Kimley»Horn

December 7, 2020

Mr. Louis Ferrante
UDON Holdings, LLC
5801 N. Union Boulevard
Suite 100
Colorado Springs, CO 80918

Re: UDON Rezone Traffic Study (PCD File No. CS-20-2)
El Paso County, Colorado

Dear Mr. Ferrante:

This traffic study has been prepared for a proposed UDON Rezoning project to be located at 12265 CO-94 in El Paso County, Colorado. The existing property contains a residence. This project is proposed to rezone the existing 34.71-acre property from Residential Rural (RR5) to Commercial Service (CS). For purposes of this study to evaluate the highest and best use from a worst-case traffic scenario, it was assumed that the development would include a 4,200 square foot wholesale nursery and 4,200 square feet of retail space. The property would also like to include an area for potential vendors for special events or occasions, likely on weekends and holidays when activities are occurring in the area. This would change the designation of the parcel. For purposes of this traffic analysis, it was considered that a Food Truck Food Court could be present on site. The site will have the ability to accommodate about 20 parking spaces for such an event.

A vicinity map illustrating the location of the property is attached as **Figure 1**. The surrounding area primarily consists of rural residences, vacant and agricultural land, industrial uses, and Aztec Family Raceway. There are auto salvage yards located to the east of the site. The site area is shown in attached **Figure 2**.

This traffic study identifies the amount of traffic associated with this proposed rezoning and the expected trip distribution and traffic assignment along with an operational analysis for the project access intersection along State Highway 94 (SH-94 or CO-94). The access driveway to the site is proposed to be located in the same location as the west access to the existing site, it is anticipated that the existing east access will be closed with development of the project. It is expected that project construction will be completed within a couple of years; therefore, analysis was performed for the 2022 short term build out horizon as well as the 2040 long-term twenty-year horizon.

Existing Roadway Network and Traffic Counts
Regional access to the UDON Rezoning project is provided by CO-94. Direct access to the development will be provided by an access driveway along the south side of CO-94. This future access intersection will operate with stop control on the northbound exiting approach from the future development. CO-94 extends primarily east-west with one through lane in each direction with a speed limit of 65 miles per hour within the project limits. CO-94 provides a double yellow striped centerline within the project limits. Both Table 4: 2040 Roadway Improvement Projects of the 2016 El Paso County Major Transportation Corridor Plan (MTCP) and the State Highway 94 Access Management Plan show that CO-94 will be widened from two lanes to four lanes within the project limits sometime in the future.

Existing daily and peak hour bi-directional count data was obtained from CDOT traffic information along CO-94 to the east of Space Village Avenue, which is in nearby vicinity of the existing UDON Rezoning property project access. These counts were collected on Thursday, July 11, 2019 and were conducted in one-hour intervals for 24 hours. These counts were adjusted by the annual growth rate

to calculate existing 2020 volumes. The daily counts from the Colorado Department of Transportation (CDOT) Online Transportation Information System (OTIS) were used as a basis for providing a directional split of project traffic. Existing lane configuration, and the existing peak hour counts are shown in attached **Figure 3**, with count information attached as well.

Unspecified Development Traffic Growth
Based on information provided on the website for the Colorado Department of Transportation, the 20-year growth factor along CO-94 adjacent to the study area is 1.25 which equates to an annual growth rate of approximately 1.12 percent per year. Traffic information from the CDOT Online Transportation Information System (OTIS) is attached. Based on this, a 1.12 percent annual growth rate was used to calculate future background traffic volumes at the study area access intersection. This annual growth rate was used to estimate short term 2022 and long term 2040 background traffic volumes at the key intersection.

Trip Generation
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 is based on the ITE Trip Generation Manual, 10th Edition (most current edition) average rates and fitted curve equations for Nursery (Wholesale) (ITE Code 818) and Shopping Center (ITE Code 820) for traffic associated with this development. Of note, calculations were also conducted comparing the retail space to an office development or automobile care center, but the retail space Shopping Center equations were used instead as the retail use generates the highest traffic volume.

Project generated traffic volumes are identified on a weekday daily as well as on a morning peak hour and afternoon peak hour basis. The morning peak hour is the highest one-hour time period of adjacent street traffic during four consecutive 15-minute intervals during the morning peak hour, between 7:00 am and 9:00 am. The afternoon peak hour is the highest one-hour time period of four consecutive 15-minute intervals between the hours of 4:00 pm and 6:00 pm representing the afternoon peak hour. The following **Table 1** summarizes the anticipated weekday peak hour trip generation for the proposed project with the nursery and retail uses (trip generation calculation worksheets attached for the studied uses as well as the compared office and automobile care center uses).

Table 1 – UDON Rezoning Project Weekday Traffic Generation

Land Use and Size	Daily Vehicle Trips	Weekday Vehicle Trips					
		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Nursery (Wholesale) (ITE 818) – 4,200 Square Feet	164	5	5	10	11	11	22
Shopping Center (ITE 820) – 4,200 Square Feet	696	95	59	154	25	27	52
Total	**860**	**100**	**64**	**164**	**36**	**38**	**74**

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

As summarized in **Table 1**, the UDON Rezoning project with a 4,200 square foot wholesale nursery and a 4,200 square foot shopping center is anticipated to generate approximately 860 new daily weekday trips with 164 of these trips occurring during morning peak hour and 74 trips occurring during the afternoon peak hours based on ITE equations and data.

As mentioned, the property would like to include services for people attending events and activities within the area on some weekends or holidays. For purposes of this analysis, a food truck food court was considered. As each food truck is approximately 250 feet square feet, and it is anticipated that four food trucks are possible on site with the planned 20 parking spaces of area available, a total "building" area of 1,000 square feet is thought to be possible. For calculation purposes, the ITE average rates for Fast Food Restaurant without Drive Thru (ITE Code 933) was considered to identify an applicable Saturday midday peak hour of generator. This trip generation is shown in **Table 2.**

Table 2 – UDON Rezoning Project Saturday Traffic Generation

Land Use and Size	Saturday Vehicle Trips Midday Peak Hour		
	In	Out	Total
Fast Food Restaurant without Drive-Thru (ITE 933) – 1,000 Square Feet	27	28	55

As summarized in **Table 2**, the UDON Rezoning property when hosting a food truck food court (assumed as 1,000 square feet of fast food restaurant without drive thru for purposes of calculation) is anticipated to generate approximately 55 Saturday midday peak hour trips based on ITE equations and data.

Distribution, Assignment, and Total Traffic

Distribution of site traffic was based on the area street system characteristics, existing traffic patterns and volumes, and the proposed access system for the project. As mentioned previously, the traffic volumes from CDOT OTIS were used as a basis for providing a directional split of project traffic. The distribution of traffic is a means to quantify the percentage of site-generated traffic that approaches the site from a given direction and departs the site back to the original source. Project traffic originating from either direction can access the site. As identified from the counts from CDOT OTIS, approximately 63 percent of the UDON Rezone trips arrive from and depart to the west. **Figure 4** illustrates the expected trip distribution for the proposed project.

Traffic assignment was obtained by applying the project trip distribution to the estimated project traffic generation of the development shown in the trip generation table. The traffic assignment is shown in **Figure 5**. Site traffic volumes were added to the 2022 and 2040 background volumes to represent estimated build-out year and long-term traffic conditions. These total traffic volumes for 2022 and 2040 are illustrated in **Figure 6** and **Figure 7**.

Traffic Operations Analysis

Kimley-Horn's analysis of traffic operations in the site vicinity was conducted to determine potential capacity deficiencies at the project key intersections for the 2022 build-out and 2040 long term horizons. The acknowledged source for determining overall capacity is the *Highway Capacity Manual*[2].

Capacity analysis results are listed in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a particular street or

2 Transportation Research Board, *Highway Capacity Manual*, Sixth Edition, Washington DC, 2016.

highway during a specific time interval. It ranges from A (very little delay) to F (long delays and congestion). For intersections and roadways in this study area, typical traffic study practice identifies overall intersection LOS D and movement or approach LOS E as the minimum thresholds for acceptable operations. The following **Table 3** shows the definition of level of service for signalized and unsignalized intersections.

Table 3 – Level of Service Definitions

Level of Service	Signalized Intersection Average Total Delay (sec/veh)	Unsignalized Intersection Average Total Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

CO-94 and Project Access Intersection

The existing CO-94 and Project Access intersection is proposed to operate with stop control along the northbound exiting approach. With completion of the rezone project, construction of an eastbound right turn lane and a westbound left turn lane will need to be constructed according to CDOT SHAC requirements. With the recommended improvements and the addition of project traffic all movements at the proposed access intersection are expected to operate acceptably with LOS D or better during the peak hours throughout the 2040 horizon. **Table 4** provides the results of the level of service analysis for this intersection with LOS worksheets attached.

Table 4 – CO-94 and Project Access Intersection LOS Results

Scenario	AM Peak Hour		PM Peak Hour	
	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
2022 Background Plus Project #				
Northbound Approach	23.4	C	17.3	C
Westbound Left	10.8	B	8.3	A
2040 Background Plus Project #				
Northbound Approach	31.9	D	21.1	C
Westbound Left	12.2	B	8.6	A

Eastbound right turn lane and westbound left turn lane

CDOT Access Permit and Turn Lane Evaluation

The need or threshold for requiring an access permit along CDOT roadways occurs when a new access is proposed or if project traffic is anticipated to increase existing access traffic volumes by more than 20 percent. Whether this is a new access to serve the property or not, it is believed that CDOT will require an Access Permit.

Since CO-94 is a state owned and maintained facility, it is recommended that auxiliary turn lanes along CO-94 be constructed in accordance with the current CDOT State Highway Access Code (SHAC). CDOT categorizes the segment of CO-94 adjacent to the property as NR-A: Non-Rural Principal Highway. CO-94 has a posted speed limit of 65 miles per hour (mph) within the project limits. According to the State Highway Access Code for category NR-A roadways, the following thresholds apply:

- A left turn deceleration lane is required for any access with a projected average peak hour left turn ingress volume greater than 10 vehicles per hour (vph).
- A right turn deceleration lane is required for any access with a projected peak hour right turning volume greater than 25 vph.
- A right turn acceleration lane is required for any access with a projected peak hour right turning volume greater than 50 vph when the posted speed on the highway is greater than 40 mph.

Based on traffic projections and the above thresholds, auxiliary turn lane requirements were calculated for the CO-94 full movement access to the property. CO-94 provides one lane of travel in each direction and has a posted speed limit of 65 mph within the study area. As such, turn lane requirements at the study area intersection along CO-94 are as follows:

- An eastbound right turn deceleration lane **is** warranted based on projected 2022 background plus project traffic being 63 right turns during the peak hour. Since CO-94 has a category of NR-A the right turn lane requirement is deceleration length. Based on the 65-mile per hour speed limit, the deceleration lane length is 800 feet. Therefore, it is recommended that this lane be constructed to 800 feet (which includes the 300-foot taper) by 2022.
- An eastbound acceleration lane along CO-94 from the project access northbound right turn **is not** warranted based on projected 2022 background plus project traffic being 24 right turns during the peak hour.
- A westbound left turn deceleration lane **is** warranted based on projected 2022 background plus project traffic being 37 left turns during the peak hour. Since CO-94 has a category of NR-A the left turn lane requirement is deceleration and storage lengths. Based on the 65-mile per hour speed limit, the deceleration lane length is 800 feet plus 40 feet of storage for a total length of 840 feet (which includes the 300-foot taper). Therefore, it is recommended that this lane be constructed to 540 feet plus 300-foot taper by 2022.

Sight Distance Evaluation

Access for this project will be approximately 625 feet from the westernmost property line. It is believed that this access is appropriate at this location to provide the necessary sight distance needed. It is recommended that appropriate sight distance triangles be provided at all site access points to give drivers exiting the development areas a clear view of oncoming traffic. Landscaping and objects within sight triangles must not obstruct drivers' views of the adjacent travel lanes. Intersection sight distances for left turn from stop and right turn from stop were analyzed for the proposed project accesses along CO-94.

With AASHTO standards and a design speed of 65 miles per hour along CO-94, the intersection sight distance for a vehicle turning left from stop is 720 feet, while the sight distance for a vehicle turning right from stop is 625 feet. Therefore, all obstructions for left turning vehicles from stop should be clear to the right within the triangle created with a vertex point located 14.5 feet from the edge of the major road traveled way (typical position of the minor road driver's eye when stopped) and a line of sight distance of 720 feet located in the middle of the westbound through lane along CO-94. Likewise, all obstructions for right turning vehicles from stop should be clear to the left within the triangle created with a vertex point located 14.5 feet from the edge of the major road traveled way and a line of sight distance of 625 feet located in the middle of the eastbound through lane along CO-94.

Bicycle and Pedestrian Access

Bicycle and pedestrian access evaluations were conducted for the UDON Rezone project. This focused on the areas of CO-94 adjacent to the site development areas. The following provides a description of the assessment.

Adjacent to the site, there are no bicycle lanes or sidewalks along CO-94. Although there are no bicycle lanes or sidewalks that exist within the study area there are very few destinations along CO-94. By 2040, the MTCP states that the secondary regional trail is proposed along CO-94 within the project limits.

Transportation Impact Fees
The applicant intends to opt out of the PID options and will pay the full fee amount at the time of building permit. The current "full-fare" is $4,958 per 1,000 square feet of commercial building floor area. Since the highest and best use is 4,200 square feet of wholesale nursery and 4,200 square feet of shopping center the total fee amount is $41,647. There are no apparent reimbursable improvements programmed in the MTCP in the general vicinity of the site.

Conclusions and Recommendations
In summary, this traffic study provides project traffic generation estimates to identify potential project traffic related impacts on the local street system with the proposed UDON Rezoning project. Based on the analysis presented in this study, Kimley-Horn believes the proposed UDON Rezoning project will be successfully incorporated into the existing and future roadway network. Based on the results of this study, it is recommended that the access intersection along CO-94 be stop controlled, and that a R1-1 "STOP" sign be installed on the northbound approach exiting the property. Also it is recommended that an eastbound right turn deceleration lane and a westbound left turn deceleration lane be constructed to comply with CDOT SHAC requirements. The recommended intersection lane configurations and control for the project development are illustrated in **Figure 8**. If you have any questions or require anything further, please feel free to call me at (303) 228-2304.

Sincerely,

KIMLEY-HORN AND ASSOCIATES, INC.

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

Traffic Engineer's Statement

The attached traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.

Curtis D. Rowe, P.E., PTOE, PE #36355

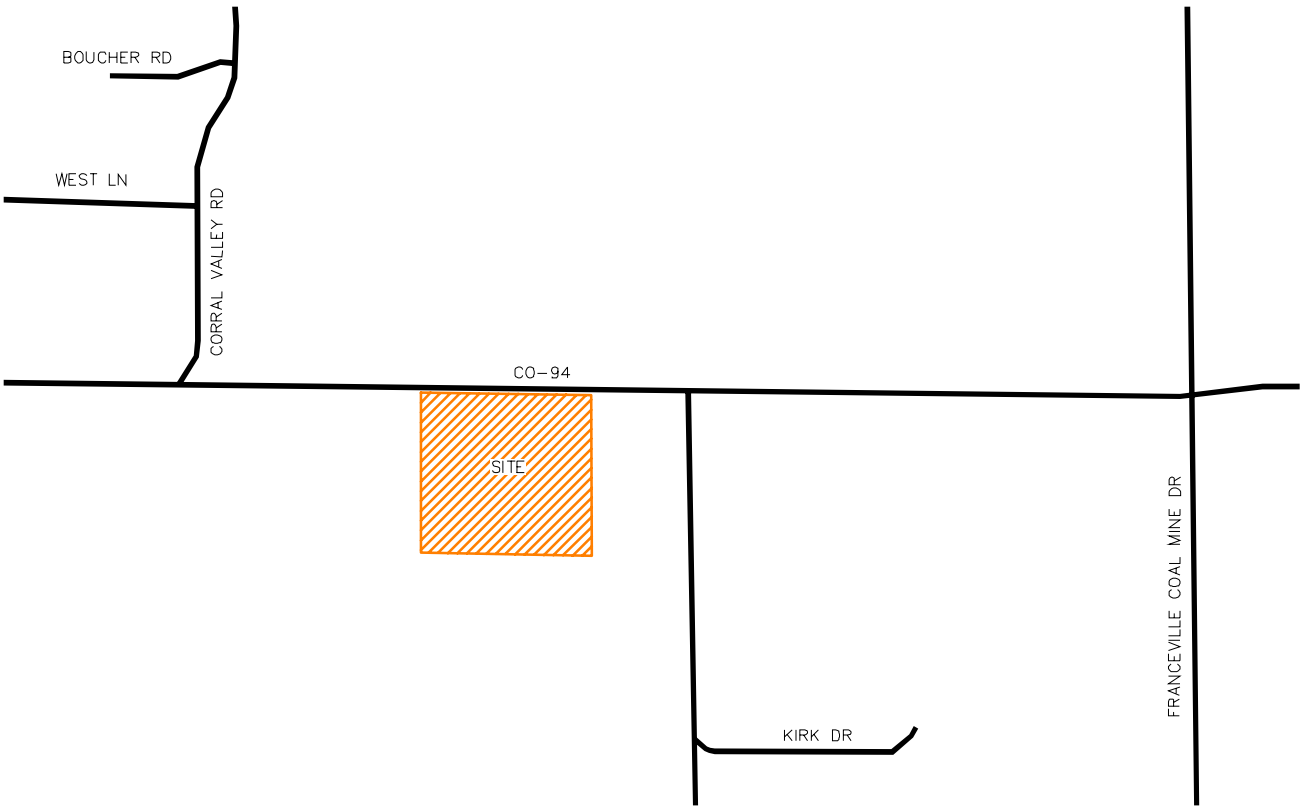
December 7, 2020
Date

Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.

Mr. Louis Ferrante
UDON Holdings, LLC
5801 N. Union Boulevard
Suite 100
Colorado Springs, CO 80918

7 DEC 2020
Date



UDON REZONE
VICINITY MAP

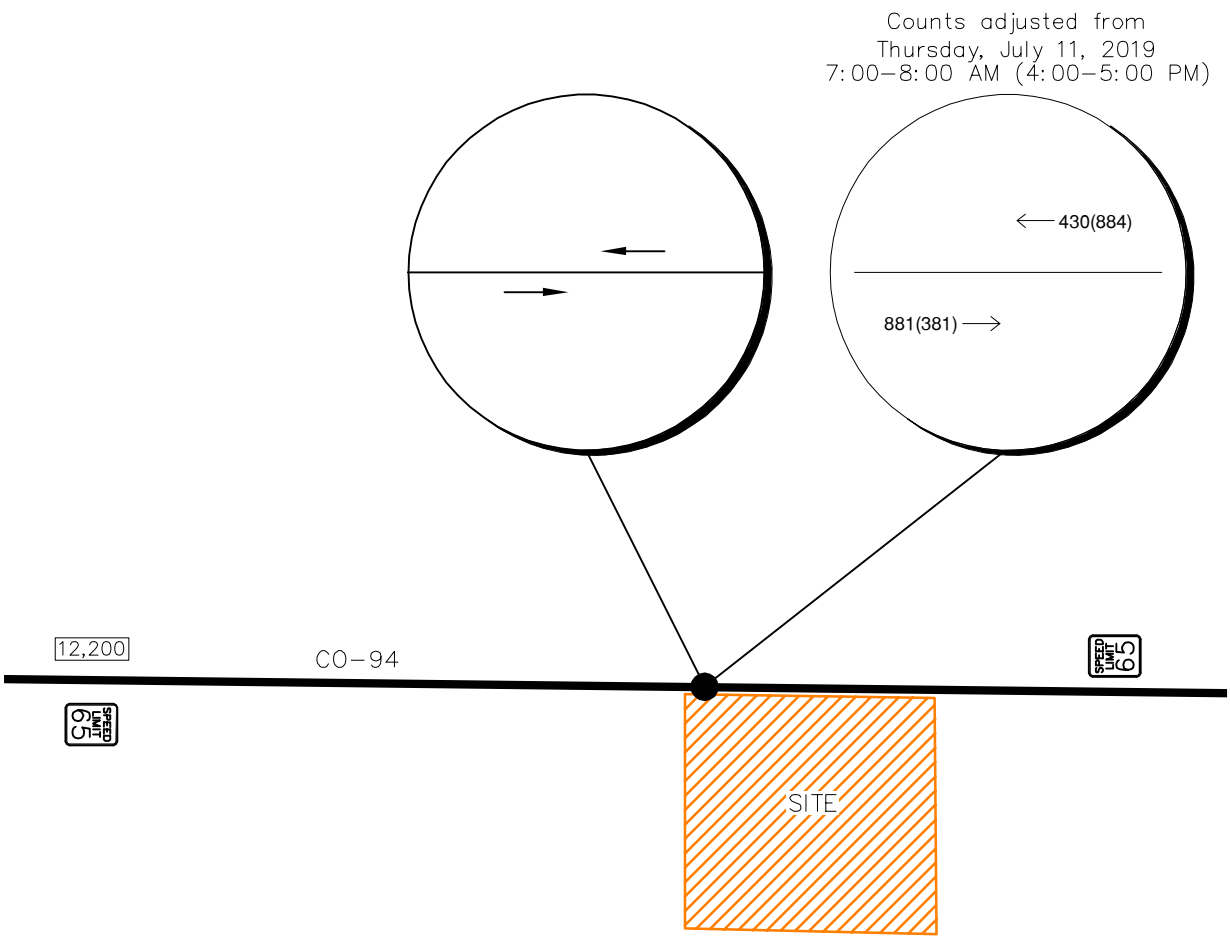
FIGURE 1

Kimley»Horn
NORTH
NTS 196020000

UDON REZONE
SITE AREA

FIGURE 2

Kimley»Horn



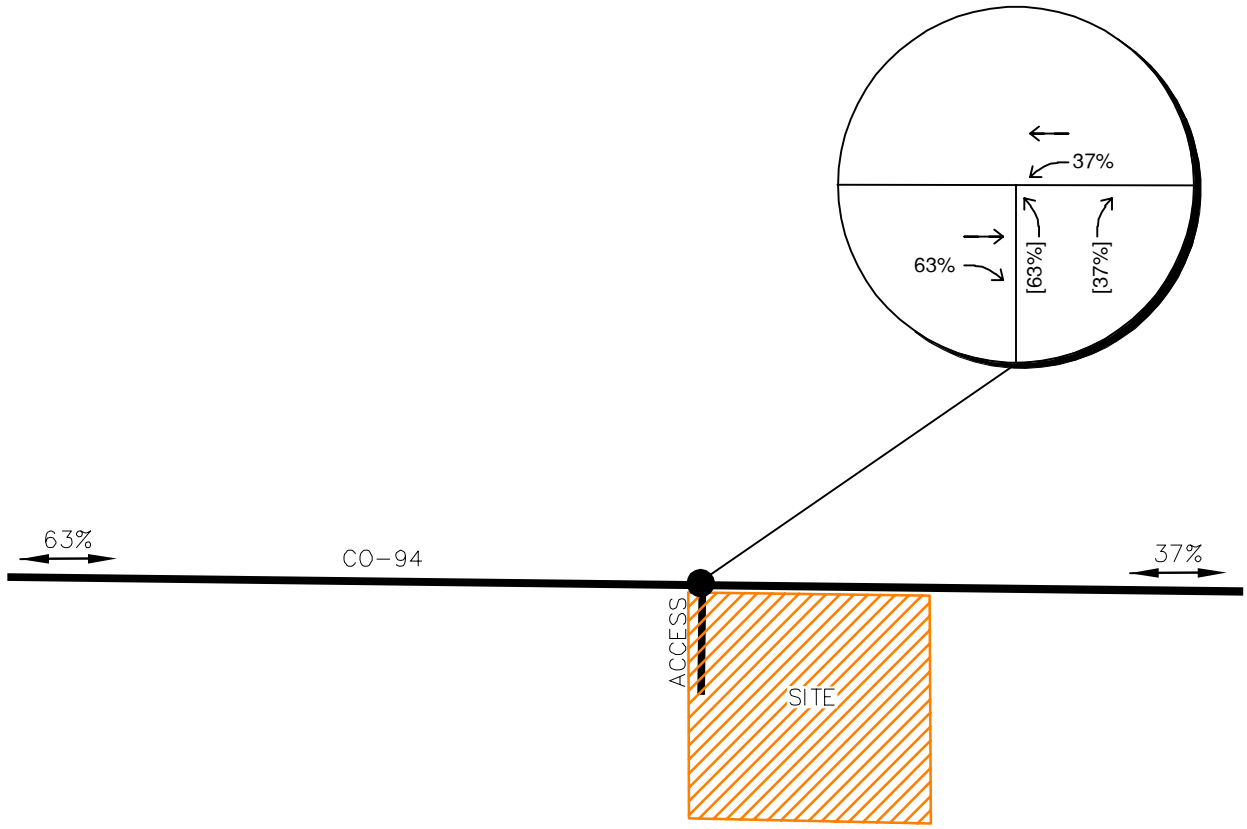
LEGEND

- Study Area Key Intersection
- Stop Controlled Approach
- Roadway Speed Limit
- XX(XX) Weekday AM(PM) Peak Hour Traffic Volumes
- XX,X00 Daily Traffic Volume

UDON REZONE
EXISTING LANE CONFIGURATIONS & TRAFFIC VOLUMES

FIGURE 3

Kimley»Horn



LEGEND

● Study Area Key Intersection

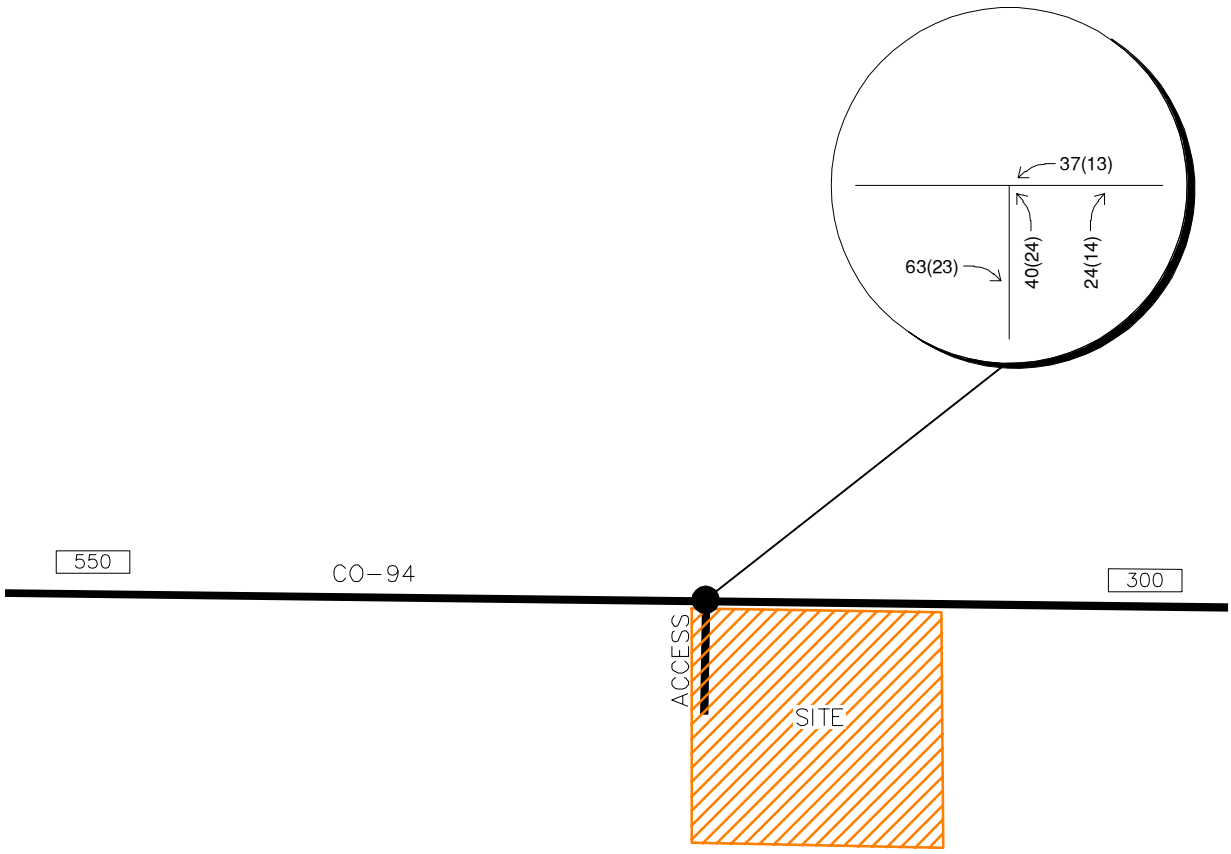
XX% External Trip Distribution Percentage

XX%[XX%] Entering[Exiting] Trip Distribution Percentage

UDON REZONE
PROJECT TRIP DISTRIBUTION

FIGURE 4

Kimley»Horn



LEGEND

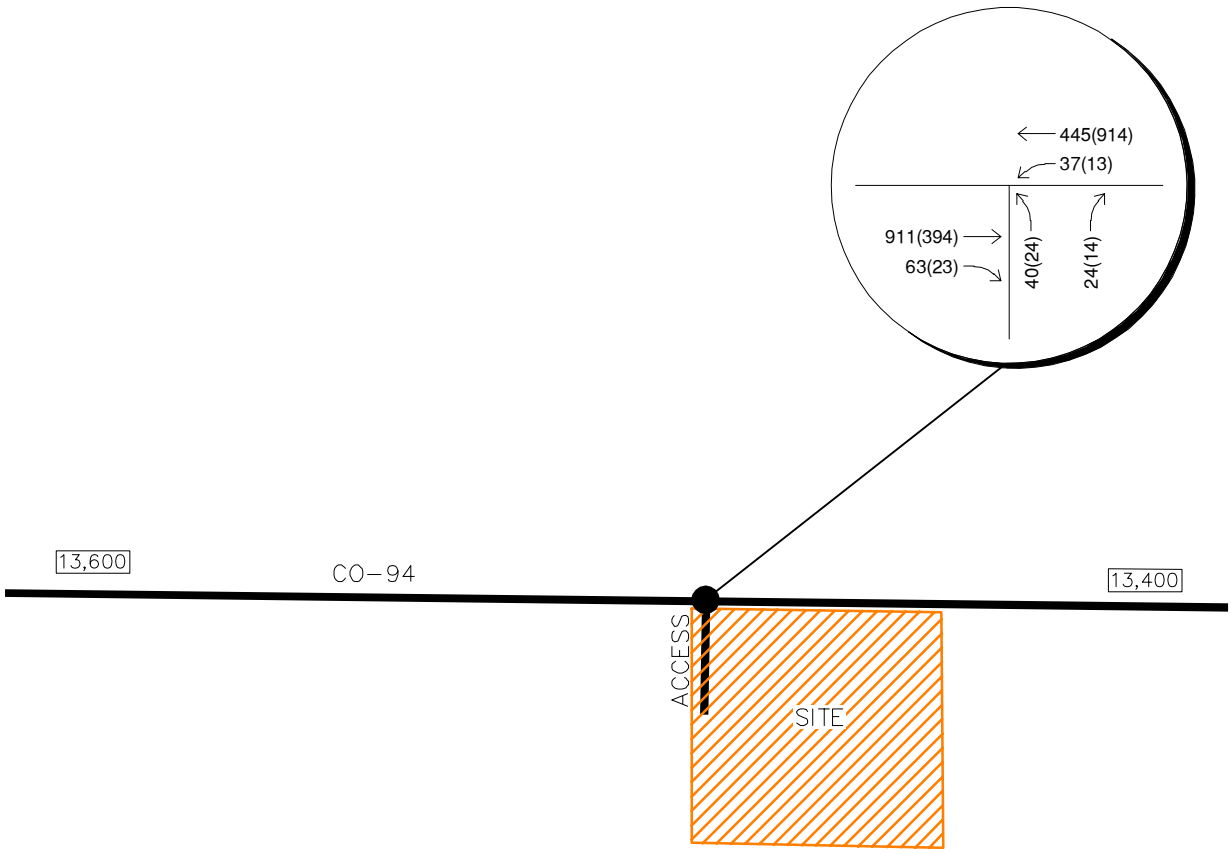
● Study Area Key Intersection

XXX(XXX) Weekday AM(PM) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

UDON REZONE
PROJECT TRAFFIC ASSIGNMENT

FIGURE 5



LEGEND

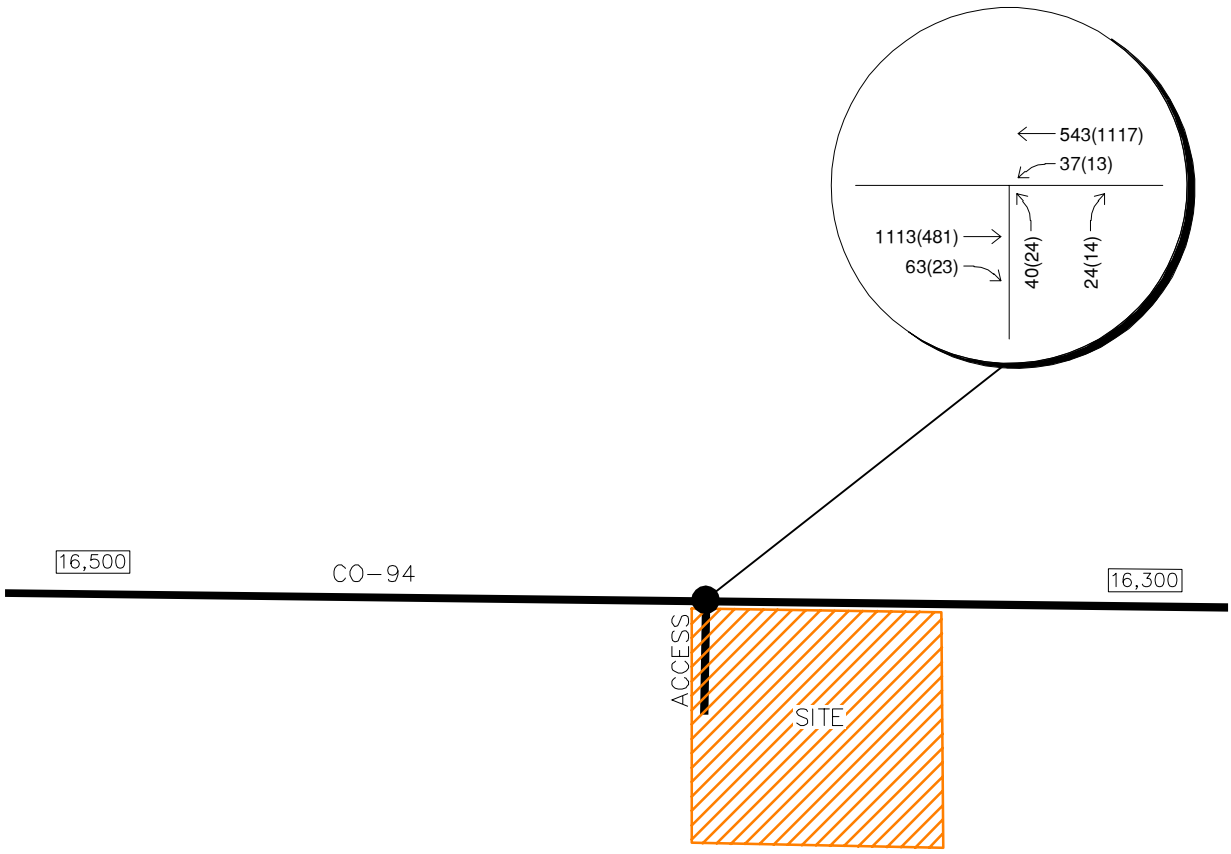
● Study Area Key Intersection

XXX(XXX) Weekday AM(PM) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

UDON REZONE
2022 TOTAL TRAFFIC VOLUMES

FIGURE 6



LEGEND

● Study Area Key Intersection

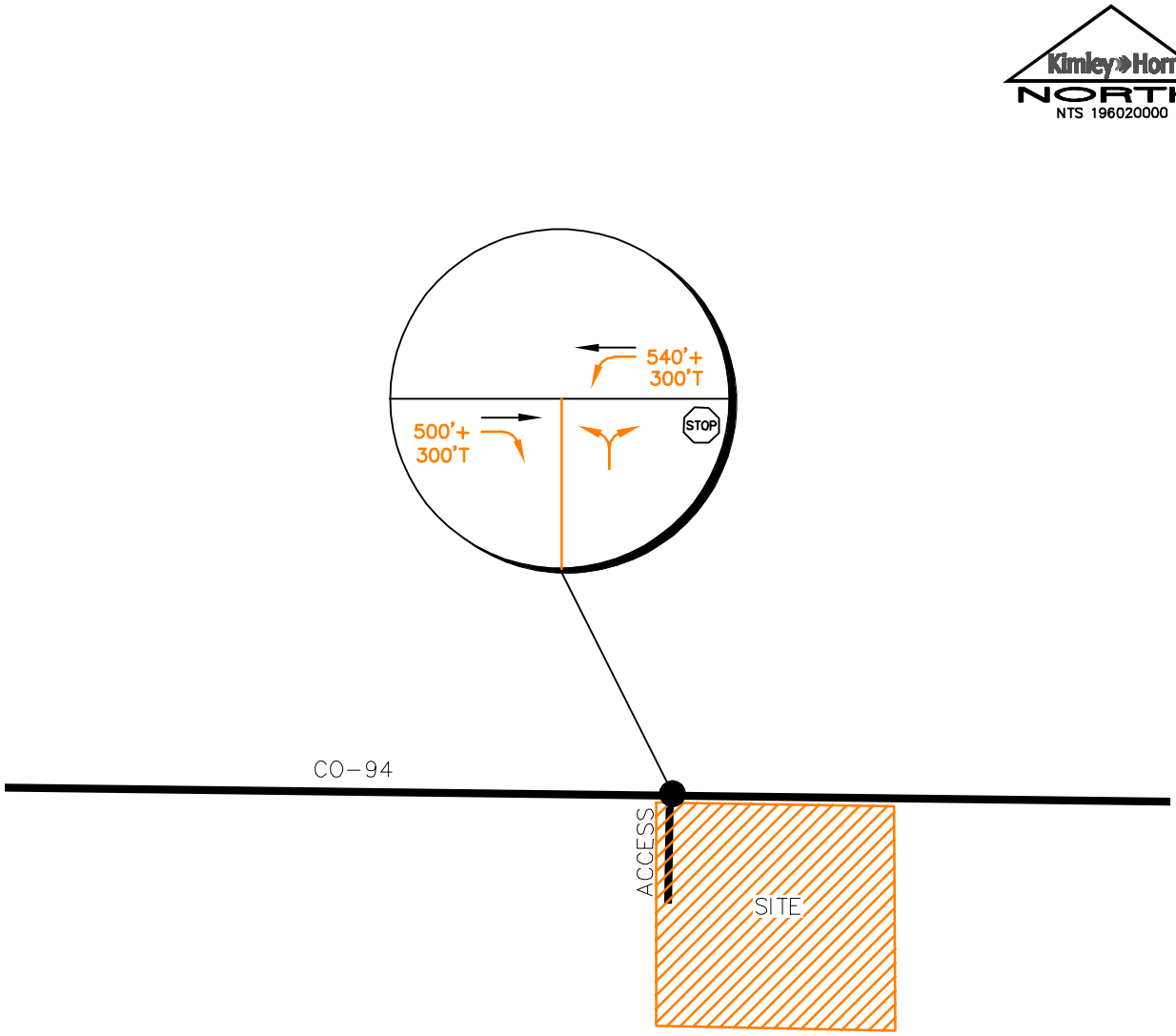
XXX(XXX) Weekday AM(PM) Peak Hour Traffic Volumes

XX,X00 Estimated Daily Traffic Volume

UDON REZONE
2040 TOTAL TRAFFIC VOLUMES

FIGURE 7

Kimley»Horn



LEGEND

- Study Area Key Intersection
- STOP Stop Controlled Approach
- T Taper
- Improvement

UDON REZONE
RECOMMENDED LANE CONFIGURATIONS

FIGURE 8

2019 CDOT Traffic Volume Data
Thursday, July 11, 2019
On SH-94 E/O Space Village Ave CR 2804

COUNTDIR	HOUR0	HOUR1	HOUR2	HOUR3	HOUR4	HOUR5	HOUR6	HOUR7	HOUR8	HOUR9	HOUR10	HOUR11	HOUR12	HOUR13	HOUR14	HOUR15	HOUR16	HOUR17	HOUR18	HOUR19	HOUR20	HOUR21	HOUR22	HOUR23	Total
P (EB)	22	23	16	13	93	272	747	871	439	262	248	222	286	246	282	292	377	429	309	224	155	129	95	52	6104
S (WB)	17	6	9	14	48	169	370	425	316	293	274	325	289	297	443	670	874	572	320	150	94	56	39	50	6120
Total	39	29	25	27	141	441	1117	1296	755	555	522	547	575	543	725	962	1251	1001	629	374	249	185	134	102	12224
Hour	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	12:00-1:00	1:00-2:00	2:00-3:00	3:00-4:00	4:00-5:00	5:00-6:00	6:00-7:00	7:00-8:00	8:00-9:00	9:00-10:00	10:00-11:00	11:00-12:00	

CDOT Traffic Projection - UDON Rezone

ROUTE	REFPT	ENDREFPT	LENGTH	AADT	AADTYR	YR20FACTOR	DHV	LOCATION
094A	1	8.085	7.077	11000	2018	1.25	12.5	ON SH 94 E/O SPACE VILLAGE AVE CR 2804

Annual Growth 1.12%

Kimley»Horn

Project	UDON Rezone				
Subject	Trip Generation for Small Office Building				
Designed by	TES	*Date*	October 21, 2020	*Job No.*	196020000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates

Land Use Code - Small Office Building (712)

Independant Variable - 1000 Square Feet (X)
SF = 4,200
X = 4.200
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (700 Series Page 95)

Directional Distribution: 83% ent. 17% exit.
(T) = 1.92 (X) T = 8 Average Vehicle Trip Ends
(T) = 1.92 * (4.2) 7 entering 1 exiting

7 + 1 = 8

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (700 Series Page 96)

Directional Distribution: 32% ent. 68% exit.
(T) = 2.45 (X) T = 10 Average Vehicle Trip Ends
(T) = 2.45 * (4.2) 3 entering 7 exiting

3 + 7 = 10

Weekday (700 Series Page 94)

Average Weekday Directional Distribution: 50% ent. 50% exit.
(T) = 16.19 (X) T = 68 Average Vehicle Trip Ends
(T) = 16.19 * (4.2) 34 entering 34 exiting

34 + 34 = 68

Saturday, Peak Hour of Generator (700 Series Page 9)

Daily Weekday Directional Distribution: 50% ent. 50% exit.
(T) = 0.40 (X) T = 2 Average Vehicle Trip Ends
(T) = 0.40 * (4.2) 1 entering 1 exiting

1 + 1 = 2

Kimley»Horn

Project	UDON Rezone				
Subject	Trip Generation for Nursery (Wholesale)				
Designed by	TES	*Date*	October 21, 2020	*Job No.*	196020000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rates
Land Use Code - Nursery (Wholesale) (818)
Independant Variable - 1,000 Square Feet (X)
Square Feet = 4,200
SF = 4.200
T = Average Vehicle Trip Ends

Weekday (800 Series Page 110)

Average Weekday — Directional Distribution: 50% ent. 50% exit.
T = 39.00 (X) — T = 164 Average Vehicle Trip Ends
T = 39.0 * (4.2) — 82 entering 82 exiting

82 + 82 = 164

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 111)

Directional Distribution: 50% ent. 50% exit.
T = 2.40 (X) — T = 10 Average Vehicle Trip Ends
T = 2.40 * (4.2) — 5 entering 5 exiting

5 + 5 = 10

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 112)

Directional Distribution: 50% ent. 50% exit.
T = 5.18 (X) — T = 22 Average Vehicle Trip Ends
T = 5.18 * (4.2) — 11 entering 11 exiting

11 + 11 = 22

Saturday (800 Series Page 115)

Average Saturday — Directional Distribution: 50% ent. 50% exit.
T = 29.94 (X) — T = 126 Average Vehicle Trip Ends
T = 29.94 * (4.2) — 63 entering 63 exiting

63 + 63 = 126

Saturday Peak Hour of Generator (800 Series Page 116)

Directional Distribution: 50% ent. 50% exit.
T = 5.53 (X) — T = 23 Average Vehicle Trip Ends
T = 5.53 * (4.2) — 12 entering 12 exiting

12 + 11 = 23

Kimley»Horn

Project	UDON Rezone				
Subject	Trip Generation for Shopping Center				
Designed by	TES	*Date*	October 21, 2020	*Job No.*	196020000
Checked by		*Date*		*Sheet No.*	of

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Fitted Curve Equations
Land Use Code - Shopping Center (820)
Independant Variable - 1000 Square Feet Gross Leasable Area (X)

Gross Leasable Area = 4,200 Square Feet
X = 4.200
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (800 Series Page 139)

Directional Distribution: 62% ent. 38% exit.

T = 0.50 * (X) + 151.78 — T = 154 Average Vehicle Trip Ends
T = 0.50 * 4 + 151.78 — 95 entering 59 exiting

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (800 Series Page 140)

Directional Distribution: 48% ent. 52% exit.

Ln(T) = 0.74 Ln(X) + 2.89 — T = 52 Average Vehicle Trip Ends
Ln(T) = 0.74 * Ln(4) + 2.89 — 25 entering 27 exiting

Weekday (800 Series Page 138)

Daily Weekday — Directional Distribution: 50% entering, 50% exiting
Ln(T) = 0.68 Ln(X) + 5.57 — T = 696 Average Vehicle Trip Ends
Ln(T) = 0.68 * Ln(4) + 5.57 — 348 entering 348 exiting

Saturday Peak Hour of Generator (Page 144)

Average Saturday — Directional Distribution: 52% ent. 48% exit.
Ln(T) = 0..79 Ln(X) + 2.79 — T = 51 Average Vehicle Trip Ends
Ln(T) = 0.79 * Ln(4) + 2.79 — 27 entering 24 exiting

Non Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017-Page 190)

AM Peak Hour = 66% Non-Pass By — PM Peak Hour = 66% Non-Pass By

	IN	Out	Total
AM Peak	63	39	102
PM Peak	16	18	34
Daily	230	230	460

PM Peak Hour Rate Applied to Daily

Pass-By Trip Volumes (Per ITE Trip Generation Handbook, 3rd Edition September 2017 -Page 190)

AM Peak Hour = 34% Pass By — PM Peak Hour = 34% Pass By

	IN	Out	Total
AM Peak	32	20	53
PM Peak	8	9	18
Daily	118	118	236

PM Peak Hour Rate Applied to Daily

Kimley»Horn

Project	UDON Rezone				
Subject	Trip Generation for Fast-Food Restaurant without Drive-Through Window				
Designed by	TES	*Date*	May 28, 2020	*Job No.*	196020000
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 Without Drive-Through Window (933)

Independant Variable - 1000 Square Feet Gross Floor Area (X)
Gross Floor Area = 1,000 Square Feet
X = 1.000
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series page 132)

Average Weekday — Directional Distribution: 60% ent. 40% exit.
T = 25.10 (X) — T = 25 Average Vehicle Trip Ends
T = 25.10 * 1.000 — 15 entering 10 exiting

15 + 10 = 25

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series page 133)

Average Weekday — Directional Distribution: 50% ent. 50% exit.
T = 28.34 (X) — T = 28 Average Vehicle Trip Ends
T = 28.34 * 1.000 — 14 entering 14 exiting

14 + 14 = 28

Weekday (900 Series page 131)

Average Weekday — Directional Distribution: 50% entering, 50% exiting
T = 346.23 (X) — T = 348 Average Vehicle Trip Ends
T = 346.23 * 1.000 — 174 entering 174 exiting

174 + 174 = 348

Saturday Peak Hour of Generator (900 Series page 137)

Directional Distribution: 49% ent. 51% exit.
T = 54.60 (X) — T = 55 Average Vehicle Trip Ends
T = 54.60 * 1.000 — 27 entering 28 exiting

27 + 28 = 55

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	8	5	13	
PM Peak	7	7	14	
Daily	87	87	174	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	7	5	12	
PM Peak	7	7	14	
Daily	87	87	174	PM Peak Hour Rate Applied to Daily

Kimley»Horn

Project	UDON Rezone				
Subject	Trip Generation for Automobile Care Center				
Designed by	TES	*Date*	October 21, 2020	*Job No.*	196020000
Checked by		*Date*		*Sheet No.*	1 *of* 1

TRIP GENERATION MANUAL TECHNIQUES

ITE Trip Generation Manual 10th Edition, Average Rate Equations

Land Use Code - Automobile Care Center (942)

Independant Variable - 1000 Square Feet Gross Floor Feet (X)
Gross Floor Area = 4,200
X = 4.2
T = Average Vehicle Trip Ends

Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m. (900 Series Page 283)

Directional Distribution: 66% ent. 34% exit.

T = 2.25 (X) T = 9 Average Vehicle Trip Ends
T = 2.25 * 4.2 6 entering 3 exiting

Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m. (900 Series Page 284)

Directional Distribution: 48% ent. 52% exit.

T = 3.11 (X) T = 14 Average Vehicle Trip Ends
T = 3.11 * 4.2 7 entering 7 exiting

Weekday (10% K-Factor from PM Peak Hour)

Average Weekday

Directional Distribution: 50% entering, 50% exiting
T = 140 Average Vehicle Trip Ends

(T) = PM Peak Total / K Factor 0.1 70 entering 70 exiting

70 + 70 = 140

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	911	63	37	445	40	24
Future Vol, veh/h	911	63	37	445	40	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	800	250	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	990	68	40	484	43	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1058	0	1554	990
Stage 1	-	-	-	-	990	-
Stage 2	-	-	-	-	564	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	658	-	125	299
Stage 1	-	-	-	-	360	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	658	-	117	299
Mov Cap-2 Maneuver	-	-	-	-	247	-
Stage 1	-	-	-	-	360	-
Stage 2	-	-	-	-	534	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	23.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	264	-	-	658	-
HCM Lane V/C Ratio	0.264	-	-	0.061	-
HCM Control Delay (s)	23.4	-	-	10.8	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	394	23	13	914	24	14
Future Vol, veh/h	394	23	13	914	24	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	800	250	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	428	25	14	993	26	15

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	453	0	1449	428
Stage 1	-	-	-	-	428	-
Stage 2	-	-	-	-	1021	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1108	-	144	627
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	348	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1108	-	142	627
Mov Cap-2 Maneuver	-	-	-	-	262	-
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	343	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	17.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	334	-	-	1108	-
HCM Lane V/C Ratio	0.124	-	-	0.013	-
HCM Control Delay (s)	17.3	-	-	8.3	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	1113	63	37	543	40	24
Future Vol, veh/h	1113	63	37	543	40	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	800	250	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1210	68	40	590	43	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1278	0	1880	1210
Stage 1	-	-	-	-	1210	-
Stage 2	-	-	-	-	670	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	543	-	78	223
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	509	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	543	-	72	223
Mov Cap-2 Maneuver	-	-	-	-	191	-
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	471	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	31.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	202	-	-	543	-
HCM Lane V/C Ratio	0.344	-	-	0.074	-
HCM Control Delay (s)	31.9	-	-	12.2	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	1.4	-	-	0.2	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	481	23	13	1117	24	14
Future Vol, veh/h	481	23	13	1117	24	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	800	250	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	523	25	14	1214	26	15

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	548	0	1765	523
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	1242	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1021	-	92	554
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	272	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1021	-	91	554
Mov Cap-2 Maneuver	-	-	-	-	203	-
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	268	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	21.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	265	-	-	1021	-
HCM Lane V/C Ratio	0.156	-	-	0.014	-
HCM Control Delay (s)	21.1	-	-	8.6	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-