



DB Enterprise, LLC  
4771 So. Danube Circle  
Aurora, Colorado 80015

Phone: (720) 231-1947  
E-Mail: [druble.jr@comcast.net](mailto:druble.jr@comcast.net)

September 15, 2021

Mr. Troy Kirschman  
Hover Architecture, PC  
385 Inverness Parkway, Suite 190  
Englewood, CO 80112

Re: Living Water - Lone Tree Car Wash Project  
Lone Tree, CO (DBE #210290)

Dear Mr. Kirschman:

I have completed the preparation of the traffic conformance letter for the proposed Living Water - Lone Tree Car Wash project. The proposed Living Water - Lone Tree Car Wash project is located near the intersection of South Yosemite Street and Park Meadows Drive. Figure 1 depicts the precise location of the proposed Living Water - Lone Tree Car Wash project. The site is bounded by South Yosemite Street on the west, Park Meadows Drive on the south, and commercial development on the east and north.

#### Introduction

The proposed Living Water - Lone Tree Car Wash project involves replacing the existing a 6,943 square-foot sit-down restaurant with a tunnel car wash facility. When completed the proposed car wash facility will have one tunnel car wash stall, 17 vacuum stations, 11 general parking spaces, and one handicapped parking space.

There will not be any changes regarding the access to the site. The commercial development where the proposed car wash project is to be located is served by a three-quarter access along Park Meadows Drive. Approximately 685 feet to the east, Kimmer Drive is a full movement signalized intersection. This intersection can be used for traffic using the proposed car wash who desire to go east and south.

Figure 2 depicts the proposed site plan for the proposed Living Water - Lone Tree Car Wash project. This site plan is under review by the City of Lone Tree and may change as a result of this review.

#### Vehicle Trip Generation Estimates

The amount of traffic that is being generated by the proposed Living Water - Lone Tree Car Wash project has been estimated based upon information provided by the applicant. The applicant provided information regarding the number of customers visiting three car wash facilities owned by the applicant. The three sites are – Littleton (6646 South Wadsworth

Boulevard), East Littleton (6875 South Broadway), and County Line (5651 County Line Place, Highlands Ranch). These three facilities each have one tunnel car wash stall and range in size from 5,195 square feet for the South Wadsworth Boulevard site to 5,700 square feet for the County Line Place site). The proposed Living Water Car Wash – Lone Tree site is expected to have one tunnel car wash stall consisting of 5,673 square feet in size. Information was provided from September 1<sup>st</sup> through September 11<sup>th</sup> with the exception of September 5<sup>th</sup> which was a holiday. Daily visitor totals were provided for each of the three sites along with the hourly totals for September 11<sup>th</sup> (Saturday) and September 8<sup>th</sup> (Wednesday). Appendix A contains this information. Tables 1 and 2 depicts this information.

**Table 1**  
Daily Customers (Excluding Employees)

Day	Littleton	East Littleton	County Line	Average
9/1/2021	428	188	139	252
9/2/2021	407	199	151	252
9/3/2021	374	180	171	242
9/6/2021	392	266	241	300
9/7/2021	576	318	237	377
9/8/2021	477	243	199	306
9/9/2021	420	221	168	270
9/10/2021	496	217	226	313
Average	446	229	192	289
Employees	5	5	5	5
Total	451	234	197	294

**Table 2**  
Hourly Customers(Excluding Employees)

Day	Littleton	East Littleton	County Line	Average
7:00 to 8:00	14	11	9	11
8:00 to 9:00	33	20	6	20
9:00 to 10:00	44	12	18	25
10:00 to 11:00	44	17	17	26
11:00 to 12:00	32	20	16	23
12:00 to 13:00	43	18	24	28
13:00 to 14:00	36	19	22	26
14:00 to 15:00	43	24	21	29
15:00 to 16:00	52	29	16	32
16:00 to 17:00	43	28	17	29
17:00 to 18:00	50	27	18	32
18:00 to 19:00	28	13	11	17
19:00 to 20:00	15	5	4	8

The attached Table 3 compares the daily and peak-hour trip generation estimates for the existing use and the proposed use. The trip generation for the existing use is based on trip generation rates published by the Institute of Transportation Engineers (ITE) in the 10<sup>th</sup> Edition, 2017, of *Trip Generation*.

As can be seen in Table 3, the proposed car wash facility has 192 fewer daily vehicles-trips, 17 fewer vehicle-trips in the AM peak-hour, and four more vehicle-trips in the PM peak-hour. This small increase in the PM peak-hour will not have any adverse impact to the operation of the intersections servicing the proposed car wash project.

#### Vehicle Stacking Analysis

As shown in Figure 2, the site has three lanes for processing vehicles desiring to use the proposed car wash facility. One lane is for monthly customers and the other two are for paying customers. The monthly customers do not have to wait to enter the car wash. For purposes of this analysis, it has been assumed that 10 percent of the peak-hour customers will be considered to be monthly customers. This means that 32 customers were used in the queue analysis. It was assumed that it will take between 60 and 120 seconds to process the payment and enter the car wash.

A traffic signal was used to simulate the wait time a customer would encounter. The software program, *SimTraffic*, was used to estimate the expected queue length. It was assumed that there would be two approach lanes. The minimum split was assumed to be 5.0 seconds and the balance was allocated to the cross street. When the traffic signal released the car wash traffic, no more than two vehicles were released. When a 60-second cycle length was used, the estimated queue length was estimated to be 55 feet, or two vehicles. When a 120-second cycle length was used, the estimated queue length was estimated to be 60 feet, or two vehicles. Based on these estimates, the expected queue length should remain on site and not adversely affect Park Meadows Drive. Appendix B contains the *SimTraffic* printout.

A report has been prepared which estimated the queue length for various land use categories that have a drive-through window. This report is entitled "Drive-Through Queue Generation" dated February 2012 prepared by Mike Spack. In this report it estimated the queue length for an automatic car wash facility to be six vehicles using the 85<sup>th</sup> percentile. When the 33<sup>rd</sup> percentile is used, the estimate queue length drops to three vehicle. The proposed site plan can store 19 vehicles, or 380 feet.

#### Internal Signage

Internal signs need to be placed in the parking next to the site access that informs the driver of which direction to go to access the car wash and the vacuum stations.

#### Conclusion

The proposed Living Water - Lone Tree Car Wash project will generate fewer daily vehicle-trips than the restaurant that is currently on the site. The initial site plan for the proposed car wash is able to accommodate the maximum number of vehicles that is expected to visit the site.

This completes my traffic conformance letter for the proposed Living Water - Lone Tree Car Wash project. Please feel free to call if you need any additional information regarding this project.

Respectfully submitted,

DB Enterprise, LLC

By:   
Dave L. Ruble Jr., P.E.



DLR/bar

Enclosures:

Figures 1-2

Table 1-3

Appendix A – Trip Generation Information from Existing Car Wash Facilities

Appendix B – Queue Length Estimates (SimTraffic)

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Approximate Scale  
Scale: 1" = 90'



Figure 1  
Vicinity Map



Approximate Scale  
Scale 1" = 65'

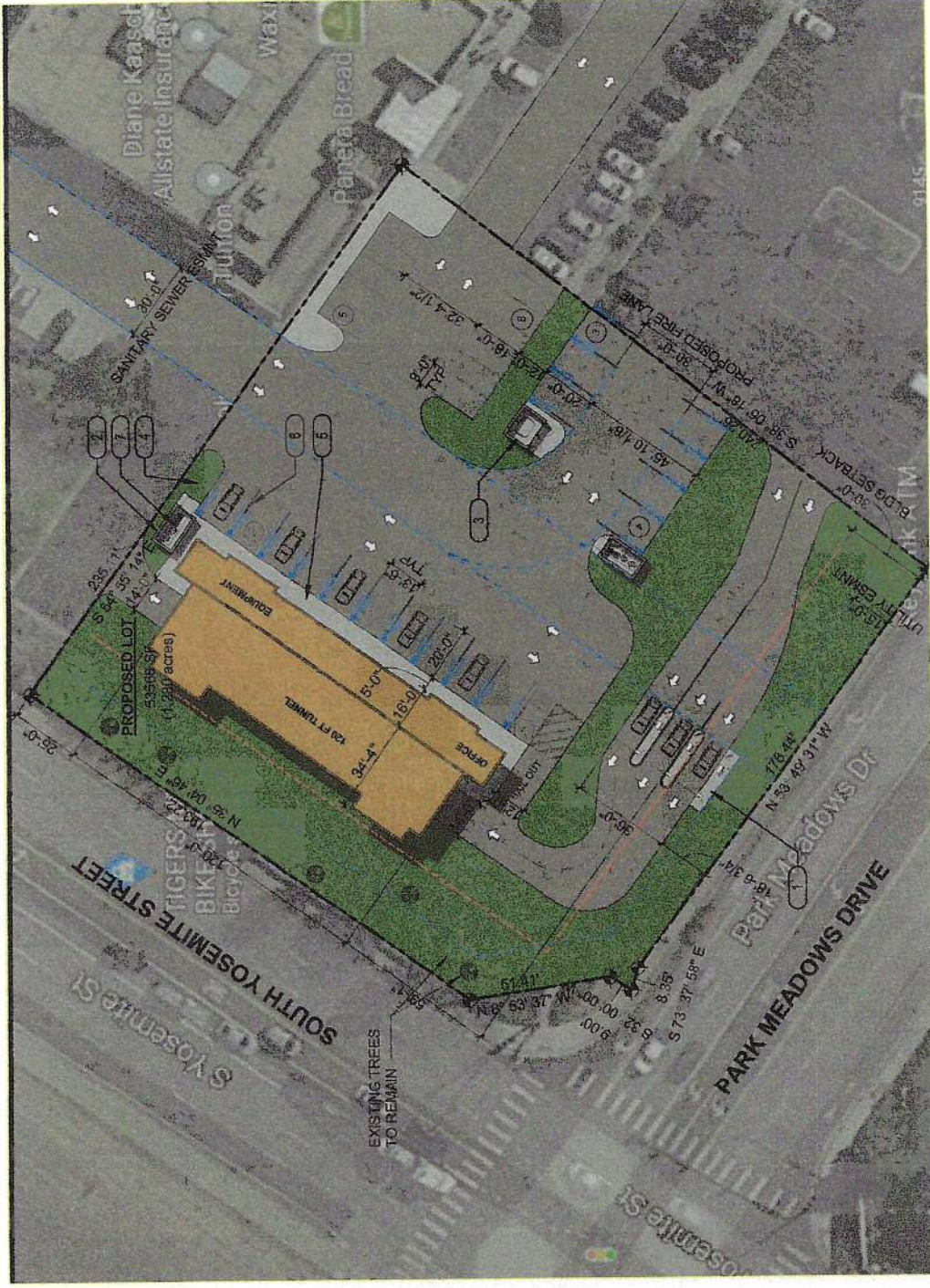


Figure 2  
Site Plan

Table 3  
 Estimated Vehicle Trip Generation  
 Living Water Car Wash - Lone Tree Project  
 Lone Tree, Colorado  
 (DBE#210290, September, 2021)

ITE Category	Quantity	Average Weekday (2)	Trip Generation Rates (1)		PM Peak-Hour (3)		Total Vehicle Trips Generated				
			AM Peak-Hour (3) In	Out	In	Out	Average Weekday	AM Peak-Hour In	Out	PM Peak-Hour In	Out
Existing Use 932 High-Turnover (Sit-Down) Restaurant	6.95	KSF (4) 112.18	5.47	4.47	6.06	3.71	780	38	31	42	26
Proposed Use Automated Car Wash (5)	1	Tunnel 588.00	26.00	26.00	36.00	36.00	688	26	26	36	36

Notes:  
 (1) Source: "Trip Generation", Institute of Transportation Engineers, 10th Edition, 2017.  
 (2) Based on calculation below  
 (3) Used the PM trip generation rate which is what ITE shows as the trip generation rate for the AM and PM Peak-Hour of the Generator  
 (4) KSF = 1,000 square feet  
 (5) Information Provided by Applicant (See Appendix A)

## Appendix A

### Trip Generation for Existing Car Wash Facilities



# Weekday Hourly Peaks - Sept 8

Time (Hour)	Living Water - Littleton	Living Water - East Littleton	Living Water - County Line	Average	Total
9/8/2021 7:00	14	11	9	11.34	34
9/8/2021 8:00	33	20	6	19.67	59
9/8/2021 9:00	44	12	18	24.67	74
9/8/2021 10:00	44	17	17	26.01	78
9/8/2021 11:00	32	20	16	22.67	68
9/8/2021 12:00	43	18	24	28.33	85
9/8/2021 13:00	36	19	22	25.66	77
9/8/2021 14:00	43	24	21	29.33	88
9/8/2021 15:00	52	29	16	32.33	97
9/8/2021 16:00	43	28	17	29.33	88
9/8/2021 17:00	50	27	18	31.67	95
9/8/2021 18:00	28	13	11	17.33	52
9/8/2021 19:00	15	5	4	8	24
<b>Total Cars</b>	<b>477</b>	<b>243</b>	<b>199</b>	<b>306.33</b>	<b>919</b>

# Saturday Hourly Peaks - Sept 11

Time (Hour)	Living Water - Littleton	Living Water - East Littleton	Living Water - County Line	Average	Total
9/11/2021 7:00	11	4	8	7.67	23
9/11/2021 8:00	37	12	14	21	63
9/11/2021 9:00	60	29	12	33.67	101
9/11/2021 10:00	60	42	26	42.67	128
9/11/2021 11:00	61	50	39	50	150
9/11/2021 12:00	44	33	30	35.67	107
9/11/2021 13:00	56	39	16	37	111
9/11/2021 14:00	44	25	25	31.33	94
9/11/2021 15:00	23	28	13	21.33	64
9/11/2021 16:00	35	17	18	23.34	70
9/11/2021 17:00	54	23	19	32	96
9/11/2021 18:00	19	10	5	11.33	34
9/11/2021 19:00	10	4	2	5.33	16
<b>Total Cars</b>	<b>514</b>	<b>316</b>	<b>227</b>	<b>352.33</b>	<b>1057</b>

# Daily Totals for the month of September

Date	Living Water - Littleton	Living Water - East Littleton	Living Water - County Line	Average	Total
9/1/2021	428	188	139	252	755
9/2/2021	407	199	151	252	757
9/3/2021	374	180	171	242	725
9/4/2021	630	334	264	409	1228
9/6/2021	392	266	241	300	899
9/7/2021	576	318	237	377	1131
9/8/2021	477	243	199	306	919
9/9/2021	420	221	168	270	809
9/10/2021	496	217	226	313	939
9/11/2021	514	316	227	352	1057
<b>Total Cars</b>	<b>4714</b>	<b>2482</b>	<b>2023</b>	<b>307</b>	<b>9219</b>

Appendix B  
Queue Length Estimates  
(SimTraffic)

Queuing and Blocking Report  
AM Peak-Hour - 60 Second Cycle Length

09/15/2021

Intersection: 3: Entrance & Driveway Access

Movement	WB	WB	NB	SB
Directions Served	LT	TR	LTR	LTR
Maximum Queue (ft)	69	6	110	113
Average Queue (ft)	20	0	51	52
95th Queue (ft)	54	4	92	96
Link Distance (ft)	347	347	490	292
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Queuing and Blocking Report  
AM Peak-Hour - 120 Second Cycle Length

09/15/2021

Intersection: 3: Entrance & Driveway Access

Movement	WB	WB	NB	SB
Directions Served	LT	TR	LTR	LTR
Maximum Queue (ft)	69	6	90	84
Average Queue (ft)	22	0	34	33
95th Queue (ft)	57	4	70	71
Link Distance (ft)	347	347	490	292
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0