

# **APPENDIX E**

## Traffic Study

Hexagon Transportation Consultants, Inc.



January 17, 2012

Mr. John Schwarz  
David J. Powers and Associates  
1871 The Alameda, Suite 200  
San Jose, CA 95126

**Re: Traffic Study for the Union and Curtner Retail Project in San Jose, CA**

Dear Mr. Schwarz:

Hexagon Transportation Consultants, Inc. has completed a traffic study for a proposed retail development to be located adjacent to an existing shopping center in San Jose, California. The existing shopping center is generally bordered by Bascom Avenue, Union Avenue, and Curtner Avenue. The project would involve replacing a paper shredding company, a salon, and two other structures on the northwest corner of Union Avenue and Curtner Avenue with a 3,911 square foot (s.f.) fast food restaurant with a drive-thru, a 4,134 s.f. bank, and 1,375 s.f. of additional retail/restaurant space. The existing adjacent Lunardi's market and Wendy's restaurant would remain unchanged.

The purpose of this traffic study is to satisfy the requirements of the City of San Jose. The City of San Jose typically does not require preparation of a comprehensive Traffic Impact Analysis (TIA) for projects that would generate very few peak hour vehicle trips (e.g., less than 50 new peak hour trips). Accordingly, City staff has reviewed the proposed project and has concluded that an analysis of vehicular trip generation, intersection level of service, and site access/circulation will be adequate to meet the City's requirements. Vehicle queuing at two study intersections and at the drive-thru location also was evaluated. The design of the drive-thru lane was evaluated against the criteria listed in the San Jose City Council Policy 6-10, which include design guidelines for the development of establishments with drive-thru facilities.

### **Project Trip Generation**

Through empirical research, data have been collected that quantify the amount of traffic produced by common land uses. Thus, for the most common land uses there are standard trip generation rates that can be applied to help predict the future traffic increases that would result from a new development. The magnitude of traffic added to the roadway system by a particular development is estimated by multiplying the applicable trip generation rates by the size of the development. The trip generation rates published in the Institute of Transportation Engineers' (ITE) manual entitled *Trip Generation, 8<sup>th</sup> Edition (2008)* for Shopping Center (Land Use 820) were used for this study.

The project proposes to construct 9,420 s.f. of retail/restaurant uses on the northwest corner of Union Avenue and Curtner Avenue, adjacent to the existing Lunardi's shopping center. The proposed retail/restaurant uses would be oriented such that they would be incorporated into the existing shopping center. Shopping centers typically are composed of multiple land use types that complement each other. Thus, a portion of the trips that are generated by a shopping center do not enter or exit the shopping center, but are instead generated internally between the various land uses. This internalization effect is reflected in the ITE Shopping Center trip generation rates.

Trip generation for retail/restaurant uses is typically adjusted to account for pass-by trips. Pass-by trips are trips that are already on the adjacent roadways (and therefore would already be counted in the background traffic volumes) but would turn into the site while passing by. Standard trip generation rates typically include pass-by trips. Therefore, the ITE trip rates that were applied to the project were adjusted to incorporate a 25 percent pass-by trip reduction, which is standard for traffic studies in San Jose.



The existing land uses on the northwest corner of Union Avenue and Curtner Avenue generate little traffic. For that reason, no trip credits for the existing uses were applied so as to provide a conservative estimate of project-generated trips.

The project trip estimates are presented in Table 1. As shown in the table, the project would generate 10 new vehicle trips during the AM peak hour and 42 new vehicle trips during the PM peak hour.

**Table 1**  
**Project Trip Generation Estimates**

Land Use	Size	Daily Rate	Daily Trips	AM Peak Hour				PM Peak Hour			
				Pk-Hr Rate /a/	In	Out	Total	Pk-Hr Rate /a/	In	Out	Total
Existing Shopping Center	32,643 SF	100.49	3,280	2.44	49	31	80	9.21	147	153	300
Existing Shopping Center + Project	42,063 SF	91.96	3,868	2.20	56	36	92	8.47	174	182	356
Net Increase:	9,420 SF		588		7	5	12		27	29	56
25% Retail Pass-by Reduction /a/			-147		-1	-1	-2		-7	-7	-14
<b>Net New Trips:</b>			<b>441</b>		<b>6</b>	<b>4</b>	<b>10</b>		<b>20</b>	<b>22</b>	<b>42</b>

**Notes:**  
 /a/ A retail pass-by trip reduction of 25% was applied (typical for San Jose).  
 Source: ITE *Trip Generation*, 8th Edition (2008). Shopping Center (Land Use 820) rates used. Fitted curve equations applied.

### Project Trip Distribution and Assignment

The project trips were assigned to the surrounding roadway network and project driveways based on existing travel patterns in the study area and the locations of complementary land uses (see Figure 1). The driveway volumes shown on the figure include pass-by trips.

### Intersection Level of Service

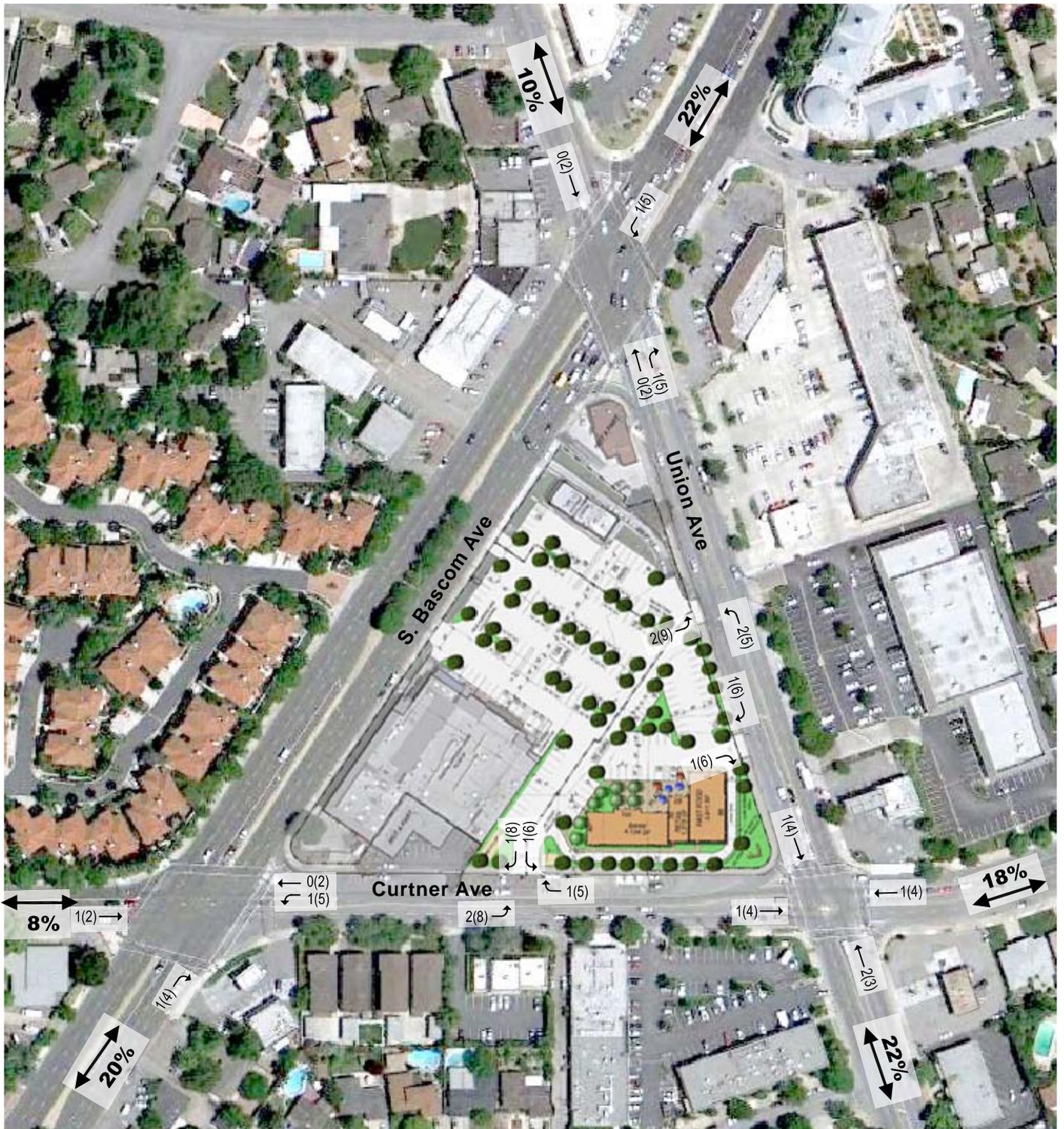
Traffic conditions at the following three study intersections were evaluated using level of service (LOS):

- Bascom Avenue and Union Avenue
- Bascom Avenue and Curtner Avenue
- Union Avenue and Curtner Avenue

*Level of Service* is a qualitative description of operating conditions ranging from LOS A, or free-flow conditions with little or no delay, to LOS F, or jammed conditions with excessive delays. The City of San Jose level of service methodology for signalized intersections is the 2000 *Highway Capacity Manual* (HCM) method. This method is applied using the TRAFFIX software. The 2000 HCM operations method evaluates signalized intersection operations on the basis of average control delay time for all vehicles at the intersection. The City of San Jose level of service standard for signalized intersections is LOS D or better.

### Level of Service Analysis Results

The results of the level of service analysis show that all three study intersections currently operate at an acceptable LOS D or better, and would continue to operate at LOS D under both background and project conditions (see Table 2). As shown in the table, the average delay and LOS are identical between existing and background conditions for each intersection. The reason for this is that there are no approved projects in the area that would add traffic to the study intersections (this has been confirmed by City of San Jose staff). Also, since the project would add very little traffic to the surrounding roadway network, the average delay and resulting LOS under project conditions remained the same for each intersection.



LEGEND

XX(X) = AM(PM) Peak-Hour Trips

Figure 1  
Project Trip Distribution and Trip Assignment



**Table 2**  
**Intersection Levels of Service**

Intersection	Peak Hour	Count Date*	Existing		Background		Project	
			Avg. Delay	LOS	Avg. Delay	LOS	Avg. Delay	LOS
Bascom Av & Union Av	AM	25-Sep-08	25.3	C	25.3	C	25.3	C
	PM	13-Oct-10	35.3	D	35.3	D	35.3	D
Bascom Av & Curtner Av	AM	25-Sep-08	34.9	C	34.9	C	34.9	C
	PM	25-Sep-08	38.4	D	38.4	D	38.3	D
Union Av & Curtner Av	AM	22-Mar-07	34.7	C	34.7	C	34.7	C
	PM	22-Mar-07	37.7	D	37.7	D	37.7	D

**Notes:**  
 \* City of San Jose staff has approved these count dates for use in this study.

### Vehicle Queues at the Study Intersections

The analysis of intersection level of service was supplemented with an analysis of left-turn pocket storage for the study intersections on Curtner Avenue: Bascom Avenue/Curtner Avenue and Union Avenue/Curtner Avenue. Left-turn vehicle queues on Curtner Avenue were estimated using the Poisson probability distribution method as follows: (1) the Poisson probability distribution was used to estimate the 95<sup>th</sup> percentile maximum number of queued vehicles per signal cycle for the left-turn movements on Curtner Avenue; (2) the estimated maximum number of left-turning vehicles in the queue was translated into a queue length, assuming 25 feet per vehicle; and (3) the estimated maximum queue length was compared to the existing or planned available storage capacity for the left-turn movements on Curtner Avenue. This analysis thus provides a basis for estimating future left-turn pocket storage requirements.

The 95<sup>th</sup> percentile queue length value indicates that during the peak hour, a queue of this length or less would occur on 95 percent of the signal cycles. Or, a queue length larger than the 95<sup>th</sup> percentile queue would only occur on 5 percent of the signal cycles (about 3 cycles during the peak hour for a signal with a 60-second cycle length). Therefore, left-turn storage pocket designs based on the 95<sup>th</sup> percentile queue length would ensure that storage space would be exceeded only 5 percent of the time. The 95<sup>th</sup> percentile queue length is also known as the "design queue length." The vehicle queue estimates and a tabulated summary of the findings are provided in Table 3.

### Intersection Queuing Analysis Results

The intersection queuing analysis indicates that the maximum vehicle queues for the westbound left-turn lane at the Bascom Avenue/Curtner Avenue intersection currently exceed the existing vehicle storage capacity during both the AM and the PM peak hours of traffic, and would continue to do so under background and project conditions. However, the project would not increase the 95<sup>th</sup> percentile vehicle queue length. The westbound left-turn lane has 125 feet of vehicle storage but requires 300 feet based on the queuing analysis. This left-turn lane could potentially be lengthened when this segment of Curtner Avenue is built out.

The intersection queuing analysis indicates that the maximum vehicle queues for the eastbound left-turn lane at the Union Avenue/Curtner Avenue intersection currently exceed the existing vehicle storage capacity by one vehicle during the PM peak hour of traffic. This condition would continue under background and project conditions. However, a left-turn storage inadequacy of only one vehicle is not likely to cause any operational issues.



**Table 3  
Vehicle Queuing and Left-Turn Pocket Storage Analysis**

Movement: Peak Hour Period:	Bascom Av & Curtner Av		Union Av & Curtner Av	
	WBL AM	WBL PM	EBL AM	EBL PM
<b>Existing</b>				
Cycle/Delay <sup>1</sup> (sec)	124	130	124	130
Volume (vphpl )	214	154	20	43
Avg. Queue (veh/ln.)	7.4	5.6	0.7	1.6
Avg. Queue <sup>2</sup> (ft./ln)	184	139	17	39
95th %. Queue (veh/ln.)	12	10	2	4
95th %. Queue (ft./ln)	300	250	50	100
Storage (ft./ ln.)	125	125	75	75
Adequate (Y/N)	<b>N</b>	<b>N</b>	Y	Y <sup>3</sup>
<b>Background</b>				
Cycle/Delay <sup>1</sup> (sec)	124	130	124	130
Volume (vphpl )	214	154	20	43
Avg. Queue (veh/ln.)	7.4	5.6	0.7	1.6
Avg. Queue <sup>2</sup> (ft./ln)	184	139	17	39
95th %. Queue (veh/ln.)	12	10	2	4
95th %. Queue (ft./ln)	300	250	50	100
Storage (ft./ ln.)	125	125	75	75
Adequate (Y/N)	<b>N</b>	<b>N</b>	Y	Y <sup>3</sup>
<b>Project</b>				
Cycle/Delay <sup>1</sup> (sec)	124	130	124	130
Volume (vphpl )	215	160	20	43
Avg. Queue (veh/ln.)	7.4	5.8	0.7	1.6
Avg. Queue <sup>2</sup> (ft./ln)	185	144	17	39
95th %. Queue (veh/ln.)	12	10	2	4
95th %. Queue (ft./ln)	300	250	50	100
Storage (ft./ ln.)	125	125	75	75
Adequate (Y/N)	<b>N</b>	<b>N</b>	Y	Y <sup>3</sup>
<b>Notes:</b>				
<sup>1</sup> Vehicle queue calculations based on cycle length for signalized intersections.				
<sup>2</sup> Assumes 25 feet per vehicle queued.				
<sup>3</sup> A left-turn pocket storage inadequacy of only 1 vehicle is not likely to cause any operational issues.				

### Site Access

The site access and circulation analysis is based on the November 11, 2011 site plan prepared by Kenneth Rodrigues & Partners, Inc. (see Figure 2). Currently, there are three driveways on Union Avenue and one driveway on Curtner Avenue providing access to the existing uses on the southeastern portion of the project site. Three additional driveways on Union Avenue and two driveways on Bascom Avenue provide access to the central parking lot that serves the existing shopping center. The project proposes to preserve the northernmost driveway on Union Avenue and combine the remaining five driveways on Union Avenue into one. The new project driveway on Union Avenue would be located approximately 150 feet from the Union Avenue/Curtner Avenue intersection. Reducing the number of driveways would improve traffic operations by minimizing the number of potential turning-movement conflicts on Union Avenue. The project also proposes to remove the existing driveway on Curtner Avenue (near Union Avenue) and provide a new driveway midway between Union Avenue and Bascom Avenue (about 320 feet from each intersection).



**SITE DATA:**

SITE AREA TOTAL:	176,227 SF (4.04 AC)
SITE AREA (NEW):	56,010 SF (1.28 AC)
ZONING:	CG
(E) BUILDING AREA:	32,643 SF
(N) BUILDING AREA:	9,420 SF
(E) PARKING:	172 STALLS (TO REMOVE)
PARKING REQUIRED:	202 STALLS
PARKING PROVIDED:	204 STALLS
RATIO:	4.8 / 1000

**PARKING TABULATION FOR (E) GROCERY STORE:**

BUILDING FLOOR AREA:	30,038 x.85=25,532 SF
PARKING REQUIRED:	25,532 SF / 200= 128 STALLS
PARKING PROVIDED:	128 STALLS TOTAL
	48 COMPACT (37%)
	5 HC

**PARKING TABULATION FOR (E) FAST FOOD:**

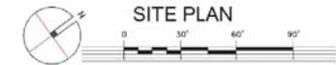
BUILDING AREA:	2,605 SF
SEATING AREA/SEATS:	840 SF/62 SEATS
PARKING REQUIRED:	840 / 40=21 OR 62 / 2.5=25 STALLS
PARKING PROVIDED:	26 STALLS TOTAL
	7 COMPACT (32%)
	2 HC

**PARKING TABULATION FOR NEW DEVELOPMENT:**

BANK FLOOR AREA:	4,134 SFx.85=3,514 SF
BANK PARKING REQUIRED:	3,514 SF/250=14 STALLS
RETAIL FLOOR AREA:	1,375 SF x.85= 1,168 SF
RETAIL PARKING REQUIRED:	1,168 SF/200= 6 STALLS
FAST FOOD AREA:	3,911 SF
SEATING AREA/SEATS:	1,095 SF/73 SEATS
PARKING REQUIRED:	1,095 / 40=27 OR 73 / 2.5=29 STALLS
TOTAL PARKING REQUIRED:	49 STALLS
PARKING PROVIDED:	50 STALLS TOTAL
	6 COMPACT (12%)
	2 HC

KENNETH RODRIGUES & PARTNERS, INC  
 445 N. Whisman Road, Suite 200  
 Mountain View, CA 94043  
 Phone: 650.965.0700  
 Fax: 650.960.0707

NO: 125.044  
 11.11.11



# CURTNER/UNION RETAIL

CURTNER AND UNION  
 SAN JOSE, CALIFORNIA

A 2

Figure 2  
 Site Plan



The site plan shows the project would build out Curtner Avenue and construct sidewalk along the project frontage. Curtner Avenue would be widened by approximately 20 feet along the project frontage. With the widening, Curtner Avenue could have four travel lanes (two lanes in each direction), or three travel lanes (two eastbound lanes and one westbound lane) with a shared two-way center left-turn (TWCLT) lane. Currently, this segment of Curtner Avenue has three lanes: two lanes eastbound and one lane westbound. Since the project is proposing a full access driveway on Curtner Avenue, a three-lane road with a TWCLT lane is the preferred configuration for this segment of Curtner Avenue. A TWCLT lane would provide a safe “refuge” for exiting vehicles, thereby facilitating a two-step merging process onto eastbound Curtner Avenue. In addition, a TWCLT lane would provide storage for vehicles turning left into the shopping center. All roadway and sidewalk improvements are subject to City of San Jose review and approval.

The driveways serving the project on Union Avenue and Curtner Avenue are shown to be 30 feet wide measured at the throat. The proposed driveway widths are consistent with the two-way commercial driveway width recommendations contained in the Institute of Transportation Engineers’ technical report entitled *Guidelines for Driveway Location & Design*.

### ***Truck and Emergency Vehicle Access***

The site plan was reviewed for truck access by the method of truck turning-movement templates. Access was reviewed for the truck types WB-40 and SU-30, which represent small semi-trailer trucks, emergency vehicles, garbage trucks, and small to medium delivery vehicles. The proposed design is considered to be adequate to handle the anticipated level of truck traffic generated by the shopping center.

### ***Sight Distance at the Driveways Serving the Project***

The driveways serving the project should be free and clear of any obstructions to optimize sight distance, thereby ensuring that exiting vehicles can see pedestrians on the sidewalk and vehicles traveling on Union Avenue and Curtner Avenue. Landscaping at the driveways should not conflict with a driver’s ability to locate a gap in traffic. Adequate sight distance (sight distance triangles) should be provided at all driveways in accordance with Caltrans standards. Sight distance triangles should be measured approximately 10 feet back from the traveled way.

Providing the appropriate sight distance reduces the likelihood of a collision at an intersection or driveway. Sight distance generally should be provided in accordance with Caltrans standards. The minimum acceptable sight distance is often considered the Caltrans stopping sight distance. Sight distance requirements vary depending on the roadway speeds. For a driveway on Union Avenue, which has a posted speed limit of 35 mph, the Caltrans stopping sight distance is 300 feet (based on a design speed of 40 mph). For a driveway on Curtner Avenue, which has a posted speed limit of 25 mph, the Caltrans stopping sight distance is 200 feet (based on a design speed of 30 mph). Thus, a driver must be able to see 300 feet down Union Avenue and 200 feet down Curtner Avenue in order to stop and avoid a collision.

Based on the project site plan, it can be concluded that the driveways on Union Avenue and Curtner Avenue would meet the Caltrans sight distance standards.

### ***Union Avenue Driveway Operations***

Based on the site plan, the new project driveway on Union Avenue would be located approximately 150 feet from Curtner Avenue. As a result, left turns in and out of the southern project driveway would pass directly across the southbound left-turn pocket on Union Avenue. That condition would be less than ideal. On the other hand, left turns in and out of the existing northern driveway on Union Avenue would operate well due to its location and the presence of a shared two-way center left-turn (TWCLT) lane. The TWCLT lane on Union Avenue would provide a safe “refuge” for exiting vehicles, thereby facilitating a two-step merging process onto northbound Union Avenue. In addition, the TWCLT lane would provide storage for vehicles turning left into the shopping center. For these reasons, it is recommended that a “right turn only” sign be installed at the southern driveway on Union Avenue to prevent left turns from this driveway. The project-generated trips were assigned to the northern and southern driveways accordingly.



### ***Curtner Avenue Driveway Operations***

Based on the site plan, the new project driveway on Curtner Avenue would be located approximately 320 feet from both Union Avenue and Bascom Avenue. The volume of traffic on Curtner Avenue is less than half that of Union Avenue. In addition, Curtner Avenue has a posted speed limit of 25 mph. As a result, allowing left turns at the Curtner Avenue driveway most likely would not create any operational issues.

### **On-Site Circulation**

On-site vehicular circulation was reviewed for the existing shopping center and the proposed project in accordance with generally accepted traffic engineering standards. The site plan shows efficient on-site circulation with no dead-end drive aisles throughout the existing shopping center and project site. The City's standard width for two-way drive aisles is 26 feet wide where 90-degree parking is provided. This allows sufficient room for vehicles to back out of parking spaces. According to the site plan, all of the drive aisles measure at least 26 feet wide.

Parking throughout the existing shopping center would be reconfigured. The majority of surface parking spaces within the existing shopping center and the project are shown to be 9 feet wide by 18 feet deep. This meets the City of San Jose off-street parking design standard for full-size car spaces (9 feet wide by 18 feet deep). The compact spaces on-site measure 8 feet wide by 16 feet deep, which meets the design standard for compact car spaces (8 feet wide by 16 feet deep). The site plan shows that landscaping strips would be provided at all of the compact parking space locations. Landscaping provides opportunities for vehicle overhang.

### ***Pedestrian Circulation***

A pedestrian plaza is proposed as part of the project. The site plan also shows sidewalks surrounding the proposed new buildings. However, the site plan does not show any pedestrian connection between the new buildings and the sidewalks along the project frontages on Union Avenue and Curtner Avenue. The project should provide a crosswalk at the drive-thru location in order to provide a safe pedestrian connection between the public sidewalks and the new buildings. A typical location for a pedestrian crossing at a drive-thru lane is at or near the drive-thru exit.

No pedestrian connection between the project site and the existing Lunardi's market is shown on the site plan. The project should provide a clearly marked pedestrian path between the existing market and the new buildings.

### **Drive-Thru Analysis**

The San Jose City Council Policy 6-10 contains guidelines for the development of establishments with drive-thru facilities within the City of San Jose. The drive-thru lanes on site should be designed to meet the criteria listed in Policy 6-10. The criteria include design guidelines related to drive-thru location, vehicular ingress/egress, and vehicle stacking.

According to the site plan, a single drive-thru lane would serve the proposed fast food restaurant. The entrance to the drive-thru lane would be provided near the Curtner Avenue project driveway, which is located midway between Bascom Avenue and Union Avenue (approximately 300 feet from each street). The drive-thru exit would be located near the Union Avenue driveway. The Union Avenue driveway is shown to be approximately 150 feet from Curtner Avenue. The San Jose City Council Policy 6-10 states: "No drive-through use shall be approved with ingress or egress driveways within 300 feet of a signalized intersection operating at LOS D, E or F unless a traffic analysis demonstrates, to the satisfaction of the Director of Public Works, that vehicles entering or leaving said use will not impair the efficiency of operation of the intersection." The Union Avenue/ Curtner Avenue intersection currently operates at LOS C during the AM peak hour but LOS D during the PM peak hour. Based on the project trip generation estimates and trip assignment, the proposed fast-food restaurant drive-thru would add very little traffic to the project driveways



and the Union Avenue/Curtner Avenue intersection. Thus, the proposed drive-thru would not be expected to negatively affect the operations of the project driveways or nearby intersection.

Policy 6-10 states that a fast-food restaurant drive-thru must provide enough vehicle stacking space for 8 vehicles per lane, assuming 20 feet per vehicle. This equates to 160 feet of required vehicle storage. According to the site plan, the single drive-thru lane would provide approximately 300 feet of vehicle storage (sufficient to accommodate 15 vehicles). Thus, the proposed drive-thru design would provide adequate vehicle stacking, and no operational problems are expected to occur on or off the site as a result of the drive-thru window.

## **Conclusions**

The site plan shows good site access and efficient on-site circulation. Below are recommendations resulting from the site plan review.

### ***Recommendations***

- The project should install a “right turn only” sign at the southern driveway on Union Avenue to prevent left turns from this driveway.
- The project should provide a crosswalk at the drive-thru location in order to provide a safe pedestrian connection between the public sidewalks and the new buildings.
- The project should provide a clearly marked pedestrian path between the new buildings and the existing Lunardi's market.