Kimley»Horn

August 16, 2023

Mr. Kristofer K. Wiest, P.E.
Project Manager
Merrick & Company
5970 Greenwood Plaza Boulevard
Greenwood Village, Colorado 80111

Re: Chick-fil-A 470 & Yosemite
Traffic Study Letter
Lone Tree, Colorado

Dear Mr. Wiest,

The purpose of this letter is to provide a trip generation comparison to adequately assess the impacts of adding a Chick-fil-A restaurant with drive through to the existing At Home store site located within the northwest quadrant of the C-470 and Yosemite Street intersection at 8585 Yosemite Street in Lone Tree, Colorado. This study will compare the trips generated by the previously developed Sears Outlet Department Store to the existing furniture/décor superstore with the addition of this proposed Chick-fil-A restaurant. The existing At Home store utilizes approximately half of the 160,000 square foot approved Sears Outlet store. The Chick-fil-A is proposed within the southeast portion of the parcel, near the northwest corner of the Yosemite Street and Park Meadows Center Drive/C-470 Westbound Ramp intersection. The purpose of this trip generation comparison will identify traffic concurrence with the previous use for the City of Lone Tree to decide if additional traffic analysis is required.

SITE INFORMATION

The existing approximate 160,000 square foot building was previously a Sears Outlet department store. The Sears Outlet closed. Currently an At Home furniture/décor store occupies approximately half of the existing building with the remaining building vacant. Chick-fil-A is proposed to be 5,380 square feet. A site plan of the existing building with the At Home store occupying a portion as well as the location of the fast-food restaurant is attached. A vicinity map of the site area is shown below.

Vicinity Map

TRIP GNERATION COMPARISON

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.

Trip generation was calculated using the 11th Edition average rates for Department Store (ITE Code 875) for the previous site use, for Furniture Store (ITE Code 890) for the existing use, and Fast-Food with Drive-Thru (ITE Code 934) for the proposed use. The following table compares the trip generation from the previous department store to the expected trip generation for the existing At Home with the proposed Chick-fil-A fast-food restaurant.

Concurrently, a Floor and Décor is proposed to occupy the vacant building space next to the existing At Home retail space. Therefore, the trip generation associated with the Floor and Décor is provided in the exisitng and proposed uses. For the proposed Floor & Décor, trips generated by seven (7) existing Floor & Decor locations throughout the country were counted to provide actual data for the specific land use. Based on these site-specific counts, a trip generation rate (trips per 1,000 square feet) of 0.45 (57% enter, 43% exit) was used for the morning peak hour and a trip generation rate of 0.62 (50% enter, 50% exit) was used for the afternoon peak hour. The trip generation calculation sheets are attached for reference.

Chick-fil-A 470 & Yosemite
Trip Generation Comparison

Use and Size	Daily Trips	Weekday Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Approved Use – Sears Outlet							
Department Store (ITE 875) 160,000 Square Feet	3,120	60	33	93	156	156	312
Existing and Proposed Use – At Home, Floor and Décor, & Chick-fil-A							
Furniture Store (ITE 890) 75,000 Square Feet	474	14	6	20	18	21	39
Floor & Décor (User Specific) 80,000 Square Feet	500*	21	15	36	25	25	50
Fast-Food w DT (ITE 934) 5,380 Square Feet	2,516	122	118	240	93	85	178
Total Trips	**3,490**	**157**	**139**	**296**	**136**	**131**	**267**
Net Difference in Trips	***+370***	***+97***	***+106***	***+203***	***-20***	***-25***	***-45***

*User specific data for Floor & Décor did not provide daily trip gen rates, therefore an assumed K factor of 10 was used to estimate daily trips

As summarized in the previous table, the existing furniture store, proposed Floor & Décor, and proposed Chick-fil-A is anticipated to generate 296 morning peak hour trips and 267 afternoon peak hour trips. The proposed addition of Chick-Fil-A and Floor and Décor to the existing At Home store is anticipated

1 Institute of Transportation Engineers, *Trip Generation Manual*, Eleventh Edition, Washington DC, 2021.

to account for an increase of 203 morning peak hour trips and a decrease of 45 afternoon peak hour trips compared to the trip generated by the previous department store.

SITE CIRUCLATION

Vehicles will enter the overall site through the existing signalized intersection at Yosemite Street, on the east side of the property. Chick-fil-A patrons will travel to the southeast corner of the overall site to access the drive-through lines and parking. Traffic on the Chick-fil-A site will be able to travel with two-way flow, while the drive-through entrance is proposed southwest of the Chick-fil-A building and then flows in a counter-clockwise direction along the southern to eastern perimeter of the building. The drive-through entrance provides two entry lanes. The drive through lanes can accommodate a total of up to 28 vehicles, eight (8) of which are located prior to the ordering location. The remaining 20 vehicles will be queued after the ordering canopy until the outside meal delivery canopy. However, beyond the drive-through area, approximately 10 additional vehicles can queue onsite directly north of the drive-through for a total of 38 vehicles, although vehicles could continue to queue onsite in the east-west parking aisles if drive-through queues extend beyond 38 vehicles.

DRIVE-THROUGH QUEUING

A drive-through queuing analysis was conducted at an existing Chick-fil-A site located in Parker, Colorado on Thursday, April 13, 2023 during the afternoon peak period of 5:00 PM to 6:00 PM. During that period, 101 vehicles were observed to be served by the drive-through at this site. The average wait time at the window was approximately 33 seconds. This Chick-fil-A site in Parker operates with two entry drive-through lanes with one order location for each lane, while it then merges down to one lane shortly thereafter as there is only one food pickup window. As such, the primary location of queuing occurs at the pickup window. The maximum drive-through queue observed to occur at this site was 21 vehicles during this period.

A Poisson Queuing analysis was performed for this site based on the methodologies provided in the ITE *Transportation and Land Development, 1st Edition* manual. This analysis was conducted to determine whether sufficient storage is anticipated to be provided at the Chick-fil-A Crossroads site based on this queuing analysis conducted at the Chick-fil-A site in Parker, Colorado. It is believed the two sites will exhibit similar characteristics to one another, as the site in Parker is along a major state highway of Parker Road (State Highway 83) and adjacent to the freeway interchange at E-470 just to the north, while the proposed Chick-fil-A is located on the northwest corner of the C-470 and Yosemite Street interchange.

Based on the Poisson Queuing analysis performed in this study, a 95th-percentile queue of up to 20 vehicles could be anticipated to be exceeded five (5) percent of the time with two service drive-through lanes. As mentioned previously, the proposed site can accommodate 28 vehicles within its drive-through queue. However, as noted, the maximum drive-through queue observed to occur at this site during the collection period was only 21 vehicles for a single lane pickup window. As such, it is believed that the Poisson Queuing analysis yields conservative results. Because the proposed Chick-fil-A site can accommodate up to 28 vehicles within its drive-through lanes and more vehicles are able to be accommodated onsite prior to spilling onto the private east/west roadway to the north of the site. It is believed that this site is designed to accommodate maximum drive-through queues onsite without spilling onto adjacent roadways. The drive-through queuing analysis worksheets are attached.

CONCLUSIONS AND RECOMMENDATIONS

In summary, this traffic study letter provides a trip generation comparison of the previous Sears Outlet Store to the existing furniture/décor superstore with the addition of a Chick-fil-A and Floor and Décor to the site at the 8585 Yosemite Street parcel in Lone Tree, Colorado. Based on the results of this trip generation comparison, the proposed addition of Chick-Fil-A and Floor and Décor to the existing At

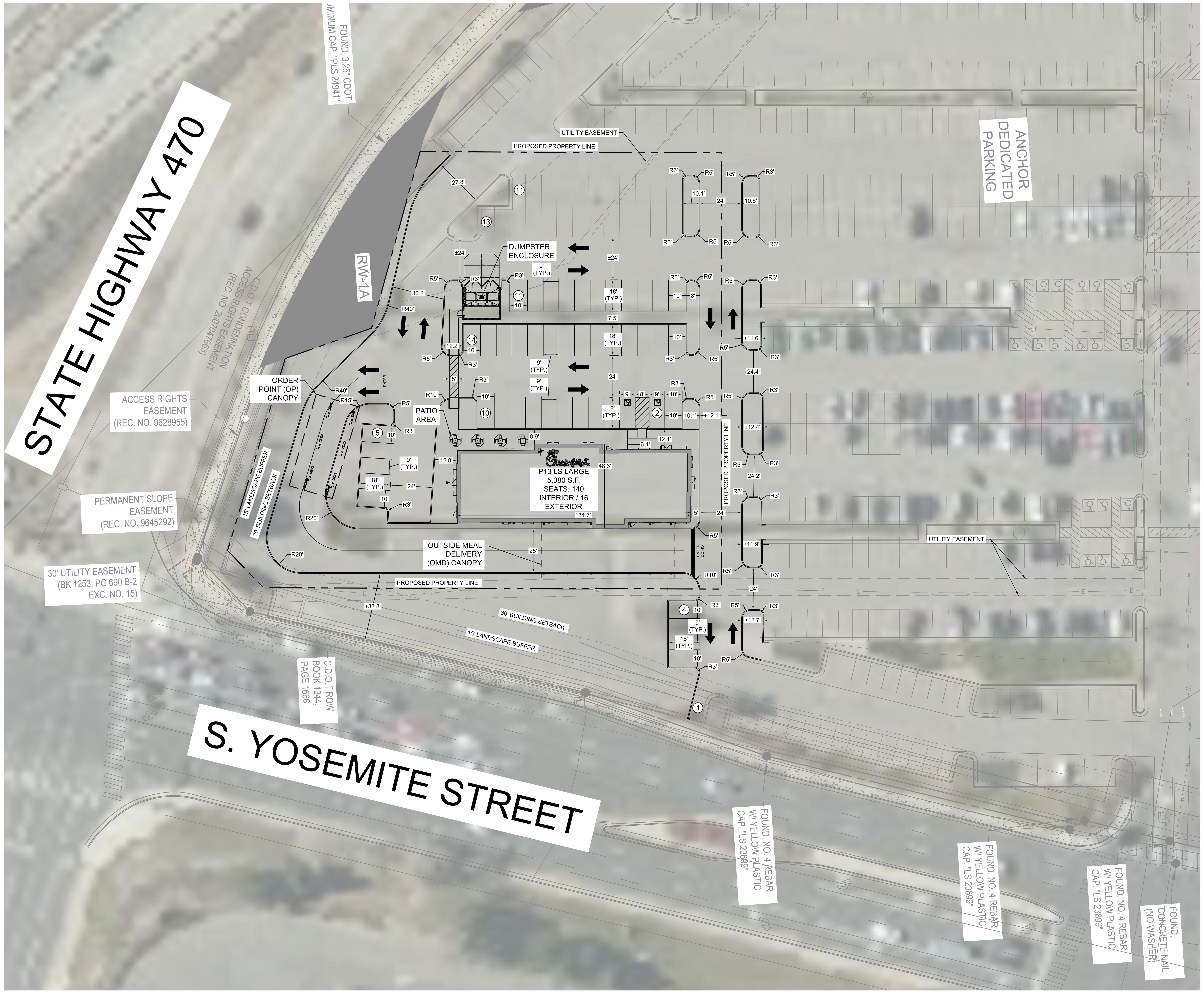
Home store is anticipated to generate traffic volumes within the site's original amount. This development now would account for an increase of 203 morning peak hour trips and a decrease of 45 afternoon peak hour trips. The increase in trips during the morning peak hour is not anticipated to significantly impact the operations of the surrounding street intersections. The morning peak hour isn't the higher controlling traffic volume hour in this area, as that occurs during the weekday afternoon peak hour due to this area of Lone Tree being primarily retail uses. The reduction in traffic during the controlling higher afternoon peak hour with this proposed change in use is anticipated to provide an improvement to traffic operations of the surrounding street network over what used to be generated by this site. However, as requested by the City, a protected left turn arrow will be provided on the eastbound approach, exiting the site onto Yosemite Street. Additionally, the maximum queue anticipated for the Chick-fil-A restaurant will be accommodated within the proposed site circulation and drive-through lanes. Therefore, it is believed no further traffic analysis is required based on this proposal. If there are any questions or if anything further is required, please let us know.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

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

Conceptual Site Plan



GRAPHIC SCALE

30 15 7.5 0 30

1" = 30'

PRELIMINARY SITE PLAN NOTES

1. CITY OF LONE TREE ALLOWS CANOPIES TO EXTEND A MAXIMUM OF 3 FEET INTO REQUIRED BUILDING SETBACKS (SECTION 16-12-130).
2. CITY OF LONE TREE REQUIRES PARKING SPACES ADJACENT TO LANDSCAPE ISLANDS TO HAVE A MINIMUM WIDTH OF 10' (SECTION 16-28-40).
3. BE ADVISED, THE CITY MAY NOT ALLOW DEAD-END PARKING.

PARKING CALCULATION	
SIR	☐ YES ☒ NO
SURVEY	☒ YES ☐ NO
BUILDING SETBACK	N: 10' S: 30' STATE HIGHWAY 470 E: 30' S. YOSEMITE STREET W: 10' SEE NOTE 1
LANDSCAPE SETBACK	N: 10' S: 15' STATE HIGHWAY 470 E: 15' S. YOSEMITE STREET W: 10'
# OF PARKING STALLS REQUIRED:	1 SPACE PER 100 SQUARE FEET OF FLOOR AREA IN PRINCIPAL STRUCTURE EXCLUDING RESTROOMS, MECHANICAL AREAS AND OTHER SIMILAR AREAS NOT INTENDED FOR HUMAN OCCUPANCY. 5,380 SF / 100 = 54 SPACES
DO PATIO SEATS COUNT TOWARD PARKING?	NO, PARKING BASED ON FLOOR AREA IN PRINCIPAL STRUCTURE
D/T STACKING	6 SPACES PER DRIVE-UP WINDOW
STANDARD 90° STALL SIZE	9' X 18' (MINIMUM), SEE NOTE 2
DRIVE AISLE WIDTH	22'
OVERHANG ALLOWED?	YES, 2'
BIKE REQUIREMENT	2 PERCENT OF PROVIDED PARKING SPACES 1 SPACE MINUMUM
NEW CURB CUT?	NO
LOAD ZONING	NONE, AS REQUIRED
TE FRONT OR SIDE LOADING	FRONT
LANDSCAPE ISLAND	8' WIDE, NO MORE THAN 15 CONSECUTIVE PARKING SPACES
TOTAL SPACES	71 SPACES
OVERALL PARCEL AREA	± 58,335 SQ. FT. (1.34 AC.)

LEGEND

- ACCESSIBLE PATH OF TRAVEL
- EXISTING PROPERTY BOUNDARY LINE
- EXISTING ROAD CENTERLINE
- PROPOSED DITCH CENTERLINE
- PROPOSED LIMITS OF BMP / DETENTION
- EXISTING CURB
- EXISTING CURB AND GUTTER
- PROPOSED CURB
- PROPOSED CURB AND GUTTER
- PROPOSED RIP RAP
- PROPOSED CONCRETE PAVEMENT
- PROPOSED CONCRETE SIDEWALK
- PROPOSED ASPHALT PAVEMENT
- PROPOSED LANDSCAPE AREA
- EXISTING SANITARY STRUCTURES
- EXISTING WATER STRUCTURES
- PROPOSED WATER STRUCTURES
- PROPOSED STORM STRUCTURES
- PROPOSED SANITARY STRUCTURES
- G — EXISTING GAS MAIN
- W — EXISTING WATER MAIN
- E — EXISTING UNDERGROUND ELECTRIC
- T — EXISTING TELEPHONE
- OH — EXISTING OVERHEAD WIRES
- S — EXISTING SANITARY
- EXISTING STORM
- STM — PROPOSED STORM PIPE
- W — PROPOSED WATER
- S — PROPOSED SANITARY
- FM — PROPOSED SANITARY FORCE MAIN
- # PARKING STALL COUNT

TOTAL SPACES	71 SPACES
OVERALL PARCEL AREA	± 58,335 SQ. FT. (1.34 AC.)

CORE STATES GROUP
4240 E. Jurupa Street, Suite 402
Ontario, CA 91761
Phone (909) 467-8919
Fax (909) 467-8919
BHumann@core-eng.com

PREPARED FOR:
Chick-fil-A
5200 Buffington Road
Atlanta, Georgia
30349-2998

REVISIONS

REV	DATE	COMMENT	BY

DOCUMENT
PRELIMINARY SITE PLAN FOR CHICK-FIL-A AT NWQ OF S. YOSEMITE STREET AND STATE HIGHWAY 470 LONE TREE, CO 80124

SITE LOCATION
NWQ OF S. YOSEMITE STREET AND STATE HIGHWAY 470
LONE TREE, CO 80124
(#05190)

ENGINEER SEAL

SHEET TITLE
PRELIMINARY SITE PLAN

JOB #:	CFA.32538
DATE:	05/13/2022
SCALE:	1"=30'
DRAWN BY:	NCW
CHECKED BY:	NCW

SHEET NO.
PSP-11

GRAPHIC SCALE

60 30 15 0 60

1" = 60'

CORE STATES GROUP

4240 E. Jurupa Street, Suite 402
Ontario, CA 91761
Phone (909) 467-8919
Fax (909) 467-8919
BHumann@core-eng.com

PREPARED FOR:

Chick-fil-A
5200 Buffington Road
Atlanta, Georgia
30349-2998

811
Know what's below. Call before you dig.

THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON DESIGN DRAWINGS, RECORDS OF THE VARIOUS UTILITY COMPANIES, AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. CORE STATES, INC. DOES NOT GUARANTEE THAT LOCATIONS SHOWN ARE EXACT. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANIES AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF UTILITIES.

REVISIONS

REV	DATE	COMMENT	BY

DOCUMENT

PRELIMINARY SITE PLAN FOR CHICK-FIL-A AT NWQ OF S. YOSEMITE STREET AND STATE HIGHWAY 470 LONE TREE, CO 80124

SITE LOCATION

NWQ OF S. YOSEMITE STREET AND STATE HIGHWAY 470
LONE TREE, CO 80124
(#05190)

ENGINEER SEAL

SHEET TITLE

OVERALL SHOPPING CENTER

JOB #:	CFA.32538
DATE:	05/13/2022
SCALE:	1"=60'
DRAWN BY:	NCW
CHECKED BY:	NCW

SHEET NO.

PSP-11

Trip Generation Calculations

Kimley»Horn

Project	CFA 470 and Yosemite (Previously Approved)				
Subject	Trip Generation for Deapartment Store				
Designed by	MAG	*Date*	November 01, 2022	*Job No.*	096206011
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Average Rates

Land Use Code - Deapartment Store (875)

Independant Variable - 1000 Square Feet (X)
SF = 160,000
X = 160.000
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 496)

Directional Distribution: 64% ent. 36% exit.
(T) = 0.58 (X) T = 93 Average Vehicle Trip Ends
(T) = 0.58 * (160.0) 60 entering 33 exiting

60 + 33 = 93

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 497)

Directional Distribution: 50% ent. 50% exit.
(T) = 1.95 (X) T = 312 Average Vehicle Trip Ends
(T) = 1.95 * (160.0) 156 entering 156 exiting

156 + 156 = 312

Weekday

*No daily weekday data available, assumed 10 * the PM peak hour.

Directional Distribution: 50% ent. 50% exit.
(T) = 10 * PM Peak Hour T = 3120 Average Vehicle Trip Ends
(T) = 10 * (312.0) 1560 entering 1560 exiting

1560 + 1560 = 3120

Kimley»Horn

Project	CFA 470 and Yosemite (Existing)				
Subject	Trip Generation for Furniture Store				
Designed by	MAG	*Date*	November 01, 2022	*Job No.*	096206011
Checked by		*Date*		*Sheet No.*	1 of 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Average Rates

Land Use Code - Furniture Store (890)

Independent Variable - 1000 Square Feet (X)
SF = 75,000
X = 75.000
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 549)

Directional Distribution: 71% ent. 29% exit.
(T) = 0.26 (X) T = 20 Average Vehicle Trip Ends
(T) = 0.26 * (75.0) 14 entering 6 exiting

14 + 6 = 20

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 550)

Directional Distribution: 47% ent. 53% exit.
(T) = 0.52 (X) T = 39 Average Vehicle Trip Ends
(T) = 0.52 * (75.0) 18 entering 21 exiting

18 + 21 = 39

Weekday (800 Series Page 548)

Average Weekday Directional Distribution: 50% ent. 50% exit.
(T) = 6.30 (X) T = 474 Average Vehicle Trip Ends
(T) = 6.30 * (75.0) 237 entering 237 exiting

237 + 237 = 474

Kimley»Horn

Project	CFA 470 & Yosemite (Proposed)				
Subject	Trip Generation for Fast-Food Restaurant with Drive-Through Window				
Designed by	MAG	*Date*	November 01, 2022	*Job No.*	096206011
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 11th Edition, Average Rates

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

Independant Variable - 1000 Square Feet (X)
SF = 5,380
X = 5.380
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 726)

Directional Distribution: 51% ent. 49% exit.
(T) = 44.61 (X) T = 240 Average Vehicle Trip Ends
(T) = 44.61 * (5.4) 122 entering 118 exiting

122 + 118 = 240

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 727)

Directional Distribution: 52% ent. 48% exit.
(T) = 33.03 (X) T = 178 Average Vehicle Trip Ends
(T) = 33.03 * (5.4) 93 entering 85 exiting

93 + 85 = 178

Weekday (900 Series Page 725)

Directional Distribution: 50% ent. 50% exit.
(T) = 467.48 (X) T = 2516 Average Vehicle Trip Ends
(T) = 467.48 * (5.4) 1258 entering 1258 exiting

1258 + 1258 = 2516

Non Pass-By Trip Volumes (Per ITE Trip Generation Manual, 11th Edition)

AM Peak Hour = 50% Non-Pass By PM Peak Hour = 45% Non-Pass By

	IN	Out	Total	
AM Peak	61	59	120	
PM Peak	42	38	80	
Daily	566	566	1132	PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per Trip Generation Manual, 11th Edition)

AM Peak Hour = 50% Pass By PM Peak Hour = 55% Pass By

	IN	Out	Total	
AM Peak	61	59	120	
PM Peak	51	47	98	
Daily	692	692	1384	PM Peak Hour Rate Applied to Daily

Parking and Trip Generation Study

Floor & Decor

Prepared for:

Floor & Decor Outlets of America, Inc.

Prepared by:

Kimley-Horn and Associates, Inc.
12740 Gran Bay Parkway West, Suite 2350
Jacksonville, Florida 32258
FBPE No. CA 00000696

William J. Schilling Jr., P.E.
Florida License Number: 53947
Date: _____

March 2017

Table 2: Peak Hour Trip Generation Summary

Store Location and Size	Date	Peak Hour	Inbound Trips	Outbound Trips	Total Trips	Trip Generation Rate (Trips per 1,000 SF GLA)	Inbound Trip Percentage	Outbound Trip Percentage
Floor & Decor - Boynton Beach 1974 High Ridge Road Boynton Beach, FL 33426 91,916 SF GLA	Wed, Jan 25, 2017	8:30 AM - 9:30 AM	43	38	81	0.88	53%	47%
	Wed, Jan 25, 2017	4:00 PM - 5:00 PM	40	37	77	0.84	52%	48%
Floor & Decor - Wayne 77 Willowbrook Boulevard Wayne, NJ 07470 88,500 SF GLA	Thur, Jan 26, 2017	8:30 AM - 9:30 AM	10	5	15	0.17	67%	33%
	Wed, Jan 25, 2017	5:15 PM - 6:15 PM	27	22	49	0.55	55%	45%
Floor & Decor - Potomac Mills 14041 Worth Avenue Woodbridge, VA 22192 76,384 SF GLA	Thur, July 14, 2016	7:30 AM - 8:30 AM	13	15	28	0.37	46%	54%
	Wed, July 13, 2016	5:00 PM - 6:00 PM	18	20	38	0.50	47%	53%
Floor & Decor - Santa Ana 1801 East Dyer Road Santa Ana, CA 92705 72,914 SF GLA	Tue, Jan 24, 2017	8:15 AM - 9:15 AM	18	17	35	0.48	51%	49%
	Tue, Jan 24, 2017	4:00 PM - 5:00 PM	15	16	31	0.43	48%	52%
Floor & Decor - North Houston 17211 North Freeway Houston, TX 77090 109,000 SF GLA	Wed, Jan 25, 2017	8:15 AM - 9:15 AM	28	26	54	0.50	52%	48%
	Tue, Jan 24, 2017	5:30 PM - 6:30 PM	31	33	64	0.59	48%	52%
Floor & Decor - Arlington Heights 600 East Rand Road Arlington Heights, IL 60004 74,900 SF GLA	Wed, Jan 25, 2017	8:30 AM - 9:30 AM	17	11	28	0.37	61%	39%
	Wed, Jan 25, 2017	5:30 PM - 6:30 PM	24	22	46	0.61	52%	48%
Floor & Decor - Mall of Georgia 2918 Buford Drive Buford, GA 30519 87,825 SF GLA	Tue, Jan 24, 2017	8:30 AM - 9:30 AM	23	11	34	0.39	68%	32%
	Tue, Jan 24, 2017	5:45 PM - 6:45 PM	33	40	73	0.83	45%	55%
Average AM Peak Hour Trip Generation Rate and Inbound/Outbound Percentage						0.45	(57% in, 43% out)	
Average PM Peak Hour Trip Generation Rate and Inbound/Outbound Percentage						0.62	(50% in, 50% out)	

Site-Specific Queue Analysis

CFA - Parker (5:00 to 6:00 PM)

Veh #	Time at Window (s)	Begin Time
1	15	5:00
2	11	5:01
3	115	5:02
4	28	5:03
5	9	5:03
6	10	5:03
7	39	5:03
8	84	5:04
9	16	5:06
10	39	5:07
11	128	5:07
12	32	5:09
13	8	5:10
14	18	5:10
15	25	5:10
16	39	5:11
17	15	5:11
18	64	5:12
19	17	5:13
20	12	5:13
21	15	5:14
22	13	5:14
23	44	5:14
24	62	5:15
25	85	5:16
26	27	5:18
27	30	5:18
28	118	5:19
29	29	5:21
30	16	5:21
31	11	5:21
32	24	5:22
33	21	5:22
34	14	5:22
35	18	5:23
36	74	5:23
37	21	5:24
38	19	5:25
39	16	5:25
40	20	5:25
41	22	5:26
42	37	5:26
43	8	5:27
44	38	5:27
45	23	5:27
46	26	5:28
47	16	5:28
48	18	5:28
49	16	5:29
50	43	5:29
51	19	5:30
52	38	5:30
53	33	5:31
54	26	5:31
55	123	5:32
56	10	5:34
57	12	5:34
58	20	5:34
59	26	5:35
60	14	5:35
61	18	5:36
62	53	5:36
63	17	5:37
64	40	5:37
65	75	5:38
66	122	5:39
67	23	5:41
68	49	5:42
69	52	5:42
70	46	5:43
71	12	5:44
72	73	5:44
73	12	5:46
74	35	5:46
75	24	5:46
76	17	5:47
77	14	5:47
78	18	5:47
79	14	5:48
80	28	5:48
81	16	5:49
82	46	5:49
83	39	5:50
84	13	5:50
85	13	5:51
86	53	5:51
87	33	5:52
88	58	5:52
89	24	5:53
90	21	5:54
91	57	5:54
92	59	5:55
93	22	5:56
94	54	5:57
95	11	5:57
96	9	5:58
97	26	5:58
98	27	5:58
99	22	5:59
100	16	5:59
101	31	5:59
Average (s)	**33.28**	
Maximum Queue Observed (veh)		**21**

QUEUE STORAGE WORKSHEET

ITE Transportation and Land Development, Chapter 8 - Drive-In Facilities

Project Chick-fil-A Crossroads
Site Counted Chick-fil-A Parker, 9335 Crown Crest Blvd, Parker, CO 80138
Condition Peak Hour of Generator

Storage = (((ln P(x>M) - ln Qm) / ln p) - 1)

M = queue length which is exceeded p percent of the time
N = number of service channels (drive in positions)
Q = service rate per channel (vehicles per hour)
p = demand rate/service rate = q/NQ = utilization factor
q = demand rate on the system (vehicles per hour)
Qm = tabled values of the relationship between queue length, number of channels and utilization factor (if n = 1, Qm = p)

Where:

Q = 55 vehicles/hour assuming a 33 second wait
P(x > M) = 5 percent = .05

q = 101 vehicles per hour
N = Number of Lanes= 2

p = q/NQ = 0.92 Qm = 0.29

M = Storage = {[(ln .05 - ln 0.29) / ln 0.92]-1}

M = Storage = {[(-2.996 - -1.233) / -0.085] - 1}

M = Storage = 20 # vehs

Where:

SL = Desirable Storage = **20 # vehs**

Available Storage = 38 # vehs
(at Chick-fil-A Crossroads)