Kimley»Horn

September 15, 2020

Mr. Dallas Palmer
Trail Star Development, LLC
425 N. Wilcox Street
Suite 210
Castle Rock, CO 80104

Re: Slim Chickens – SWC Pine Lane and Parker Road
Traffic Compliance Letter
Parker, Colorado

Dear Mr. Palmer:

This traffic study letter has been prepared to provide a trip generation comparison to identify compliance with the original traffic impact study for a Slim Chickens restaurant to be developed as part of the Parker and Pine project in Parker, Colorado. An approximate 3,272 square foot Slim Chickens fast food restaurant with drive thru is proposed within a portion of the Parker and Pine site. The proposed fast food restaurant is located on a parcel within the development on the southwest corner of the Pine Lane and Parker Road intersection. Specifically, Slim Chickens is proposed directly on the southwest corner of the Parker Road right-in/right-out access intersection on Lot 3 (site plan attached). The site is currently undeveloped land. Kimley-Horn completed the "Parker and Pine Traffic Impact Study" in April 2020 which included this development area. The trip generation of this proposed fast food restaurant is compared with the trip generation for the applicable use evaluated as part of the original traffic study within the same development area. Applicable documents from the original traffic study are attached for reference.

Site Information and Trip Generation Comparison
Slim Chickens is proposed to contain an approximate 3,272 square foot restaurant building with drive thru. The original Parker and Pine traffic study identified development of two 3,000 square foot fast-food restaurants with drive thru for a total of 6,000 square feet of building space; therefore, the originally studied fast-food restaurant use was prorated to one (1) restaurant of 3,000 square feet and was compared with the development of this proposed Slim Chickens fast-food restaurant on Lot 3. Therefore, the purpose of this letter is to summarize a comparison of the trip generation from the proposed Slim Chickens site to the originally studied fast food restaurant use.

Site-generated traffic estimates are determined through a process known as trip generation. Rates and equations are applied to the proposed land use to estimate traffic generated by the development during a specific time interval. The acknowledged source for trip generation rates is the *Trip Generation Manual*[1] published by the Institute of Transportation Engineers (ITE). ITE has established trip rates in nationwide studies of similar land uses.

1 Institute of Transportation Engineers, *Trip Generation Manual*, Tenth Edition, Washington DC, 2017.

Trip generation for the original traffic study and the currently proposed land use is based on the ITE Trip Generation, 10th Edition (most current edition) average rates for Fast-Food Restaurant with Drive Through (ITE Land Use Code 934). The following table compares the trip generation from the original study compared to the expected trip generation for the proposed Slim Chickens site. The trip generation calculation sheets from the original traffic study, as well as from the current proposal are attached for reference.

Trip Generation Comparison: Original Study vs. Current Proposal

Use and Size	Daily Vehicle Trips	Weekday Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Original Traffic Study – Fast Food Restaurant							
Fast-Food Restaurant w/ DT (ITE 934) – 3,000 Square Feet	1,414	62	59	121	51	47	98
Current Proposal – Slim Chickens Fast Food Restaurant							
Fast-Food Restaurant w/ DT (ITE 934) – 3,272 Square Feet	1,542	67	65	132	56	51	107
Net Difference in Trips	***+128***	***+5***	***+6***	***+11***	***+5***	***+4***	***+9***

As summarized in the table, one fast food restaurant originally studied was anticipated to generate approximately 1,414 weekday daily trips, with 121 of these trips occurring during the morning peak hour, and 98 trips occurring during the afternoon peak hour. The proposed Slim Chickens restaurant is expected to generate 1,542 weekday daily trips, with 132 trips occurring during the morning peak hour, and 107 trips occurring during the afternoon peak hour according to the ITE trip equations based on building area. The proposed Slim Chickens is anticipated to generate 11 more trips during the morning peak hour and nine (9) more trips during the afternoon peak hour than previously studied.

When comparing to the total number of trips generated by the Parker and Pine project, the increase in traffic is anticipated to account for only an increase of approximately 1.4 percent of the daily traffic (128 trips / 9,088 trips). Likewise, the morning peak hour trips are anticipated to increase by only 1.5 percent (11 / 736), while the afternoon peak hour trips are anticipated to increase by 1.2 percent (9 / 782). This is a very low increase in traffic volume, accounting for about 10 additional trips per hour than the daily volume previously evaluated. Therefore, this traffic volume isn't anticipated to change the identified level of service of the adjacent intersections, so the results and conclusions of the original traffic study remain valid. It is believed that the recommended improvements to the surrounding street network will be sufficient to accommodate the additional traffic to be generated by this project. It should be noted the original study assumed two 3,000 square foot fast food restaurants; therefore, 2,728 square feet of fast food restaurant space can still be developed within the overall development to remain in overall traffic compliance with this specific use.

Drive-Through Queuing Analysis
As provided in the Institute of Transportation Engineers (ITE) Drive-Through Queue Generation, 1st Edition, by Mike Spack, P.E., PTOE (data and information attached), the recommended vehicle queue length for fast food restaurants with drive-thru is 240 feet or 12 vehicles, represented by the 85th percentile queue. As shown in the attached site plan, the queue of cars anticipated to be accommodated specifically within the drive-through lane is nine (9) vehicles, with room along the south side of the site to accommodate an additional five (5) vehicles if needed for a total 14 vehicle queue length. Therefore, it is believed that the site has been designed with an appropriate configuration to accommodate the drive-through queueing needs onsite.

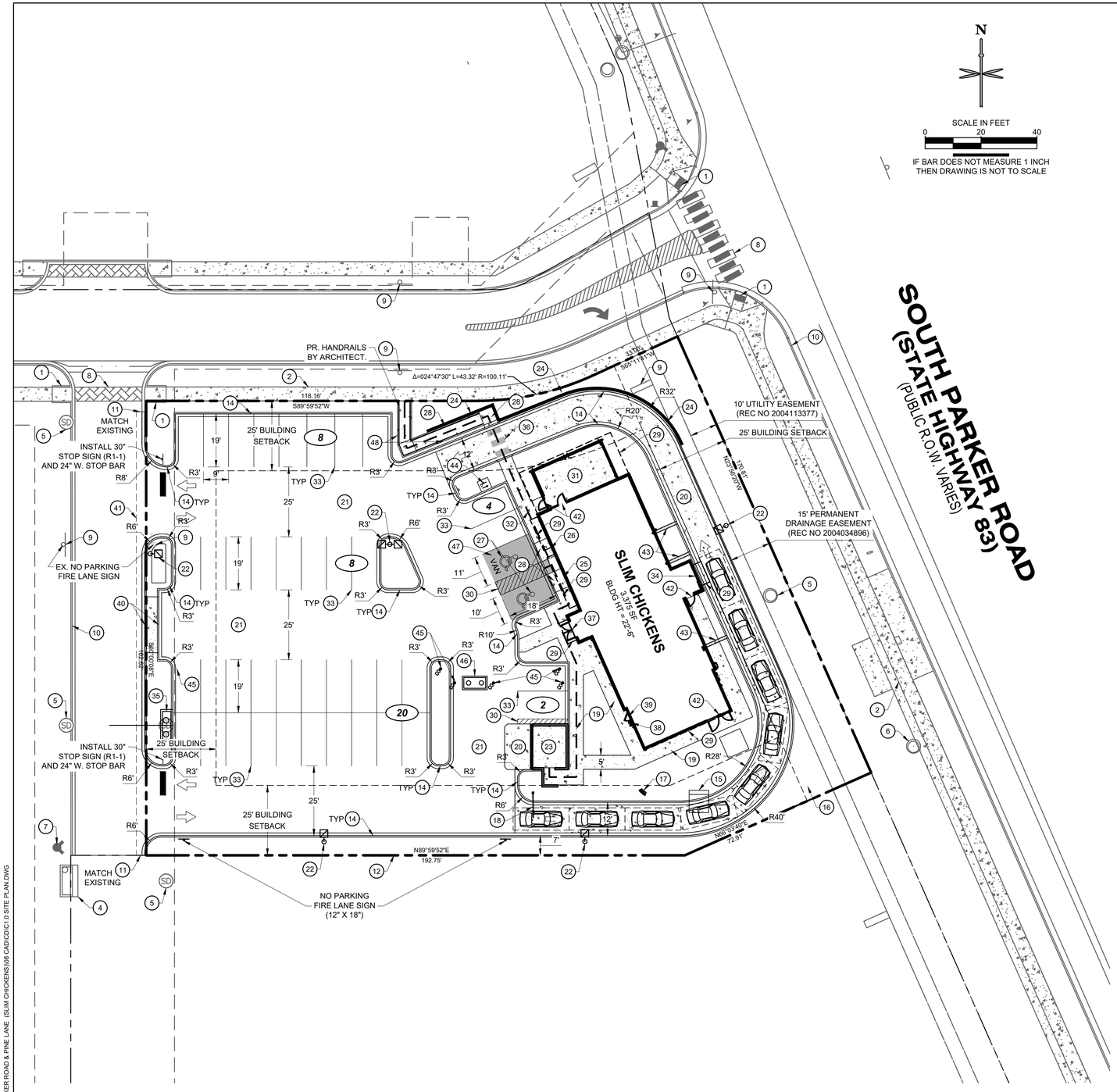
Conclusions
The proposed Slim Chickens within the Parker and Pine development is anticipated to slightly increase traffic (by approximately one (1) percent) from what was previously studied within the original "Parker and Pine Traffic Impact Study" prepared by Kimley-Horn and Associates, dated April 2020. However, it is believed that development of this 3,272 square foot Slim Chickens to be located on Lot 3 within the Parker and Pine development will not change the results or conclusions of the original traffic study. It is believed that the surrounding street network has been constructed sufficiently to accommodate the traffic to be generated by this project. Please let us know if you have any questions or require anything further.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

Curtis D. Rowe, P.E., PTOE
Vice President

Conceptual Site Plan



SITE SCHEDULE

1. EXISTING ADA RAMP TO REMAIN
2. EXISTING SIDEWALK TO REMAIN
3. EXISTING PROJECT MONUMENT SIGN TO REMAIN.
4. EXISTING STORM INLET TO REMAIN
5. EXISTING STORM MANHOLE TO REMAIN
6. EXISTING SANITARY MANHOLE TO REMAIN
7. EXISTING FIRE HYDRANT TO REMAIN
8. EXISTING CROSSWALK STRIPING
9. EXISTING SIGN TO REMAIN
10. EXISTING CURB AND GUTTER TO REMAIN
11. BEGIN CURB CUT. MATCH EXISTING CURB AND PROVIDE AN EXPANSION JOINT AT THE INTERFACE WITH EXISTING.
12. PROPERTY LINE
13. PROPOSED PAINT 4" SOLID WHITE DRIVE-THRU STRIPING.
14. PROPOSED CURB AND GUTTER (TYP.)
15. PROPOSED DRIVE-THRU ORDER SCREEN. REFER TO ARCHITECTURAL PLANS UNDER A SEPARATE COVER.
16. PROPOSED 8'X8' ELECTRICAL TRANSFORMER PAD. GENERAL CONTRACTOR TO PROVIDE CONCRETE PAD PER MANUFACTURER'S SPECIFICATIONS. REFER TO MEP PLANS FOR TRANSFORMER DESIGN AND DETAILS.
17. PROPOSED DRIVE-THRU MENU BOARD. REFER TO ARCHITECTURAL PLANS UNDER A SEPARATE COVER.
18. PROPOSED DRIVE-THRU CLEARANCE BAR & ENTRY SIGNAGE. REFER TO ARCHITECTURAL PLANS UNDER A SEPARATE COVER.
19. PROPOSED CONCRETE SIDEWALK
20. PROPOSED CONCRETE PAVEMENT
21. PROPOSED ASPHALT PAVEMENT
22. APPROX. LOCATION OF PROPOSED LIGHT POLES, BASE, AND FIXTURE. REFER TO PHOTOMETRIC PLAN UNDER SEPARATE COVER. (TYP.)
23. PROPOSED TRASH ENCLOSURE. REFER TO ARCHITECTURAL PLANS UNDER SEPARATE COVER.
24. PROPOSED SEGMENTAL BLOCK RET. WALL - DESIGN BY OTHERS.
25. PROPOSED ADA PARKING SIGNAGE R7-8 MOUNTED ON BUILDING
26. PROPOSED ADA HANDICAP VAN ACCESSIBLE SIGN R7-8 AND R7-8A MOUNTED ON BUILDING
27. PROPOSED PAINT HC PARKING SYMBOL
28. PROPOSED ADA RAMP
29. PROPOSED BUILDING OVERHANG. REFER TO ARCHITECTURAL PLANS UNDER SEPARATE COVER.
30. PROPOSED PAINT 4" SOLID WHITE PARKING STRIPS AT 16" O.C. AN 45° TO THE DIRECTION OF TRAFFIC. BORDER TO BE 4" SOLID WHITE LINE.
31. PROPOSED COVERED PATIO AREA (397 SF). REFER TO ARCHITECTURAL PLANS UNDER A SEPARATE COVER.
32. PROPOSED ADA ROUTE
33. PROPOSED PAINT 4" 90° SOLID WHITE PARKING STRIP (TYP.)
34. PROPOSED DRIVE-THRU WINDOW
35. PROPOSED STORM INLET
36. PROPOSED CROSSWALK STRIPING
37. FACILITY MAIN PUBLIC ENTRY
38. PROPOSED FDC
39. FIRE RISER ROOM
40. MOUNTABLE CURB AND PAVEMENT FOR FIRE VEHICLE ACCESS
41. PROPOSED 2' SAWCUT ADJACENT TO PROPOSED SITE ACCESS.
42. SECONDARY ENTRANCE
43. PROPOSED SIDEWALK CHASE
44. PROPOSED BIKE RACK
45. PROPOSED HS-20 TRAFFIC RATED SANITARY SEWER CLEANOUT
46. PROPOSED 1,500 GALLON GREASE INTERCEPTOR
47. SCREENED AREA DEFINES ADA COMPLIANT ZONE OF ACCESSIBILITY FROM BUILDING FRONT ENTRANCE TO HANDICAP PARKING STALLS. CROSS SLOPE NOT TO EXCEED 2% IN ALL DIRECTIONS.
48. CURB TURN DOWN

LEGEND

- PROPERTY LINE
- OFF-SITE PROPERTY LINE
- PROPOSED BUILDING
- # PARKING COUNT
- EXISTING CURB AND GUTTER
- PROPOSED 6" CURB AND GUTTER
- EXISTING SITE LIGHTING
- EXISTING FIRE HYDRANT
- PROPOSED CONCRETE PAVEMENT
- DENOTES TRAFFIC FLOW PATTERNS
- DENOTES ADA ROUTE
- PROPOSED SITE LIGHTING
- EXISTING STORM INLET
- EXISTING SANITARY/STORM MANHOLE
- EXISTING SIGN
- PROPOSED SIGN
- PROPOSED STORM INLET AND MANHOLE

GENERAL NOTES:

1. ALL ITEMS IN SCHEDULE ARE PROPOSED UNLESS NOTED OTHERWISE.
2. ALL EXISTING UTILITIES AND SITE FEATURES TO REMAIN UNLESS NOTED OTHERWISE.
3. ALL CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH STANDARD SPECIFICATIONS OF ALL GOVERNING JURISDICTIONS AS APPLICABLE.
4. EMERGENCY AND SERVICE TRUCKS WILL MANEUVER THROUGH DRIVE AISLES IN A ONE-WAY TRAFFIC MOVEMENT.
5. CARS/TRUCKS WILL MANEUVER AROUND BUILDING DRIVE AISLES IN A TWO-WAY TRAFFIC MOVEMENT UNLESS OTHERWISE NOTED FOR SPECIFIC DRIVES.
6. HANDICAP PARKING AREAS PROVIDED PER TOWN STANDARDS AND SHALL COMPLY WITH REQUIREMENTS OF THE CURRENT, ADOPTED UNIFORM BUILDING CODE.
7. CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS FOR PRECISE BUILDING DIMENSIONS, SERVICE AREA, DIMENSIONS, AND ELEVATIONS.
8. THE DISPOSAL OF DEMOLISHED ITEMS SHALL COMPLY TO ALL STATE AND LOCAL REQUIREMENTS.
9. MECHANICAL UNITS, DUMPSTERS AND TRASH COMPACTORS SHALL BE SCREENED IN ACCORDANCE WITH THE TOWN ZONING ORDINANCE.
10. ALL SIGNAGE CONTINGENT UPON APPROVAL BY THE TOWN. ALL SIGNS SHALL BE INSTALLED IN ACCORDANCE WITH THE ZONING ORDINANCE.
11. ALL ACCESSIBLE RAMPS SHALL HAVE A MAXIMUM SLOPE OF 12:1.
12. SIDEWALKS SHALL NOT EXCEED 2% CROSS SLOPE.
13. THE SLIM CHICKENS HOURS OF OPERATION WILL BE 12 HOURS A DAY.
14. THERE ARE NO USES WITHIN THE SLIM CHICKENS PROJECT THAT UTILIZE OR GENERATE ANY SIGNIFICANT QUANTITIES OF TOXIC MATERIAL.
15. ALL DIMENSIONS ARE FLOWLINE TO FLOWLINE UNLESS OTHERWISE NOTED.
16. ALL PARKING LOT STRIPING SHALL BE WHITE.
17. UNLESS OTHERWISE NOTED, ALL RADII ON PARKING ISLAND SHALL BE 3'.
18. THE CONTRACTOR SHALL OBTAIN THE LATEST CAD FILE OF SITE IMPROVEMENTS FROM THE ENGINEER OF RECORD FOR HORIZONTAL AND VERTICAL SURVEY CONTROL PRIOR TO CONSTRUCTION. CONTRACTOR TO VERIFY WITH ENGINEER OF RECORD ANY DISCREPANCIES BETWEEN THE CAD FILES AND CONSTRUCTION PLANS PRIOR TO INSTALLATION OF PLAN IMPROVEMENTS.
19. SEE ARCHITECTURAL PLANS FOR BUILDING DIMENSIONS.

THE TOWN OF PARKER REVIEW CONSTITUTES GENERAL COMPLIANCE WITH THE TOWN'S STANDARDS AND APPROVED VARIANCES, SUBJECT TO THESE PLANS BEING STAMPED, SIGNED, AND DATED BY THE PROFESSIONAL ENGINEER OF RECORD. REVIEW BY THE TOWN DOES NOT CONSTITUTE APPROVAL OF THE PLAN DESIGN OR ACCURACY AND CORRECTNESS OF ENGINEERING CALCULATIONS. ERRORS IN THE DESIGN OR CALCULATIONS REMAIN THE RESPONSIBILITY OF THE REGISTERED PROFESSIONAL ENGINEER WHOSE STAMP AND SIGNATURE ARE AFFIXED TO THIS DOCUMENT. THIS REVIEW DOES NOT CONSTITUTE APPROVAL OF ANY PRIVATE ON-SITE IMPROVEMENTS WHICH MAY BE SHOWN. CONSTRUCTION CANNOT COMMENCE UNTIL ALL REQUIRED DRAINAGE/TRAFFIC REPORT(S), FINAL DEVELOPMENT PLAN(S), SPECIAL REVIEW(S), GRADING PERMIT, AND/OR OTHER PERMITS ARE COMPLETE, APPROVED AND ON FILE WITH THE TOWN OF PARKER.

TOWN OF PARKER, DIRECTOR OF ENGINEERING/PUBLIC WORKS — DATE

811 CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811
CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.
Know what's below. Call before you dig.

P:\TRAIL STAR DEVELOPMENT\CO, PARKER - PARKER ROAD & PINE LANE (SLIM CHICKENS)\08 CAD\C\D\C1.0 SITE PLAN.DWG

No.	REVISION	BY	DATE

EES
ENTITLEMENT AND ENGINEERING SOLUTIONS, INC.
501 S Cherry St, Suite 300
Glendale, CO 80246
303-572-7997 www.ees.us.com

Life Changing Chicken
SLIM CHICKENS
Chicken Tenders — Buffalo Wings — Sandwiches — Salads — Wraps

SITE PLAN
SLIM CHICKENS
SWC OF S. PARKER ROAD AND E. PINE LANE, PARKER, CO 80134

SITE PLAN

PROJECT NO:	TSD003.01
DESIGNED BY:	CAM
DRAWN BY:	CAM
DATE:	06/15/2020

C1.0

Trip Generation Calculations

Kimley»Horn

Project	Slim Chickens Parker & Pine				
Subject	Trip Generation for Fast-Food Restaurant with Drive-Through Window				
Designed by	JRP	*Date*	June 15, 2020	*Job No.*	096099002
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Fast Food Restaurant With Drive-Through Window (934)

Independant Variable - 1000 Square Feet Gross Floor Area (X)
Gross Floor Area = 3,272 Square Feet
X = 3.272
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series page 158)

Average Weekday — Directional Distribution: 51% ent. 49% exit.
T = 40.19 (X) — T = 132 Average Vehicle Trip Ends
T = 40.19 * 3.272 — 67 entering 65 exiting

67 + 65 (*) = 132

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series page 159)

Average Weekday — Directional Distribution: 52% ent. 48% exit.
T = 32.67 (X) — T = 107 Average Vehicle Trip Ends
T = 32.67 * 3.272 — 56 entering 51 exiting

56 + 51 = 107

Weekday (900 Series page 157)

Average Weekday — Directional Distribution: 50% entering, 50% exiting
T = 470.95 (X) — T = 1542 Average Vehicle Trip Ends
T = 470.95 * 3.272 — 771 entering 771 exiting

771 + 771 = 1542

Saturday Peak Hour of Generator (900 Series page 163)

Directional Distribution: 51% ent. 49% exit.
T = 54.86 (X) — T = 180 Average Vehicle Trip Ends
T = 54.86 * 3.272 — 92 entering 88 exiting

92 + 88 = 180

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour = 51% Non-Pass By — PM Peak Hour = 50% Non-Pass By

	IN	Out	Total	
AM Peak	34	33	67	
PM Peak	28	26	54	
Daily	386	386	772	PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour = 49% Pass By — PM Peak Hour = 50% Pass By

	IN	Out	Total	
AM Peak	33	32	65	
PM Peak	28	26	54	
Daily	385	385	770	PM Peak Hour Rate Applied to Daily

Slim Chickens Trip Generation Comparison

Land Use	Weekday Vehicle Trips						
	Daily	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Original Traffic Study - ITE 10th Edition							
All Land Uses	9,088	363	373	736	399	383	782
Current Proposal - ITE 10th Edition							
All Land Uses	9,216	368	379	747	404	387	791
Net Change	128	5	6	11	5	4	9
Percentage Change	1.4%	1.4%	1.6%	1.5%	1.3%	1.0%	1.2%

Drive-Through Queueing Information

Institute of Transportation Engineers
A Community of Transportation Professionals

Summer E-Newsletter

Traffic Engineering Council - Summer 2012

In This Issue

Executive Committee

- Troy A. Peoples, P.E., Chair
- Lynn A. LaMunyon, P.E., PTOE, Vice Chair
- Albert E. Schaufler, P.E., Vice Chair
- Jess J. Billmeyer, P.E., PTOE
- W. Martin Bretherton

Message from the Chair

By Troy A. Peoples, P.E.

Summer is upon us! The 2012 ITE Annual Meeting and Exhibit in Atlanta is scheduled for August 12 thru 15. The Traffic Engineering Council (TENC) will be having an Executive Committee meeting. Make sure you check Upcoming Events on the TENC page on the ITE Community for the date, time and location. If you plan on being in Atlanta, GA, I encourage you to come to our meeting and take the opportunity to provide insight and feedback and discover how you can contribute directly to the Council and give back to the profession. Also be sure to check out the workshop being sponsored by the TENC SimCap Committee: The *Traffic Study of the Future: New and Emerging Trends in Traffic Analysis Tools and Methods* scheduled for Monday, August 13 from 11:00 am until 12:00 pm. There are a lot of other extremely informative presentations on the agenda at the Annual Meeting so I hope you will plan to attend.

This summer the TENC is participating in activities at the TRB Signal Systems Committee meeting being held at the Beckman Center in Irvine, CA on July 23-24. More specifically TENC members are involved with the sessions on *Alternative Geometrics to Improve Signal Operations and a Diverging Diamond Signal Timing Competition*. If you have interest in attending, contact Susan Langdon, the TENC District/Section Representative

Jr., P.E.
- John A. Davis, P.E., PTOE, TSOS
- Matthew R. Davis, P.E., PTOE, TSOS
- Christa A. Greene, P.E.
- James T. Harris, TSOS
- David Hurwitz
- Beverly T. Kuhn, Ph.D.
- Susan Langdon, P.E., PTOE
- Gordon E. Meth, P.E., PTOE, PTP
- Orla H. Pease, P.E., PTOE
- David A. Petrucci, Jr., P.E., PTOE
- Troy A. Rother, P.E.
- Richard F. Ryan, P.E.
- Douglas E. Smith, P.E.
- Kevin J. Sylvester, P.E., PTOE
- Lisa M. Fontana Tierney, P.E.
- David E. Woosley, P.E.
- Peter J. Yauch, P.E.

Chair, at susan@savantgroupinc.com.

If you have not visited the ITE Community recently, I want to encourage you to check it out and see what a great resource it can be. Go to www.ite.org and click the ITE Community tab at the top of the webpage. From there, you will need to log in to your ITE Account by clicking "log in to see member only content" near the top right side of the page. There are several places to find out the current "hot topics" and find out more about what is going on around the Country. An active discussion on the All Member Forum is related to Flashing Yellow Arrows. Based on the feedback from all around the US, many Cities have now adopted Flashing Yellow Arrows as the standard after a successful pilot program. Local studies are referenced for operations and crash analysis where these signals are installed. The discussion also addresses clearance intervals and if additional signing is needed at these locations. If you are interested in this or a wide variety of other topics, check out the Traffic Engineering Council Forum and All Member Forum on the ITE Community. To access the All Member Forum or go to www.ite.org and log in; click the ITE Community tab at the top of the webpage then lick "Communities" under Quick Links; select the All Member Forum and do a search for Flashing Yellow Arrows.
ITE has also established five new panels to address ways of identifying and responding to evolving hot issues (i.e., ensuring that content needs reflect the state of the science, the feasibility of accommodating e-book publications, membership training), and other related member needs. Those panels include a Traffic Engineering Handbook Panel, Transportation Planning Handbook Panel, Trip Generation Handbook Panel and two Professional Development Panels. The TENC has recommended council members for consideration as possible participants in this process.

As you can see, there's a lot going on in the TENC! You need not be a veteran member of the council to volunteer, nor do you need to commit to extensive travel to become involved. You just need to be energetic, full of great and innovative ideas about involving members in our activities and willing to devote a small amount of your time. If you are interested in volunteering for council activities, simply contact Christa Greene (christa.greene@stantec.com) at 919-210-5116 or me. You won't regret it!

As always, do not hesitate to contact me if you have any questions about any of these items or anything else related to the council. I would love to hear from you and I hope you take advantage of all of the wonderful opportunities from ITE and the council.

(troy.peoples@stantec.com).

Drive-Through Queue Generation, 1st Edition

By Mike Spack, P.E., PTOE

Wells Fargo drive-through, Friday March 23, 2012 at 9:30am in St. Louis Park, Minnesota

Businesses with drive-through lanes are commonplace in the United States. Yet, up-to-date queue-generation data isn't available. The most recent ITE article published on the topic was in 1995 (ITE Technical Council Committee 5D-10) using data collected between the late 1960s and early 1990s.

Things have changed in the past 17 years, and we felt it was necessary to create an up-to-date report that provided accurate queuing data for businesses with drive-through lanes to aid engineers and site designers. We modeled our data collection similar to that of the Institute of Transportation Engineers' Trip Generation and Parking Generation reports and a presentation by Mark Stuecheli at the 2009 ITE Annual Meeting that concentrated on bank and coffee shop drive-through lanes.

Of course, this type data collection effort is daunting if we're putting people in the field to count cars. Our traffic innovation firm (CountingCars.com) solved this issue by developing new hardware and software systems. For this project, we used portable COUNTcams to collect 1,220 hours of drive-through video footage for up to five straight days at a minimum of six locations for each land use. Videos were collected throughout Minneapolis and several suburbs between 2010 and 2012 at banks, car washes, coffee shops, fast food restaurants and pharmacies.

The 1,220 hours of videos were watched in 120 labor hours at high speeds using PC-TAS counting software and maximum queues throughout the day were recorded. 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.

Starbucks drive-through, Friday, March 23, 2012 at 9:15am in St. Louis Park, Minnesota

Once the maximum queue length 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 (see Table 1).

Designers can choose whether the average maximum queue or the 85th percentile maximum should be designed to. As conservative engineers, we lean towards the 85th percentile maximum. We recommend using the following design queues (assuming each vehicle occupies 20 feet in the queue, which matches our observations):

- **Banks**: 160 feet (*eight vehicles*)
- **Car washes**: 140 feet (*seven vehicles*)
- **Coffee shops**: 260 feet (*13 vehicles*)
- **Fast food restaurants**: 240 feet (*12 vehicles*)
- **Pharmacies**: 100 feet (*five vehicles*)

	Fast Food	Coffee Shops	Banks	Pharmacies	Car Washes
Number of Data Points	14	26	21	12	12
Average Maximum Queue (vehicles)	8.50	10.23	5.76	2.92	4.42
Standard Deviation (vehicles)	2.68	2.76	2.21	1.16	2.31
Coefficient of Variation	32%	27%	38%	40%	52%
Range (vehicles)	5 to 13	3 to 16	1 to 10	1 to 5	1 to 10
85th Percentile (vehicles)	12.00	13.00	8.00	4.05	6.20

33rd Percentile (vehicles)	7.90	9.91	5.00	2.00	3.00

Table 1 - Queue Statistics

Fast food restaurants and coffee shops have the longest maximum queues of the five land uses observed. Coffee shops have a maximum 85th percentile queue of 13 vehicles and fast food restaurants have a maximum 85th percentile queue of 12 vehicles. Coffee shops have a tendency for the morning queues to build up so long that they spill out onto the street, though, as is expected, their afternoon and evening queues are minimal. Fast food restaurants typically have sizeable queues, but they tended to have enough dedicated space that stacking did not go beyond the designated queuing area. Bank and pharmacy drive-through lanes seem to be significantly over-designed for today's use. Car washes also seem to be significantly overdesigned, but they can have significant peaks in Minnesota based on weather conditions. We may not have observed extreme peak conditions.

To read the full study, including data from each site observed, please visit MikeonTraffic.com.

Flexible Roundabout Design: Redesign of Park City's 10 Year Old Deer Valley Roundabout

By Bill Baranowski, P.E.

Abstract:

The Park City Deer Valley Roundabout was constructed in 2000 for the 2002 Winter Olympics in Salt Lake City, UT. Note that recent presidential contender Mitt Romney, coming from Boston where they have large old rotary intersections, to take charge of the Winter Olympics required extensive testing of the new roundabout in 2001.The roundabout was state of the art when it was constructed at a difficult location connecting two ski resorts and a main street shopping area and the Olympic Transit Station near Park City. It included innovative construction staging, hazardous materials, steep slopes, pedestrian trail, bicycle tunnel and a very active transit center. The area also receives up to 500 inches of snow during the winter. After the Olympics left town parts of the roundabout needed changes and requests from Deer Valley ski resort required other changes to the basic design of the roundabout. The design and construction of these changes cost only $40,000 but resulted in a more effective and safer roundabout operation for all users. It is unique in that it now includes a turbo island that separates traffic streams on one of the legs.

www.westernite.org/annualmeetings/alaska11/Compendium/Moderated%20Session%20Papers/3C-Bill%20Baranowski.pdf

Stuck In Traffic? Looking For Greener Options? Want To Save Lives? Consider This ...

By Phil Rust, Roundabout Communications Chair

At the 2010 Vancouver meeting, Rock Miller issued a challenge to the roundabout committee: create a roundabout policy for ITE that reflects the current stature of roundabouts in the profession and one that properly credits good design for this achievement. This March, ITE formally adopted the following policy:
ITE "recognizes the safety, operational, and sustainability benefits of well-designed roundabouts and recommends the use of roundabouts be considered when intersections are being planned, designed or modified."

The roundabout committee appreciates everyone who helped direct ITE's attention toward using well-designed roundabouts to meet the difficult transportation challenges facing us today. For more ITE policies, please visit the following link: www.ite.org/aboutite/policies.pdf

To learn more about roundabouts or the roundabout committee, please visit the following link: www.ite.org/councils/traffic/roundabout.asp

Hot Topics in the Traffic Engineering Council Discussion Group

By Jim Harris, TSOS, MITE

We are in our fourth quarter since the switch from the popular Traffic Engineering Council Listserv group discussion to the ITE Community Group Discussion. It continues to go well and to grow in popularity although there is some competition from the All Member Forum. If you haven't made the move and wish to, use the following steps:

1. Log onto ITE Community at http://community.ite.org with your ITE username and password.
2. Select **My Profile -> My Subscriptions**.
3. Select **Real Time**, **Daily Digest** or **Legacy** next to Traffic Engineering Council.
4. If you wish, select other groups in the list as well.
5. Save.

Benefits of the updated discussion group are:

- The discussion e-mails you receive in your inbox will now include links to posters' professional profiles.
- All e-mail attachments will automatically be added to the searchable Library on ITE Community.
- You can easily update your subscription setting at any time (including no e-mails while on vacation).
- No more "Out-of-Office" emails.
- Searching the archive on ITE Community will bring up relevant discussions and documents to any group you belong to, not just the Traffic Engineering Council.
- Access to the ITE Traffic Listserv archives.
- Only current ITE/Traffic Engineering Council members can participate.

For you LinkedIn members, ITE's Zach Pleasant added a feature to ITE Community that allows you to create a profile by importing directly from your LinkedIn profile. Now there's no need to cut, paste or keep two profiles up-to-date. Log into ITE Community at http://community.ite.org, select My Profile and Import from LinkedIn.

If you have any questions about ITE Community, please ask. He's happy to help: Zach Pleasant, Information Services Manager, Phone: 202-785-0060 ext. 120, E-mail: zpleasant@ite.org.

Several topics generated a lot of discussion this quarter. Here are several of the more popular:

1. "The 2009 MUTCD was recently adopted in California with revisions. The California MUTCD contemplates an optional pedestrian walking speed study to guide the development of pedestrian clearance interval timing. The relevant portion reads: "A walking speed between 3.5 and 4 feet per second may be used for the pedestrian clearance time if an engineering study at a representative location documents that it is sufficient to accommodate the walking speed of the 15th percentile pedestrian." (Elsewhere, 15th percentile is defined as the speed at which 85% of pedestrians walk at or faster.)
   I am interested in undertaking such a study and am looking for guidelines for such a study which would form a reasonable starting point. Ruminations are also welcome. I've come up with the following thoughts thus far:
   - Any particular intersection needs but one "representative location." I am thinking about collecting data at locations that are representative of school zones, residential areas not near schools, commercial areas, and office areas. We also have a senior center and I would include the nearby intersection there. Then the data would be reported and guidance developed for our use at intersections that have similar characteristics. I recognize that residential areas can be further stratified and also that I am omitting, e.g. industrial areas, but these can be considered separately at a later date.
   - With respect to how to conduct the study, the guidelines for engineering and traffic surveys (e.g. speed surveys) come to mind. (I recognize this is a California term but I presume at least some other states perform similar analyses.) Thus, off-peak (i.e. non-commuting pedestrians) may be desirable for the same reasons as they are

recommended for speed surveys; dry conditions would be a prerequisite; aim for at least 50 crossers, with 100 desired.
    - But, there would be distinctions drawn with the engineering and traffic survey. For instance, since every pedestrian can independently select his/her own speed, one need not just get the fastest or slowest pedestrian in a group (i.e. the analogy to the lead car in a platoon would not apply). I would also not consider anomalous crossings, e.g. the person who turns around part of the way across (perhaps forgot something), or the person who runs.
    - Please critique and/or supplement. I appreciate any input provided."

2. "What is the ADA requirement for clear path of travel (e.g., for sidewalks)? Is it 36 inches or 48 inches? A colleague mentioned the standard had changed to 48 inches."

3. "I am looking for thoughts on a cost/benefit methodology that could be specifically associated with only upgrading to current standards/maintaining an existing traffic signal. Nothing would be improved as part of this work, such as the addition of turn lanes or phasing. It is strictly providing maintenance and necessary upgrades for an older signal to be considered current. Energy consumption was an initial thought, but we were thinking there might be others."

4. "In an effort to share alternative perspectives on sustainable design, ITE's Sustainability Task Force in partnership with Greenroads Foundation will soon be offering a web briefing titled "Greenroads: A Sustainability Rating System for Roadways". The web briefing will be held on **Wednesday, July 18, 2012 from 3:00 p.m. to 4:30 p.m. EST**.
   Please visit the following link for additional information:
   www.ite.org/education/webinars_green.asp"

5. "**Section 4D.14 Longitudinal Positioning of Signal Faces** of the **MUTCD** discusses the longitudinal placement of signals within an intersection. Assume the situation of two closely spaced signalized intersections (tight urban diamonds, downtown grids, etc.) for these questions:

   Is anyone familiar with any studies, evaluations, or guidelines for optical distance limiting of signals such that a driver waiting at a red at the first signal does not get drawn through the intersection because the far intersection turned green?
   Is there a distance threshold where you can assume this is not a problem?"

Search the old listserv archives for more questions and replies as indicated above. Also, the Search field in the upper right hand corner of ITE Community will search ALL discussions, blogs, events, and libraries you belong to; therefore, the more you contribute, the bigger this resource will become.

With the ITE Community format you no longer have to worry about inserting an appropriate signature. Your signature is inserted automatically for you based on how you are registered with ITE.

Tips and Trends in Transportation

Compiled by Jim Harris, TSOS, MITE

Driver Distraction Poses Safety Issue

The risk of driver distraction is growing with the growth in information and communication technologies (ICT). Car manufacturers are under pressure to offer the latest technologies to maintain product strength. But at the same time firms also have to keep process of human interaction with the car simple, to reduce driver distraction. Research by The US National Highway Traffic Safety Administration (NHTSA) has shown that 17% (an estimated 899,000) of all police-reported accidents in 2010 reportedly involved some type of driver distraction. Of those 899,000 crashes, distraction by a device/control integral in the vehicle was reported in 26,000 cases (3% of the distraction-related police-reported accidents). Reacting on these results, the NHTSA has formulated voluntary guidelines for driver distraction, which will be rolled out in three phases based on device origin and interaction type. NHTSA's approach toward driver distraction will help manufacturers with the coming information systems, according to Frost & Sullivan Research Analyst, Krishna Jayaraman. He added that NHTSA plans to implement the feedback from the public and hold public hearings before finalising the first phase of recommendations. This will open up opportunities for OEMs and suppliers to convey their message and help set guidelines that will benefit them as well as the consumers.

As smartphones are one of the major sources of driver distraction, the US National Transportation Safety Board (NTSB) in December 2011 proposed a nation-wide ban on the use of personal electronics devices while driving, as the risk of an accident is four times higher when using a phone while driving a car, various studies, revealed. The regulation applies in 50 states and bans the use of hands-free systems, including wireless headsets. This could act against those firms offering phone integration and hands-free systems as a part of their portfolio.

But due to pressure from the automotive and the Smartphone industries, it remains to be seen how this regulation will be implemented according to Jayaraman. This will be a testing phase though for all Smartphone interfacing solutions available in the market, where judgment will be made on how intelligently a phone is handled with the in-vehicle HMI. All advancements to reduce driver distraction point toward the development of and the need for natural voice control interfaces. Before the goal of achieving a voice-controlled environment is realized however, a number of demands have to be met, particularly regarding the migration from command-based to natural speech systems.

"The categorization of driving-related critical and non-critical functions will be pivotal when designing a safe and simple HMI solution," Jayaraman said. "The key focus will be to achieve a proper balance when splitting critical functions among the different interfaces available. A major part of this process will be based on the aforementioned guidelines for reducing driver distraction and keeping in mind consumer preference for different controls." A balance between the implementation of new technologies and the reduction of driver distraction needs to be achieved. This revokes the need for a multi-modal HMI solution wherein all the control interfaces will play a major role. Combining Driver assistance systems (DAS) and information systems will be the modular approach to ensure driver safety.

Noise Systems for Electric Vehicles

New rules in the US mean that electric vehicles will require noise generation

equipment. This covers electric vehicles and hybrids as well as motorcycles, medium and heavy trucks and buses. It specifies that the alert sound must be sufficient to allow a pedestrian to detect a nearby EV or PHEV operating at constant speed, accelerating, decelerating and operating in any other critical scenarios. It must reflect the minimum sound level emitted by a motor vehicle that is necessary to allow visually-impaired and other pedestrians to detect a nearby EV or PHEV operating below the cross-over speed. In addition, it must reflect the performance requirements necessary to ensure that each vehicle's alert sound is as recognizable to pedestrians as that of a motor vehicle in operation. The implementation of the rulemaking is due in 2014 and should come into effect by 2017.

In 2011 the European Commission drafted a guideline for Acoustic Vehicle Alerting Systems. This guideline, intended to make recommendations to manufacturers for the installation of systems that provide vehicle operation information to vulnerable road users, is planned as an interim guidance until completion of on-going research activities and the development of a global harmonisation for device performance specifications. Two main types of warning device have been developed and are in use by car manufacturers so far.

Devices mimicking conventional internal combustion engine cars use all-weather audio speakers placed on the vehicle's wheel wells and send audible signals only in the direction of travel (to minimise noise pollution and to maximise acoustic information for pedestrians). Depending on the system, most of them automatically switch off when reaching a speed higher than 32 km/h - at which point the tyres and wind make sufficient noise - or when the hybrid combustion engine kicks in. ECTunes and Enhanced Vehicle Acoustics (EVA) are companies that have developed such devices. Huyndai and Lotus have also developed such warning noises, called respectively the "Virtual Engine Sound System" (VESS) and the "HALOsonic".

These were integrated to the Hyundai Sonata Hybrid (2011) and the Lotus Evora 414E Hybrid. Other warning sounds different to those of combustion engine cars are used on the Chevrolet Volt and the Nissan Leaf. GM's system is called "Pedestrian-Friendly Alert System" and is manually activated by the driver, but future generations will probably include an active system. The Nissan Leaf's includes one sound for forward motion and another for reverse.

Depending on the speed and whether the Leaf is accelerating or decelerating, the sound system will make sweeping, high-low sounds. Fisker has installed two one-watt sound generators to its 2012 Karma ES to alert pedestrians of its presence in EV mode. Ford should integrate such sounds to its 2012 Focus Electric. Toyota's "Vehicle Proximity Notification System" (VSPN) will be introduced in the United States in all 2012 Prius family vehicles.

Free Training on ITS Standards

The ITS PCB Program is pleased to offer FREE training on ITS standards! Learn how to evaluate, procure, and implement standards-based ITS devices and systems.

The ITS Professional Capacity Building Program (ITS PCB) is offering free online ITS standards training. The 18-module series is aimed at practitioners in state and local highway agencies and transit agencies who seek the skills needed to procure, implement, and operate ITS standards-based devices and equipment. Consultants, system designers and integrators, and system testers will also find the training informative and are welcome to view the modules. Modules are free and can be viewed anytime on the ITS PCB website!

Original Traffic Study Documents

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

Parker and Pine

Parker, Colorado

Prepared for
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anticipated during the weekday morning and afternoon peak hours, respectively. **Table 1** summarizes the estimated trip generation for the proposed Parker and Pine development. The trip generation worksheets are included in **Appendix D**.

Table 1 – Parker and Pine Traffic Generation

Land Use	Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Total Trips								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	952	15	44	59	46	30	76
Day Care Center (ITE 565)	13,000 SF	620	74	69	143	68	77	145
Shopping Center (ITE 820)	17,000 SF	642	10	6	16	31	34	65
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,414	62	59	121	51	47	98
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,414	62	59	121	51	47	98
Gas Station w/ Convenience (ITE 945)	16 Positions	3,286	102	98	200	114	110	224
Automated Car Wash (ITE 948)	5,400 SF	760	38	38	76	38	38	76
Total	-	9,088	363	373	736	399	383	782
Total Trips After Internal Capture (ITE Methodology)								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	857	14	40	53	41	27	68
Day Care Center (ITE 565)	13,000 SF	558	67	62	129	61	69	131
Shopping Center (ITE 820)	17,000 SF	642	10	6	16	31	34	65
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,273	56	53	109	46	42	88
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,273	56	53	109	46	42	88
Gas Station w/ Convenience (ITE 945)	16 Positions	2,957	92	88	180	103	99	202
Automated Car Wash (ITE 948)	5,400 SF	684	34	34	68	34	34	68
Total	-	8,244	329	336	664	362	347	710
Non Pass-By Trips								
Mid-Rise Multifamily Residential (ITE 221)	175 Units	857	14	40	53	41	27	68
Day Care Center (ITE 565)	13,000 SF	558	67	62	129	61	69	131
Shopping Center (ITE 820)	17,000 SF	546	9	5	14	26	29	55
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,082	48	45	93	39	36	75
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	1,082	48	45	93	39	36	75
Gas Station w/ Convenience (ITE 945)	16 Positions	2,513	78	75	153	88	84	172
Automated Car Wash (ITE 948)	5,400 SF	684	34	34	68	34	34	68
Total	-	7,322	298	306	603	328	315	644
Pass-By Trips								
Shopping Center (ITE 820)	17,000 SF	96	0	0	0	5	5	10
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	191	8	8	16	7	6	13
Fast Food Restaurant w/ D.T. (ITE 934)	3,000 SF	191	8	8	16	7	6	13
Gas Station w/ Convenience (ITE 945)	16 Positions	444	14	13	27	15	15	30
Total	-	922	30	29	59	34	32	66

Note: ITE does not provide AM trip generation information for Automated Car Wash (ITE 948) although car washes are open in the morning. Therefore, the PM trip generation was duplicated for the AM trip generation.

Kimley»Horn

Project	Parker and Pine				
Subject	Trip Generation for Fast-Food Restaurant with Drive-Through Window				
Designed by	JRP	*Date*	October 07, 2019	*Job No.*	096502001
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Fast Food Restaurant With Drive-Through Window (934)

Independant Variable - 1000 Square Feet Gross Floor Area (X)
Gross Floor Area = 3,000 Square Feet
X = 3.000
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series page 158)

Average Weekday
T = 40.19 (X)
T = 40.19 * 3.000

Directional Distribution: 51% ent. 49% exit.
T = 121 Average Vehicle Trip Ends
62 entering 59 exiting

62 + 59 (*) = 121

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series page 159)

Average Weekday
T = 32.67 (X)
T = 32.67 * 3.000

Directional Distribution: 52% ent. 48% exit.
T = 98 Average Vehicle Trip Ends
51 entering 47 exiting

51 + 47 = 98

Weekday (900 Series page 157)

Average Weekday
T = 470.95 (X)
T = 470.95 * 3.000

Directional Distribution: 50% entering, 50% exiting
T = 1414 Average Vehicle Trip Ends
707 entering 707 exiting

707 + 707 = 1414

Saturday Peak Hour of Generator (900 Series page 163)

Directional Distribution: 51% ent. 49% exit.
T = 54.86 (X)
T = 54.86 * 3.000

T = 165 Average Vehicle Trip Ends
84 entering 81 exiting

84 + 81 = 165

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour = 51% Non-Pass By PM Peak Hour = 50% Non-Pass By

	IN	Out	Total	
AM Peak	32	30	62	
PM Peak	26	24	49	
Daily	354	354	708	PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017)

AM Peak Hour = 49% Pass By PM Peak Hour = 50% Pass By

	IN	Out	Total	
AM Peak	30	29	59	
PM Peak	26	24	49	
Daily	353	353	706	PM Peak Hour Rate Applied to Daily