September 21, 2018

Mr. Marvin Otsuji
Aloha Aina, Inc.
c/o Beck Law | Canna Legal
Attention: Mr. Josh Abrams
2681 Cleveland Avenue
Santa Rosa, CA 95403

Updated Trip Generation for the Yogurt Time Center Project

Dear Mr. Otsuji;

As requested, W-Trans has reviewed the draft traffic impact study prepared for the Yogurt Time Center project and compared the trip generation for the project as currently proposed to that for the originally proposed development for the same site. A copy of the draft *Traffic Impact Study for the Yogurt Time Center*, dated May 22, 2015, is enclosed for reference.

Project Description

The proposed project includes a cannabis dispensary in a portion of the space that was previously proposed to be a coffee shop. As currently proposed, the dispensary would occupy most of the building space and the size of the coffee shop would be reduced to approximately 419 feet and re-envisioned as a small coffee shop or juice bar with a drive-through window. The dispensary would include 1,479 square feet of retail space, with the remaining 439 square feet allocated to employee facilities and a lobby area. The dispensary would be open from 9:00 a.m. to 9:00 p.m. seven days a week and would also operate a cannabis delivery service during those hours. Deliveries would be made with standard passenger vehicles and would be consolidated to reduce the number of trips generated; six deliveries are expected to be made throughout the day. Under the current project proposal, no changes would be made to the 5,705 square feet of specialty retail space.

Trip Generation

The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 10th Edition, 2017. Because the site is currently unoccupied, there are no existing trips to be considered. Rates for “Marijuana Dispensary” (ITE LU #882) were applied to the dispensary retail space while rates for General Office Building (ITE LU #710) were applied to the remaining balance of floor space associated with the dispensary as this space would mostly be reserved for employee use. Rates for “Coffee/Donut Shop with Drive-Thru Window” (ITE LU #937) were applied to the coffee/ juice shop floor area. Since no changes are proposed to the specialty retail space, the trip generation for this use as detailed in the original traffic study was applied.

Pass-by Trips

Some of the trips associated with the coffee/juice shop are expected to be drawn from existing traffic on nearby streets. These vehicle trips are not considered "new," but are instead comprised of drivers who are already driving on the adjacent street system and choose to make an interim stop; these trips are referred to as “pass by.” For the proposed project, pass-by trips would be “captured” from existing traffic on Piner Road and Marlow Road. The percentage of these pass-by trips was developed based on information provided in the *Trip Generation Handbook*, which includes pass-by data collected at numerous locations for many land uses. Rates for the “Coffee/Donut Shop with Drive-Through” land use were not available; however, pass-by percentages are available for similar land uses so pass-by percentages for these land uses were averaged and applied to the proposed coffee/juice shop.

The "Restaurant with Drive-Through Window" land use (ITE LU #934), has a pass-by percentage of 49 percent and the "Coffee/Donut Shop with Drive-Through Window and No Indoor Seating" land use (ITE LU #938) has a pass-by percentage of 89 percent so a pass-by rate of 69 percent was applied to the coffee/juice shop trips.

Total Project Trip Generation

The expected trip generation potential for the proposed project is indicated in Table 1, with deductions taken for trips that were deemed pass-by. The proposed cannabis dispensary is expected to generate an average of 378 trips per day, including 16 trips during the a.m. peak hour and 33 trips during the p.m. peak hour. When added to the trip generation for the coffee/juice shop and the specialty retail space, the entire project would be expected to generate an average of 738 new trips daily, including 32 trips during the morning peak hour and 49 trips during the evening peak hour. As currently proposed, the project would be expected to generate 47 fewer trips during the morning peak hour and 66 fewer trips during the evening peak hour compared to the project that was analyzed in the traffic impact study.

Table 1 – Trip Generation Summary

Land Use	Units	Daily		AM Peak Hour				PM Peak Hour			
		Rate	Trips	Rate	Trips	In	Out	Rate	Trips	In	Out
Previous Project Trips			**2,258**		**79**	**41**	**38**		**115**	**57**	**58**
Proposed											
Marijuana Dispensary	1.48 ksf	252.70	374	10.44	15	9	6	21.83	32	16	16
General Office Building	0.44 ksf	9.74	4	1.16	1	1	0	1.15	1	0	1
Total Dispensary Trips			378		16	10	6		33	16	17
Coffee/Donut Shop with Drive-Thru Window	0.42 ksf	820.38	345	88.99	37	19	18	43.38	18	9	9
Pass-By		*-69%*	*-238*	*-69%*	*-26*	*-13*	*-13*	*-69%*	*-12*	*-6*	*-6*
Total Coffee Shop Trips			107		11	6	5		6	3	3
Specialty Retail Center	5.705 ksf	44.32	253	0.96	5	3	2	2.71	15	7	8
Pass-By		-	-	-	-	-	-	*-34%*	*-5*	*-2*	*-3*
Total Specialty Retail Trips			253		5	3	2		10	5	5
Total Project Trips (at driveways)			**976**		**58**	**32**	**26**		**66**	**32**	**34**
Net New Project Trips			**738**		**32**	**19**	**13**		**49**	**24**	**25**
Comparison with Previous Project			***-1,520***		***-47***	***-22***	***-25***		***-66***	***-33***	***-33***

Note: ksf = 1,000 square feet

Conclusions

The proposed project would be expected to generate an average of 738 new daily vehicle trips including 32 trips during the a.m. peak hour and 49 trips during the p.m. peak hour. Because the project would generate fewer peak hour trips than the project as evaluated in the enclosed traffic impact study, and there were no significant impacts identified in this study, it is reasonable to conclude that the project, as currently proposed, would have a *less-than-significant* impact on traffic operation of the surrounding roadway network.

It is further noted that the project as currently proposed is expected to generate fewer than 50 net new trips, so under the City's guidelines for traffic impact studies would require only a focused analysis, and the access information and other site-specific analysis that would be part of such a study is provided in the enclosed traffic study prepared for a previous proposal at the same site.

Thank you for giving W-Trans the opportunity to provide these services. Please call if you have any questions.

Sincerely,

Julia Walker
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Assistant Engineer

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Principal

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Enclosures: Draft *Traffic Impact Study for the Yogurt Time Center*

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Traffic Impact Study for Yogurt Time Center

in the

City of Santa Rosa

Draft Report

May 22, 2015

Table of Contents

Executive Summary

The proposed Yogurt Time Center Project consists of 5,705 square feet of retail space and a 2,449 square foot coffee shop with drive-through service to be constructed on an existing vacant lot. The net increase in traffic associated with the project is 2,258 daily trips during a weekday, 79 trips including reduction of 172 pass-by trips during the a.m. peak hour, and 115 trips during the p.m. peak hour.

The study area consists of the intersection of Piner Road/Marlow Road-Pinercrest Drive. The analysis indicates that the study intersection is currently operating acceptably, and is projected to continue operating acceptably under Existing plus Cumulative conditions, as well as with the project.

Drivers can access the project site via two existing driveways. The driveway on Piner Road is a full access driveway, with a two-way left-turn lane available to make inbound and outbound left turns easier for motorists. An existing raised median island restricts outbound left-turn movements from the project driveway on Marlow Road. Sight distance at the existing driveways for both entering and exiting drivers is adequate. Facilities for alternative modes, including pedestrians and bicyclists, are expected to be adequate. On-site circulation is also expected to be adequate with the exception of pedestrians crossing the drive-through, and signage should be installed to accompany the crosswalk. The drive-through is expected to adequately service project traffic by accommodating ten vehicles without stacking into the parking lot and restricting movements within the project site.

Introduction

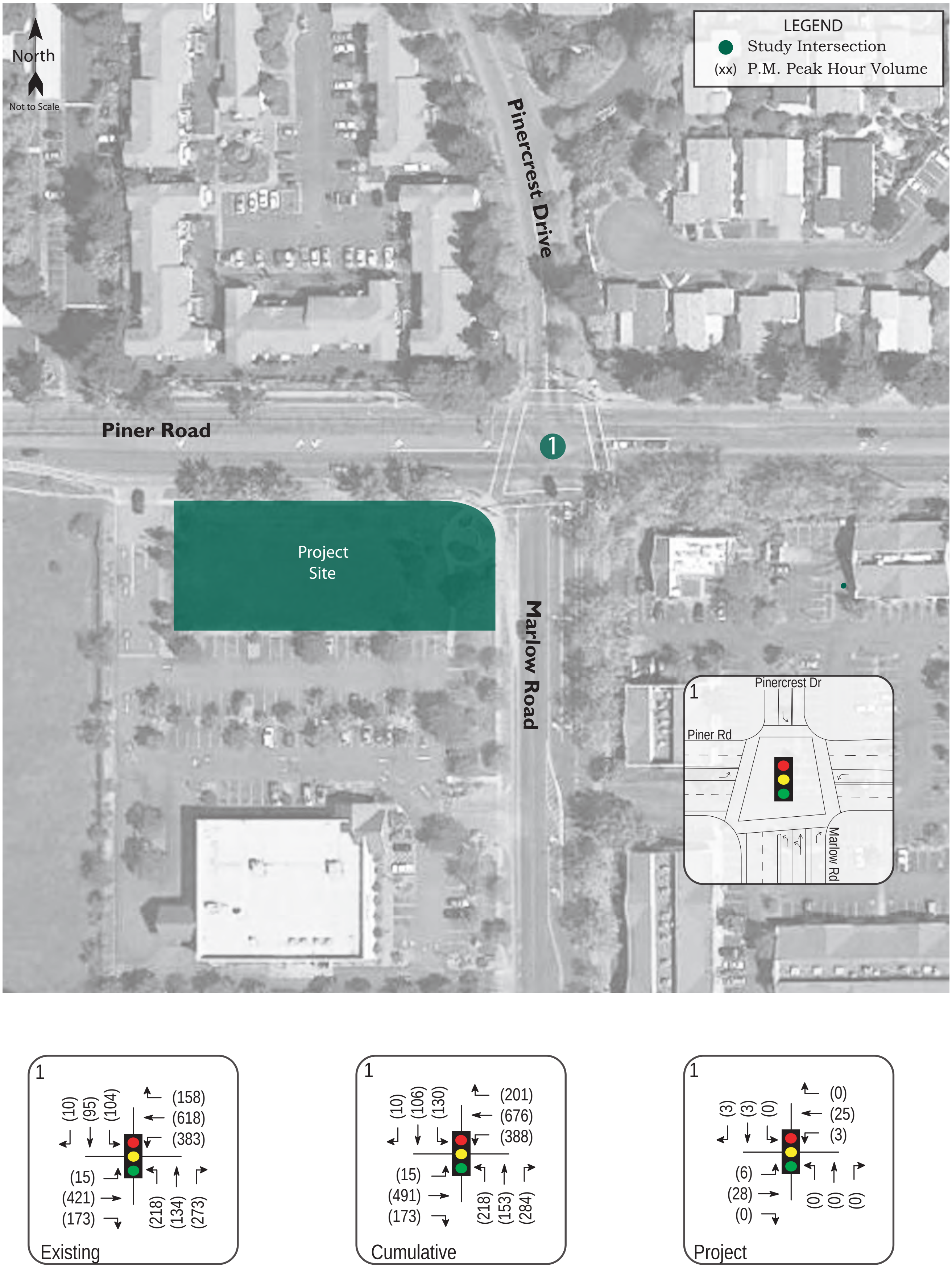
This report presents an analysis of the potential traffic impacts that would be associated with development of the proposed Yogurt Time Center to be located at 3093 Marlow Road in the City of Santa Rosa. The traffic study was completed in accordance with the criteria established by the City of Santa Rosa, and is consistent with standard traffic engineering techniques.

Prelude

The purpose of a traffic impact study is to provide City of Santa Rosa staff and policy makers with data that they can use to make an informed decision regarding the potential traffic impacts of a proposed project, and any associated improvements that would be required in order to mitigate these impacts to a level of insignificance as defined by the City of Santa Rosa's General Plan or other policies. Vehicular traffic impacts are typically evaluated by determining the number of new trips that the proposed use would be expected to generate, distributing these trips to the surrounding street system based on existing travel patterns or anticipated travel patterns specific to the proposed project, then analyzing the impact the new traffic would be expected to have on critical intersections or roadway segments. Impacts relative to access for pedestrians, bicyclists, and to transit are also addressed.

Project Profile

The proposed project consists of 5,705 square feet of retail space and a 2,449 square foot coffee shop with drive-through on a currently vacant lot. The site is located at 3093 Marlow Road in the City of Santa Rosa. The project site is located at 3093 Marlow Road, as shown in Figure 1.



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Traffic Impact Study for Yogurt Time Center

Figure 1 – Lane Configurations and Traffic Volumes

Operational Analysis

Study Area and Periods

The study area consists of the intersection of Piner Road/Marlow Road-Pinercrest Drive.

Operation during the p.m. peak period, which occurs between 4:00 and 6:00 p.m., was evaluated to capture the period during which there are the highest volumes on the local transportation network and specifically at the study intersection. A review of turning movement counts for the intersection of Piner Road/Marlow Road-Pinercrest Drive obtained in October 2011 and provided by the City indicate that the volumes entering the intersection during the morning peak hour are lower, and the volumes on the critical left-turn movements are also lower during the morning except on Pinercrest Drive. Given that the evening peak represents the worst-case operation, it was selected to indicate the project's highest potential impact.

Study Intersections

Piner Road/Marlow Road-Pinercrest Drive is a four-legged signalized intersection with protected left-turn phasing in the east-west direction on Marlow Road, split phasing (or exclusive operation for each approach) in the north-south direction and a right-turn overlap on the northbound Marlow Road approach. The intersection has full pedestrian facilities, including pedestrian push buttons, crosswalks, and curb ramps on all legs.

The locations of the study intersections and the existing lane configurations and controls are shown in Figure 1.

Alternative Modes

Pedestrian Facilities

Pedestrian facilities include sidewalks, crosswalks, pedestrian signal phases, curb ramps, curb extensions, and various streetscape amenities such as lighting, benches, etc. In general, a network of sidewalks, crosswalks, pedestrian signals, and curb ramps provide access for pedestrians in the vicinity of the proposed project site. Existing gaps and obstacles along the connecting roadways impact convenient and continuous access for pedestrians and present safety concerns in those locations where appropriate pedestrian infrastructure would address potential conflict points.

- *Piner Road* – Intermittent sidewalk coverage is provided on Piner Road with gaps on both sides of the street where property frontages have not yet been developed. Sidewalks are provided along developed property frontages. Curb ramps and crosswalks at side street approaches are available. Lighting is provided by overhead streetlights.

- *Marlow Road* – Continuous sidewalk coverage is provided on Marlow Road within the project study area. Sidewalks are provided along developed property frontages. Curb ramps and crosswalks at side street approaches are available. Lighting is provided by overhead streetlights.

- *Pinercrest Drive* – Continuous sidewalk coverage is provided on Pinercest Drive within the project study area. Sidewalks are provided along developed property frontages. Curb ramps and crosswalks at side street approaches are available. Lighting is provided by overhead streetlights.

Bicycle Facilities

The *Highway Design Manual*, California Department of Transportation (Caltrans), 2012, classifies bikeways into three categories:

- *Class I Multi-Use Path*: a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- *Class II Bike Lane*: a striped and signed lane for one-way bike travel on a street or highway.
- *Class III Bike Route*: signing only for shared use with motor vehicles within the same travel lane on a street or highway.

In the project area, Class II bike lanes exist on Piner Road between Fulton Road and Marlow Road and on Marlow Road-Stony Point Road between Piner Road and Santa Rosa Creek. Bicyclists ride in the roadway and/or on sidewalks along all other streets within the project study area. Class II bike lanes are proposed on Piner Road per the *Santa Rosa Bicycle and Pedestrian Master Plan,* 2010, and exist sporadically west of Marlow Road-Pinercrest Drive. Table 1 summarizes the existing and planned bicycle facilities in the project vicinity, as contained in the *Santa Rosa Bicycle and Pedestrian Master Plan*.

Table 1
Bicycle Facility Summary

Status **Facility**	**Class**	**Length (miles)**	**Begin Point**	**End Point**
Existing				
Piner Rd	II	1.00	Fulton Rd	Marlow Rd
Marlow Rd	II	1.50	Piner Rd	College Ave
Planned				
Piner Road	II	1.25	Marlow Rd	Cleveland Avenue
Piner Creek Trail	I	2.50	Santa Rosa Creek	Northwestern Pacific Railroad
Northwestern Pacific Trail	I	-	-	Paulin Creek Trail

Source: *Santa Rosa Bicycle and Pedestrian Master Plan*, 2010

Intersection Level of Service Methodologies

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersection was analyzed using the signalized methodology published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2000. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The signalized methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. For purposes of this study, optimized signal timing was used to evaluate operation.

The ranges of delay associated with the various levels of service are indicated in Table 2.

Table 2
Signalized Intersection Level of Service Criteria

LOS A	Delay of 0 to 10 seconds. Most vehicles arrive during the green phase, so do not stop at all.
LOS B	Delay of 10 to 20 seconds. More vehicles stop than with LOS A, but many drivers still do not have to stop.
LOS C	Delay of 20 to 35 seconds. The number of vehicles stopping is significant, although many still pass through without stopping.
LOS D	Delay of 35 to 55 seconds. The influence of congestion is noticeable, and most vehicles have to stop.
LOS E	Delay of 55 to 80 seconds. Most, if not all, vehicles must stop and drivers consider the delay excessive.
LOS F	Delay of more than 80 seconds. Vehicles may wait through more than one cycle to clear the intersection.

Reference: *Highway Capacity Manual*, Transportation Research Board, 2000

Traffic Operation Standards

The City of Santa Rosa's adopted Level of Service (LOS) Standard is contained in *Santa Rosa General Plan 2035*. Standard TD-1 states that the City will try to maintain a Level of Service (LOS) D or better along all major corridors. Exceptions to meeting this standard are allowed where attainment would result in significant environmental degradation; where topography or environmental impacts make the improvement impossible; or where attainment would ensure loss of an area's unique character.

While a corridor level of service is applied by the City in its analysis of the entire City as part of the environmental documentation supporting the General Plan, this type of analysis only provides relevant data when performed on a much longer segment than the one included as the study area for the project. Therefore, although the City's standard does not specify criteria for intersections, for the purposes of this study a minimum operation of LOS D for the overall operation of signalized intersections was applied.

Existing Conditions

The Existing Conditions scenario provides an evaluation of current operation based on existing traffic volumes during the p.m. peak period. This condition does not include project-generated traffic volumes. Volume data was collected for the City on April 1, 2015 while local schools were in session.

Intersection Level of Service

Under existing conditions, the study intersection operates acceptably at LOS C. The existing traffic volumes are shown in Figure 1. The intersection level of service calculation is summarized in Table 3, and a copy provided in Appendix A.

Table 3
Existing PM Peak Hour Intersection Level of Service

Study Intersection	Existing Conditions	
	Delay	LOS
1. Piner Rd/Marlow Rd-Pinercrest Dr	32.7	C

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Existing plus Cumulative Conditions

Existing plus Cumulative operating conditions were determined with traffic for approved projects added to the existing volumes. The City provided a list of approved projects that are residential projects of five units or greater and commercial/industrial projects with over 5,000 square feet of floor area. Smaller projects and projects that are over 50 percent constructed are not included. For the purpose of this analysis, the approved projects used are those that are expected to generate additional traffic within the study area prior to occupancy of the proposed project.

- *Courtney Estates* – 47 single-family residential dwelling units and 10 multi-family residential dwelling units at 1549 Fulton Road
- *Fox Hollow* – 171 single-family residential dwelling units and 14 multi-family residential dwelling units at 1615 Fulton Road
- *Fulton Oaks* – 10 single-family residential dwelling units at 1530 Fulton Road
- *Kerry Ranch* – 95 single-family residential dwelling units and 41 residential second units at 2181, 2191 and 2193 Francisco Avenue
- *Marlow Mews* – 11 single-family residential dwelling units at 3018 Marlow Road
- *North Village 2* – 112 single-family residential dwelling units at 2406 Fulton Road
- *O'Rourke Electric* – 25,500 square feet of light industrial use at 3300 Industrial Drive
- *Sports City* – 128,000 square feet of indoor sports facility use at 3215, 3219 Coffey Lane
- *Spring Brook*– 12 single-family residential dwelling units at 1552 Fulton Road
- *Tapestry* – 29 single-family residential dwelling units and 5 residential second units at 2245-2271 San Miguel Avenue
- *Wildflower* – 27 single-family residential dwelling units at 2321-2285 San Miguel Avenue

Under the projected Existing plus Cumulative volumes during the p.m. peak hour the study intersection is expected to continue operating acceptably, though at LOS D. The calculation is provided in Appendix A and the results shown in Table 4.

Table 4
Existing plus Cumulative PM Peak Hour Intersection Level of Service

Study Intersection	Existing plus Cumulative Conditions	
	Delay	LOS
1. Piner Rd/Marlow Rd-Pinercrest Dr	37.7	D

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Project Description

The proposed project consists of 5,705 square feet of retail space and a 2,449 square foot drive-through coffee shop. The site consists of the existing vacant lot at the southwest corner of Piner Road/Marlow Road-Pinercrest Drive and the northernmost row of parking in the existing Walgreens parking lot.

The proposed project site plan is shown in Figure 2.

Trip Generation

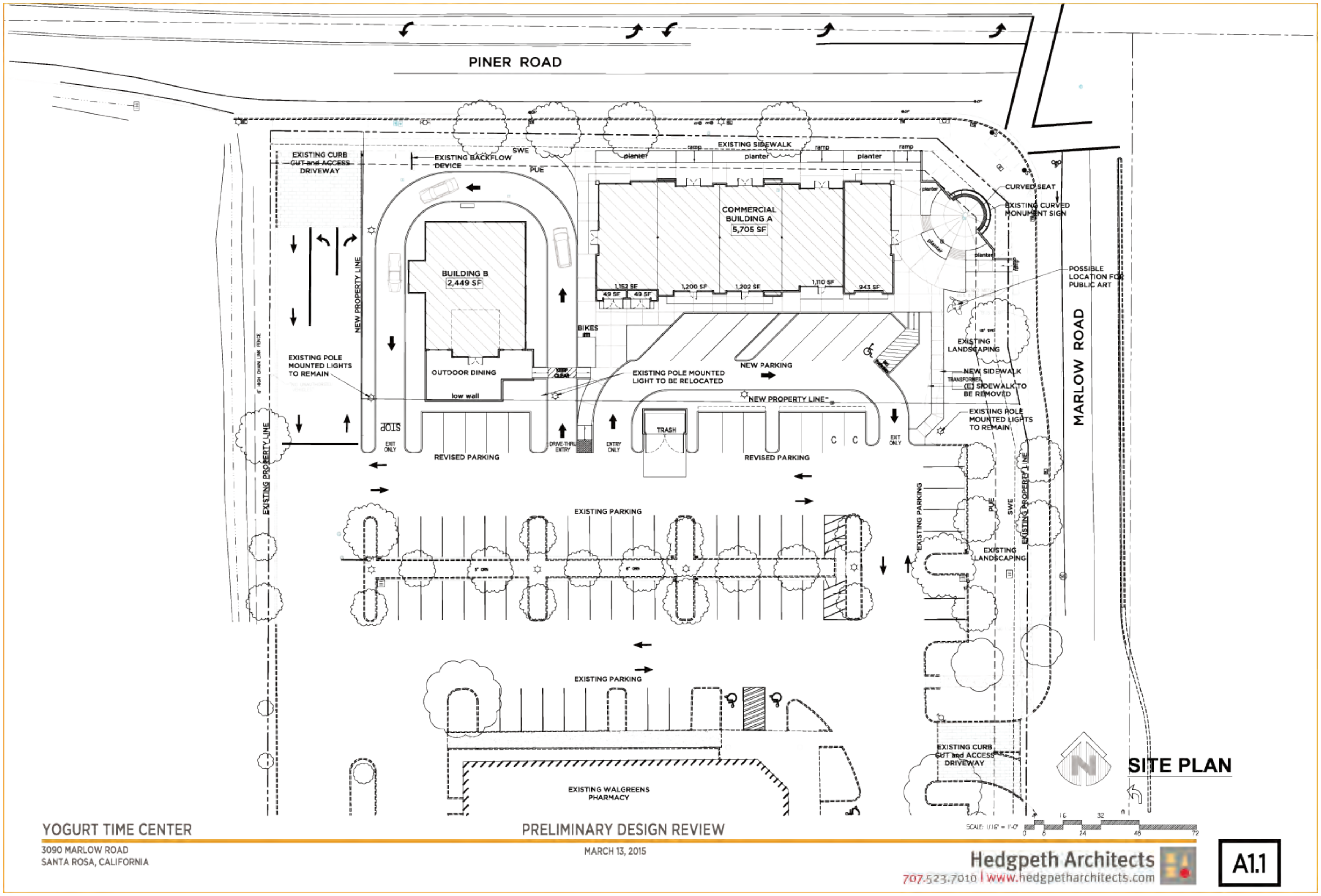
The anticipated trip generation for the proposed project was estimated using standard rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition, 2012 for Specialty Retail Center (Land Use #826) and Coffee/Donut Shop with Drive-Through Window (Land Use #937), as these descriptions most closely match the proposed project. It is noted that while the a.m. peak hour is not part of the operational analysis, the morning trip generation is presented as this data is used for the drive-through queueing analysis.

<u>Pass-by Trips</u>

Some portion of traffic associated with retail uses is drawn from existing traffic on nearby streets. These vehicle trips are not considered "new," but are instead comprised of drivers who are already driving on the adjacent street system and choose to make an interim stop, and are referred to as “pass-by.” At the proposed project, pass-by trips would in essence be “captured” from traffic on Piner Road and Marlow Road. The percentage of these pass-by trips was developed based on information provided in the *Trip Generation Manual*. This reference includes pass-by data collected at numerous locations for many land uses, such as the retail use applied in this traffic analysis.

Rates for Coffee/Donut Shop with Drive-Through are not available. Pass-by percentages were observed for similar land uses of Fast-Food Restaurant with Drive-Through Window (LU #934), which had an average of 49 percent pass-by trips and weekday rates for Coffee/Donut Shop with Drive-Through Window and No Indoor Seating (LU #938), which had an average of 89 percent pass-by trips. Based on this data, a 70 percent pass-by rate was applied for the Coffee Shop with Drive-Through use for the a.m. peak hour. Since a majority of trips associated with coffee shops are drawn from the stream of traffic passing the site during the morning peak, no deduction was taken for the evening peak.

Rates for the p.m. peak period are not available for Specialty Retail, so pass-by rates for Shopping Center (LU #820) were applied. Use of this land use would be expected to result in a conservative assessment as a shopping center is typically more of a specific destination while a small retail center such as the proposed project would draw customers from traffic already in the area as opposed to drivers making a specific trip out of their way to a smaller shopping opportunity.



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Traffic Impact Study for Yogurt Time Center
Figure 2 – Site Plan

Total Project Trip Generation

The expected trip generation potential for the proposed project is summarized in Table 5, with deductions taken for pass-by trips. After deductions are taken into account, the project would be expected to generate 2,258 new trips on a daily basis, including 79 new trips during the morning peak hour and 115 new trips during the evening peak hour. It is noted that the retail space generates few, if any, trips during the morning peak hour and the bulk of trips to a coffee shop are pass-by trips, so the number of new trips during the morning peak would be considerably lower, with most drivers coming from eastbound Piner Road on the way toward US 101. The higher trip generation during the evening peak hour, which coincides with higher delays at the study intersection, further indicates that the analysis of this peak period provides the worst-case assessment of project impacts.

Table 5
Trip Generation Summary

Land Use	**Units**	**Daily**		**AM Peak Hour**				**PM Peak Hour**			
		Rate	**Trips**	**Rate**	**Trips**	**In**	**Out**	**Rate**	**Trips**	**In**	**Out**
Proposed											
Specialty Retail Center	5.705 ksf	44.32	253	0.96	5	3	2	2.71	15	7	8
Pass-by	-	-	-	-	-	-	-	*-34%*	*-5*	*-2*	*-3*
Coffee/Donut Shop w/ Drive-Thru	2.449 ksf	818.58	2,005	100.58	246	126	120	42.80	105	52	53
Pass-by	-	-	-	*-70%*	*-172*	*-88*	*-84*	-	-	-	-
Total Trips			**2,258**		**79**	**41**	**38**		**115**	**57**	**58**

Note: ksf = 1,000 square feet

Trip Distribution

The pattern used to allocate new project trips to the street network was determined based on the location of likely trip origins and destinations as well as knowledge of local travel trends near the project site and input from City staff. Based on the applied assumptions, the following distribution is proposed.

Table 6
Trip Distribution Summary

Route	**Percent**		**PM Peak Hour Trips**
Marlow Rd to the south	15%		17
Pinercrest Dr to the north	10%		12
Piner Rd to the west	25%		29
Piner Rd to the east	50%		57
TOTAL	**100%**		**115**

Intersection Operation

Existing plus Project Conditions

Upon the addition of project-related traffic to the Existing volumes, the study intersection is expected to operate acceptably at LOS D. These results are summarized in Table 7 and the calculation is provided in Appendix A. Project traffic volumes are shown in Figure 1.

Table 7
Existing and Existing plus Project PM Peak Hour Intersection Levels of Service

Study Intersection	Existing Conditions		Existing plus Project	
	Delay	LOS	Delay	LOS
1. Piner Rd/Marlow Rd-Pinercrest Dr	32.7	C	35.2	D

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding: The study intersection is expected to operate acceptably upon the addition of project-generated traffic to existing volumes.

Existing plus Cumulative plus Project Conditions

Upon the addition of project-related traffic to the Existing plus Cumulative volumes, the study intersection is expected to continue operating acceptably at LOS D. These results are summarized in Table 7. A copy of the calculation is provided in Appendix A. Project traffic volumes are shown in Figure 1.

Table 8
Existing plus Cumulative and Existing plus Cumulative plus Project
PM Peak Hour Intersection Levels of Service

Study Intersection	Existing plus Cumulative Conditions		Existing plus Cumulative plus Project Conditions	
	Delay	LOS	Delay	LOS
1. Piner Rd/Marlow Rd-Pinercrest Dr	37.7	D	38.5	D

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service

Finding: The study intersection is expected to continue operating acceptably at the same level of service upon the addition of project-generated traffic to cumulative volumes.

Alternative Modes

Pedestrian Facilities

Given the proximity of residences to the north, south and east and other retail uses to the south and east of the site, it is reasonable to assume that some project patrons and employees will want to walk, bicycle, and/or utilize transit to reach the Yogurt Time Center.

Project Site – Sidewalks exist along the project frontages on Piner Road and Marlow Road and connect to planned sidewalks along the building frontages.

Finding: Pedestrian facilities serving the project site are adequate.

Bicycle Facilities

Existing bicycle facilities, including bike lanes on Piner Road and Marlow Road, provide adequate access for bicyclists.

Bicycle Storage

Per the site plan, short-term bicycle parking would be provided by a bicycle rack located between the proposed drive-through coffee shop and retail building. Per the Santa Rosa City Code, a minimum of two bike parking spaces are required.

Finding: Bicycle facilities serving the project site are adequate.

Access and Circulation

Site Access

The project site will be accessed via two existing driveways; one full access driveway is located on Piner Road approximately 350 feet west of Marlow Road. The other driveway is located on Marlow Road approximately 350 feet south of Piner Road and allows inbound left and right turns, but restricts outbound traffic to right-turns-only.

Sight Distance

At driveways, a substantially clear line of sight should be maintained between the driver of a vehicle waiting to cross or enter the street and the driver of a vehicle approaching on that street. Adequate time must be provided for the waiting vehicle to either cross, turn left, or turn right, without requiring the through traffic to radically alter their speed. Sight distances along Piner Road and Marlow Road at the project driveways were evaluated based on sight distance criteria contained in the *Highway Design Manual* published by Caltrans. The recommended sight distances for driveways are based on stopping sight distance, which use the approach travel speeds as the basis for determining the recommended sight distance. Based on the posted speed limits in the vicinity of the project of 35 mph on Marlow Road and 40 mph on Piner Road, the minimum stopping sight distances needed are 250 feet and 300 feet, respectively and a review of the field conditions showed that the sight distances from the project driveways are more than adequate. The existing center turn lane on Piner Road will accommodate left turns both into and out of the Piner Road driveway, allowing drivers to make the move without impeding through traffic.

Finding: Adequate sight distance is available.

On-Site Circulation

On-site circulation was evaluated to determine if the layout would provide adequate circulation and room for turning movements. Based on a review of the site plan provided, the internal roadways, including the drive-through entry and exit points, are expected to provide an acceptable circulation system.

Vehicles turn into either of the two existing driveways. Vehicles taking access from the Piner Road driveway enter the parking lot on the north side of the project site, and drivers must immediately turn left to access the drive though or adjacent retail, which provides access to diagonal parking from a one-way loop drive aisle. Those entering from the Marlow Road driveway make an immediate right to access the project site. Additional parking is provided along the south frontage of the coffee shop, south frontage of the loop aisle with access to the retail space, and in the parking lot shared with the adjacent Walgreens.

The proposed site plan shows an internal pedestrian walkway from the southwest corner of Piner Road/ Marlow Road, walkways along the retail building and crossing the drive-through to the front entrance of the proposed coffee shop. The walkways would serve pedestrian travel between the parking lot, the coffee entrance and retail entrance. In order to eliminate potential conflicts between vehicles and pedestrians at the drive-through, signage warning of pedestrians crossing should be provided along with the striped crosswalk.

Finding: On-site circulation is expected to be adequate, except the pedestrian crossing on the drive through should be made more conspicuous to drivers.

Recommendation: Signage should be installed to accompany the striped crosswalk at the entrance of the drive through.

Drive-Through Operation

The proposed coffee shop drive-through would have capacity for ten vehicles to queue without stacking into the parking lot and restricting movements within the project site. The arrival rate was determined assuming 65 percent of a.m. peak hour inbound pass-by trips would use the drive-through, which results in an arrival rate of 57 vehicles per hour.

A recent survey conducted at a Starbucks with a drive-through in Rohnert Park indicated that 46 percent of all inbound trips made by Starbucks patrons used the drive-through. Using this secondary methodology, the arrival rate would be 58 vehicles per hour. As essentially the same results were derived through both methodologies, it appears reasonable to use this volume for the drive-through queueing analysis.

Using standard queuing theory together with a peak arrival rate of 57 vehicles per hour (customers using the drive-through) and a service rate of 60 vehicles per hour (customers receiving service using the drive-through), there is an 89 percent probability that a customer will have to wait four to six minutes, which is consistent with the experience observed at various coffee drive-through operations. The 95th-percentile queue is generally applied as the acceptable limit for on-site circulation impact assessment and was determined to be ten vehicles for the proposed project. This anticipated peak stacking can be accommodated within the available storage capacity of ten vehicles, so is adequate to serve project traffic.

On the rare occasion when the queue exceeds ten vehicles, any additional vehicles would likely stack up in the east-west drive aisle along the south edge of the project site. Drivers attempting to pass through the area would still be able to get by using the opposing lane, just as they would pass a driver waiting for a parking spot to open up in a crowded lot. Given that parking lots are a low-speed environment, the short-term blockage is not expected to cause problems as it is consistent with driver behavior and expectation within a parking lot.

The queuing computation is provided in Appendix B.

Conclusions and Recommendations

Conclusions

- Under Existing conditions, Piner Road/Marlow Road-Pinercrest Drive operates acceptably at Level of Service C.
- With the addition of approved projects, or the Existing plus Cumulative scenario, the study intersection is expected to operate acceptably at LOS D.
- The project is expected to generate an average of 2,258 daily trips during a weekday, including 79 net new trips during the a.m. peak hour and 115 during the p.m. peak hour.
- With the project, the study intersection is expected to operate acceptably at LOS D under Existing and Existing plus Cumulative conditions.
- Pedestrian and bicycle facilities are adequate to serve the project site.
- With the implementation of the recommended improvements, a system of sidewalks and paths would accommodate on-site pedestrian circulation.
- Drive-through operation is expected to be adequate, with the 95th percentile queue contained within the available stacking space.
- Sight lines at the Piner Road and Marlow Road driveways are adequate.

Recommendations

- Signage should be installed to accompany the crosswalk at the drive-through entrance.

Study Participants and References

Study Participants

Principal in Charge:	Dalene J. Whitlock, PE, PTOE
Project Manager:	Smadar Boardman, EIT
Assistant Engineer:	Alex Zhang
Technician/Graphics:	Deborah J. Mizell
Editing/Formatting:	Angela McCoy

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Appendix A

Intersection Level of Service Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	421	173	383	618	158	218	134	273	104	95	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3385		1770	3431		1681	1747	1583	1770	1837	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3385		1770	3431		1681	1747	1583	1770	1837	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	439	180	399	644	165	227	140	284	108	99	10
RTOR Reduction (vph)	0	52	0	0	20	0	0	0	162	0	5	0
Lane Group Flow (vph)	16	567	0	399	789	0	179	188	122	108	104	0
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	7	4		3	8		2	2	3	6	6	
Permitted Phases									2			
Actuated Green, G (s)	1.4	18.7		16.2	33.5		16.2	16.2	32.4	8.2	8.2	
Effective Green, g (s)	1.4	18.7		16.2	33.5		16.2	16.2	32.4	8.2	8.2	
Actuated g/C Ratio	0.02	0.25		0.22	0.44		0.22	0.22	0.43	0.11	0.11	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	32	840		380	1526		361	375	681	192	200	
v/s Ratio Prot	0.01	c0.17		c0.23	0.23		0.11	c0.11	0.04	c0.06	0.06	
v/s Ratio Perm									0.04			
v/c Ratio	0.50	0.68		1.05	0.52		0.50	0.50	0.18	0.56	0.52	
Uniform Delay, d1	36.6	25.6		29.6	15.1		26.0	26.0	13.2	31.8	31.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	11.8	2.2		59.9	0.3		4.8	4.7	0.1	3.7	2.3	
Delay (s)	48.4	27.7		89.4	15.4		30.8	30.7	13.4	35.6	33.9	
Level of Service	D	C		F	B		C	C	B	D	C	
Approach Delay (s)		28.2			39.8			23.2			34.8	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	32.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	75.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	67.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	449	173	386	643	158	218	134	273	104	98	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3392		1770	3434		1681	1747	1583	1770	1829	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3392		1770	3434		1681	1747	1583	1770	1829	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	22	468	180	402	670	165	227	140	284	108	102	14
RTOR Reduction (vph)	0	48	0	0	20	0	0	0	164	0	7	0
Lane Group Flow (vph)	22	600	0	402	815	0	179	188	120	108	109	0
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	7	4		3	8		2	2	3	6	6	
Permitted Phases									2			
Actuated Green, G (s)	2.9	18.1		16.0	31.2		16.0	16.0	32.0	9.8	9.8	
Effective Green, g (s)	2.9	18.1		16.0	31.2		16.0	16.0	32.0	9.8	9.8	
Actuated g/C Ratio	0.04	0.24		0.21	0.41		0.21	0.21	0.42	0.13	0.13	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	67	808		373	1411		354	368	667	228	236	
v/s Ratio Prot	0.01	c0.18		c0.23	0.24		0.11	c0.11	0.04	c0.06	0.06	
v/s Ratio Perm									0.04			
v/c Ratio	0.33	0.74		1.08	0.58		0.51	0.51	0.18	0.47	0.46	
Uniform Delay, d1	35.6	26.7		30.0	17.3		26.5	26.5	13.7	30.7	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.9	3.7		68.9	0.6		5.1	5.0	0.1	1.6	1.4	
Delay (s)	38.4	30.5		98.9	17.8		31.5	31.5	13.9	32.2	32.0	
Level of Service	D	C		F	B		C	C	B	C	C	
Approach Delay (s)		30.7			44.2			23.8			32.1	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	35.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	491	173	388	676	201	218	153	284	130	106	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3401		1770	3418		1681	1752	1583	1770	1839	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3401		1770	3418		1681	1752	1583	1770	1839	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	16	511	180	404	704	209	227	159	296	135	110	10
RTOR Reduction (vph)	0	41	0	0	24	0	0	0	145	0	4	0
Lane Group Flow (vph)	16	650	0	404	889	0	188	198	151	135	116	0
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	7	4		3	8		2	2	3	6	6	
Permitted Phases									2			
Actuated Green, G (s)	1.4	19.3		16.0	33.9		16.0	16.0	32.0	11.0	11.0	
Effective Green, g (s)	1.4	19.3		16.0	33.9		16.0	16.0	32.0	11.0	11.0	
Actuated g/C Ratio	0.02	0.25		0.20	0.43		0.20	0.20	0.41	0.14	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	31	838		361	1479		343	358	646	248	258	
v/s Ratio Prot	0.01	c0.19		c0.23	0.26		0.11	c0.11	0.05	c0.08	0.06	
v/s Ratio Perm									0.05			
v/c Ratio	0.52	0.78		1.12	0.60		0.55	0.55	0.23	0.54	0.45	
Uniform Delay, d1	38.1	27.5		31.1	17.0		27.9	27.9	15.1	31.3	30.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	13.7	4.5		83.6	0.7		6.2	6.0	0.2	2.4	1.2	
Delay (s)	51.9	32.0		114.8	17.7		34.1	34.0	15.3	33.8	32.1	
Level of Service	D	C		F	B		C	C	B	C	C	
Approach Delay (s)		32.4			47.5			25.9			33.0	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	78.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	21	519	173	391	701	201	218	153	284	130	109	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		0.95	0.95	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.97		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3407		1770	3421		1681	1752	1583	1770	1832	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3407		1770	3421		1681	1752	1583	1770	1832	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	22	541	180	407	730	209	227	159	296	135	114	14
RTOR Reduction (vph)	0	39	0	0	24	0	0	0	143	0	6	0
Lane Group Flow (vph)	22	682	0	407	915	0	188	198	153	135	122	0
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA	
Protected Phases	7	4		3	8		2	2	3	6	6	
Permitted Phases									2			
Actuated Green, G (s)	2.9	18.5		16.0	31.6		16.0	16.0	32.0	11.0	11.0	
Effective Green, g (s)	2.9	18.5		16.0	31.6		16.0	16.0	32.0	11.0	11.0	
Actuated g/C Ratio	0.04	0.24		0.21	0.41		0.21	0.21	0.41	0.14	0.14	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	66	813		365	1394		347	361	653	251	260	
v/s Ratio Prot	0.01	c0.20		c0.23	0.27		0.11	c0.11	0.05	c0.08	0.07	
v/s Ratio Perm									0.05			
v/c Ratio	0.33	0.84		1.12	0.66		0.54	0.55	0.23	0.54	0.47	
Uniform Delay, d1	36.4	28.1		30.8	18.6		27.5	27.5	14.8	30.9	30.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	7.6		82.0	1.1		6.0	5.9	0.2	2.2	1.3	
Delay (s)	39.3	35.7		112.7	19.7		33.4	33.4	15.0	33.1	31.9	
Level of Service	D	D		F	B		C	C	B	C	C	
Approach Delay (s)		35.8			47.8			25.4			32.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	38.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	77.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix B

Queuing Calculations

Drive Through Queueing Evaluation Worksheet

Project: Yogurt Time Center (Coffee Shop Drive-Through
By: Alex Zhang
Project No: SRO367
Date: 4/30/2015

Arrival Rate (veh/hr):	57	No. of Service Points:	1
Service Rate (veh/hr):	60	Queuing Capacity (veh):	10

Probability the System is Empty	11%	
Probability the System is Full	6%	
Probability That Customer Waits	89%	
Average Time Customer Waits	5.5	minutes
Average Time Customer Waits To Get To Service Point	4.5	minutes
Probability That a Customer Elects Not to Enter the Queue	6%	
Average In System	4.9	vehicles
Average Total Length of Vehicles in System	122	feet
95th Percentile in System	10	vehicles
95th Percentile Total Length of Vehicles in System	250	feet