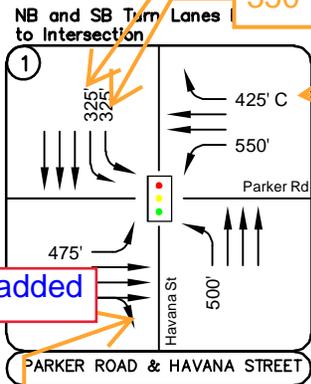
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August 2024

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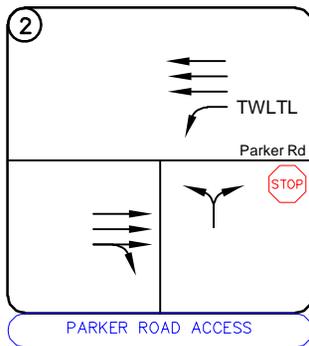
Lengths updated

free flow channelized (225') & right lane marked from 1300'

Channelized length of 225' (Accel) and continuous length of 1,300 has been identified.

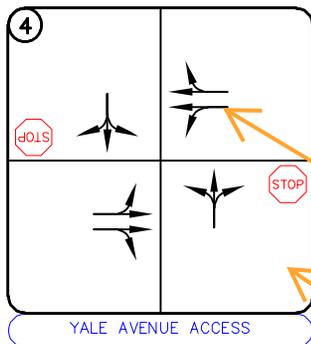
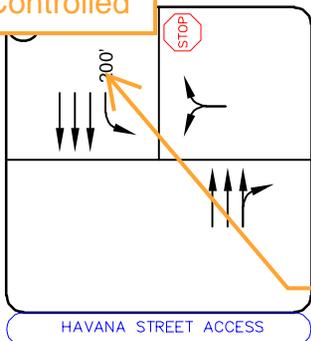
Yield label added

Yield Controlled



I only get 125' max

Revised.



would call this a left turn only lane, 155' long

Technically then, there are three access points on Yale...

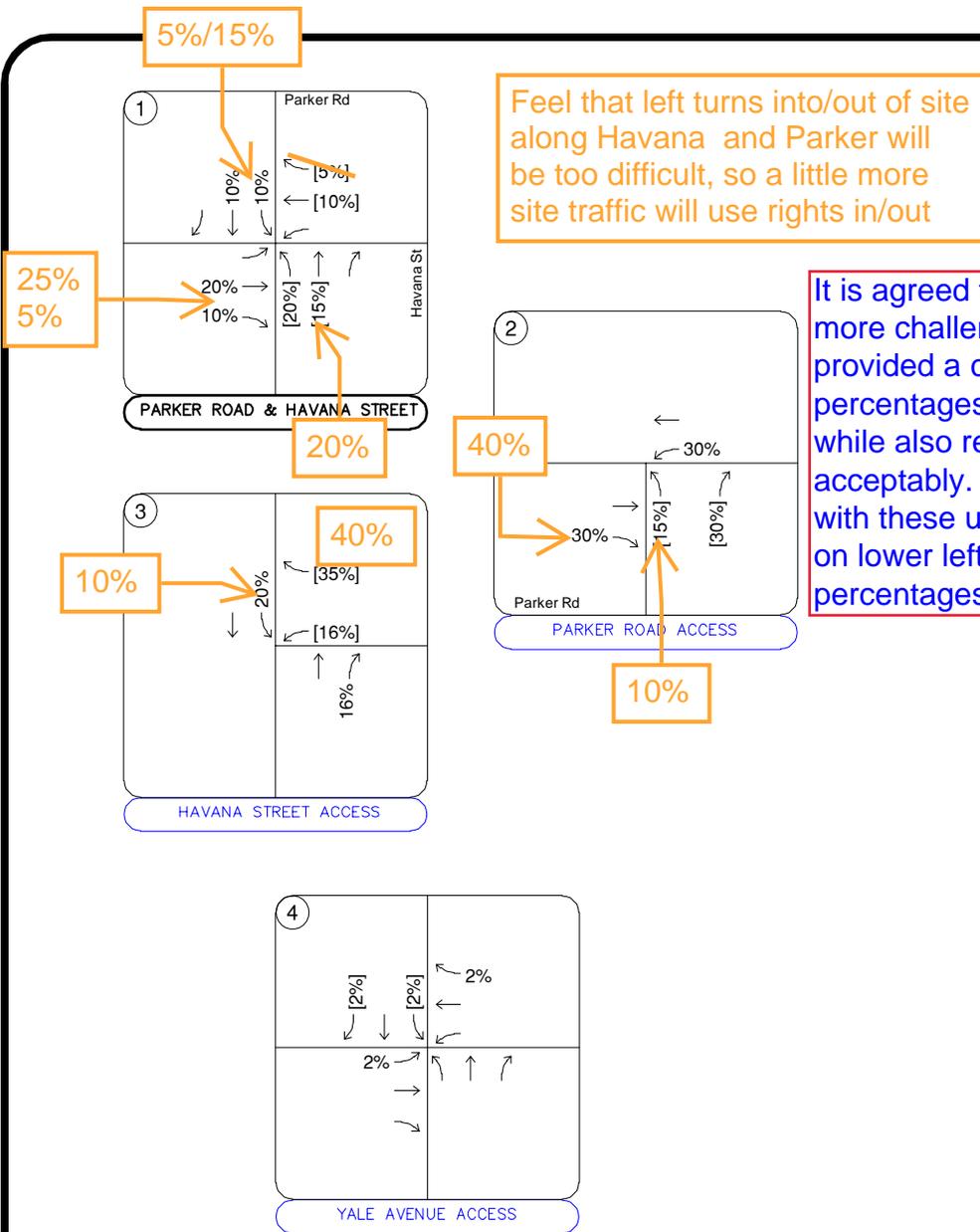


updated to a left turn (extension of the dropped left turn immediately to west) labeled with 155' feet of storage and one shared through/right turn lane

LEGEND	
(X)	Study Area Key Intersection
(X)	Project Access Intersection

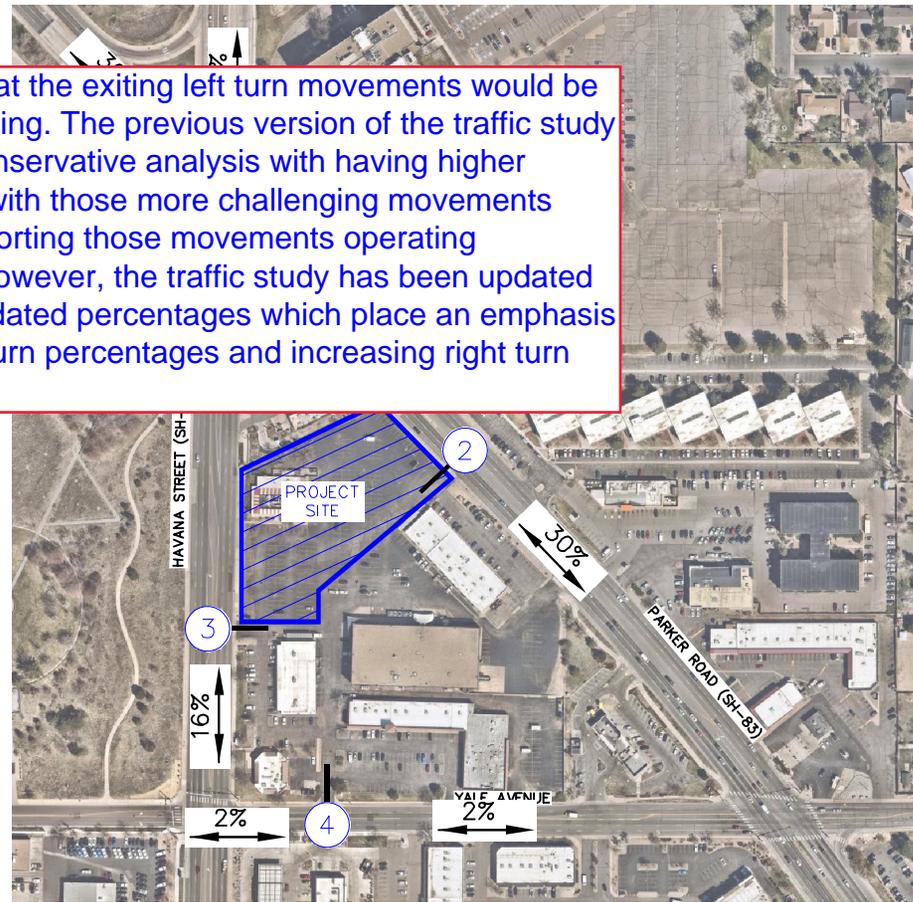
It is understood that three accesses are along Yale Avenue. This traffic study is only studying the accesses that would be utilized by this project. Therefore, labeling as one access is believed to be appropriate in this situation.

FIGURE 2
QUIKTRIP 4263
AURORA, COLORADO
EXISTING GEOMETRY AND CONTROL



Feel that left turns into/out of site along Havana and Parker will be too difficult, so a little more site traffic will use rights in/out

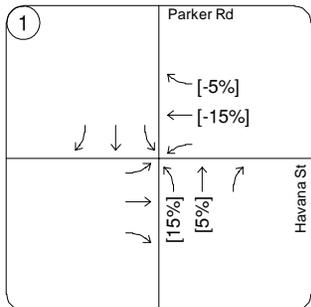
It is agreed that the exiting left turn movements would be more challenging. The previous version of the traffic study provided a conservative analysis with having higher percentages with those more challenging movements while also reporting those movements operating acceptably. However, the traffic study has been updated with these updated percentages which place an emphasis on lower left turn percentages and increasing right turn percentages.



LEGEND

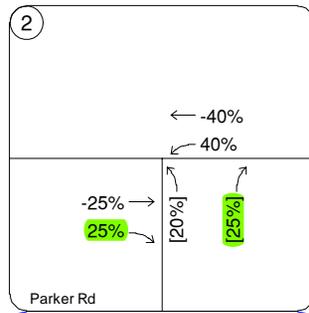
- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XX% External Trip Distribution Percentage
- XX%[XX%] Entering[Exiting] Trip Distribution Percentage

FIGURE 6
 QUIKTRIP 4263
 AURORA, COLORADO
 NON PASS-BY PROJECT TRIP DISTRIBUTION

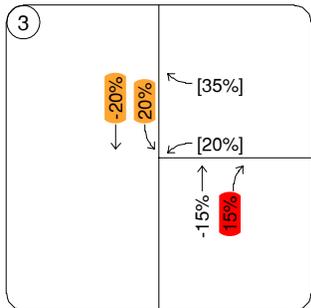


PARKER ROAD & HAVANA STREET

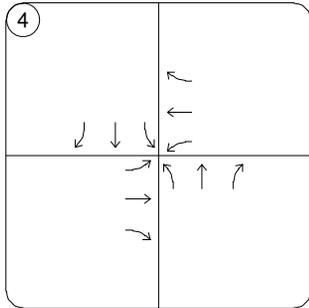
Sorry, can not follow pass-bys through and out of the site to the north, both peaks



PARKER ROAD ACCESS

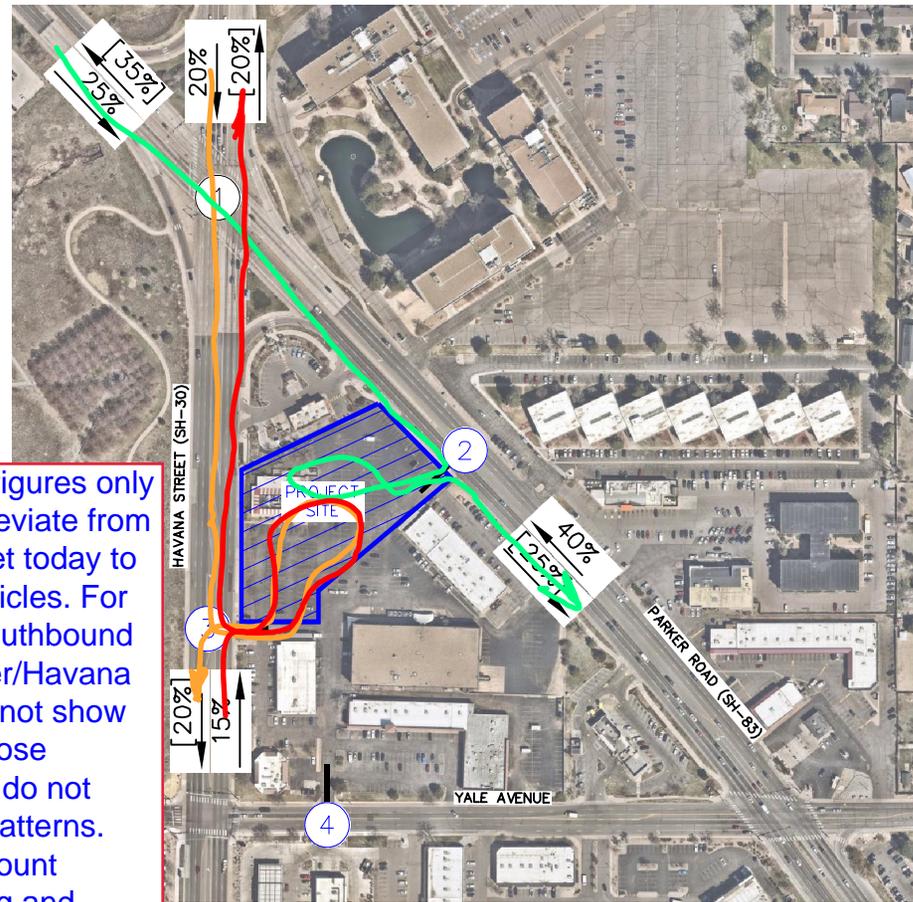


HAVANA STREET ACCESS



YALE AVENUE ACCESS

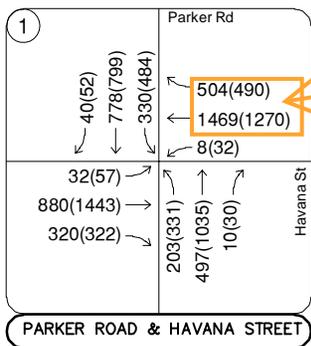
Our pass-by trip distribution figures only show the percentages that deviate from existing volumes on the street today to avoid double counting of vehicles. For example, we have 20% of southbound through movements at Parker/Havana (Intersection #1) but they do not show up on the figures because those movements occur today and do not deviate from existing travel patterns. The trip distribution cordon count matches the external entering and exiting percentages.



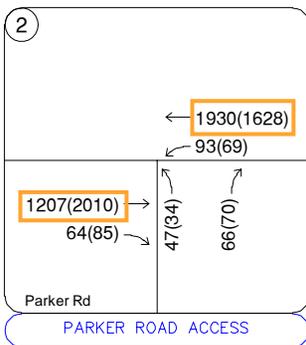
LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XX% External Trip Distribution Percentage
- XX%[XX%] Entering[Exiting] Trip Distribution Percentage

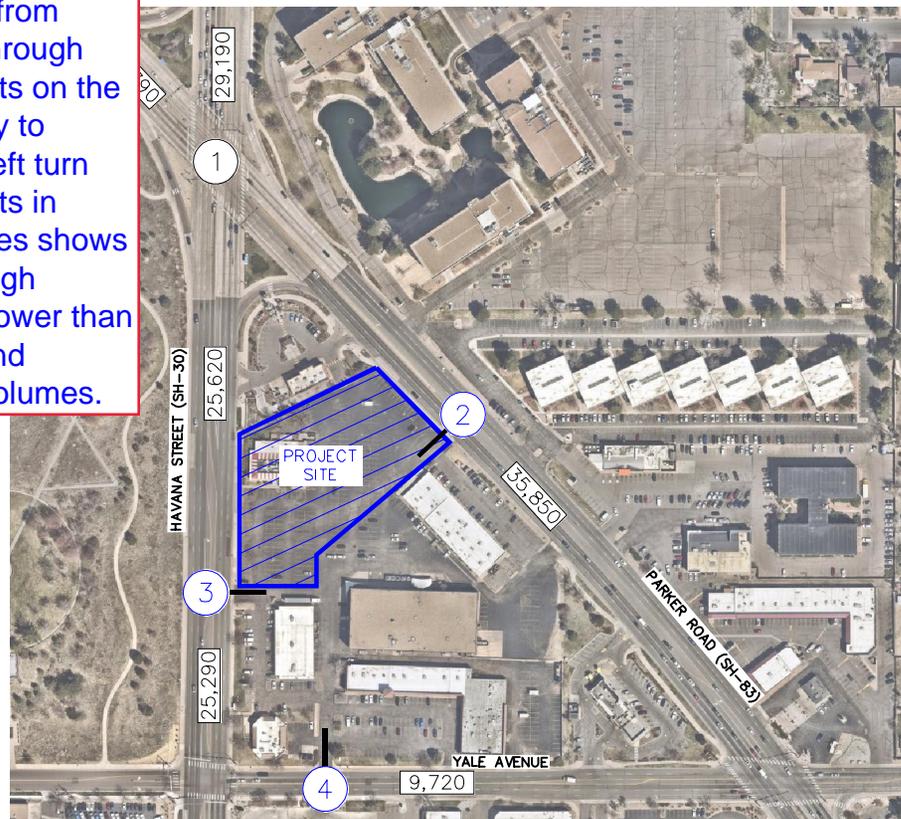
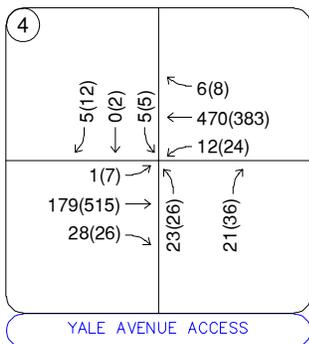
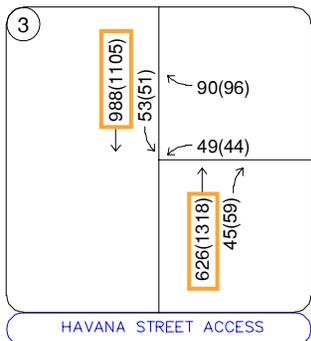
FIGURE 7
 QUIKTRIP 4263
 AURORA, COLORADO
 AM PASS-BY PROJECT TRIP DISTRIBUTION



Less traffic than Background, due to redistributed pass-bys?



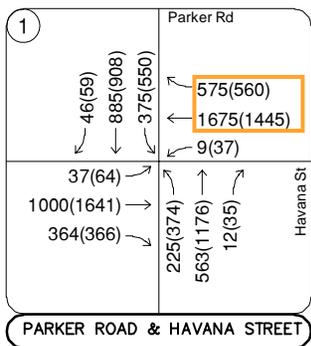
Correct, the pass-by percentages deviating from existing through movements on the road today to entering left turn movements in some cases shows total through volumes lower than background through volumes.



LEGEND

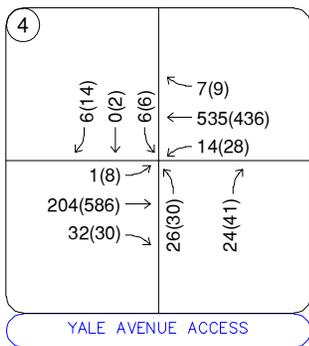
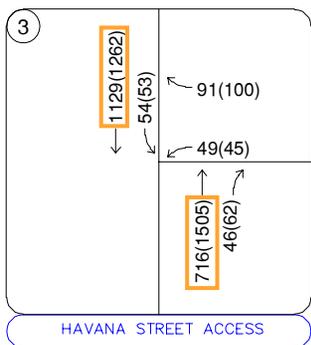
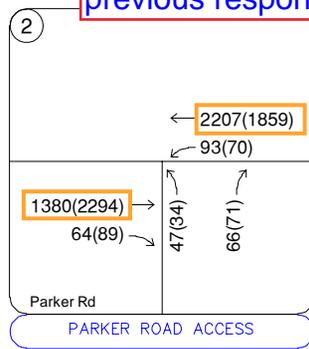
- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XXX(XXX) Weekday AM(PM)
Peak Hour Traffic Volumes
- XX,X00 Estimated Daily Traffic Volume

FIGURE 11
 QUIKTRIP 4263
 AURORA, COLORADO
 2026 TOTAL TRAFFIC VOLUMES



Same comment from 2026 Total

Please see previous response.



LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- XXX(XXX) Weekday AM(PM)
Peak Hour Traffic Volumes
- XX,X00 Estimated Daily Traffic Volume

FIGURE 12
 QUIKTRIP 4263
 AURORA, COLORADO
 2050 TOTAL TRAFFIC VOLUMES

Project Accesses

A project access analysis has been provided for the three existing full movement accesses along Parker Road (SH-83), Havana Street (SH-30), and Yale Avenue that currently serve the existing overall shopping center. The project access intersections currently provide stop control on the approaches exiting the existing development. Of note, a R1-1 “STOP” sign is recommended to be placed on the southbound approach, exiting the site onto Yale Avenue. **Table 4** provides the results of the level of service analysis for the project access intersections. As shown in the table, the three project access intersections are anticipated to have all movements operating with acceptable LOS D or better during the peak hours in the long-term horizon with the planned configuration.

Table 4 – Project Access Level of Service Results

Intersection	2026 Total				2050 Total			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS						
Parker Road Access								
Northbound Approach	15.5	C	19.8	C	17.9	C	24.1	C
Westbound Left	14.9	B	21.1	C	16.8	C	26.5	D
Havana Street Access								
Westbound	10.0	B	14.5	B	11.2	B	14.2	B
Southbound	10.0	B	2.0	B	9.5	A	12.7	B
Yale Avenue Access								
Northbound	11.4	B	11.4	B	11.4	B	13.4	B
Eastbound	8.2	A	8.2	A	8.6	A		
Westbound	8.1	A	8.1	A	7.7	A		
Southbound	1.7	B	1.7	B	13.1	B		

This entire section has been updated with more clarity and less confusion. Only the direct accesses have now been referenced while references to the adjacent intersection of Parker Road/Havana Street has been removed.

Revise 'leg' designations to match your Fig 2 directions

5.3 CDOT Access Permit Determination

The threshold for requiring an access permit along Colorado Department of Transportation (CDOT) roadways occurs when project traffic is anticipated to increase the existing access traffic volumes by more than 20 percent. Based on traffic projections, the addition of project traffic on the south leg of the Parker Road (SH-83) and east leg of the Havana Street (SH-30) project accesses are anticipated to increase existing traffic by more than 20 percent. Therefore, access permits are anticipated to be needed at these two intersections accesses as development occurs.

Unsure why this statement necessary, site does not 'access' the intersection directly

However, the addition of project traffic on the all four legs of Parker Road (SH-83) and Havana Street (SH-30) intersection is not anticipated to increase existing access traffic volumes by more

than 20 percent, Therefore, a CDOT access permit is not anticipated to be required in association with this project at the Parker Road (SH-83) and Havana Street (SH-30) intersection.

5.4 Auxiliary Turn Lane Warrant & Length Analysis

Auxiliary turn lanes along CDOT controlled highways are to be implemented based on volume threshold requirements set forth in the State Highway Access Code. Further, turn lane lengths should be designed based on the State Highway Access Code. Parker Road (SH-83) is classified as a Regional Highway (R-A) with a posted speed limit of 45 miles per hour. Whereas Havana Street (SH-30) is classified as a Non-Rural Arterial (NR-B) with a posted speed limit of 45 miles per hour. Additionally, the City of Aurora defaults to the Colorado Department of Transportation (CDOT) State Highway Access Code guidelines to determine if turn lanes are warranted at studied intersections. CDOT classifies their state highways based on roadway types. It is believed that Yale Avenue matches the characteristics of a CDOT Non-Rural Arterial (NR-C) roadway.

Of note, since Parker Road (SH-83) and Havana Street (SH-30) both provide three through lanes in each direction near the project accesses, the auxiliary right turn lane can be absorbed within the third through lane per CDOT guidelines. Additionally, southbound left turn lanes are already provided along Parker Road (SH-83) and Havana Street (SH-30) at the project access intersections within the existing two-way left turn center lane.

Adjust this sentence, not a TWLTL on Havana, just a striped SB left turn lane

However, the Yale Avenue access intersection turn lane guidelines will follow the State Highway Access Code for category NR-C roadways. Revised. The following threshold applies for determining the need for a turn lane:

- A left turn lane with storage length plus taper length is required for any access with a projected peak hour left ingress turning volume greater than 25 vehicles per hour (vph). If the posted speed is greater than 40 mph, a deceleration lane and taper is required for any access with a projected peak hour left ingress turning volume greater than 10 vph.
- A right turn lane with storage length plus taper is required for any access with a projected peak hour right ingress turning volume greater than 50 vehicles per hour. If the posted speed limit is greater than 40 miles per hour, a right turn lane deceleration lane and taper is required for any access with a project peak hour right ingress turning volume greater than 25 vehicles per hour.

Based on the 2050 traffic volume projections, turn lane requirements at the project access intersection along Yale Avenue are as follows:

- An eastbound left turn lane **is not** warranted along Yale Avenue at the existing access based on projected 2050 background plus project traffic volumes being eight (8) eastbound left turns during the peak hour and the threshold being 25 vph.
- A westbound right turn lane **is not** warranted along Yale Avenue at the existing access based on projected 2050 background plus project traffic volumes being nine (9) westbound right turns during the peak hour and the threshold being 50 vph.

5.5 Vehicle Queuing Analysis

A vehicle queuing analysis was conducted for the study area intersections. The queuing analysis was performed using Synchro presenting the results of the 95th percentile queue lengths. Results are shown in the following **Table 5** with calculations provided within the level of service operational sheets of **Appendix E** for unsignalized intersections and **Appendix F** for signalized intersections.

Table 5 – Turn Lane Queuing Analysis Results

Intersection Turn Lane	Existing Turn Lane Length	2026 Calculated Queue	2026 Recommended Length	2050 Calculated Queue	2050 Recommended Length
Parker Rd & Havana St					
Eastbound Left	475'	48'	475'	56'	475'
Westbound Left	550'	25'	550'	25'	550'
Westbound Right	425'	373'	425'	424'	-
Northbound Left	500'	437'	500'	192' DL	500'/ 375'
Southbound Left	325' DL	202' DL	325' DL	335' DL	325' DL
Parker Road Access					
Westbound Left	TWLTL	TWLTL	TWLTL	TWLTL	TWLTL
Havana Street Access					
Southbound Left	200'	25'	25'	25'	25'

DL = Dual Left Turn Lane; **Blue** Text = Recommendation; TWLTL= Two-Way Left Turn Lane

Chk Fig 2

Lengths updated to existing, 2026, and 2050.

The vehicle queues are all anticipated to remain within the existing turn lane lengths though the horizon. However, if 2050 volumes are realized, then the second northbound left lane is recommended to be striped to provide a length of 375 feet at the intersection of Parker Road (SH-83) and Havana Street (SH-30). The southbound left turn queue was calculated to exceed the provided capacity at the intersection of Parker Road (SH-83) and Havana Street (SH-30) by less than one car length under 2050 conditions. It is expected that there is at least one car length of additional queuing space within the taper length with additional space within the painted median; therefore, the southbound left turn lane is not recommended to be extended.

5.6 Crash Data Summary

Crash data was requested from CDOT along Parker Road (SH-83) and Havana Street (SH-30) in the vicinity of the project site for the latest three-year period where crash data is available (2020 – 2022). The crash data was summarized by severity, lighting, type, and location in **Tables 6, 7, 8, and 9**, respectively for Havana Street (SH-30). The crash data was summarized by severity, lighting, type, and location in **Tables 10, 11, 12, and 13**, respectively for Parker Road (SH-83).

Crash data sheets are provided in **Appendix G**.

Recommend removing, too detailed and IDs can not be publicized. The summarizes are fine

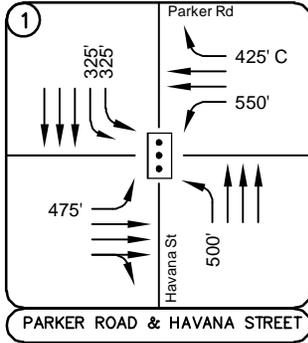
Table 6 – SH-30 Crash Data Summarize

Severity		2020		2021		2022		Total	
		#	%	#	%	#	%	#	%
Fatal	K	0	0%	Crash data has been removed from the Appendix.		0%	1	2%	
Evident, Incapacitating	A	0	0%			0%	0	0%	
Evident Non-Incapacitating	B	4	17%			21%	9	15%	
Possible/Complaint of Injury	C	6	25%	2	12%	4	21%	12	20%
No Injury (PDO)	O	14	58%	13	76%	11	57%	38	63%
Total		24		17		19		60	

Table 7 – SH-30 Crash Data Summarized by Lighting Conditions

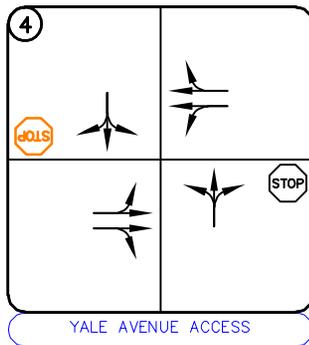
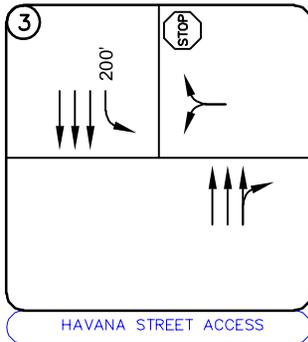
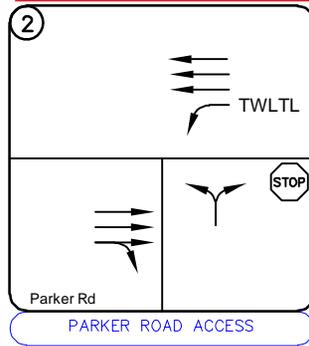
Lighting Condition	2020		2021		2022		Total	
	#	%	#	%	#	%	#	%
Daylight	14	58%	6	35%	15	79%	35	58%
Dawn or Dusk	3	13%	1	6%	0	0%	4	7%
Dark Lighted	5	21%	10	59%	4	21%	19	32%
Dark Un-Lighted	2	8%	0	0%	0	0%	2	4%
Unknown	0	0%	0	0%	0	0%	0	0%
Total	24		17		19		60	

NB and SB Turn Lanes Prior to Intersection



Chk storage
from Fig 2

Updated based on
changes to Figure 2.

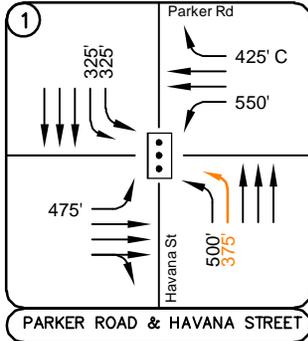


LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- ⋮ Signalized Intersection
- STOP Stop Controlled Approach
- ← Improvement
- ↪ 100' Turn Lane Length (feet)

FIGURE 13
 QUIKTRIP 4263
 AURORA, COLORADO
 2026 RECOMMENDED GEOMETRY AND CONTROL

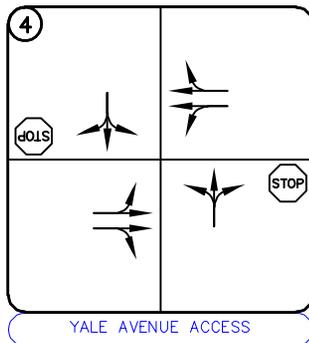
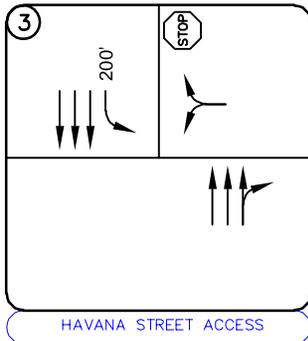
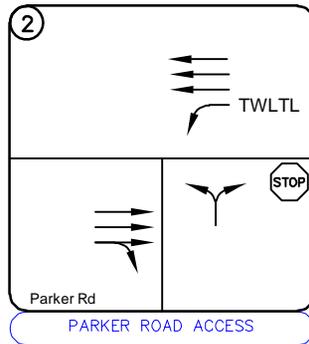
NB and SB Turn Lanes Prior to Intersection



Chk storage from Fig 2

Updated based on changes to Figure 2.

Note that CDOT could keep the existing lane configurations or implement NB dual left turn lanes operating lead/lag with the southbound left turn lane due to geometric constraints.



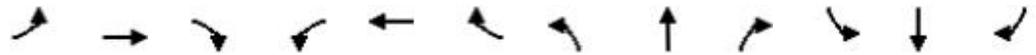
LEGEND

- (X) Study Area Key Intersection
- (X) Project Access Intersection
- ⋮ Signalized Intersection
- STOP Stop Controlled Approach
- ← Improvement
- ↩ 100' Turn Lane Length (feet)

FIGURE 14
 QUIKTRIP 4263
 AURORA, COLORADO
 2050 RECOMMENDED GEOMETRY AND CONTROL

HCM 7th Signalized Intersection Summary
 1: Havana St (SH-30)/Havana St (SH-30) & Parker Rd (SH-83)

2050 Background AM
 08/14/2024



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑		↘	↑↑	↗	↘	↑↑↑		↗	↑↑↑	
Traffic Volume (veh/h)	37	988	358	9	1697	581	185	545	0	369	879	0
Future Volume (veh/h)	37	988	358	9	1697	581	185	545	0	369	879	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width 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
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
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	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	39	1029	0	9	1768	0	193	568	0	384	916	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	114	2523		280	1687		190	802		415	872	
Arrive On Green	0.03	0.49	0.00	0.01	0.32	0.00	0.04	0.05	0.00	0.12	0.17	0.00
Sat Flow, veh/h	1781	5274	0	1781	3554	1585	1767	5233	0	3456	5274	0
Grp Volume(v), veh/h	39	1029	0	9	1768	0	193	568	0	384	916	0
Grp Sat Flow(s),veh/h/ln	1781	1702	0	1781	1777	1585	1767	1689	0	1728	1702	0
Q Serve(g_s), s	1.3	15.3	0.0	0.3	57.0	0.0	12.9	13.2	0.0	13.2	20.5	0.0
Cycle Q Clear(g_c), s	1.3	15.3	0.0	0.3	57.0	0.0	12.9	13.2	0.0	13.2	20.5	0.0
Prop In Lane	1.00		0.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	114	2523		280	1687		190	802		415	872	
V/C Ratio(X)	0.34	0.41		0.03	1.05		1.02	0.71		0.93	1.05	
Avail Cap(c_a), veh/h	134	2523		335	1687		190	802		415	872	
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	28.6	19.2	0.0	16.7	40.9	0.0	57.9	54.1	0.0	52.3	49.7	0.0
Incr Delay (d2), s/veh	1.8	0.5	0.0	0.0	35.7	0.0	69.5	2.9	0.0	26.7	44.5	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	0.6	6.1	0.0	0.1	34.1	0.0	9.8	6.2	0.0	7.2	12.3	0.0
Unsig. Movement Delay, s/veh			1.00			0.00			1.00			0.00
LnGrp Delay(d), s/veh	30.3	19.7	1.0	16.8	76.6	0.0	127.4	57.0	1.0	78.9	94.2	0.0
LnGrp LOS	C	B	A	B	F	A	F	E	A	E	F	A
Approach Vol, veh/h		1441			2382			761			1300	
Approach Delay, s/veh		15.2			56.9			74.9			89.7	
Approach LOS		B			E			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.8	65.8	20.9	25.5	10.1	63.5	19.4	27.0				
Change Period (Y+Rc), s	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5				
Max Green Setting (Gmax), s	5.0	55.6	14.4	19.0	5.0	55.6	12.9	20.5				
Max Q Clear Time (g_c+I1), s	2.3	17.3	15.2	15.2	3.3	59.0	14.9	22.5				
Green Ext Time (p_c), s	0.0	9.2	0.0	1.3	0.0	0.0	0.0	0.0				

Intersection Summary	Lead/Lag left turning phasing has been incorporated on the northbound and southbound approaches of this intersection and this can be confirmed with timing sheet on the following page.
HCM 7th Control Delay, s/veh	
HCM 7th LOS	
Notes	
Unsignalized Delay for [NBR, EBL, SBL, SBR]	and intersection delay.

Lead/lag expected as geometry might not allow dual protected only operation - okay with this CDOT comments supersede as required

Remove, or significantly modify/edit.

This has been removed.

APPENDIX G

Crash Data Sheets

