Or

TRAFFIC IMPACT STUDY

Casa de Verde Apartments
1121 Greenfield Drive
El Cajon, California 92021
APN: 484-101-08

County of San Diego Case Numbers: R06-012; S06-036; ER 06-14-038

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Glossary of Terms and Acronyms

ADT ..... Average Daily Traffic
LOS ..... Level of Service
MPH ..... Miles per Hour
TIS ..... Traffic Impact Study

Executive Summary
Casa de Verde Apartments (R06-012; S06-036; ER 06-14-038)

The Case de Verde Apartment project is proposed to consist of 13 apartment units (12 rentals and 1 manager's unit with a small manager's office) on approximately 0.44 acres. The project site is located at 1121 Greenfield Drive, which is on the south side of Greenfield Drive between 1st Street and Oro Street in the Lakeside/Pepper Drive-Bostonia area of San Diego County, California.

The project site is currently being used as outdoor storage facility that has two existing driveways. As part of the project, the applicant will close both of the existing driveways and construct a single driveway on Greenfield Drive to be located approximately in the center of the parcel.

The project applicant proposes a zone reclassification from C36 to C34 to allow for multifamily as the primary use. Land uses within C34 are a subset of C36 with the exception that C34 allows for residential as a primary use. C36 allows for residential only as a secondary use to commercial. From a traffic generation perspective, the existing C36 zoning has more options (i.e. gasoline sales or laundry services) having higher traffic generation than C34. As all of C34 land use options are included within C36, with the only exception of sole residential use, the C34 traffic generation can only be at or less than C36 for identical uses.

The project trip generation was calculated using SANDAG trip rates from the *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002. Based on SANDAG trip rates and with credit taken for the existing use that will be replaced by the project, the net traffic increase is calculated at 91 ADT, 9 AM peak hour trips, and 8 PM peak hour trips.

The project is calculated to have no direct impacts, some potential cumulative impacts, and one potential driveway spacing deficiency under near-term conditions as shown in **Table E-1**.

TABLE E-1: SUMMARY OF PROJECT IMPACTS AND MITIGATION

Roadway Facility	Near-Term Direct Impacts	Near-Term Cumulative Impacts
Intersections	0 (no mitigation required)	Potential (TIF participation)
Segments	0 (no mitigation required)	Potential (TIF participation)
Freeways	0 (no mitigation required)	Potential (TIF participation)
Ramps	0 (no mitigation required)	Potential (TIF participation)
Driveway Spacing	Potential (Design Variance Request *)	Potential (Design Variance Request*)

* The applicant's Civil Engineer will submit under separate cover a design variance request for the proposed driveway spacing if required.

1.0 Introduction

This report describes the existing roadway network in the vicinity of the project site and includes a review of the existing and proposed activities for weekday peak AM and PM periods, and daily traffic conditions when the project is completed. The format of this study includes the following chapters:

1.0	Introduction
2.0	Existing Conditions
3.0	Project Impact Analysis
4.0	Impact Summary
5.0	Summary of Recommended Project Design Features Impacts & Mitigation
6.0	References
7.0	List of Preparers and Persons and Organizations Contacted

1.1 Purpose of the Report

The purpose of this traffic impact study is to determine and analyze potential traffic impacts for the proposed 13 apartment unit Casa de Verde apartment complex (12 rentals and 1 manager's unit with a small manager's office).

1.2 Project Location and Description

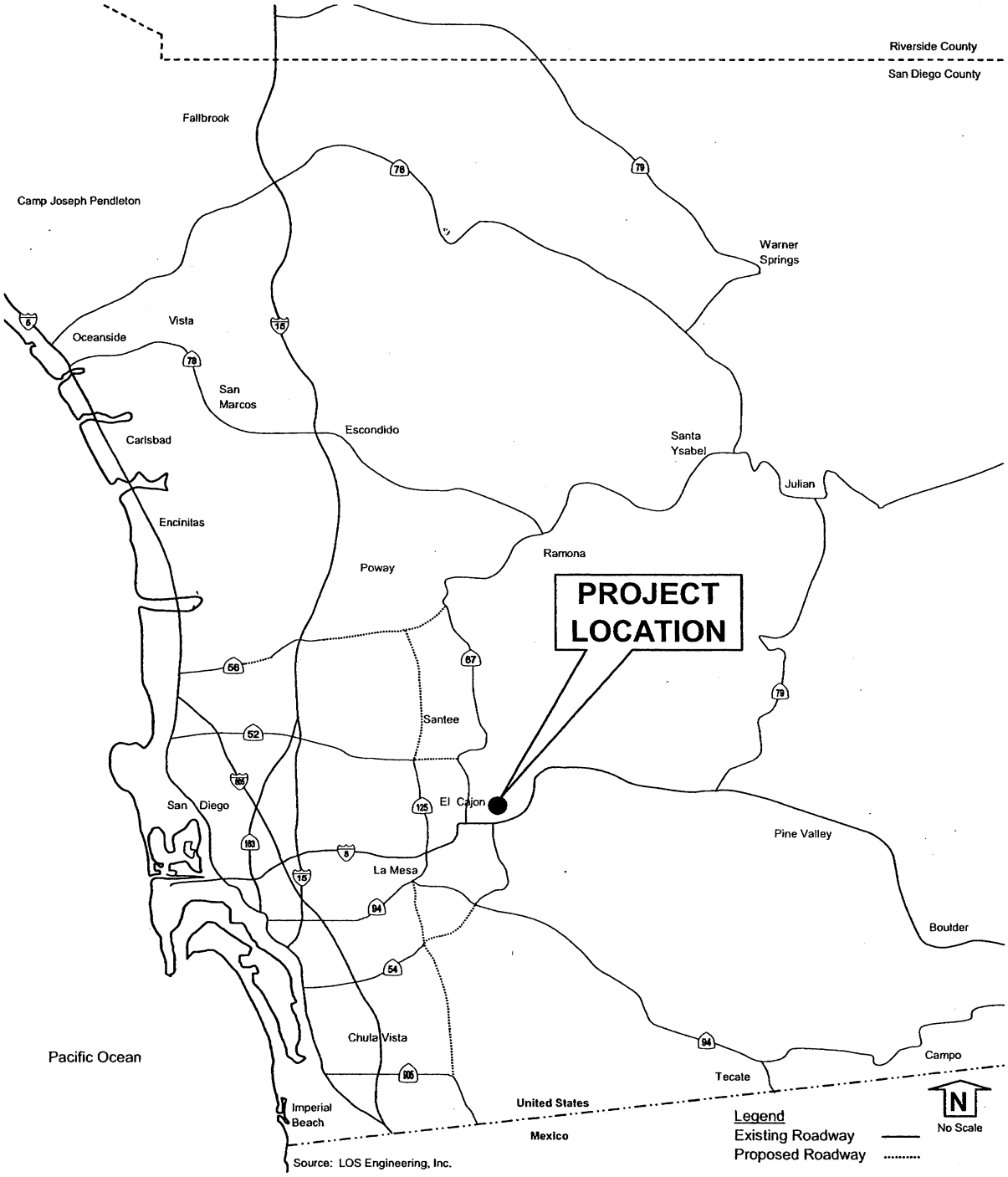
The Case de Verde Apartment project is proposed to consist of 13 apartment units (12 rentals and 1 manager's unit with a small manager's office) on approximately 0.44 acres. The project site is located at 1121 Greenfield Drive, which is on the south side of Greenfield Drive between 1st Street and Oro Street in the Lakeside/Pepper Drive-Bostonia area of San Diego County, California.

The project site is currently being used as outdoor storage facility that has two existing driveways. As part of the project, the applicant will close both of the existing driveways and construct a single driveway to Greenfield Drive that will be located approximately in the middle of the parcel. The location of the project is shown in **Figure 1.** The map of the Traffic Impact Study (TIS) area is shown in **Figure 2.** A preliminary site plan is shown in **Figure 3**.

1.3 Summary of Significance Criteria

This section describes traffic impact significance criteria, which is based on the San Diego County *Report Format & Content Requirements Transportation and Traffic*, September 26, 2006 and on the County of San Diego General Plan Public Facilities Element (Part XII).

Figure 1: Project Location



Source: LOS Engineering, Inc.

Figure 2: TIS Study Area

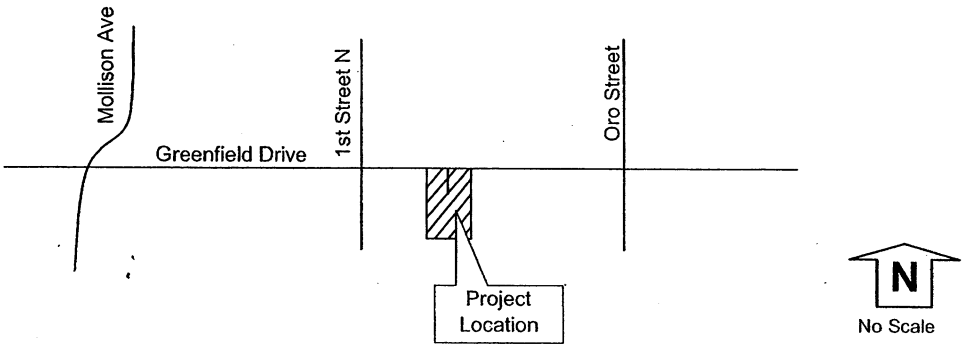
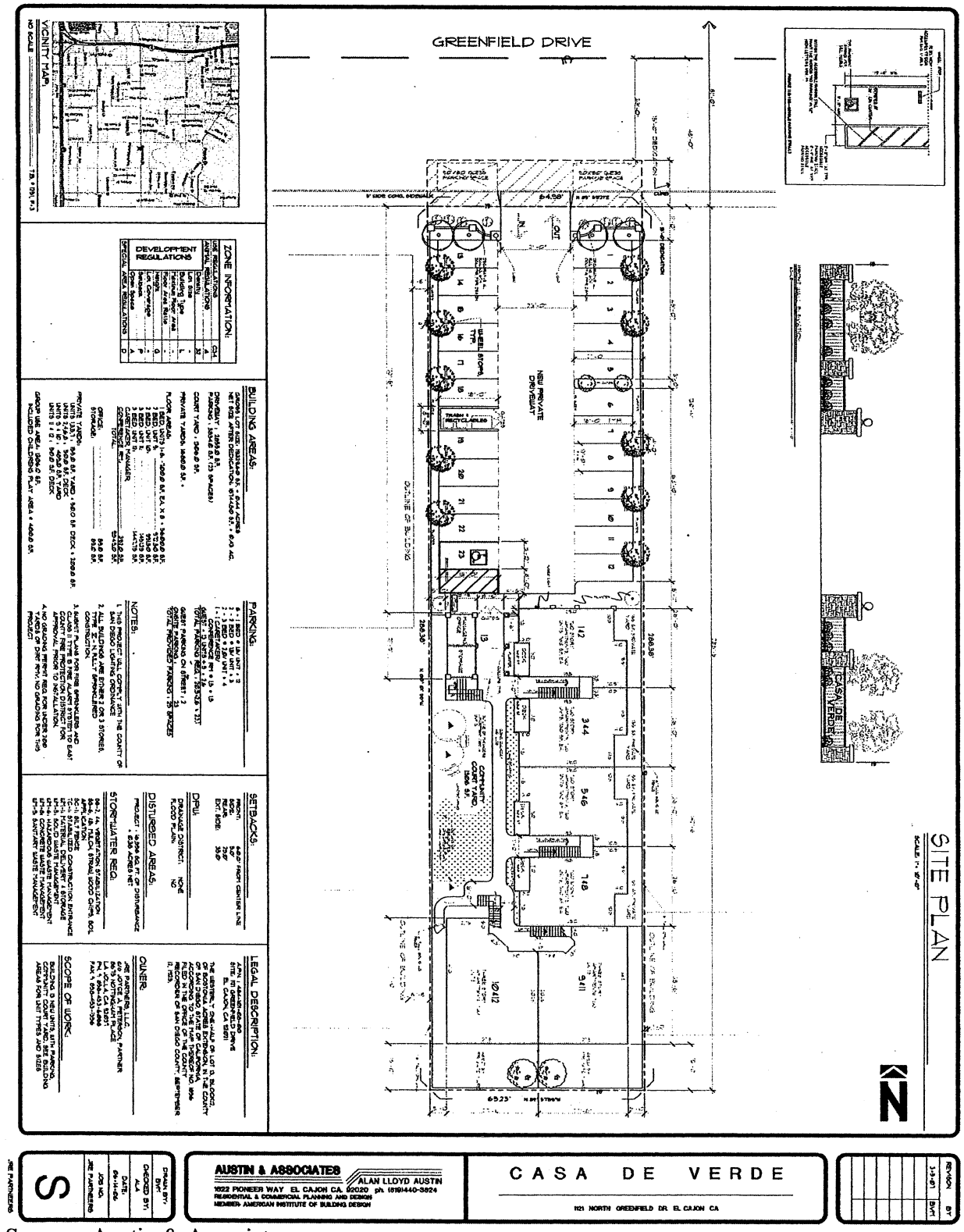


Figure 3: Site Plan



Source: Austin & Associates

1.3.1 County of San Diego Guidelines for Determining Significance

Based on the San Diego County *Report Format & Content Requirements Transportation and Traffic*, September 26, 2006, a project may have a direct and/or cumulative impact if the significance criteria are exceeded, as shown in **Table 1**.

TABLE 1: COUNTY OF SAN DIEGO SIGNIFICANT TRAFFIC IMPACT THRESHOLDS

Measures of Significant Project Impacts to Congestion Allowable Increases on Congested Roads and Intersections					
	Road Segments			Intersections	
Operations	2-Lane Road	4-Lane Road	6-Lane Road	Signalized	Un-signalized
LOS E	200 ADT	400 ADT	600 ADT	Delay of 2 seconds	20 peak hour trips on a critical movement
LOS F	100 ADT	200 ADT	300 ADT	Delay of 1 second, or 5 peak hour trips on a critical movement	5 peak hour trips on a critical movement

Source: County of San Diego *Guidelines for Determining Significance* Table 1 from page 9. Note: A critical movement is one that is experiencing excessive queues. By adding proposed project trips from a list of projects, these same tables are used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project that contributes any trips must mitigate it's share of the cumulative impacts. The County may also determine impacts have occurred on roads even when a project's traffic or cumulative impacts do not trigger an unacceptable level of service, when such traffic uses a significant amount of remaining road capacity.

A direct impact would occur when the significance criteria are exceeded. If the proposed project exceeds the values provided in the above table, then the individually proposed project would result in a direct traffic impact. Specific improvements to mitigate direct impacts must be identified.

A cumulative impact would occur when two conditions are met: 1) build-out of all near term projects results in a cumulative traffic impact and 2) the amount of traffic generated by the individual proposed project contributes (even in a small part) to that cumulative impact. Both conditions must be met for an individual project to result in a cumulative traffic impact. If the traffic generated from all the near term projects (cumulative projects) would result in a cumulative traffic impact then condition one is met. If the total amount of traffic generated exceeds the values provided in the above table, then condition 2 is met and the individually proposed project would result in a cumulative traffic impact. Fair-share contributions toward cumulative impacts may only be provided when a specific transportation improvement project and schedule for completion of the improvement project has been identified.

Potential mitigation measures may include traffic signal improvements, physical road improvements, street re-striping and parking prohibitions, fair share contributions, and transportation demand management programs.

The County of San Diego *Guidelines for Determining Significance and Report Format and Content Requirements Transportation and Traffic,* dated September 26, 2006 includes a summary of how a project's potential traffic impact would be perceptible to the average driver on roadway segments:

"Based on these criteria [Table 1 above], an impact from new development on an LOS E

road would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 200 ADT. Using SANDAG's "Brief Guide for Vehicular Traffic Generation Rates for the San Diego Region" for most discretionary projects this would generate less than 25 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 2.4 minutes. Therefore, the addition of 200 ADT, in most cases, would result in changes to traffic flow that would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. Significance criteria were also established for four-lane and six-lane roads operating at LOS E and are based upon the above 24 hour ADT significance criterion established for two-lane roads. The two-lane road criterion was doubled to determine impacts to four-lane roads and tripled to determine impacts to six-lane roads. This was considered to be conservative since the 24 hour per lane road capacity for a 4-lane road is more than double that of a two-lane road and the per lane capacity of a six-lane road is more than triple that of the two-lane road. For LOS E roads, the additional significance criteria are 400 ADT for a four-lane road and 600 ADT for a six-lane road. Similar to criterion for two-lane road, the 400 ADT for a 4-lane road and 600 ADT for a 6-lane road criteria would generate less than 25 per lane peak hour trips for most discretionary projects. On average, during peak hour conditions, this would be only one additional car per lane every 2.4 minutes. The addition of 200 ADT per lane (400 ADT for a 4 lane road or 600 for a 6-lane road), in most cases, would result in changes to traffic flow that would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway..."

"The second significance criteria listed in [Table 1 above] addresses roadways presently operating at LOS F. Under LOS F congested conditions, small changes and disruptions to the traffic flow on County Circulation Element Road can have a greater effect on traffic operations when compared to other LOS conditions. In order to better account for potential effects of increased traffic on LOS F road more stringent significance criteria was established when compared to that for LOS E. Based on this guidance, an impact from new development on an LOS F road would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 100. Again, using SANDAG's "Brief Guide for Vehicular Traffic Generation Rates for the San Diego Region" for most discretionary projects this would generate less than 12.5 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 4.8 minutes. The addition of 100 ADT, in most cases, would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. The same approach used to determine significance criteria for four-lane and six-lane roads operating at LOS E was used to determine appropriate significance criteria for four-lane and six-lane road operating at LOS F. Based on this approach, the significance criteria for a four-lane road (200 ADT) and for a six-lane road (300 ADT) would generate less than 12.5 per lane peak hour trips for most discretionary projects. On average, during peak hour conditions, this would be only one additional car per lane every 4.8 minutes. The addition of 100 per lane ADT (200 ADT for a 4-lane and 300 ADT for a 6-lane road) would, in most cases, not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. In summary, under extremely congested LOS F conditions, small changes and disruptions to the traffic flow can significantly affect traffic operations and additional project traffic can increase the likelihood or frequency of these events. Therefore, the LOS F ADT significance criteria was set at 100

ADT (50% of the LOS E threshold) to provide a higher level of assurance that the traffic allowed under the threshold would not significantly impact traffic operation on the road segment."

And, a summary of how a project's potential traffic impact would be perceptible to the average driver at intersections:

"The significance criterion for signalized intersections listed in [Table 1 above] allows an increase in the overall delay at an intersection operating at LOS E of two seconds. This is consistent with the capacity threshold contained in the SANDAG' CMP and guidelines established by the City of San Diego. A delay of two seconds is a small fraction of the typical cycle length for a signalized intersection that ranges between 60 and 120 seconds. The likelihood of increased queues forming does due to the additional two seconds of delay is low. Therefore, an increased wait time of two seconds, on average, would result in changes to traffic flow that would not be noticeable to the average driver. Therefore the significance guideline for intersections operating at LOS E is two seconds."

"The primary significance criterion for signalized intersections operating at LOS F conditions was based upon increased delay at the intersection. Under LOS F congested conditions, small changes and disruptions to the traffic flow to signalized intersection can have a greater effect on overall intersection operations when compared to other LOS conditions. In order to better account for potential effects of increased traffic at signalized intersections operating at LOS F, a more stringent guideline was established when compared to signalized intersection operating at LOS E. A significance guideline of an increased delay of 1 second was established for signalized intersections operating at LOS F. An increase in the overall delay at an intersection of one second, on average, would result in changes to traffic flow that would not be noticeable to the average driver. Therefore the significance guideline for intersections operating at LOS F is 1 second."

"Signalized intersections operating at LOS F also have the potential for substantial queuing at specific turning movements that may detrimentally effect overall intersection and/or road segment operations. Thus, an increase of peak hour trips to a critical move was also established as a secondary significance criterion for signalized intersections. A critical movement would be a movement or a lane at an intersection that is experiencing queuing or substantial delay and is affecting the overall operation of the intersection. The increase in peak hour trips to a critical move is a measurement of how many cars can be added to an existing queue. The addition of five trips (peak hour) per critical movement will normally be considered a significant impact. This significance criterion was selected because the five additional trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver (one trip every 12 minutes or 720 seconds). For LOS E intersections, the 5 peak hour trips to a critical movement would not be noticeable to the average driver since the one additional trip during the 12 minute interval on average would clear the traffic signal cycles well within the 12 minute period. It should also be noted that if the 5 additional peak hour trips arrived at the same time these trips would also clear the traffic cycle and existing queue lengths would be re-established."

"The significance guidelines for unsignalized intersections identify a minimum number of trips added to a critical movement at an unsignalized intersection. Since the operations of unsignalized intersections under congested conditions are heavily influenced by traffic volume increases on critical moves, the significance guidelines for unsignalized intersections were based upon the number of trips added to a critical movement. This guideline directly relates to the number of vehicles that can be added to an existing queue that forms at the intersection. A significance criteria of twenty trips (peak hour) per critical movement was used for LOS E conditions. Although delays drivers experience under LOS E conditions may be noticeable, they are not yet considered unacceptable. The twenty trips spread out over the peak hour would not likely cause the intersection delay or existing queue lengths to become unacceptable. The twenty trips (peak hour) would not be noticeable to the average driver. A significance guideline of five trips (peak hour) per critical movement was used for LOS F conditions. The five trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver."

"The operations of unsignalized intersections under congested conditions are heavily influenced by traffic volumes increases on critical moves. Therefore, the significance guidelines for unsignalized intersections are based upon the number of peak hour trips added to a critical movement at that intersection. This guideline examines the number of vehicles that may be added to an existing queue that forms at the intersection by the additional traffic generated by a project. In LOS E situations, the delays that drivers experience are noticeable, but are not considered excessive. A peak hour increase of twenty trips to the critical movement of an unsignalized intersection would be, on average, one additional car every 3.0 minutes or 180 seconds. Assuming the average wait time for a vehicle in the critical movement queue is less than 3.0 minutes, which is typical for LOS E conditions, this would not be noticeable to the average driver and would not be considered a significant impact."

"For LOS F conditions, a significance threshold of five trips (peak hour) per critical movement was used. The five trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver. Five trips spread out over an hour would be one car every 12 minutes. This typically exceeds the average wait time in the queue and would not be noticeable to the average driver."

1.3.2 County of San Diego General Plan Public Facilities Element (Part XII)

The County of San Diego *Guidelines for Determining Significance and Report Format and Content Requirements Transportation and Traffic* dated September 26, 2006 includes a summary of the Public Facilities Element of the San Diego County General Plan as follows:

"The County of San Diego General Plan Public Facilities Element establishes policies and implementation measures regarding the assessment and mitigation of traffic impacts of new development. One of the goals of the Public Facilities Element (PFE) is to provide "A safe, convenient, and economical integrated transportation system including a

wide range of transportation modes (PFE, page XII-4-18)." The PFE also identifies an objective in the Transportation Section to provide a "Level of Service C or better on County Circulation Element roads (PFE, page XII-4-18)." The PFE, however, establishes LOS D as an off-site mitigation threshold for discretionary projects. When an existing Level of Service is already D, "a LOS of D may be allowed (PFE, page XII-4-18)." According to the PFE, projects that significantly increase congestion on roads operating at LOS E or LOS F must provide mitigation. According to the PFE, this mitigation can consist of a fair share contribution to an established program or project to mitigate the project's impacts. If impacts cannot be mitigated, the project will be denied unless a specific statement of overriding findings is made pursuant to Sections 15091 and 15093 of the State CEQA Guidelines to approve the project as proposed."

The County of San Diego significance criteria is consistent with the aforementioned summary of PFE Policy 1.1, which requires mitigation for projects that significantly increase congestion on roads operating at LOS E or LOS F.

PFE Policy 1.2 states "General Plan Amendments and Rezones shall be reviewed to ensure that any proposed increases in density of intensity of use will not prevent the planned Circulation Element road system from operating at its planned Level of Service at buildout." The project applicant proposes a zone reclassification from C36 to C34 to allow for multifamily as the primary use. The C34 land uses are a subset of C36 uses with the exception of a primary residential use option in C34. C36 allows for residential only as a secondary use to commercial (this means that both C34 and C36 could have residential uses; however, C36 could have a higher traffic generation by adding a commercial component to the residential use). From a traffic generation perspective, the existing C36 zoning has more options (i.e. gasoline sales or laundry services) having higher traffic generation than C34. As all of C34 land use options are included within C36, with the only exception of sole residential use, the C34 traffic generation can only be at or less than C36 for identical uses.

In summary, the County of San Diego traffic impact significance criteria covers the significance criteria identified in PFE policies 1.1 and 1.2.

1.4 Congestion Management Program Criteria

The Congestion Management Program (CMP), adopted in January 2003 by the SANDAG Board, is intended to determine if a large project (greater than 2,400 ADT or more than 200 peak hour trips) will adversely impact the CMP transportation system. A CMP analysis is NOT included because this project is calculated to generate less than 2,400 ADT and less than 200 peak hour trips.

2.0 Existing Conditions

2.1 Existing Transportation Conditions

This section describes the study area street system, peak hour intersection volumes and daily roadway volumes.

In the vicinity of the project, only the roadways where project traffic is anticipated to travel were analyzed as part of this study, which included:

Greenfield Drive from 1st Street to Oro Street is classified as a *Collector Road with bike lanes* on the San Diego County Circulation Element map (A copy from the San Diego County Circulation Element Map is included in **Appendix A**). This two-lane roadway is constructed within approximately 64 feet of pavement just west of the project location and 56 feet of pavement just east of the project site. Greenfield Drive is constructed with one twelve (12) foot travel lane and a paved shoulder/bike lane of varying width in each direction. Parking is allowed where sufficient pavement exists and is delineated as such. The posted speed limit is 35 Miles Per Hour (MPH). The 85th percentile speed on Greenfield Drive east of North First Street was measured at 36 MPH in the eastbound direction and 42 MPH in the westbound direction. The 85th percentile speed data are included in **Appendix C**. The existing roadway conditions are shown in **Figure 4**.

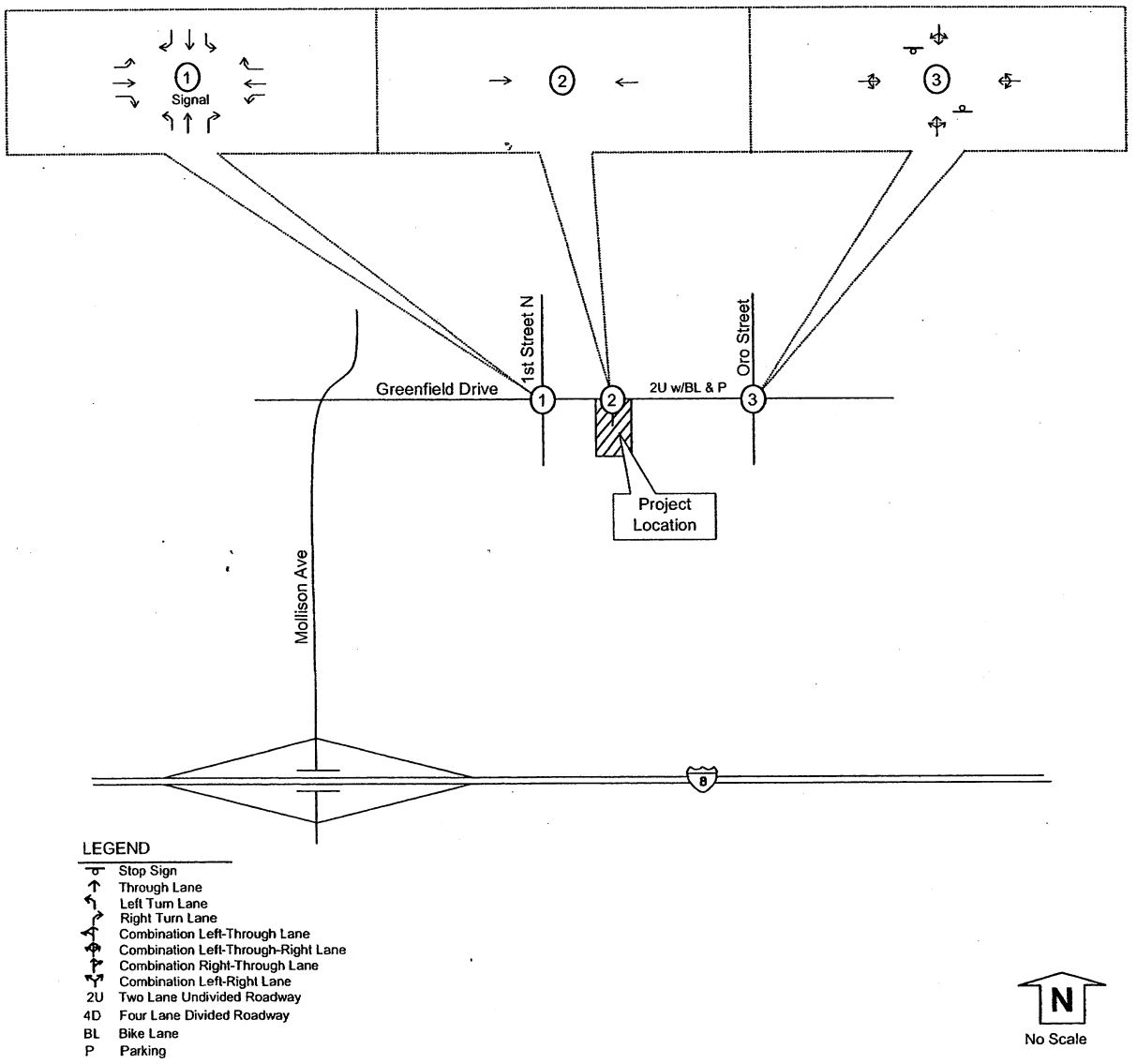
2.2 Existing Parking, Transit and On-site Circulation

The project site is currently used as an outdoor storage facility with two driveways. On-site parking is provided for the stored items.

Nearby transit service is provided on North 2nd Street and Broadway. The project site is located approximately 2,400 feet west of North 2nd Street, which is served by bus route 848. The project site is also located approximately 2,400 feet north of Broadway, which is served by bus route 848, 864, and 874. A map is included in **Appendix B**.

The existing parking and on-site circulation appear adequate for the existing use.

Figure 4: Existing Roadway Conditions



3.0 Project Impact Analysis

3.1 Analysis Methodology

The project study area is generally determined by the limits or extent of where 25 or more peak hour trips would travel from the proposed project, which is based on the San Diego County *Report Format & Content Requirements Transportation and Traffic*, September 26, 2006.

The traffic analyses prepared for this study were based on the *2000 Highway Capacity Manual* (HCM) operations analysis using Level of Service (LOS) evaluation criteria. The operating conditions of the study intersections, street segments, and highway segments are measured using the HCM LOS designations, which ranges from A through F. LOS A represents the best operating condition and LOS F denotes the worst operating condition. The individual LOS criteria for each roadway component are described below.

3.1.1 Intersections

The study intersections were analyzed based on the **operational analysis** outlined in the 2000 HCM. This process defines LOS in terms of **average control delay** per vehicle, which is measured in seconds. LOS at the intersections were calculated using the computer software program Synchro 6.0 (Trafficware Corporation, 2003). The HCM LOS for the range of delay by seconds for un-signalized and signalized intersections is described in **Table 2**.

TABLE 2: UN-SIGNALIZED AND SIGNALIZED INTERSECTION LEVEL OF SERVICE (HCM 2000)

Level of Service	Un-Signalized Average Control Delay (seconds/vehicle)	Signalized Average Control Delay (seconds/vehicle)
A	0-10	0-10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	>35-50	> 55-80
F	> 50	> 80

Source: Highway Capacity Manual 2000.

3.1.2 Street Segments

The street segments were analyzed based on the functional classification of the roadway using the County of San Diego *Average Daily Vehicle Trips* capacity lookup table. The roadway segment capacity and LOS standards used to analyze street segments are summarized in **Table 3**.

TABLE 3: STREET SEGMENT DAILY CAPACITY AND LOS (COUNTY OF SAN DIEGO)

Circulation Element Road Classification	CROSS SECTION	LOS A	LOS B	LOS C	LOS D	LOS E
Expressway	126/146	<36,000	<54,000	<70,000	<86,000	<108,000
Prime Arterial	102/122	<22,200	<37,000	<44,600	<50,000	<57,000
Major Road	78/98	<14,800	<24,700	<29,600	<33,400	<37,000
Collector	64/84	<13,700	<22,800	<27,400	<30,800	<34,200
Town Collector	54/74	<3,000	<6,000	<9,500	<13,500	<19,000
Light Collector	40/60	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Collector	40/84	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Light Collector	40/60	<1,900	<4,100	<7,100	<10,900	<16,200
Recreational Parkway	40/100	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Mountain	40/100	<1,900	<4,100	<7,100	<10,900	<16,200
Non-Circulation Roads						
Residential Collector	40/60	NA	NA	<4,500	NA	NA
Residential Road	36/56	NA	NA	<1,500	NA	NA

Source: County of San Diego Department of Public Works *Public Road Standards* July 14, 1999.

3.1.3 Existing Traffic Volumes and LOS Analyses

Existing AM and PM peak hour intersection volumes (with count dates) for the following intersections were collected for this study:

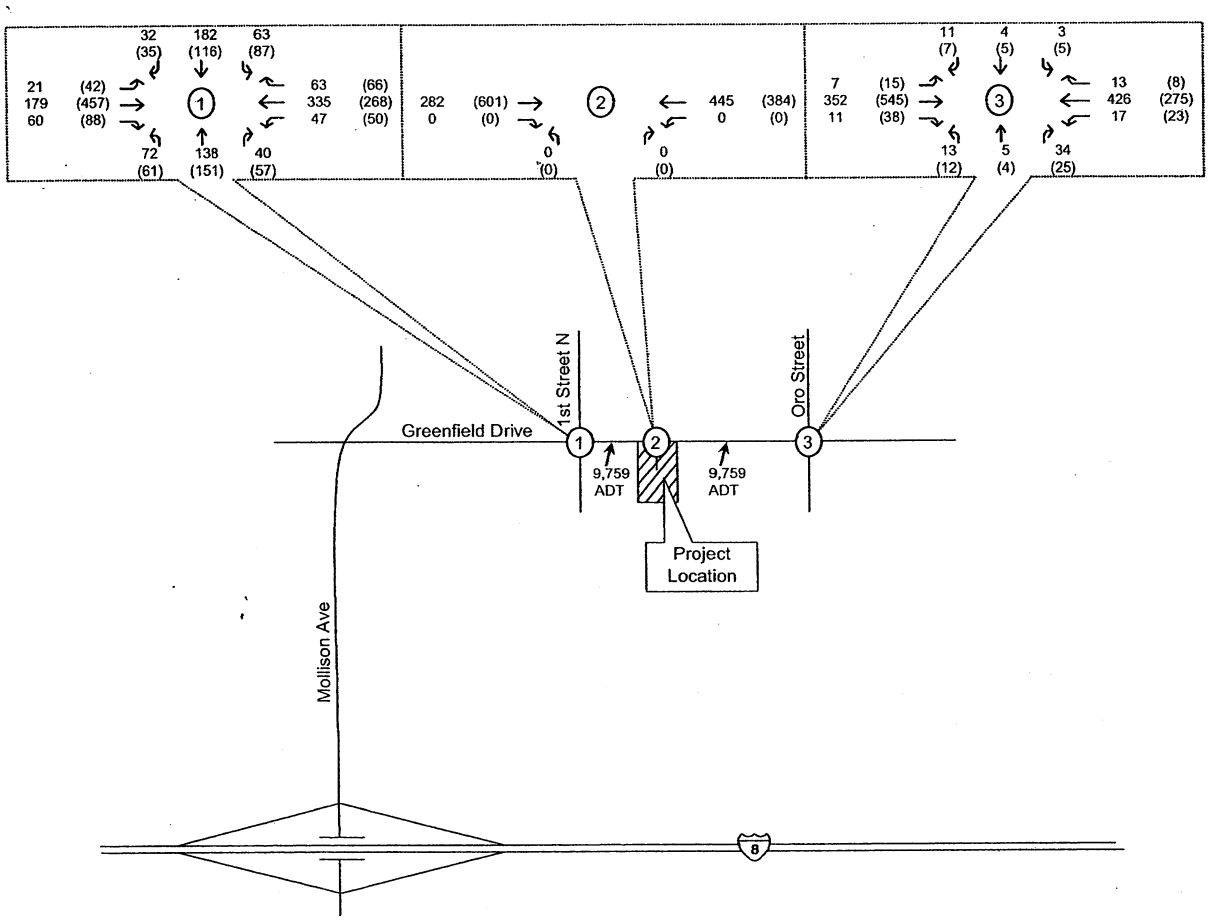
1) North 1st Street/Greenfield Drive (Thursday, 11/16/2006)
2) Oro Street/Greenfield Drive (Thursday, 11/16/2006)

Additionally, the following street segment volumes (with count dates) were analyzed as part of this study:

1) Greenfield Drive between North 1st Street and Oro Street (Thursday, 11/16/2006)

The existing AM, PM, and ADT volumes are shown on **Figure 5**, with count data included in **Appendix D**. The LOS calculated for the intersections and street segments are shown in **Tables 4 and 5**, respectively.

Figure 5: Existing Volumes



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

TABLE 4: EXISTING INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Movement	Peak Hour	Existing Delay[2]	Existing LOS[3]
1) 1st Street N at	All	AM	22.7	C
Greenfield Drive (S)	All	PM	28.6	C
2) Project Drwy at	NB LR	AM	NA	NA
Greenfield Drive (U)	NB LR	PM	NA	NA
3) Oro Street at	NB LR	AM	14.6	B
Greenfield Drive (U)	SB LR	AM	14.6	B
	NB LR	PM	17.2	C
	SB LR	PM	17.4	C

Notes: 1) Intersection Analysis - S - signalized, U - Unsignalized; 2) HCM - Highway Capacity Manual delay in seconds
3) Level of Service

TABLE 5: EXISTING SEGMENT ADT VOLUMES AND LEVEL OF SERVICE

Segment	Current Classification (as built)	LOS E Capacity	Existing Daily Volume	Existing V/C	Existing LOS
Greenfield Drive					
North First Street to Project Driveway	Collector (2U, BL, P)	16,200	9,759	0.602	D
Project Driveway to Oro Street	Collector (2U, BL, P)	16,200	9,759	0.602	D

Notes: Classification (as built): 2U: 2 lane undivided roadway, P: Parking, BL: Bike Lane; Daily volume is a 24 hour volume.
V/C: Volume to Capacity ratio.

Under existing conditions, all study intersections and roadways were calculated to operate at LOS D or better. Existing LOS calculations are included in **Appendix E**.

3.2 Project Trip Generation

The project trip generation was calculated using SANDAG trip rates from the *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002. Trip credit was taken for the existing outdoor storage facility. Pictures documenting the existing storage use are included in **Appendix F**. Based on SANDAG trip rates and with credit taken for the existing use that will be replaced by the project, the net traffic increase for 13 apartments (12 rentals and 1 manager's unit with a small manager's office) is calculated at 91 ADT, 9 AM peak hour trips (2 inbound and 7 outbound), and 8 PM peak hour trips (6 inbound and 2 outbound) as shown in **Table 6** (a copy of the SANDAG rates is included in **Appendix G**).

TABLE 6: PROJECT TRIP GENERATION

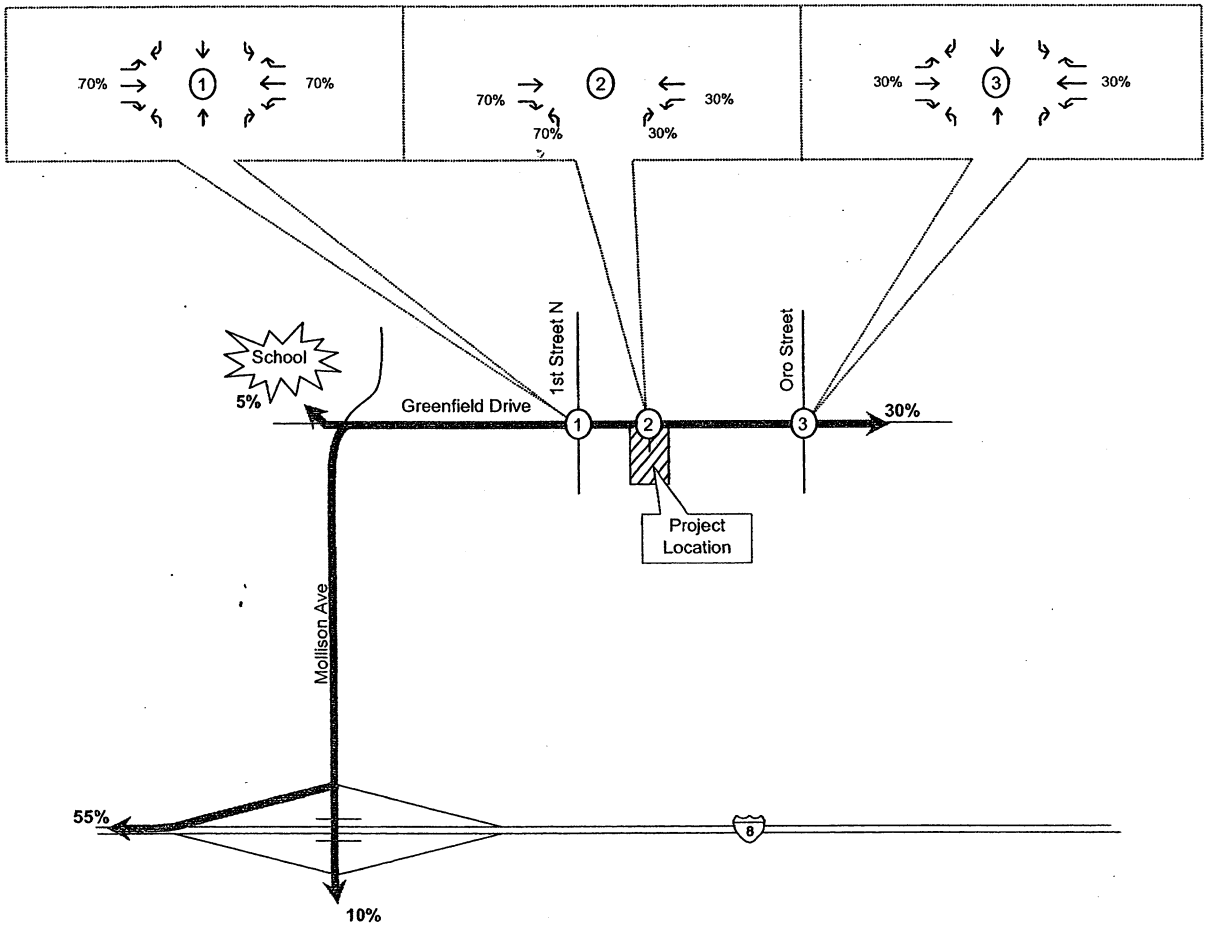
Proposed Land Use	Rate	Size & Units		ADT	%	Split		AM IN	AM OUT	%	Split		PM IN	PM OUT
Project: Multi Family	8 /DU	13	DU	104	8%	0.2	0.8	2	7	10%	0.7	0.3	7	3
Credit for Storage (to be removed)	30 /acre	0.44	acres	-13	6%	0.5	0.5	0	0	9%	0.5	0.5	-1	-1
Net Traffic Increase				**91**				**2**	**7**				**6**	**2**

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region,* April 2002.
DU-dwelling unit; ADT-Average Daily Traffic; Split-percent inbound and outbound.

3.3 Project Distribution and Assignment

Project trips were distributed based on the proximity of the nearest access to Interstate 8 and local restaurants and convenience stores. The distribution and assignment are shown in **Figures 6 and 7**.

Figure 6: Distribution



LEGEND

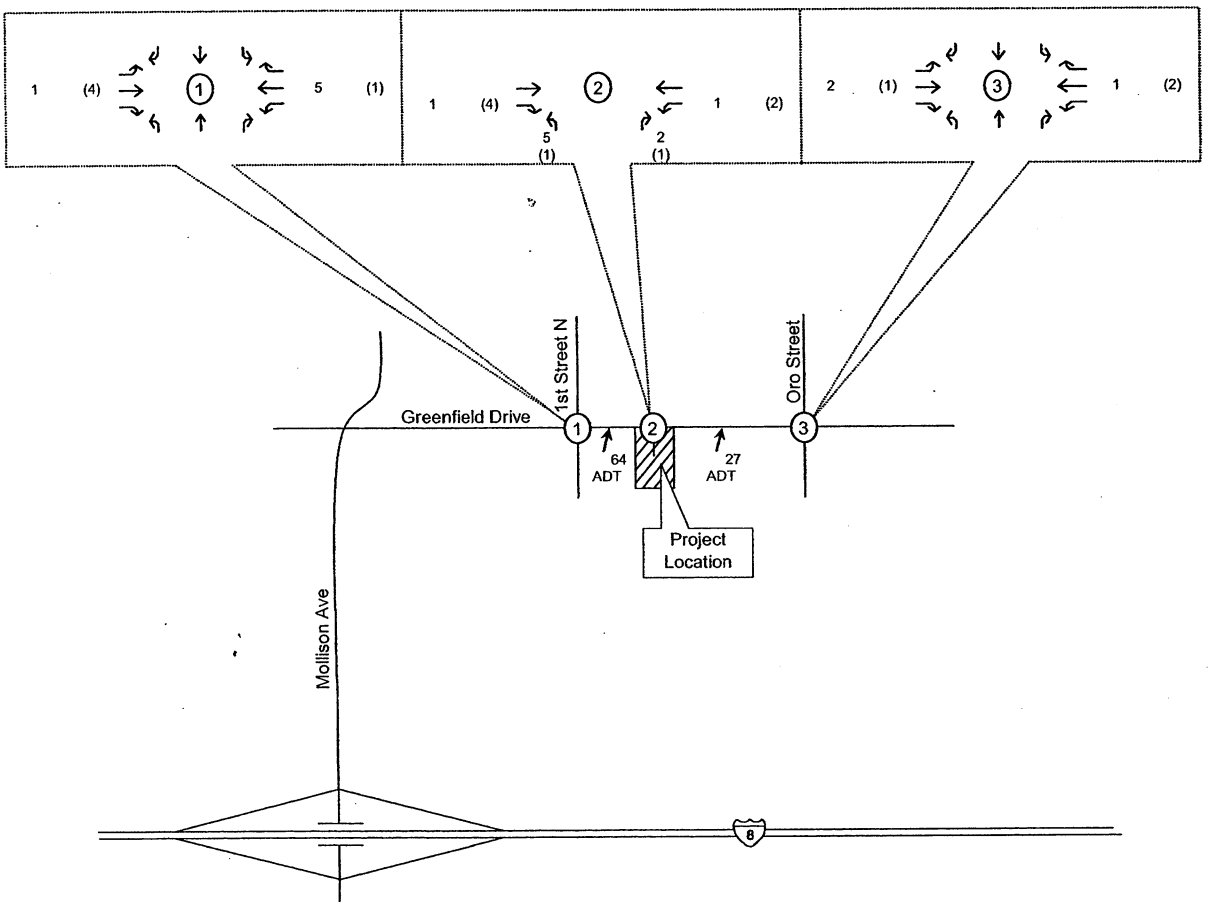
Regional distribution

1 Intersection Reference Number to LOS Tables

N

No Scale

Figure 7: Assignment



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N
No Scale

3.4 Existing + Project Conditions

This section will summarize the analysis for the addition of project traffic onto the existing background traffic for AM, PM and ADT conditions. The traffic analysis criteria are the same as outline in section 2.1.

The peak hour intersection volumes and daily traffic volumes for this scenario of existing + project are shown in **Figure 8**. The LOS calculated for the intersections and street segments are shown in **Tables 7 and 8**, respectively.

TABLE 7: EXISTING + PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Movement	Peak Hour	Existing Delay[2]	Existing LOS[3]	Existing + Project Delay[2]	Existing + Project LOS[3]	Delta[4]	Sig[5]
1) 1st Street N at	All	AM	22.7	C	22.7	C	0.0	No
Greenfield Drive (S)	All	PM	28.6	C	28.8	C	0.2	No
2) Project Drwy at	NB LR	AM	NA	NA	13.9	B	NA	No
Greenfield Drive (U)	NB LR	PM	NA	NA	19.2	C	NA	No
3) Oro Street at	NB LR	AM	14.6	B	14.6	B	0.0	No
Greenfield Drive (U)	SB LR	AM	14.6	B	14.6	B	0.0	No
	NB LR	PM	17.2	C	17.2	C	0.0	No
	SB LR	PM	17.4	C	17.4	C	0.0	No

Notes: 1) Intersection Analysis - S - signalized, U - Unsignalized; 2) HCM - Highway Capacity Manual delay in seconds
3) Level of Service. 4) Delta is the increase in delay from project. 5) Significant Impact? (yes or no).

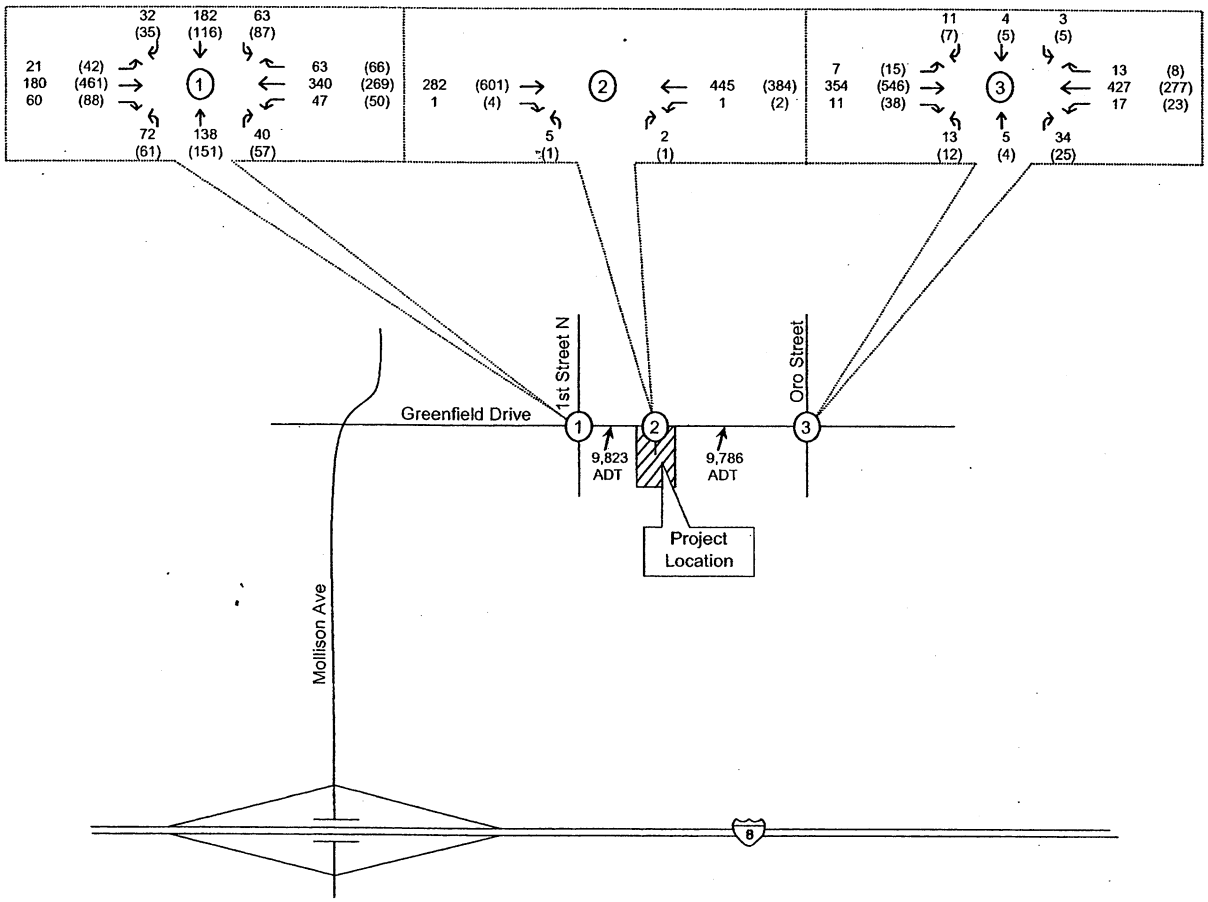
TABLE 8: EXISTING + PROJECT SEGMENT ADT VOLUMES AND LEVEL OF SERVICE

Segment	Current Classification (as built)	LOS E Capacity	Existing Daily Volume	Existing V/C	Existing LOS	Project Daily Volume	Existing + Project Daily Volume	Existing + Project V/C	Existing + Project LOS	Change in V/C	Project Impact?
Greenfield Drive											
North First Street to Project Driveway	Collector (2U, BL, P)	16,200	9,759	0.602	D	64	9,823	0.606	D	0.00	No
Project Driveway to Oro Street	Collector (2U, BL, P)	16,200	9,759	0.602	D	27	9,786	0.604	D	0.00	No

Notes: Classification (as built): 2U: 2 lane undivided roadway, P: Parking, BL: Bike Lane; Daily volume is a 24 hour volume.
V/C: Volume to Capacity ratio.

Under existing + project conditions, all study intersections and roadways were calculated to operate at LOS D or better. Existing + project LOS calculations are included in **Appendix H.**

Figure 8: Existing + Project Volumes



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

3.5 Near-Term + Existing Conditions

This section will analyze the near-term conditions (consisting of existing + known cumulative projects).

3.5.1 Cumulative Projects

Based on a review of San Diego County records, four (4) nearby cumulative projects were identified, which are anticipated to generate traffic and use identical roadways as the project. Other potential cumulative projects may add additional traffic to the study area roadways; however, since the County has a TIF program, the applicant can mitigate all cumulative impacts regardless of the number of cumulative projects included in the analysis.

A summary of the cumulative projects is included below with their respective and cumulative traffic generation shown in **Table 9.**

1) *TPM 20931 (560 Pepper Drive)* – A residential project of 4 single-family homes on Pepper Drive. The traffic generation for this cumulative project is calculated at 40 ADT with 3 AM and 4 PM peak hour trips.
2) *TPM 20921 (1269 Tuttle Lane)* – A residential project of 3 single-family homes on Tuttle Lane. The traffic generation for this cumulative project is calculated at 30 ADT with 3 AM and 3 PM peak hour trips.
3) *TPM 20895 (1103 Topper Lane)* – A residential project of 4 single-family homes on Topper Lane. The traffic generation for this cumulative project is calculated at 40 ADT with 3 AM and 4 PM peak hour trips.
4) *TPM 20862 (624 Pepper Drive)* – A residential project of 3 single-family homes on Pepper Drive. The traffic generation for this cumulative project is calculated at 30 ADT with 3 AM and 3 PM peak hour trips.

TABLE 9: CUMULATIVE PROJECT TRAFFIC GENERATION

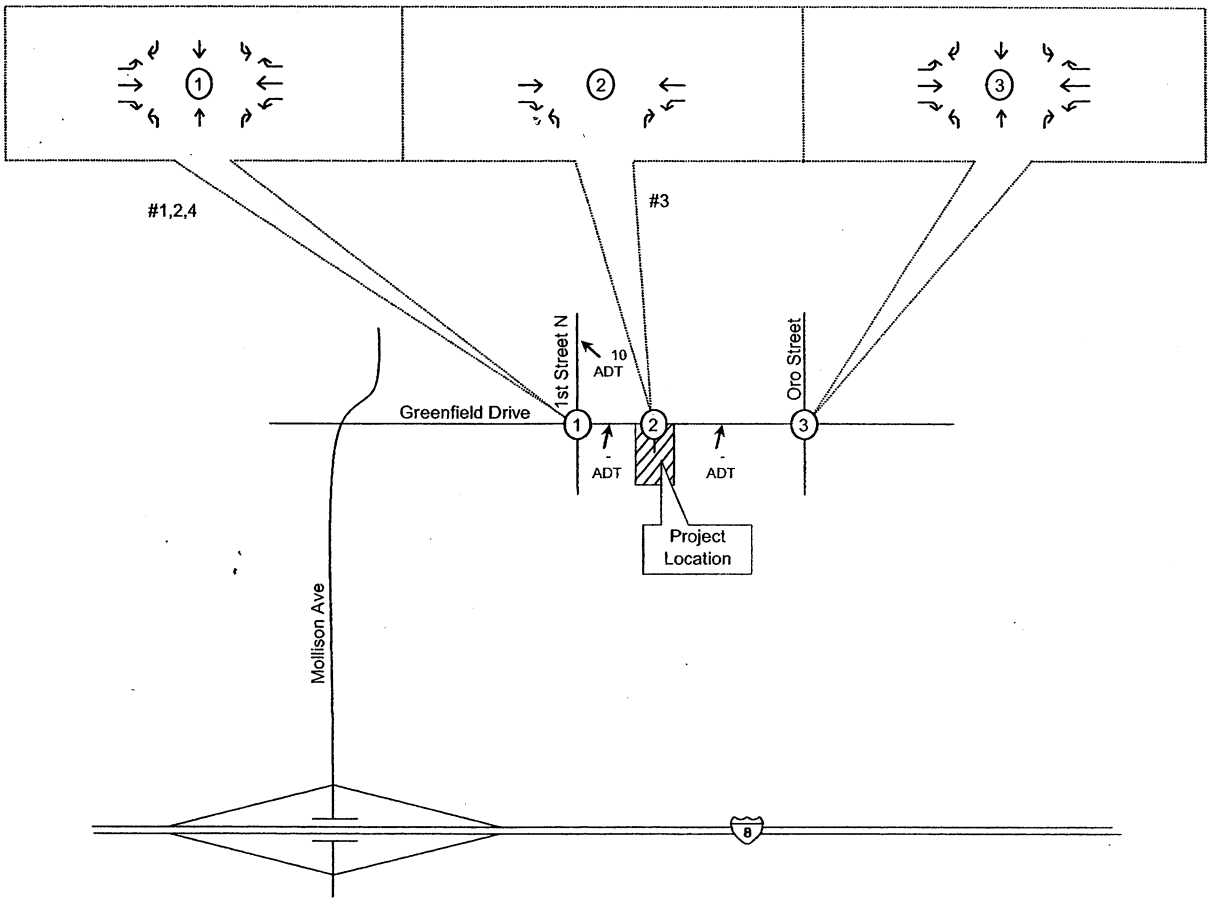
Proposed Project	Proposed Land Use	Rate	Size & Units		ADT	AM IN	AM OUT	PM IN	PM OUT
#1 TPM 20931 - 560 Pepper Drive	Single Family Detached	10 /DU	4	DU	40	1	2	3	1
#2 TPM 20921 - 1269 Turtle Lane	Single Family Detached	10 /DU	3	DU	30	1	2	2	1
#3 TPM 20895 - 1103 Topper Lane	Single Family Detached	10 /DU	4	DU	40	1	2	3	1
#4 TPM 20862 - 624 Pepper Drive	Single Family Detached	10 /DU	3	DU	30	1	2	2	1
	TOTAL				140	4	8	10	4

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region,* April 2002.
DU-dwelling unit; ADT-Average Daily Traffic; Split-percent inbound and outbound.

The individual and group cumulative project locations and volumes are shown on **Figure 9** with support data included in **Appendix I.**

The above cumulative generated traffic is anticipated to pass through the intersection of North First Street and Greenfield Drive. The traffic generated is so low that per the SANDAG trip generation tables, zero trips occur during the AM and PM peak hours. The cumulative ADTs on North First Street north of Greenfield Drive are shown in Figure 9.

Figure 9: Cumulative Project Locations and Volumes



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

Cumulative Projects

#1 TPM 20931
#2 TPM 20921
#3 TPM 20895
#4 TPM 20862

N
No Scale

3.5.2 Near-Term + Existing Conditions Analysis

The Near-Term traffic conditions were determined by adding known cumulative project traffic onto the existing traffic. The peak hour intersection volumes and daily traffic volumes for this scenario of near-term (existing + cumulative projects) are shown in **Figure 10**.

The LOS calculated for the intersections and street segments are shown in **Tables 10 and 11**, respectively.

TABLE 10: NEAR-TERM (EXISTING + CUMULATIVE) INTERSECTION LEVEL OF SERVICE

Intersection and (Analysis)[1]	Movement	Peak Hour	Existing Delay[2]	Existing LOS[3]	Existing + Cumulative Delay[2]	Existing + Cumulative LOS[3]
1) 1st Street N at	All	AM	22.7	C	22.7	C
Greenfield Drive (S)	All	PM	28.6	C	28.6	C
2) Project Drwy at	NB LR	AM	NA	NA	NA	NA
Greenfield Drive (U)	NB LR	PM	NA	NA	NA	NA
3) Oro Street at	NB LR	AM	14.6	B	14.6	B
Greenfield Drive (U)	SB LR	AM	14.6	B	14.6	B
	NB LR	PM	17.2	C	17.2	C
	SB LR	PM	17.4	C	17.4	C

Notes: 1) Intersection Analysis - S - signalized, U - Unsignalized; 2) HCM - Highway Capacity Manual delay in seconds
3) Level of Service

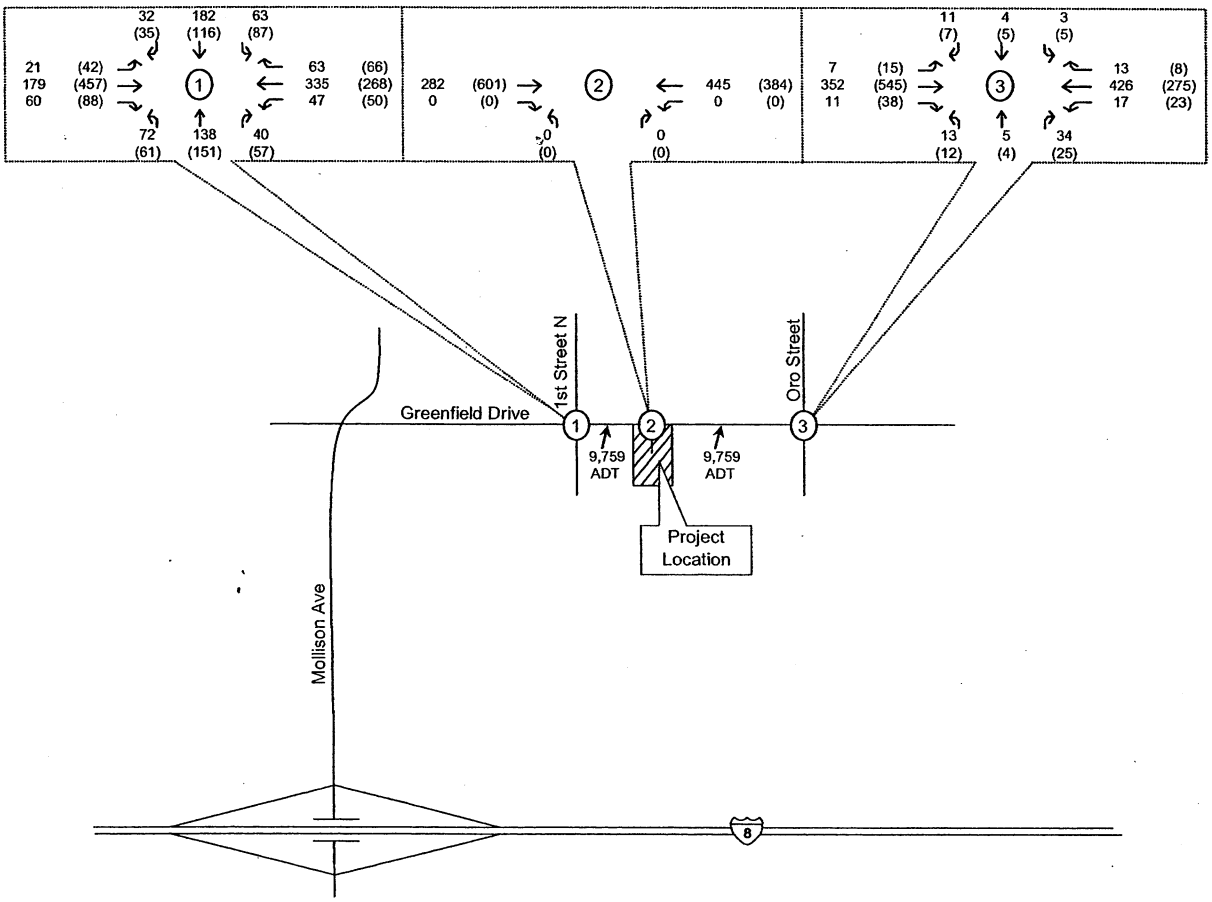
TABLE 11: NEAR-TERM (EXISTING + CUMULATIVE) SEGMENT ADT VOLUMES AND LEVEL OF SERVICE

Segment	Current Classification (as built)	LOS E Capacity	Existing Daily Volume	Existing V/C	Existing LOS	Cumulative Daily Volume	Existing + Cumulative Daily Volume	Existing + Cumulative V/C	Existing + Cumulative LOS
Greenfield Drive									
North First Street to Project Driveway	Collector (2U, P)	16,200	9,759	0.602	D	0	9,759	0.602	D
Project Driveway to Oro Street	Collector (2U, P)	16,200	9,759	0.602	D	0	9,759	0.602	D

Notes: Classification (as built): 2U: 2 lane undivided roadway, P: Parking, BL: Bike Lane; Daily volume is a 24 hour volume.
V/C: Volume to Capacity ratio.

Under Existing + cumulative conditions, all study intersections and roadways were calculated to operate at LOS D. Existing + cumulative LOS calculations are included in **Appendix J.**

Figure 10: Near-Term (Existing + Cumulative) Volumes



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

3.6 Near-Term + Existing + Project Conditions

This scenario accounts for the addition of project traffic onto the Near-Term (existing + cumulative) traffic for AM, PM and ADT conditions. The peak hour intersection volumes and daily traffic volumes for this scenario of Near-Term (existing + cumulative) + project conditions are shown in **Figure 11**.

The LOS calculated for the intersections and street segments are shown in **Tables 12 and 13**, respectively.

TABLE 12: NEAR-TERM (EXISTING +CUMULATIVE) + PROJECT INTERSECTION LEVEL OF SERVICE

Intersection and	Movement	Peak	Existing + Cumulative		Existing + Cumulative + Project			
(Analysis)[1]		Hour	Delay[2]	LOS[3]	Delay[2]	LOS[3]	Delta[4]	Cumulative[5]
1) 1st Street N at	All	AM	22.7	C	22.7	C	0.0	No
Greenfield Drive (S)	All	PM	28.6	C	28.8	C	0.2	No
2) Project Drwy at	NB LR	AM	NA	NA	13.9	B	NA	No
Greenfield Drive (U)	NB LR	PM	NA	NA	19.2	C	NA	No
3) Oro Street at	NB LR	AM	14.6	B	14.6	B	0.0	No
Greenfield Drive (U)	SB LR	AM	14.6	B	14.6	B	0.0	No
	NB LR	PM	17.2	C	17.2	C	0.0	No
	SB LR	PM	17.4	C	17.4	C	0.0	No

Notes: 1) Intersection Analysis - S - signalized, U - Unsignalized; 2) HCM - Highway Capacity Manual delay in seconds
3) Level of Service. 4) Delta is the increase in delay from project. 5) Cumulative Impact? (yes or no).

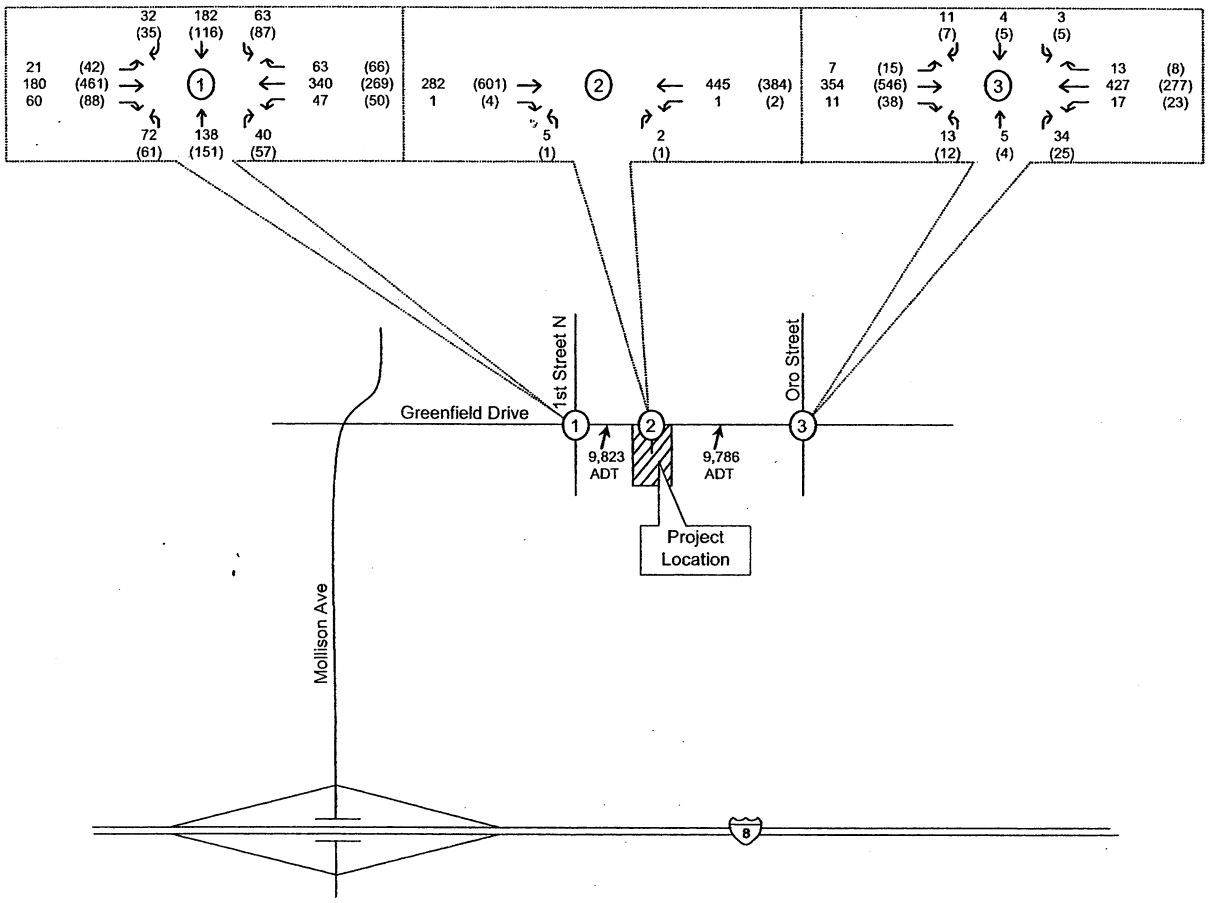
TABLE 13: NEAR-TERM (EXISTING + CUMULATIVE) + PROJECT SEGMENT ADT VOLUMES AND LEVEL OF SERVICE

Segment	Current Classification (as built)	LOS E Capacity	Existing + Cumulative Daily Volume	V/C	LOS	Project Daily Volume	Existing + Cumulative + Project Daily Volume	V/C	LOS	Change in V/C	Cumulative Impact?
Greenfield Drive											
North First Street to Project Driveway	Collector (2U, BL, P)	16,200	9,759	0.602	D	64	9,823	0.606	D	0.004	No
Project Driveway to Oro Street	Collector (2U, BL, P)	16,200	9,759	0.602	D	27	9,786	0.604	D	0.002	No

Notes: Classification (as built): 2U: 2 lane undivided roadway, P: Parking, BL: Bike Lane; Daily volume is a 24 hour volume.
V/C: Volume to Capacity ratio.

Under Near-Term (existing + cumulative) + project conditions, all study intersections and roadways were calculated to operate at LOS D or better. Near-term (existing + cumulative) + project LOS calculations are included in **Appendix K.**

Figure 11: Near-Term (Existing + Cumulative) + Project Volumes



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N
No Scale

3.7 Horizon Year (2030) Conditions

A horizon year analysis was not prepared because the project is calculated to generate less than 500 ADT.

3.8 Horizon Year (2030) + Project Conditions

A horizon year analysis was not prepared because the project is calculated to generate less than 500 ADT.

3.9 Ramps

A ramp analysis was not prepared because the project is calculated to add less than 20 peak hour trips to the surrounding Caltrans freeway on-ramps.

3.10 Congestion Management Plan

A CMP analysis was not prepared because the project is calculated to generate less than 2,400 ADT and less than 200 peak hour trips.

3.11 Hazards Due To An Existing Transportation Design Feature

This section documents how the project will interface with the exiting roadway network.

3.11.1 Project Driveway Corner Sight Distance Analysis

A field review was completed and determined that there is a parking lane in addition to a bike lane adjacent to the project site along this portion of Greenfield Drive. Motorists are required to place themselves in the most appropriate position prior to entering the roadway, which would require encroaching into the bike lane once it is clear. Encroaching into the bike lane provides motorists with an unobstructed sight distance with said lines of sight within the existing right-of-way in both directions along Greenfield Drive for the 85th percentile speed of traffic on Greenfield Drive; however, this does requiring looking across the intersection of Greenfield Drive at 1st Street to the west, which is approximately 300 feet west of the project driveway. The Caltrans stopping sight distance is calculated at 265 feet, which is within the distance of the project driveway and the intersection of Greenfield Drive at 1st Street. The Caltrans stopping sight distance reference and calculations are included in **Appendix L**. The corner sight distance analysis for the proposed project driveway is summarized in **Table 14**.

TABLE 14: CORNER SIGHT DISTANCE

Proposed Driveway Location	Observed Direction When Leaving	Posted Speed (MPH)	85th Percentile Speed (MPH)	County Minimum Corner Sight Distance[1] and Observation
Greenfield	Looking West	35	36	360 ft observed looking across 1st Street
Drive	Looking East	35	42	420 ft observed

Source: [1]County of San Diego Department of Public Works *Public Road Standards* July 14, 1999.

3.11.2 Project Driveway Spacing Analysis

Project access is proposed as a single driveway on Greenfield Drive located approximately in the center of the parcel.

The proposed project access is less than 200 feet from other driveways on Greenfield Drive, which is less than the required County separation. Because the northern edge of the parcel is significantly less than 200 feet, no options exist for locating the project driveway more than 200 feet from other existing driveways along Greenfield Driver. If a design exception request is required, then the project Civil Engineer will submit a design exception request under separate cover.

3.12 Hazards To Pedestrians or Bicyclists

Project access is proposed on Greenfield Drive, which does have a bicycle lane identified on the circulation element. Any required improvements will be constructed to maintain existing conditions as it relates to pedestrians and bicyclists.

3.13 Parking Capacity

The project is proposed with 23 on-site parking spaces.

3.14 Alternative Transportation

Nearby transit service is provided on North 2nd Street and Broadway. The project site is located approximately 2,400 feet west of North 2nd Street, which is served by bus route 848. The project site is also located approximately 2,400 feet north of Broadway, which is served by bus route 848, 864, and 874. A map is included in Appendix B.

3.15 Project Access and On-Site Circulation

As part of the project, the applicant will close both of the existing driveways and construct a single driveway onto Greenfield Drive that will be located approximately in the middle of the parcel.

On-site circulation is proposed by a single aisle with double loaded parking.

4.0 Impact Summary

4.1 Impact Summary Table

The project is calculated to have a deficiency in driveway spacing. No other direct impacts were calculation; however, the project has the potential for cumulative impacts as summarized below in **Table 15.**

TABLE 15: IMPACT SUMMARY TABLE

Roadway Facility	Near-Term Direct Impacts	Near-Term Cumulative Impacts
Intersections	0	Potential
Segments	0	Potential
Freeways	0	Potential
Ramps	0	Potential
Driveway Spacing	Potential	Potential

4.2 Road Segments

4.2.1 Guidelines for the Determination of Significance

Based on the San Diego County *Report Format & Content Requirements Transportation and Traffic*, September 26, 2006, a project may have a direct and or cumulative impact if the significance criteria are exceeded as shown in **Table 16.**

TABLE 16: COUNTY OF SAN DIEGO SIGNIFICANT TRAFFIC IMPACT THRESHOLDS – ROAD SEGMENTS

Measures of Significant Project Impacts to Congestion Allowable Increases on Congested Roads			
	Road Segments		
Operations	2-Lane Road	4-Lane Road	6-Lane Road
LOS E	200 ADT	400 ADT	600 ADT
LOS F	100 ADT	200 ADT	300 ADT

Source: County of San Diego *Guidelines for Determining Significance* Table 1 from page 9.

A direct impact would occur when the significance criteria is exceeded. If the proposed project exceeds the values provided in the above table, then the individually proposed project would result in a direct traffic impact. Specific improvements to mitigate direct impacts must be identified.

A cumulative impact would occur when two conditions are met: 1) will build-out of all near term projects result in a cumulative traffic impact and 2) does the amount of traffic generated by the individual proposed project contribute (even in a small part) to that cumulative impact. Both conditions must be met for an individual project to result in a cumulative traffic impact. If the traffic generated from all the near term projects (cumulative projects) would result in a cumulative traffic impact then condition one is met. If the total amount of traffic generated exceeds the values provided in the above table, then condition 2 is met and the individually proposed project would result in a cumulative traffic impact. Fair share contributions toward cumulative impacts may only

be provided when a specific project and schedule for completion of the project has been identified.

4.2.2 Significance of Impacts Prior to Mitigation

No direct project impacts were calculated. The project may add to the regional cumulative impacts; therefore, the project is considered to have a potential cumulative impact.

4.2.3 Mitigation Measures and Design Considerations

To mitigate the potential cumulative impacts, the project applicant proposes to pay into the Transportation Impact Fee (TIF) program. The County of San Diego has developed an overall programmatic solution that addresses existing and projected future road deficiencies in the unincorporated portion of San Diego County. This program includes the adoption of a TIF program to fund improvements to roadways necessary to mitigate potential cumulative impacts caused by traffic from future development. Based on SANDAG regional growth and land use forecasts, the SANDAG Regional Transportation Model was utilized to analyze projected build-out (year 2030) development conditions on the existing circulation element roadway network throughout the unincorporated area of the County. Based on the results of the traffic modeling, funding necessary to construct transportation facilities that will mitigate cumulative impacts from new development was identified. Existing roadway deficiencies will be corrected through improvement project funded by other public funding sources, such as TransNet, gas tax, and grants. Potential cumulative impacts to the region's freeways have been addressed in SANDAG's Regional Transportation Plan (RTP). This plan, which considers freeway buildout over the next 30 years, will use funds from TransNET, state, and federal funding to improve freeways to projected level of service objectives in the RTP.

The proposed project generates 91 ADT. These trips will be distributed on circulation element roadways in the County that were analyzed by the TIF program, some of which currently or are projected to operate at inadequate levels of service. These project trips therefore contribute to a potential significant cumulative impact and mitigation is required. The potential growth represented by this project was included in the growth projections upon which the TIF project is based. Therefore, payment of the TIF, which will be required at issuance of building permits, in combination with other components of the program describe above, will mitigate potential cumulative impacts to less than significant.

4.2.4 Conclusions

The project's potential cumulative impacts can be mitigated by participating in the TIF program.

ctions (Signalized & Un-signalized)

nes for the Determination of Significance

San Diego County *Report Format & Content Requirements Transportation and* mber 26, 2006, a project may have a direct and or cumulative impact if the teria are exceeded as shown in **Table 17**.

Y OF SAN DIEGO SIGNIFICANT TRAFFIC IMPACT THRESHOLDS - INTERSECTIONS

Measures of Significant Project Impacts to Congestion Allowable Increases on Congested Intersections	
Intersections	
Signalized	Un-signalized
Delay of 2 seconds	20 peak hour trips on a critical movement
Delay of 1 second, or 5 peak hour trips on a critical movement	5 peak hour trips on a critical movement

of San Diego *Guidelines for Determining Significance* Table 1 from page 9. Note: A critical movement is one ncing excessive queues.

t would occur when the significance criteria is exceeded. If the proposed project values provided in the above table, then the individually proposed project would result ffic impact. Specific improvements to mitigate direct impacts must be identified.

impact would occur when two conditions are met: 1) will build-out of all near term lt in a cumulative traffic impact and 2) does the amount of traffic generated by the posed project contribute (even in a small part) to that cumulative impact. Both st be met for an individual project to result in a cumulative traffic impact. If the ated from all the near term projects (cumulative projects) would result in a cumulative hen condition one is met. If the total amount of traffic generated exceeds the values e above table, then condition 2 is met and the individually proposed project would mulative traffic impact. Fairshare contributions toward cumulative impacts may only hen a specific project and schedule for completion of the project has been identified.

cance of Impacts Prior to Mitigation

ject impacts were calculated. The project may add to the regional cumulative impacts; project is considered to have a potential cumulative impact.

ion Measures and Design Considerations

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5.0 Summary of Project Impacts and Mitigation

The project is calculated to have no direct impacts, some potential cumulative impacts, and one potential driveway spacing deficiency under near-term conditions as shown in **Table 18**.

TABLE 18: SUMMARY OF PROJECT IMPACTS AND MITIGATION

Roadway Facility	Near-Term Direct Impacts	Near-Term Cumulative Impacts
Intersections	0 (no mitigation required)	Potential (TIF participation)
Segments	0 (no mitigation required)	Potential (TIF participation)
Freeways	0 (no mitigation required)	Potential (TIF participation)
Ramps	0 (no mitigation required)	Potential (TIF participation)
Driveway Spacing	Potential (Design Variance Request *)	Potential (Design Variance Request*)

* The applicant's Civil Engineer will submit under separate cover a design variance request for the proposed driveway spacing if required.

7.0 List of Preparers and Persons and Organizations Contacted

7.1 List of Preparers

Justin Rasas, P.E. (RCE 60690), LOS Engineering, Inc. Primary Author

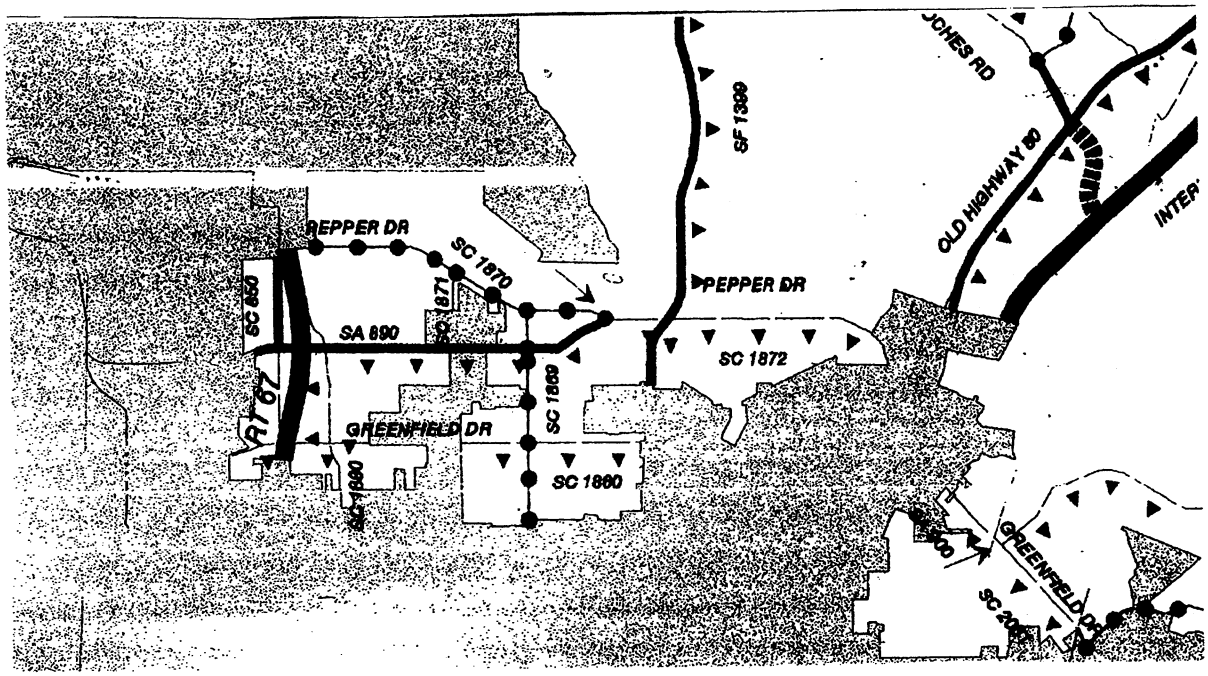
7.2 Organizations Contacted

Craig Lorenz, Eilar Associates, Inc. - Environmental staff and firm used by applicant.
Alan Austin, Austin & Associates – Staff used by applicant.

Appendix A

County of San Diego Circulation Element Classification

San Diego County Circulation Element Map – September 2005



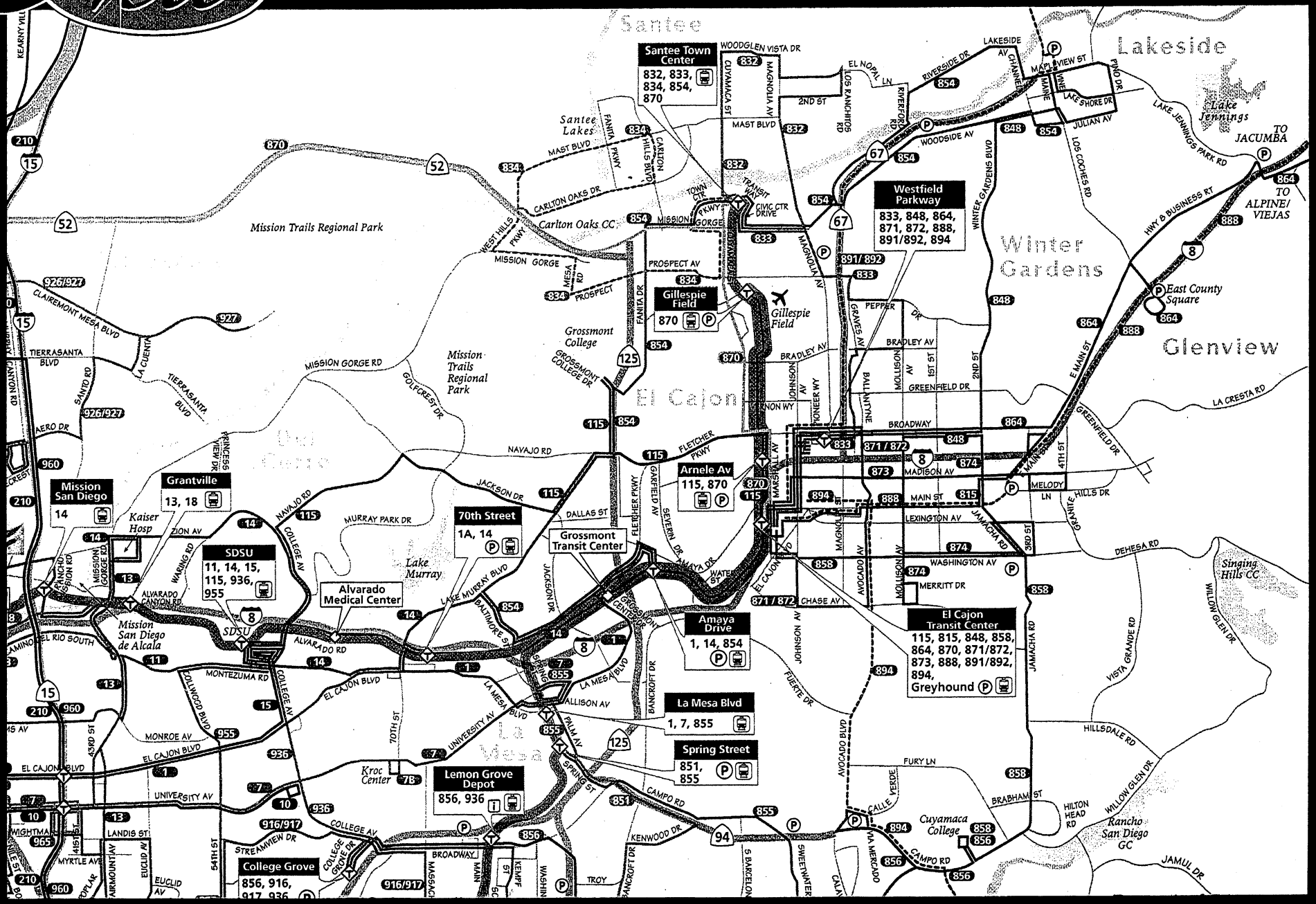
LEGEND

	FREEWAYS		THREE LANE COLLECTOR
	FREEWAYS (Proposed)		RURAL COLLECTORS
	EXPRESSWAYS		RURAL LIGHT COLLECTORS
	PRIME ARTERIALS		LIGHT COLLECTORS
	MAJOR ROADS		RURAL MOUNTAIN ROADS
	RECREATIONAL PARKWAYS		BICYCLE NETWORK SYSTEM
	COLLECTOR ROADS		INCORPORATED CITIES

Appendix B

Transit Service Near Project

New September 3, 2006 -



For more information call: 619.233.3004; or visit www.sdcommute.com

Appendix C

85th Percentile Speed Data

Speed Report

Date: 11/16/06 Site: [664.03] Greenfield Dr btwn First St and Oro St

WESTBOUND

		5	10	15	20	25	30	35	40	45	50	55	60	65	70	
Time		**9**	**14**	**19**	**24**	**29**	**34**	**39**	**44**	**49**	**54**	**59**	**64**	**69**	**74+**	**Total**
00:00	AM	0	0	0	1	1	5	4	8	0	0	0	0	0	0	19
01:00		0	0	0	0	1	2	12	7	2	0	1	0	1	0	26
02:00		0	0	0	0	0	3	8	4	0	0	0	0	0	0	15
03:00		0	0	0	0	0	3	2	2	3	3	0	0	0	0	13
04:00		0	0	0	1	0	2	8	11	7	1	0	0	0	0	30
05:00		0	2	1	0	2	11	41	42	14	0	1	0	0	0	114
06:00		0	10	3	2	19	83	140	69	16	2	0	0	0	0	344
07:00		0	14	10	23	39	99	195	67	12	3	0	0	0	0	462
08:00		0	11	12	20	54	120	148	58	4	0	0	0	0	0	427
09:00		0	8	4	7	18	74	98	39	22	1	1	0	0	0	272
10:00		0	5	4	9	19	51	108	45	5	1	0	0	0	0	247
11:00		0	6	3	7	12	87	93	32	12	1	0	0	0	0	255
12:00	PM	0	8	6	12	22	69	100	55	10	1	1	0	0	0	284
13:00		0	8	3	12	31	67	114	49	3	0	0	0	0	0	287
14:00		0	14	3	9	24	68	93	44	7	1	0	0	0	0	263
15:00		0	23	7	24	49	133	103	26	4	1	0	0	0	0	370
16:00		0	24	10	17	61	97	67	20	4	0	1	0	0	0	301
17:00		0	17	7	6	30	70	83	33	6	0	0	0	0	0	252
18:00		0	3	1	2	16	47	88	53	11	2	0	0	0	0	223
19:00		0	5	0	1	5	25	62	44	16	1	0	0	0	0	159
20:00		0	0	0	1	1	27	29	38	8	1	1	1	1	0	108
21:00		0	1	0	1	1	14	32	20	8	1	1	0	0	0	79
22:00		0	1	0	1	1	9	20	21	3	1	1	0	0	0	58
23:00		0	0	0	0	1	4	16	11	1	1	0	0	0	0	34
Totals		**0**	**160**	**74**	**156**	**407**	**1170**	**1664**	**798**	**178**	**22**	**8**	**1**	**2**	**0**	**4640**
% of Totals			3%	2%	3%	9%	25%	36%	17%	4%	0%	0%	0%	0%		100%
% AM			1%	1%	2%	4%	12%	18%	8%	2%	0%	0%		0%		48%
AM Peak Hour			07:00	08:00	07:00	08:00	08:00	07:00	06:00	09:00	03:00	01:00		01:00		07:00
Volume			14	12	23	54	120	195	69	22	3	1		1		462
% PM			2%	1%	2%	5%	14%	17%	9%	2%	0%	0%	0%	0%		52%
PM Peak Hour			16:00	16:00	15:00	16:00	15:00	13:00	12:00	19:00	18:00	12:00	20:00	20:00		15:00
Volume			24	10	24	61	133	114	55	16	2	1	1	1		370

Average Speed	50th Percentile	85th Percentile
35.0	36	42

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Speed Report

Date: 11/16/06 Site: [664.03] Greenfield Dr btwn First St and Oro St

EASTBOUND

		5	10	15	20	25	30	35	40	45	50	55	60	65	70	
Time		**9**	**14**	**19**	**24**	**29**	**34**	**39**	**44**	**49**	**54**	**59**	**64**	**69**	**74+**	**Total**
00:00	AM	0	1	2	3	6	10	11	1	2	0	0	0	0	0	36
01:00		0	0	0	0	2	8	4	2	1	0	0	0	0	0	17
02:00		0	1	0	3	4	1	5	1	0	0	0	0	0	0	15
03:00		0	0	0	0	2	3	4	4	0	0	0	0	0	0	13
04:00		0	0	1	0	1	2	2	1	0	0	0	0	0	0	7
05:00		0	1	1	2	9	20	13	4	0	0	0	0	0	0	50
06:00		0	5	9	9	12	60	33	8	4	0	0	0	0	0	140
07:00		0	11	3	7	51	96	48	3	0	0	0	0	0	0	219
08:00		0	18	7	18	82	145	59	3	0	0	0	0	0	0	332
09:00		0	6	11	18	46	126	34	10	1	0	0	0	0	0	252
10:00		0	4	10	19	53	107	43	8	1	0	0	0	0	0	245
11:00		0	6	9	26	70	109	54	5	1	0	0	0	0	0	280
12:00	PM	0	8	6	13	69	148	58	9	0	0	0	0	0	0	311
13:00		0	5	5	25	64	142	57	16	1	0	0	0	0	0	315
14:00		0	16	16	28	105	148	59	3	0	1	0	0	0	0	376
15:00		0	27	16	70	192	191	38	1	1	0	0	0	0	0	536
16:00		0	35	15	53	248	207	41	6	1	0	0	0	0	0	606
17:00		0	20	19	44	179	206	50	6	0	0	0	0	0	0	524
18:00		0	5	6	5	65	131	66	7	1	0	0	0	0	0	286
19:00		0	2	1	4	24	103	66	8	2	0	0	0	0	0	210
20:00		0	0	0	2	17	43	40	10	1	0	0	0	0	0	113
21:00		0	0	0	0	13	42	34	12	0	1	0	0	0	0	102
22:00		0	1	0	6	16	39	24	4	0	0	0	0	0	0	90
23:00		0	0	0	0	8	14	17	4	1	0	0	0	0	0	44
Totals		**0**	**172**	**137**	**355**	**1338**	**2101**	**860**	**136**	**18**	**2**	**0**	**0**	**0**	**0**	**5119**
% of Totals			3%	3%	7%	26%	41%	17%	3%	0%	0%					100%
% AM			1%	1%	2%	7%	13%	6%	1%	0%						31%
AM Peak Hour			08:00	09:00	11:00	08:00	08:00	08:00	09:00	06:00						08:00
Volume			18	11	26	82	145	59	10	4						332
% PM			2%	2%	5%	20%	28%	11%	2%	0%	0%					69%
PM Peak Hour			16:00	17:00	15:00	16:00	16:00	18:00	13:00	19:00	14:00					16:00
Volume			35	19	70	248	207	66	16	2	1					606

Average Speed	50th Percentile	85th Percentile
30.5	31	36

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Appendix D

Count Data

LOS Engineering, Inc.

6342 Ferris Square, San Diego, CA 92121

Counted By: Emp. #02
Location: 1st Street & Greenfield Avenue

Start Date: 11/16/2006
File Name: 664-01-1

	1st Street Northbound				1st Street Southbound				Greenfield Avenue Eastbound				Greenfield Avenue Westbound				Vehicle
Start Time	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Interval Total
7:00	14	12	7	0	5	21	13	1	1	41	12	0	6	91	8	0	231
7:15	7	25	3	0	14	28	11	1	2	28	18	0	7	68	8	0	219
7:30	19	37	9	9	12	56	6	0	6	30	18	8	9	81	16	0	299
7:45	23	38	9	14	9	53	13	0	4	45	20	4	19	103	18	0	354
Total	63	112	28	23	40	158	43	2	13	144	68	12	41	343	50	0	1103
8:00	21	43	9	23	22	39	7	0	6	43	10	6	9	87	18	0	314
8:15	9	20	13	7	20	34	6	0	5	61	12	0	10	64	11	1	265
8:30	11	16	8	0	17	17	6	1	0	57	8	0	14	63	11	2	228
8:45	14	20	9	0	22	31	16	0	8	42	7	1	9	86	18	0	282
Total	55	99	39	30	81	121	35	1	19	203	37	7	42	300	58	3	1089
Grand Total	118	211	67	53	121	279	78	3	32	347	105	19	83	643	108	3	2192
Approach%	26.3	47.0	14.9	11.8	25.2	58.0	16.2	0.6	6.4	69.0	20.9	3.8	9.9	76.8	12.9	0.4	
Total%	5.4	9.6	3.1	2.4	5.5	12.7	3.6	0.1	1.5	15.8	4.8	0.9	3.8	29.3	4.9	0.1	

Peak hour analysis for the period 07:30 to 08:15

Volume	72	138	40	53	63	182	32	-	21	179	60	18	47	335	63	1	1,232
Approach%	23.8	45.5	13.2	17.5	22.7	65.7	11.6	-	7.6	64.4	21.6	6.5	10.5	75.1	14.1	0.2	
Total%	5.8	11.2	3.2	4.3	5.1	14.8	2.6	-	1.7	14.5	4.9	1.5	3.8	27.2	5.1	0.1	
PHF				0.79				0.92				0.89				0.80	

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LOS Engineering, Inc.

6342 Ferris Square, San Diego, CA 92121

Counted By: Emp. #02
Location: 1st Street & Greenfield Avenue

Start Date: 11/16/2006
File Name: 664-01-2

	1st Street Northbound				1st Street Southbound				Greenfield Avenue Eastbound				Greenfield Avenue Westbound				Vehicle
Start Time	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Interval Total
16:00	19	43	15	12	21	33	10	7	12	125	29	3	21	62	24	5	414
16:15	14	41	10	2	15	34	14	3	10	107	21	2	13	67	11	0	357
16:30	8	28	13	4	29	23	3	0	10	127	18	1	7	71	18	0	355
16:45	20	39	19	0	22	26	8	0	10	98	20	0	9	68	13	3	352
Total	61	151	57	18	87	116	35	10	42	457	88	6	50	268	66	8	1478
17:00	21	48	9	5	10	25	3	0	8	67	19	0	6	35	5	1	256
17:15	15	97	16	0	11	48	4	4	9	29	2	0	10	33	9	6	283
17:30	24	64	12	4	11	25	11	0	11	64	23	5	9	56	21	0	331
17:45	15	43	9	1	18	38	6	0	18	70	21	0	11	45	11	3	305
Total	75	252	46	10	50	136	24	4	46	230	65	5	36	169	46	10	1175
Grand Total	136	403	103	28	137	252	59	14	88	687	153	11	86	437	112	18	2653
Approach%	20.3	60.1	15.4	4.2	29.7	54.5	12.8	3.0	9.4	73.2	16.3	1.2	13.2	66.9	17.2	2.8	
Total%	5.1	15.2	3.9	1.1	5.2	9.5	2.2	0.5	3.3	25.9	5.8	0.4	3.2	16.5	4.2	0.7	

Peak hour analysis for the period 16:00 to 16:45

Volume	61	151	57	18	87	116	35	10	42	457	88	6	50	268	66	8	1,478
Approach%	21.3	52.6	19.9	6.3	35.1	46.8	14.1	4.0	7.1	77.1	14.8	1.0	12.8	68.4	16.8	2.0	
Total%	4.1	10.2	3.9	1.2	5.9	7.8	2.4	0.7	2.8	30.9	6.0	0.4	3.4	18.1	4.5	0.5	
PHF				0.81				0.87				0.88				0.88	

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LOS Engineering, Inc.

6342 Ferris Square, San Diego, CA 92121

Counted By: Emp. #03
Location: Oro Street & Greenfield Avenue

Start Date: 11/16/2006
File Name: 664-02-1

	Oro Street Northbound				Oro Street Southbound				Greenfield Avenue Eastbound				Greenfield Avenue Westbound				Vehicle
Start Time	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Interval Total
7:00	2	2	7	0	2	0	5	0	0	58	2	0	1	127	2	0	208
7:15	2	6	7	0	3	0	2	0	0	41	4	0	5	102	1	0	173
7:30	4	2	10	4	0	0	2	0	4	58	4	0	4	114	2	0	204
7:45	3	0	7	4	0	1	2	0	0	57	2	0	2	143	2	0	219
Total	11	10	31	8	5	1	11	0	4	214	12	0	12	486	7	0	804
8:00	3	3	4	11	0	0	7	0	2	75	2	0	2	106	4	1	208
8:15	4	1	9	18	0	2	2	0	4	92	8	0	0	95	3	0	220
8:30	2	0	11	10	1	1	2	0	0	91	1	0	7	96	5	0	217
8:45	4	1	10	2	2	1	0	0	1	94	0	2	8	129	1	0	251
Total	13	5	34	41	3	4	11	0	7	352	11	2	17	426	13	1	896
Grand Total	24	15	65	49	8	5	22	0	11	566	23	2	29	912	20	1	1700
Approach%	15.7	9.8	42.5	32.0	22.9	14.3	62.9	-	1.8	94.0	3.8	0.3	3.0	94.8	2.1	0.1	
Total%	1.4	0.9	3.8	2.9	0.5	0.3	1.3	-	0.6	33.3	1.4	0.1	1.7	53.6	1.2	0.1	

Peak hour analysis for the period 08:00 to 08:45

Volume	13	5	34	41	3	4	11	-	7	352	11	2	17	426	13	1	896
Approach%	14.0	5.4	36.6	44.1	16.7	22.2	61.1	-	1.9	94.6	3.0	0.5	3.7	93.2	2.8	0.2	
Total%	1.5	0.6	3.8	4.6	0.3	0.4	1.2	-	0.8	39.3	1.2	0.2	1.9	47.5	1.5	0.1	
PHF				0.73				0.64				0.89				0.83	

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LOS Engineering, Inc.

6342 Ferris Square, San Diego, CA 92121

Counted By: Emp. #03
Location: Oro Street & Greenfield Avenue

Start Date: 11/16/2006
File Name: 664-02-2

	Oro Street Northbound				Oro Street Southbound				Greenfield Avenue Eastbound				Greenfield Avenue Westbound				Vehicle
Start Time	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Left	Thru	Right	Ped	Interval Total
16:00	2	4	6	2	2	0	2	1	6	136	7	0	4	83	3	1	255
16:15	0	0	8	3	0	1	4	0	3	107	8	0	9	77	4	0	221
16:30	2	1	9	1	1	0	0	0	5	140	7	0	8	81	2	0	256
16:45	3	1	2	0	0	1	2	0	2	113	8	0	5	72	1	0	210
Total	7	6	25	6	3	2	8	1	16	496	30	0	26	313	10	1	942
17:00	0	2	6	5	3	0	1	0	5	140	14	0	5	62	4	0	242
17:15	7	0	8	3	1	4	4	0	3	152	9	0	5	60	1	1	254
17:30	6	3	6	0	2	0	2	0	6	104	10	0	3	72	1	0	215
17:45	5	0	4	0	0	1	3	0	5	101	8	0	1	54	2	0	184
Total	18	5	24	8	6	5	10	0	19	497	41	0	14	248	8	1	895
Grand Total	25	11	49	14	9	7	18	1	35	993	71	0	40	561	18	2	1837
Approach%	25.3	11.1	49.5	14.1	25.7	20.0	51.4	2.9	3.2	90.4	6.5	-	6.4	90.3	2.9	0.3	
Total%	1.4	0.6	2.7	0.8	0.5	0.4	1.0	0.1	1.9	54.1	3.9	-	2.2	30.5	1.0	0.1	

Peak hour analysis for the period 16:30 to 17:15

Volume	12	4	25	9	5	5	7	-	15	545	38	-	23	275	8	1	962
Approach%	24.0	8.0	50.0	18.0	29.4	29.4	41.2	-	2.5	91.1	6.4	-	7.5	89.6	2.6	0.3	
Total%	1.2	0.4	2.6	0.9	0.5	0.5	0.7	-	1.6	56.7	4.0	-	2.4	28.6	0.8	0.1	
PHF				0.69				0.47				0.91				0.84	

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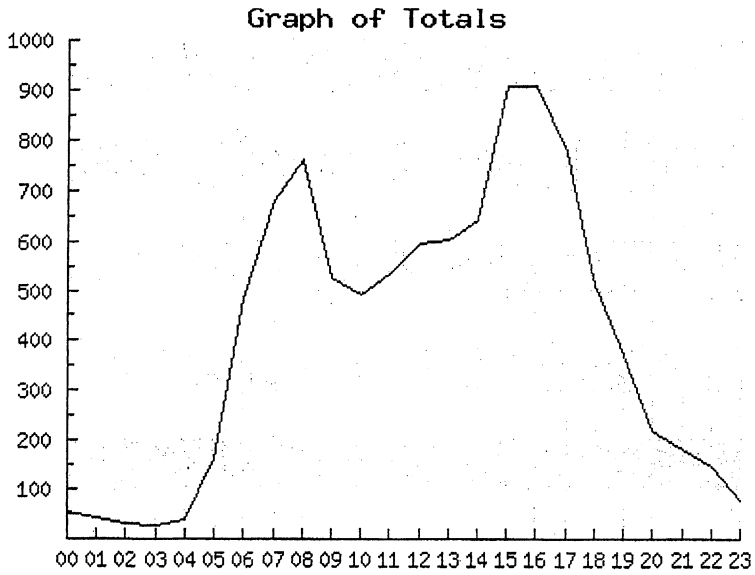
Daily Vehicle Volume Report

Location:
Greenfield Dr btwn First St and Oro St
File Number: 66403
Counter ID: 9319
Report Duration:
Thursday Nov 16, 2006 - 00:00 to
Thursday Nov 16, 2006 - 23:59
Other Notes:
None at this time.



Time	West Bound Volume	East Bound Volume	Total Volume
00:00 - 00:59	19	36	55
01:00 - 01:59	26	17	43
02:00 - 02:59	15	15	30
03:00 - 03:59	13	13	26
04:00 - 04:59	30	7	37
05:00 - 05:59	114	50	164
06:00 - 06:59	344	140	484
07:00 - 07:59	462	219	681
08:00 - 08:59	427	332	759
09:00 - 09:59	272	252	524
10:00 - 10:59	247	245	492
11:00 - 11:59	253	280	533
12:00 - 12:59	284	311	595
13:00 - 13:59	287	315	602
14:00 - 14:59	263	376	639
15:00 - 15:59	370	536	906
16:00 - 16:59	301	606	907
17:00 - 17:59	252	524	776
18:00 - 18:59	223	286	509
19:00 - 19:59	159	210	369
20:00 - 20:59	108	113	221
21:00 - 21:59	79	102	181
22:00 - 22:59	58	90	148
23:00 - 23:59	34	44	78
Total	**4640**	**5119**	**9759**
AM Peak Hour	7:15 8:14	8:00 8:59	8:00 8:59
Volume	469	332	759
PM Peak Hour	15:15 16:14	15:45 16:44	15:45 16:44
Volume	374	619	947

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Appendix E

Existing Level of Service Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	21	179	60	47	335	63	72	138	40	63	182	32
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	188	63	49	353	66	76	145	42	66	192	34
RTOR Reduction (vph)	0	0	48	0	0	48	0	0	26	0	0	21
Lane Group Flow (vph)	22	188	15	49	353	18	76	145	16	66	192	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.4	15.7	15.7	4.4	17.7	17.7	5.2	24.9	24.9	4.9	24.6	24.6
Effective Green, g (s)	2.4	15.7	15.7	4.4	17.7	17.7	5.2	24.9	24.9	4.9	24.6	24.6
Actuated g/C Ratio	0.04	0.24	0.24	0.07	0.27	0.27	0.08	0.38	0.38	0.07	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	58	444	338	106	500	381	125	704	535	118	695	529
v/s Ratio Prot	0.01	0.10		c0.03	c0.19		c0.05	0.08		0.04	c0.10	
v/s Ratio Perm			0.01			0.01			0.01			0.01
v/c Ratio	0.38	0.42	0.04	0.46	0.71	0.05	0.61	0.21	0.03	0.56	0.28	0.02
Uniform Delay, d1	31.0	21.3	19.3	29.6	21.8	17.9	29.4	13.8	12.9	29.5	14.4	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.7	0.1	3.2	4.5	0.1	8.1	0.7	0.1	5.6	1.0	0.1
Delay (s)	35.1	21.9	19.4	32.8	26.3	17.9	37.5	14.5	13.0	35.1	15.4	13.1
Level of Service	D	C	B	C	C	B	D	B	B	D	B	B
Approach Delay (s)		22.4			25.8			20.9			19.6	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	65.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	352	11	17	426	13	13	5	34	3	4	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	7	371	12	18	448	14	14	5	36	3	4	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	462			382			896	889	376	921	888	455
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	462			382			896	889	376	921	888	455
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			95	98	95	99	98	98
cM capacity (veh/h)	1099			1176			249	276	670	230	277	605

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	389	480	55	19
Volume Left	7	18	14	3
Volume Right	12	14	36	12
cSH	1099	1176	430	394
Volume to Capacity	0.01	0.02	0.13	0.05
Queue Length 95th (ft)	1	1	11	4
Control Delay (s)	0.2	0.5	14.6	14.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.5	14.6	14.6
Approach LOS			B	B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	42	457	88	50	268	66	61	151	57	87	116	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	481	93	53	282	69	64	159	60	92	122	37
RTOR Reduction (vph)	0	0	65	0	0	48	0	0	41	0	0	24
Lane Group Flow (vph)	44	481	28	53	282	21	64	159	19	92	122	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.2	22.1	22.1	4.7	22.6	22.6	5.1	24.1	24.1	7.6	26.6	26.6
Effective Green, g (s)	4.2	22.1	22.1	4.7	22.6	22.6	5.1	24.1	24.1	7.6	26.6	26.6
Actuated g/C Ratio	0.06	0.30	0.30	0.06	0.30	0.30	0.07	0.32	0.32	0.10	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	89	553	420	100	565	430	108	603	458	161	665	506
v/s Ratio Prot	0.03	c0.26		c0.03	0.15		0.04	c0.09		c0.06	0.07	
v/s Ratio Perm			0.02			0.01			0.01			0.01
v/c Ratio	0.49	0.87	0.07	0.53	0.50	0.05	0.59	0.26	0.04	0.57	0.18	0.03
Uniform Delay, d1	34.1	24.8	18.8	33.8	21.3	18.3	33.7	18.6	17.3	31.9	16.5	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	13.7	0.1	5.3	0.7	0.0	8.4	1.1	0.2	4.8	0.6	0.1
Delay (s)	38.4	38.5	18.9	39.1	22.0	18.4	42.1	19.7	17.5	36.7	17.1	15.6
Level of Service	D	D	B	D	C	B	D	B	B	D	B	B
Approach Delay (s)		35.5			23.6			24.3			24.1	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

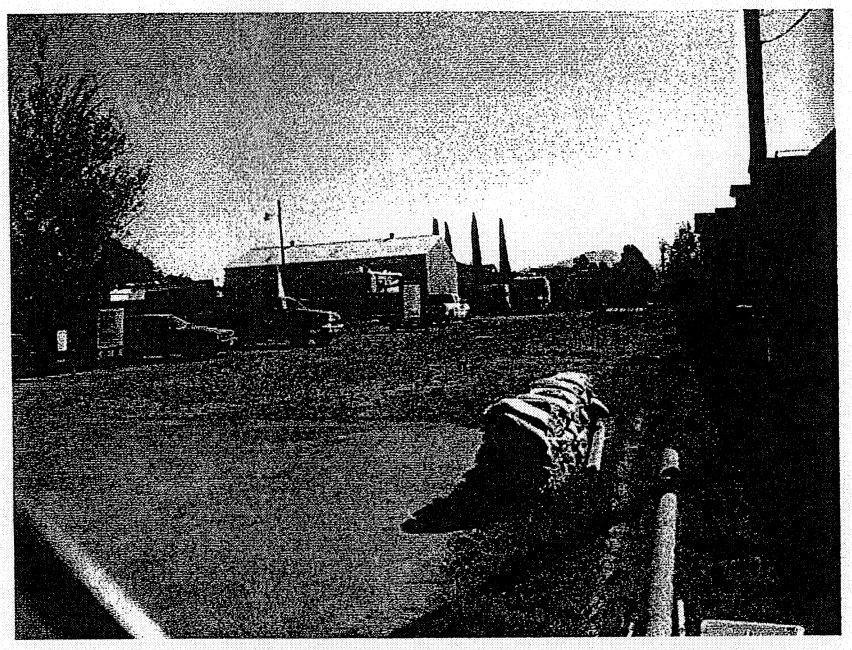
c Critical Lane Group

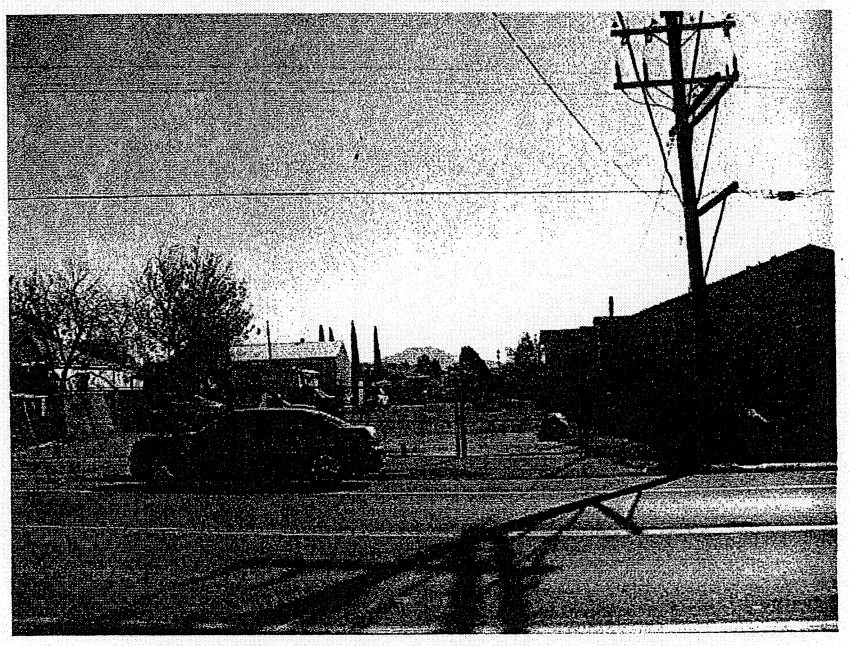
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	545	38	23	275	8	12	4	25	5	5	7
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	574	40	24	289	8	13	4	26	5	5	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	298			614			977	972	594	996	987	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	298			614			977	972	594	996	987	294
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			94	98	95	97	98	99
cM capacity (veh/h)	1263			966			217	243	505	203	238	746

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	629	322	43	18
Volume Left	16	24	13	5
Volume Right	40	8	26	7
cSH	1263	966	338	309
Volume to Capacity	0.01	0.03	0.13	0.06
Queue Length 95th (ft)	1	2	11	5
Control Delay (s)	0.3	0.9	17.2	17.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	17.2	17.4
Approach LOS			C	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

Project Site – Existing Use Pictures





(NOT SO)

BRIEF GUIDE OF VEHICULAR TRAFFIC GENERATION RATES FOR THE SAN DIEGO REGION

APRIL 2002

SANDAG
401 B Street, Suite 800
San Diego, California 92101
(619) 699-1900 • Fax (619) 699-1950

NOTE: This listing only represents a guide of average, or estimated, traffic generation "driveway" rates and some very general trip data for land uses (emphasis on acreage and building square footage) in the San Diego region. These rates (both local and national) are subject to change as future documentation becomes available, or as regional sources are updated. For more specific information regarding traffic data and trip rates, please refer to the San Diego Traffic Generators manual. *Always check with local jurisdictions for their preferred or applicable rates.*

LAND USE	TRIP CATEGORIES (PRIMARY:DIVERTED:PASS-BY)*	ESTIMATED WEEKDAY VEHICLE TRIP GENERATION RATE (DRIVEWAY)	HIGHEST PEAK HOUR % (plus IN:OUT ratio) Between 6:00-9:30 A.M.	Between 3:00-6:30 P.M.	TRIP LENGTH (miles)*
AGRICULTURE (Open Space)	[80:18:2]	2/acre**			10.0
AIRPORT	[78:20:2]				12.5
Commercial		60/acre, 180/flight, 20/1000 sq. ft.* **	5% (6:4)	8% (5:5)	
General Aviation		90/acre, 28/flight, 6/based aircraft* **	9% (7:3)	15% (5:5)	
Heliports		100/acre**			
AUTOMOBILE*					
Car Washs					
Automatic		900/site, 600/acre**	4% (5:5)	8% (5:5)	
Self-serve		100/wash stall**	4% (5:5)	8% (5:5)	
Gas/Fuel	[21:51:28]				2.8
with/Food Mart		160/vehicle fueling space**	7% (5:5)	8% (5:5)	
with/Food Mart & Car Wash		155/vehicle fueling space**	8% (5:5)	1% (5:5)	
Older Service Station Design		160/vehicle fueling space, 900/station**	7% (5:5)	9% (5:5)	
Sales (Dealer & Repair)		50/1000 sq. ft., 300/acre, 40/service stall* **	5% (7:3)	8% (4:6)	
Auto Repair Center		20/1000 sq. ft., 400/acre, 20/service stall*	8% (7:3)	11% (4:6)	
Auto Parts Sales		60/1000 sq. ft.**	4%	30%	
Quick Lube		40/service stall**	7% (6:4)	10% (5:5)	
Tire Store		25/1000 sq. ft., 30/service stall**	5% (6:4)	11% (5:5)	
CEMETERY		5/acre*			
CHURCH (or Synagogue)	[64:25:11]	9/1000 sq. ft., 30/acre** (doubling rates for Sunday, or days of assembly)	8% (6:4)	8% (5:5)	5.1
COMMERCIAL/RETAIL*					
Super Regional Shopping Center (More than 80 acres, more than 800,000 sq. ft., w/usually 3 + major stores)		35/1000 sq. ft.,* 400/acre*	4% (7:3)	10% (6:5)	
Regional Shopping Center	[54:35:11]	50/1000 sq. ft.,* 500/acre*	4% (7:3)	9% (5:5)	5.2
(40-80 acres, 400,000-800,000 sq. ft., w/usually 2 + major stores)					
Community Shopping Center	[47:31:22]	80/1000 sq. ft., 300/acre**	4% (6:4)	10% (5:5)	3.6
(15-40 acres, 125,000-400,000 sq. ft., w/usually 1 major store, detached restaurant(s), grocery anchor(s) store)					
Neighborhood Shopping Center (less than 15 acres, less than 125,000 sq. ft., w/usually grocery & drugstore, cleaners, beauty & barber shop, & fast food services)		120/1000 sq. ft., 1200/acre**	4% (6:4)	10% (5:5)	
Commercial Shops	[45:40:15]				
Specialty Retail/Strip Commercial		40/1000 sq. ft., 400/acre*	3% (6:4)	9% (5:5)	4.3
Electronics Superstore		50/1000 sq. ft.**		10% (5:5)	
Factory Outlet		40/1000 sq. ft.**	3% (7:3)	9% (5:5)	
Supermarket		150/1000 sq. ft., 2000/acre**	4% (7:3)	10% (5:5)	
Drugstore		90/1000 sq. ft.**	4% (6:4)	10% (5:5)	
Convenience Market (16-16 hours)		500/1000 sq. ft.**	8% (5:5)	8% (5:5)	
Convenience Market (24 hours)		300/1000 sq. ft.**	9% (5:5)	7% (5:5)	
Convenience Market (w/gasoline pumps)		85/1000 sq. ft., 550/vehicle fueling space**	6% (5:5)	7% (5:5)	
Discount Club		60/1000 sq. ft., 600/acre**	1% (7:3)	9% (5:5)	
Discount Store		60/1000 sq. ft., 600/acre**	3% (6:4)	8% (5:5)	
Furniture Store		6/1000 sq. ft., 100/acre**	4% (7:3)	9% (5:5)	
Lumber Store		30/1000 sq. ft., 150/acre**	7% (8:4)	9% (5:5)	
Home Improvement Superstore		40/1000 sq. ft.**	5% (6:4)	8% (5:5)	
Hardware/Paint Store		60/1000 sq. ft., 600/acre**	2% (6:4)	9% (5:5)	
Garden/Nursery		40/1000 sq. ft., 80/acre**	3% (6:4)	10% (5:5)	
Mixed Use: Commercial (w/supermarket)/Residential		110/1000 sq. ft., 2000/acre* (commercial only)	3% (6:4)	9% (5:5)	
		5/dwelling unit, 200/acre* (residential only)	8% (3:7)	13% (6:4)	
EDUCATION*					
University (4 years)	[81:9:9]	2.4/student, 100/acre*	10% (8:2)	9% (3:7)	6.9
Junior College (2 years)	[92:7:1]	1.2/student, 24/1000 sq. ft., 120/acre**	12% (8:2)	9% (6:4)	9.6
High School	[75:19:6]	1.3/student, 15/1000 sq. ft., 60/acre**	20% (7:3)	10% (4:6)	4.8
Middle/Junior High	[63:25:12]	1.4/student, 12/1000 sq. ft., 50/acre**	30% (6:4)	9% (4:6)	5.0
Elementary	[57:25:18]	1.6/student, 14/1000 sq. ft., 60/acre**	32% (6:4)	9% (4:6)	3.4
Day Care	[28:58:14]	5/child, 80/1000 sq. ft.**	17% (5:5)	18% (5:5)	3.7
FINANCIAL*	[35:42:23]				3.4
Bank (Walk-in only)		150/1000 sq. ft., 1000/acre**	4% (7:3)	8% (4:6)	
with Drive-Through		250/1000 sq. ft., 1500/acre*	5% (6:4)	10% (5:5)	
Drive-Through only		250/1-25 one waylane*	3% (5:5)	13% (5:5)	
Savings & Loan		65/1000 sq. ft., 600/acre**	2%	9%	
Drive-Through only		100/50 one way/lane**	6%	18%	
HOSPITAL	[73:25:2]				6.3
General		20/bed, 25/1000 sq. ft., 250/acre*	8% (7:3)	10% (4:6)	
Convalescent/Nursing		4/bed**	7% (6:4)	7% (4:6)	
INDUSTRIAL					
Industrial/Business Park (commercial included)	[79:19:2]	16/1000 sq. ft., 200/acre**	12% (8:2)	12% (2:8)	9.0
Industrial Park (no commercial)		8/1000 sq. ft., 90/acre**	11% (9:1)	12% (2:8)	
Industrial Plant (manufacturing)	[92:5:3]	10/1000 sq. ft., 120/acre*	14% (8:2)	15% (3:7)	11.7
Manufacturing Assembly		4/1000 sq. ft., 50/acre**	10% (9:1)	20% (2:8)	
Warehousing		5/1000 sq. ft., 65/acre**	13% (7:3)	15% (4:6)	
Storage		2/1000 sq. ft., 0.25/unit, 30/acre*	6% (5:5)	9% (5:5)	
Science Research & Development		8/1000 sq. ft., 80/acre*	12% (9:1)	14% (2:8)	
Landfill & Recycling Center		6/acre	11% (5:5)	10% (4:5)	

(OVER)

MEMBER AGENCIES: Cities of Carlsbad, Chula Vista, Coronado, El Cajon, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego, San Marcos, Santee, Solana Beach, Vista and County of San Diego.
ADVISORY/LIAISON MEMBERS: Caltrans, Department of Transportation; County Water Authority; U.S. Department of Defense; S.D. Unified Port District and Tijuana/Baja California

LAND USE	TRIP CATEGORIES (PRIMARY:DIVERTED:PASS-BY)[1]	ESTIMATED WEEKDAY VEHICLE TRIP GENERATION RATE (DRIVEWAY)	HIGHEST PEAK HOUR % (plus IN:OUT ratio) Between 6:00-9:30 A.M.		Between 3:00-6:30 P.M.		TRIP LENGTH (Miles)[5]
LIBRARY	[14:44:42]	50/1000 sq. ft., 400/acre**	2%	(7:3)	10%	(5:5)	3.9
LODGING	[68:38:4]						7.6
Hotel (w/conventions/facilities/restaurant)		10/occupied room, 300/acre	8%	(6:4)	8%	(6:4)	
Motel		8/occupied room, 200/acre*	8%	(4:6)	9%	(6:4)	
Resort Hotel		8/occupied room, 100/acre*	8%	(6:4)	7%	(4:6)	
Business Hotel		7/occupied room**	8%	(4:6)	9%	(6:4)	
MILITARY	[82:16:2]	2.5/military & civilian personnel*	9%	(9:1)	10%	(2:8)	11.2
OFFICE							
Standard Commercial Office (less than 100,000 sq. ft.)	[77:19:4]	20/1000 sq. ft.,[6] 300/acre*	14%	(9:1)	13%	(2:8)	8.8
Large (High-Rise) Commercial Office (more than 100,000 sq. ft., 6+ stories)	[82:15:3]	17/1000 sq. ft.,[6] 600/acre*	13%	(9:1)	14%	(2:8)	10.0
Office Park (400,000+ sq. ft.)		12/1000 sq. ft., 200/acre**	13%	(9:1)	13%	(2:8)	
Single Tenant Office		14/1000 sq. ft., 110/acre*	15%	(9:1)	15%	(2:8)	8.8
Corporate Headquarters		7/1000 sq. ft., 110/acre*	17%	(9:1)	16%	(1:9)	
Government (Civic Center)	[50:34:16]	30/1000 sq. ft.**	9%	(9:1)	12%	(3:7)	6.0
Post Office							
Counter/Walk-In Only		90/1000 sq. ft.**	9%		7%		
Community (not including mail drop lane)		200/1000 sq. ft., 1300/acre*	8%	(6:4)	9%	(5:5)	
Community (w/mail drop lane)		300/1000 sq. ft., 2000/acre*	7%	(5:5)	10%	(5:5)	
Mail Drop Lane only		1500 (750 one-way)/lane*	7%	(5:5)	12%	(5:5)	
Department of Motor Vehicles		180/1000 sq. ft., 900/acre**	8%	(6:4)	10%	(4:6)	
Medical-Dental	[80:30:10]	50/1000 sq. ft., 500/acre*	8%	(8:2)	11%	(3:7)	6.4
PARKS	[66:28:6]		4%		8%		5.4
City (developed w/meeting rooms and sports facilities)		50/acre*	13%	(5:5)	9%	(5:5)	
Regional (developed)		20/acre*					
Neighborhood/County (undeveloped)		5/acre (add for specific sport uses), 6/picnic site**					
State (average 1000 acres)		1/acre, 10/picnic site**					
Amusement (Theme)		80/acre, 130/acre (summer only)**			6%	(6:4)	
San Diego Zoo		115/acre*					
Sea World		80/acre*					
RECREATION							
Beach, Ocean or Bay	[52:39:9]	600/1000 ft. shoreline, 60/acre*					6.3
Beach, Lake (fresh water)		50/1000 ft. shoreline, 5/acre*					
Bowling Center		30/1000 sq. ft., 300/acre, 30/lane**	7%	(7:3)	11%	(4:6)	
Campground		4/campsite**	4%		6%		
Golf Course		7/acre, 40/hole, 700/course**	7%	(8:2)	9%	(3:7)	
Driving Range only		70/acre, 14/tee box*	3%	(7:3)	5%	(5:5)	
Marinas		4/berth, 20/acre**	3%	(3:7)	7%	(6:4)	
Multi-purpose (miniature golf, video arcade, batting cage, etc.)		90/acre	2%		6%		
Racquetball/Health Club		30/1000 sq. ft., 300/acre, 40/court*	4%	(6:4)	9%	(6:4)	
Tennis Courts		16/acre, 30/court**	5%		11%	(6:5)	
Sports Facilities							
Outdoor Stadium		50/acre, 0.2/seat*					
Indoor Arena		30/acre, 0.1/seat*					
Racetrack		40/acre, 0.6/seat*					
Theaters (multiplex w/matinee)	[68:17:17]	80/1000 sq. ft., 1.8/seat, 360/screen*	7%		8%	(5:4)	6.1
RESIDENTIAL	[68:11:3]						7.9
Estate, Urban or Rural (average 1-2 DU/acre)		12/dwelling unit*[8]	8%	(3:7)	10%	(7:3)	
Single Family Detached (average 3-6 DU/acre)		10/dwelling unit*[8]	8%	(3:7)	10%	(7:3)	
Condominium (or any multi-family 6-20 DU/acre)		8/dwelling unit*[8]	8%	(2:8)	10%	(7:3)	
Apartment (or any multi-family units more than 20 DU/acre)		6/dwelling unit*[8]	8%	(2:8)	9%	(7:3)	
Military Housing (off-base, multi-family)							
(less than 6 DU/acre)		8/dwelling unit	7%	(3:7)	9%	(6:4)	
(6-20 DU/acre)		6/dwelling unit	7%	(3:7)	9%	(6:4)	
Mobile Home							
Family		5/dwelling unit, 40/acre*	8%	(3:7)	11%	(6:4)	
Adults Only		3/dwelling unit, 20/acre*	8%	(3:7)	10%	(6:4)	
Retirement Community		4/dwelling unit**	5%	(4:6)	7%	(6:4)	
Congregate Care Facility		2.5/dwelling unit**	4%	(6:4)	8%	(6:5)	
RESTAURANT[1]	[51:33:12]						4.7
Quality		100/1000 sq. ft., 3/seat, 500/acre**	8%	(6:4)	9%	(7:3)	
Sit-down, high turnover		160/1000 sq. ft., 8/seat, 1000/acre**	8%	(5:5)	8%	(6:4)	
Fast Food (w/drive-through)		650/1000 sq. ft., 20/seat, 3000/acre**	7%	(5:5)	7%	(6:5)	
Fast Food (without drive-through)		700/1000 sq. ft.**	9%	(6:4)	7%	(5:5)	
Delicatessen (7am-4pm)		150/1000 sq. ft., 11/seat*	8%	(6:4)	3%	(3:7)	
TRANSPORTATION							
Bus Depot		25/1000 sq. ft.**					
Truck Terminal		10/1000 sq. ft., 7/bay, 80/acre**	8%	(4:6)	8%	(6:5)	
Waterport/Marine Terminal		12/berth, 12/acre**					
Transit Station (Light Rail w/parking)		300/acre, 2[9]/parking space (4/occupied)**	14%	(7:3)	15%	(3:7)	
Park & Ride Lots		400/acre (600/paved acre), 2/parking space (8/occupied)**	14%	(7:3)	15%	(3:7)	

* Primary source: San Diego Traffic Generators

* Other sources: ITE Trip Generation Report (6th Edition), Trip Generation Rates (other agencies and publications), various SANDAG & CALTRANS studies, reports and estimates

[1] Trip category percentage ratios are daily (from local household surveys) and cannot be applied to very specific land uses, and do not include non resident drivers (since SANDAG Analysis of Trip Diversion, revised November, 1993)
PRIMARY - can trip directly between origin and primary destination
DIVERTED - linked trip (having one or more stops during the way to primary destination) whose distance compared to direct distance < 1 mile
PASS BY - unlinked trip (diverted > 1 mile)

[2] Trip lengths are average weighted for all trips to and from generic land use site. (All trips system wide average length = 6.9 miles)

[3] Fitted curve equation: $\ln(T) = 0.902 \ln(x) + 6.945$

[4] Fitted curve equation: $\ln(T) = 0.756 \ln(x) + 3.950$

[5] T = trip length (miles), x = 1,000 sq. ft.

[6] Fitted curve equation: $T = -2.1695 \ln(x) + 12.85$ T = trip length (miles), x = density (DU/acre), DU = dwelling unit

[7] Suggested PASS BY (unlinked diverted > 1 mile) percentages for trip generation only during P.M. peak period (based on combination of local data, survey and other sources)[1]:

COMMERCIAL/RETAIL	
Regional Shopping Center	20%
Community " "	30%
Neighborhood " "	40%
Specialty Retail/Strip Commercial (other)	10%
Supermarket	40%
Convenience Market	50%
Discount Club/Store	30%
FINANCIAL	
Bank	25%
AUTOMOBILE	
Gasoline Station	50%
RESTAURANT	
Quality	10%
Sit-down high turnover	20%
Fast food	40%

[8] Trip Reductions - limited to the promotion of regional "smart growth" patterns and acknowledge San Diego's expanding mass transit system, consider other appropriate reductions (with proper documentation and necessary adjustments to peak periods). The following are some examples:

(1) A 5% daily trip reduction for land uses within ¼ mile access or real time transit stations access rate within ¼ mile

(2) Up to 10% daily trip reduction for mixed-use developments where residential and commercial/retail are within walkable distance (total walking trips to replace vehicular trips)

Appendix H

Existing + Project Level of Service Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	21	180	60	47	340	63	72	138	40	63	182	32
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	189	63	49	358	66	76	145	42	66	192	34
RTOR Reduction (vph)	0	0	48	0	0	48	0	0	26	0	0	21
Lane Group Flow (vph)	22	189	15	49	358	18	76	145	16	66	192	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.4	15.9	15.9	4.4	17.9	17.9	5.2	24.8	24.8	4.9	24.5	24.5
Effective Green, g (s)	2.4	15.9	15.9	4.4	17.9	17.9	5.2	24.8	24.8	4.9	24.5	24.5
Actuated g/C Ratio	0.04	0.24	0.24	0.07	0.27	0.27	0.08	0.38	0.38	0.07	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	58	449	341	106	505	384	125	700	532	118	692	526
v/s Ratio Prot	0.01	0.10		c0.03	c0.19		c0.05	0.08		0.04	c0.10	
v/s Ratio Perm			0.01			0.01			0.01			0.01
v/c Ratio	0.38	0.42	0.04	0.46	0.71	0.05	0.61	0.21	0.03	0.56	0.28	0.02
Uniform Delay, d1	31.1	21.2	19.2	29.7	21.7	17.8	29.4	13.9	13.0	29.5	14.5	13.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.6	0.1	3.2	4.5	0.1	8.1	0.7	0.1	5.6	1.0	0.1
Delay (s)	35.2	21.8	19.3	32.8	26.2	17.8	37.5	14.6	13.1	35.2	15.5	13.2
Level of Service	D	C	B	C	C	B	D	B	B	D	B	B
Approach Delay (s)		22.3			25.7			21.0			19.7	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	66.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	282	1	1	445	5	2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	297	1	1	468	5	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	355					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			298		768	297
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			244		750	243
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1228		352	739

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	298	469	7
Volume Left	0	1	5
Volume Right	1	0	2
cSH	1700	1228	413
Volume to Capacity	0.18	0.00	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	13.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	13.9
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	354	11	17	427	13	13	5	34	3	4	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	7	373	12	18	449	14	14	5	36	3	4	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	463			384			899	892	378	924	891	456
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	463			384			899	892	378	924	891	456
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			94	98	95	99	98	98
cM capacity (veh/h)	1098			1174			248	275	668	229	275	604

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	392	481	55	19
Volume Left	7	18	14	3
Volume Right	12	14	36	12
cSH	1098	1174	428	393
Volume to Capacity	0.01	0.02	0.13	0.05
Queue Length 95th (ft)	1	1	11	4
Control Delay (s)	0.2	0.5	14.6	14.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.5	14.6	14.6
Approach LOS			B	B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	42	461	88	50	269	66	61	151	57	87	116	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	485	93	53	283	69	64	159	60	92	122	37
RTOR Reduction (vph)	0	0	65	0	0	48	0	0	41	0	0	24
Lane Group Flow (vph)	44	485	28	53	283	21	64	159	19	92	122	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.2	22.2	22.2	4.7	22.7	22.7	5.2	24.2	24.2	7.6	26.6	26.6
Effective Green, g (s)	4.2	22.2	22.2	4.7	22.7	22.7	5.2	24.2	24.2	7.6	26.6	26.6
Actuated g/C Ratio	0.06	0.30	0.30	0.06	0.30	0.30	0.07	0.32	0.32	0.10	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	89	554	421	100	566	431	110	604	459	161	663	505
v/s Ratio Prot	0.03	c0.26		c0.03	0.15		0.04	c0.09		c0.06	0.07	
v/s Ratio Perm			0.02			0.01			0.01			0.01
v/c Ratio	0.49	0.88	0.07	0.53	0.50	0.05	0.58	0.26	0.04	0.57	0.18	0.03
Uniform Delay, d1	34.2	24.9	18.8	33.9	21.3	18.4	33.7	18.7	17.3	32.0	16.6	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	14.4	0.1	5.3	0.7	0.0	7.6	1.1	0.2	4.8	0.6	0.1
Delay (s)	38.5	39.3	18.9	39.2	22.0	18.4	41.3	19.7	17.5	36.8	17.2	15.7
Level of Service	D	D	B	D	C	B	D	B	B	D	B	B
Approach Delay (s)		36.2			23.7			24.1			24.2	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	74.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	601	4	2	384	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	633	4	2	404	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	355					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			637		1043	635
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			511		1058	509
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			783		184	420

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	637	406	2
Volume Left	0	2	1
Volume Right	4	0	1
cSH	1700	783	256
Volume to Capacity	0.37	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.1	19.2
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	19.2
Approach LOS			C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

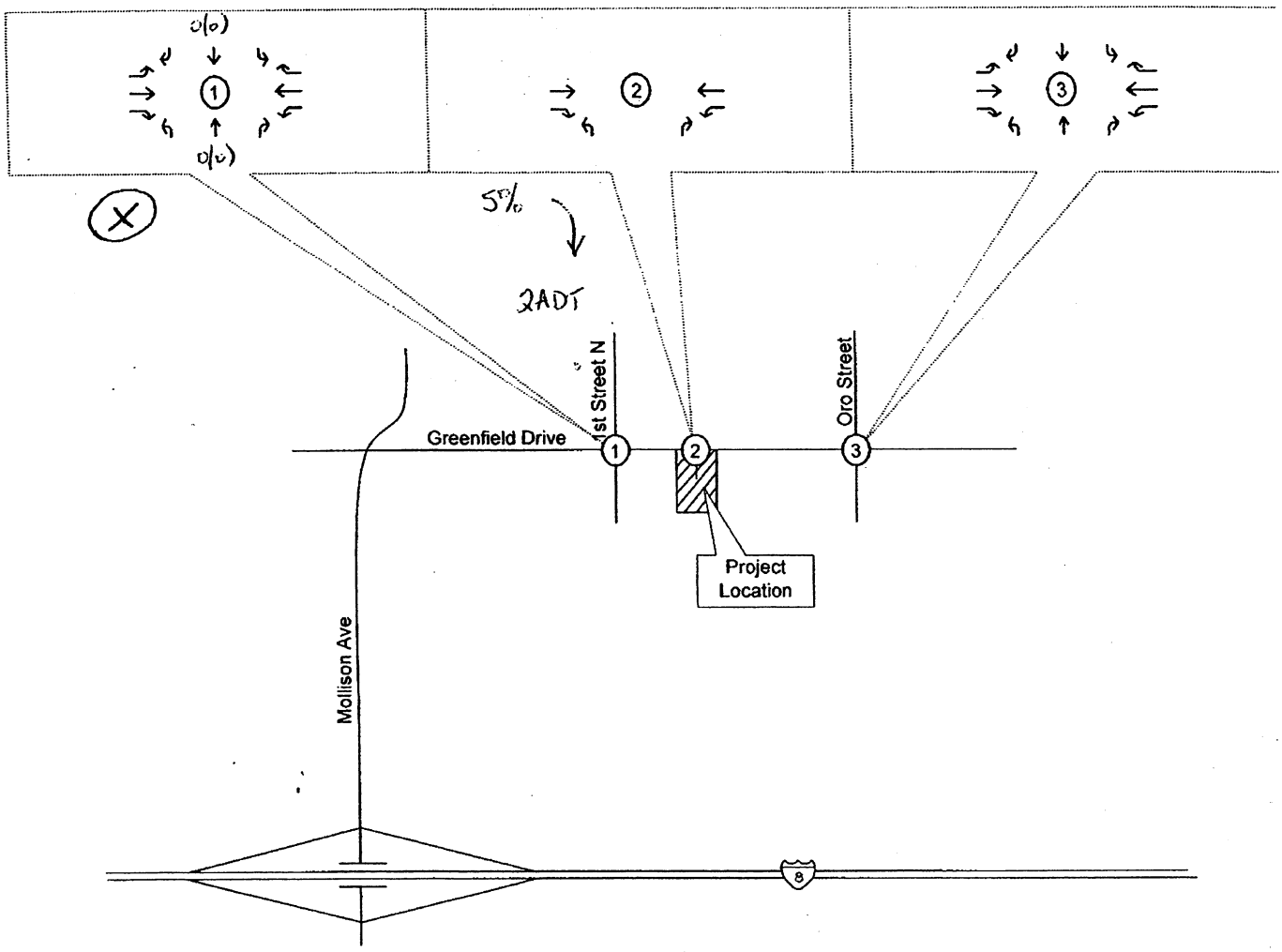
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	546	38	23	277	8	12	4	25	5	5	7
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	575	40	24	292	8	13	4	26	5	5	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	300			615			981	975	595	999	991	296
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	300			615			981	975	595	999	991	296
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			94	98	95	97	98	99
cM capacity (veh/h)	1261			965			216	242	504	202	237	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	631	324	43	18
Volume Left	16	24	13	5
Volume Right	40	8	26	7
cSH	1261	965	337	308
Volume to Capacity	0.01	0.03	0.13	0.06
Queue Length 95th (ft)	1	2	11	5
Control Delay (s)	0.3	0.9	17.2	17.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	17.2	17.4
Approach LOS			C	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix I

Cumulative Project Information



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N
No Scale

Proposed Project	Proposed Land Use	Rate	Size & Units		ADT	AM IN	AM OUT	PM IN	PM OUT
#1 TPM 20931 - 560 Pepper Drive	Single Family Detached	10 /DU	4	DU	40	1	2	3	1

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.

SF - Square Feet; ADT-Average Daily Traffic; Split-percent inbound and outbound.

CUMULATIVE TRAFFIC DATA SHEET

The following table has been compiled by County DPLU staff to assist in the preparation of cumulative traffic analysis for discretionary projects within the County of San Diego. The following information is requested by the County of San Diego for an interim use by traffic consultants while a public-interface of County of San Diego permit tracking and GIS applications is being programmed.

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Date Prepared:	**April 17, 2005**	**Prepared by:**	**Jarrett Ramaiya**	**(858) 694-3015**
	Today's date		**Print your name**	**Phone #**
Project Name or Address: Pepper Dr. TPM: 560 Pepper Dr, El Cajon, CA				
Community Planning Area: Pepper Drive-Bostonia				
Thomas Brother's page and location: 1251 G/1				
Case Numbers (e.g., TM, TPM, MUP, STP, ER, etc.): TPM 20931				
Assessor Parcel Number(s): 388-510-38				
Residential Lots: 1(4 units) **Lots**		**Commercial Square Footage:** N/A **s.f**		**Other?**(explain below)
Project Description - Please summarize type of project – residential, commercial, school, church, industrial, etc. The proposed project is a minor residential subdivision within the Pepper Drive-Bostonia Community Planning Area. The project proposes to divide 1.1 net acres into 4 parcels measuring from 10,050 square feet to 15,730 square feet net. An existing single-family residence is located on proposed parcel 1. The project is subject to the Regional Land Use Element 1.1 (CUDA) Current Urban Development Area and General Plan Use Designation (5) Residential, which permits 4.35 units per acre. The current zone for the property is RS4, which requires that a minimum lot size of 10,000 square feet be maintained.				
Public Roadway(s) Providing direct access to the project site (This includes *all* roadways that the future occupants would use to directly enter the site.) Pepper Drive, Poincianna Drive, Wanatchee Avenue, Highway 67 (San Vicente Freeway)				
Project Traffic Consultant:			**Final Traffic Report Avail. (if yes, please check)**☐	

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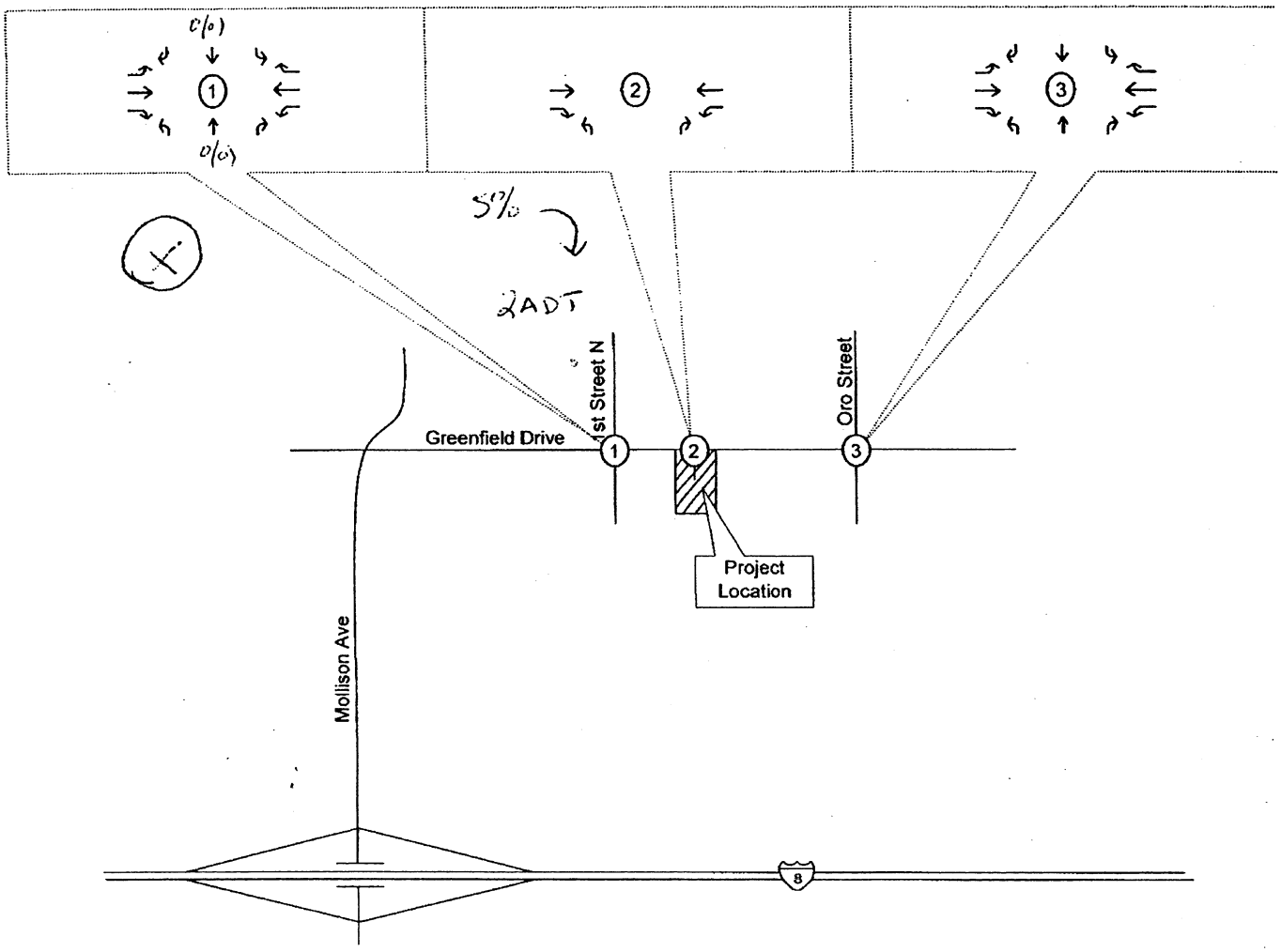

LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

Proposed Project	Proposed Land Use	Rate	Size & Units		ADT	AM IN	AM OUT	PM IN	PM OUT
#2 TPM 20921 - 1269 Turtle Lane	Single Family Detached	10 /DU	3	DU	30	1	2	2	1

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.

SF - Square Feet; ADT-Average Daily Traffic; Split-percent inbound and outbound.

Planning Area: Pepper Dr./Bostonia Case Number: TPM 20921

CUMULATIVE TRAFFIC DATA SHEET

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Date Prepared: April 6, 2005 (Today's date)	Prepared by: Michael Hogan (Print your name (*and* firm name, if applicable))	858-694-3703 (Phone #)
Project Name or Address: Tuttle Lane Lot Split, 1269 Tuttle Ln. El Cajon, CA 92021		
Community Planning Area: Pepper Dr./Bostonia		
Thomas Brother's page and location: 1251 G1		
Case Numbers (e.g., TM, TPM, MUP, STP, ER, etc.): TPM 20921 ER 05-14-007		
Assessor Parcel Number(s): 388-130-20		
Residential Lots: 3 Lots	Commercial Square Footage: N/A s.f	Other?(explain below)
Project Description - Please summarize type of project – residential, commercial, school, church, industrial, etc. (If *residential*, number of lots and type of residential – apartment, condo, townhome, single-family; if *commercial*, number of square feet of building space and on-site parking; If *school*, *church* or *other non-traditional* traffic generator, please describe the project's enrollment/capacity/attendance or any other characteristic in which traffic generation can be derived) Project proposed 3 lot subdivision in single-family residential zone. 3 lots ranging from .29 acres to .39 acres net. Project gains access from Pepper Drive via Tuttle Lane a private road.		
Public Roadway(s) Providing direct access to the project site (This includes *all* roadways that the future occupants would use to directly enter the site.) Pepper Dr & Tuttle Lane		
Project Traffic Consultant:	Final Traffic Report Avail. (if yes, please check) ☐	

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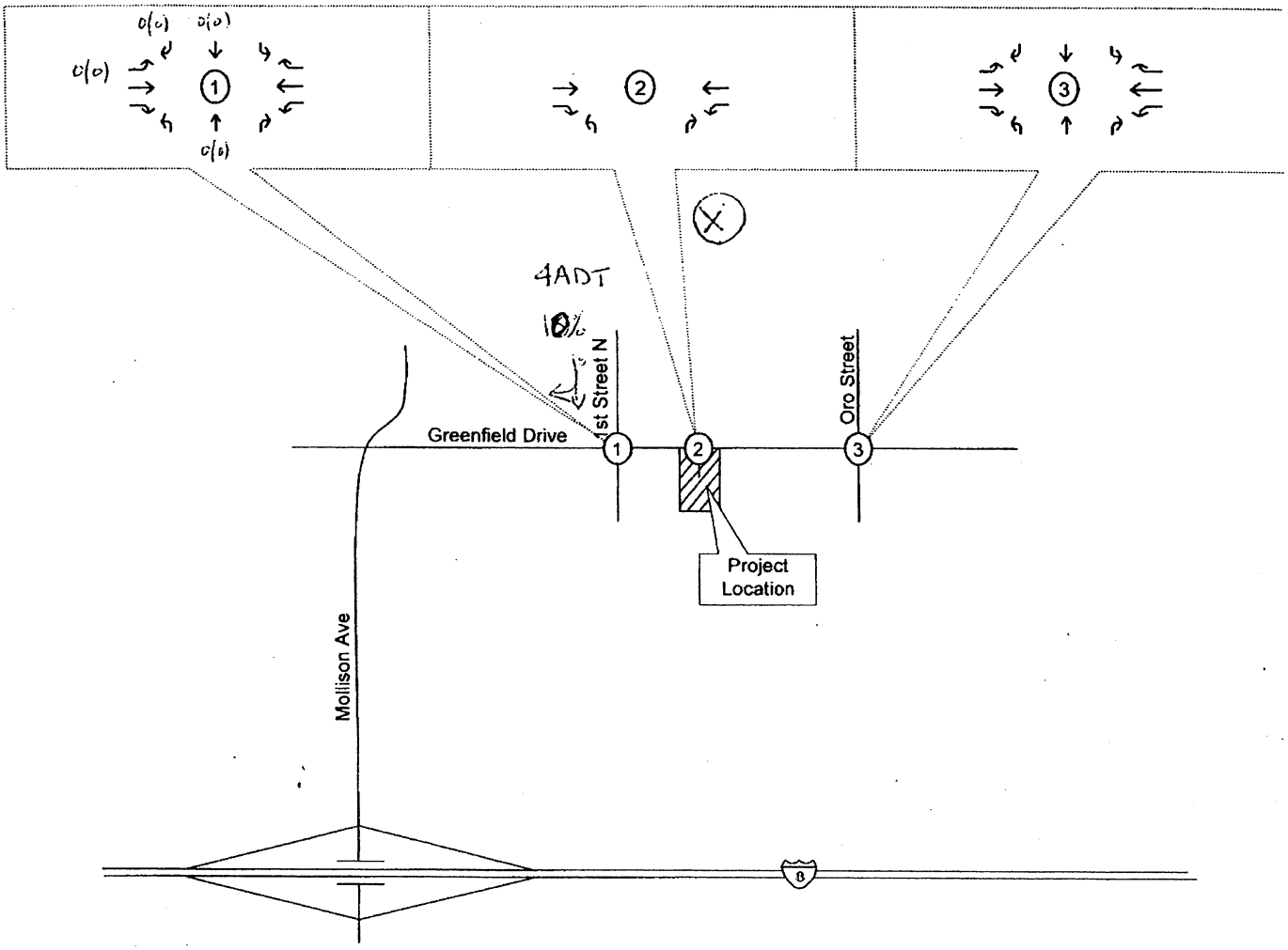

LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

Proposed Project	Proposed Land Use	Rate	Size & Units		ADT	AM IN	AM OUT	PM IN	PM OUT
#3 TPM 20895 - 1103 Topper Lane	Single Family Detached	10 /DU	4	DU	40	1	2	3	1

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.

SF - Square Feet; ADT-Average Daily Traffic; Split-percent inbound and outbound.

Planning Area: LAKESIDE CPG

Case Number: TPM 20895
~~04-14-047~~
91-14-044A

CUMULATIVE TRAFFIC DATA SHEET

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Date Prepared: 01/05/05 (Today's date)	Prepared by: JARRETT RAMAIYA (858) 694-3015 (Print your name (*and* firm name, if applicable) / Phone #)	
Project Name or Address: TOPPER LANE TPM	1163 TOPPER LANE, LAKESIDE	
Community Planning Area: LAKESIDE CPG / PEPPER DR. BOSTONIA		
Thomas Brother's page and location: 1251 J/2		
Case Numbers (e.g., TM, TPM, MUP, STP, ER, etc.): TPM 20895 / ER ~~04-14-047~~ 91-14-044A		
Assessor Parcel Number(s): 388-231-10 + 11		
Residential Lots: 4 Lots (proposed)	Commercial Square Footage: N/A s.f	Other?(explain below)

Project Description - Please summarize type of project – residential, commercial, school, church, industrial, etc. (If *residential*, number of lots and type of residential – apartment, condo, townhome, single-family; if *commercial*, number of square feet of building space and on-site parking; If *school, church* or *other non-traditional* traffic generator, please describe the project's enrollment/capacity/attendance or any other characteristic in which traffic generation can be derived)

Proposal for (4) LOTS, eventual site for SFR's, EXISTING SFR on proposed parcel (4)

Public Roadway(s) Providing direct access to the project site
(This includes *all* roadways that the future occupants would use to directly enter the site.)

TOPPER LANE / PEPPER DRIVE

Project Traffic Consultant: NOT YET ASSIGNED ~~N/A AS YET~~ Final Traffic Report Avail. (if yes, please check) ☐

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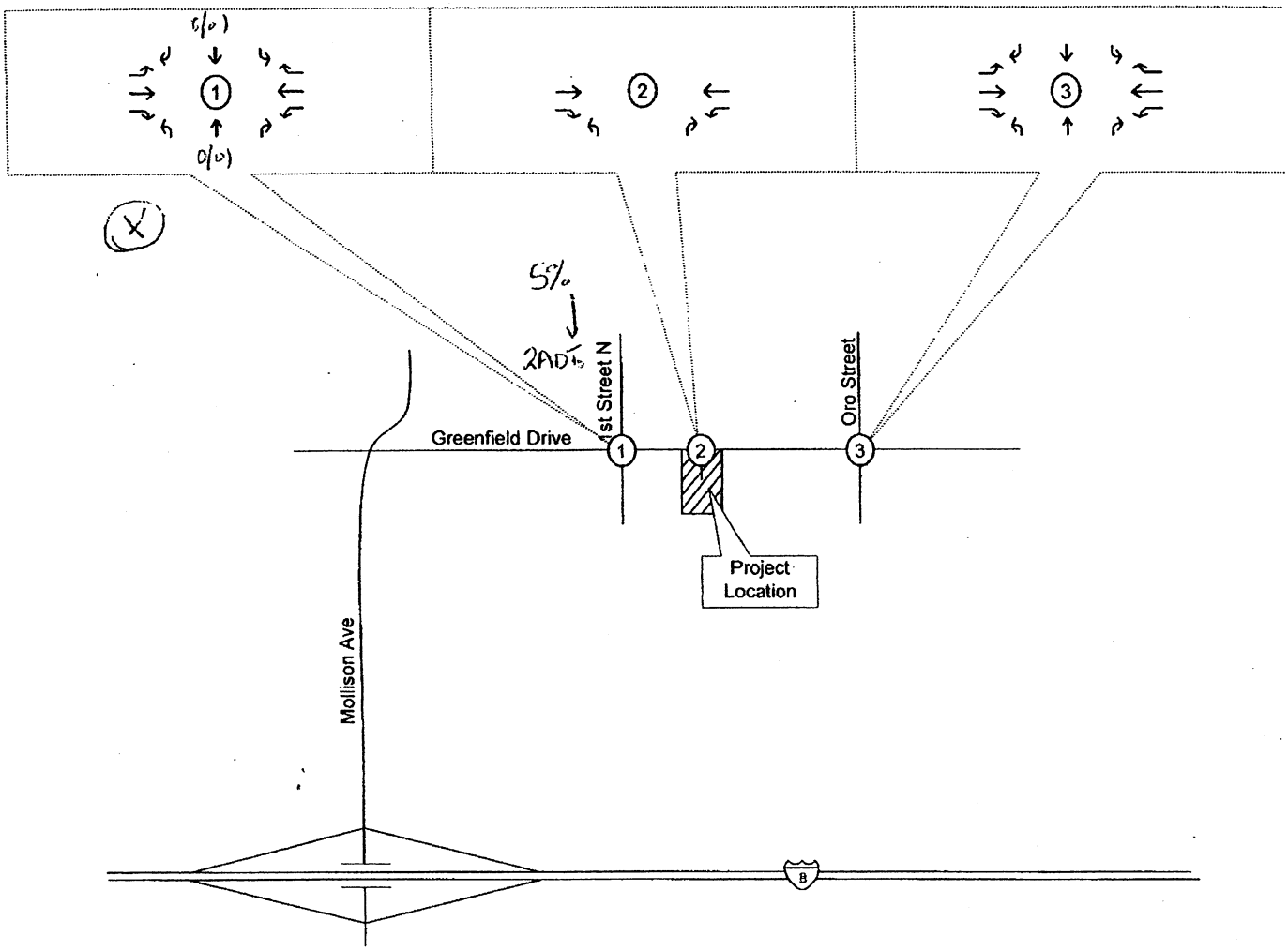
10/2/06



LEGEND

XX	AM peak hour volumes at intersections
(YY)	PM peak hour volumes at intersections
Z,ZZZ	ADT volumes shown along segments
(1)	Intersection Reference Number to LOS Tables

N

No Scale

Proposed Project	Proposed Land Use	Rate	Size & Units		ADT	AM IN	AM OUT	PM IN	PM OUT
#4 TPM 20862 - 624 Pepper Drive	Single Family Detached	10 /DU	3	DU	30	1	2	2	1

Source: SANDAG *Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.

SF - Square Feet; ADT-Average Daily Traffic; Split-percent inbound and outbound.

Planning Area: ~~Pepper Drive Bostonia~~ Lakeside

Case Number: TPM 20862

CUMULATIVE TRAFFIC DATA SHEET

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Date Prepared: 11/9/04 (Today's date)	Prepared by: Emery McCaffery - DPLU (Print your name)	858-694-3704 (Phone #)	
Project Name or Address: Tills			
Community Planning Area: Pepper Drive Bostonia			
Thomas Brother's page and location: pg. 1251 G/1, 624 Pepper Drive			
Case Number: TPM 20862, Log No. 04-14-029			
Assessor Parcel Number: 388-510-14			
Residential Lots: 3 Lots	Commercial Square Footage: ____s.f	Other?(explain below)	
Project Description - Please summarize type of project – residential, commercial, school, church, industrial, etc. The proposed project is a minor residential subdivision within the Pepper Drive-Bostonia Community Planning Area. The applicant proposes to divide 0.68 net acres into 3 parcels measuring from 10,000 square feet to 10,611 square feet. Grading will total 100 cubic yards of cut with a maximum cut slope ratio of 1.5:1 and 100 cubic yards of fill with a maximum fill slope ratio of 2:1. The maximum cut height will be 1-feet and the maximum fill height will be 1-feet. The project is subject to the Regional Land Use Policy 1.1 (CUDA) Current Urban Development Area and General Plan Use Designation (5) Residential, which permits 4.3 dwelling units per acre. The current zone for the property is RS4, which requires that a minimum lot size of 10,000 square feet be maintained. The project site is located at 624 Pepper Drive in the Pepper Drive-Bostonia Community Planning Area within an unincorporated portion of San Diego County. The entire project will be served by the following agencies/districts: Helix Water District, City of Santee CSA Fire Protection District, Padre Dam Municipal Water District, Grossmont Union High School District, and Santee School District. Approximately 36 Average Daily Trips (ADT's) will be generated from this project.			
Public Roadway(s) Providing direct access to the project site Access will be provided from Pepper Drive.			
Project Traffic Consultant: To be determined	Final Traffic Report Avail. (if yes, please check)☐		

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Appendix J

Existing + Cumulative Level of Service Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	21	179	60	47	335	63	72	138	40	63	182	32
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	188	63	49	353	66	76	145	42	66	192	34
RTOR Reduction (vph)	0	0	48	0	0	48	0	0	26	0	0	21
Lane Group Flow (vph)	22	188	15	49	353	18	76	145	16	66	192	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.4	15.7	15.7	4.4	17.7	17.7	5.2	24.9	24.9	4.9	24.6	24.6
Effective Green, g (s)	2.4	15.7	15.7	4.4	17.7	17.7	5.2	24.9	24.9	4.9	24.6	24.6
Actuated g/C Ratio	0.04	0.24	0.24	0.07	0.27	0.27	0.08	0.38	0.38	0.07	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	58	444	338	106	500	381	125	704	535	118	695	529
v/s Ratio Prot	0.01	0.10		c0.03	c0.19		c0.05	0.08		0.04	c0.10	
v/s Ratio Perm			0.01			0.01			0.01			0.01
v/c Ratio	0.38	0.42	0.04	0.46	0.71	0.05	0.61	0.21	0.03	0.56	0.28	0.02
Uniform Delay, d1	31.0	21.3	19.3	29.6	21.8	17.9	29.4	13.8	12.9	29.5	14.4	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.7	0.1	3.2	4.5	0.1	8.1	0.7	0.1	5.6	1.0	0.1
Delay (s)	35.1	21.9	19.4	32.8	26.3	17.9	37.5	14.5	13.0	35.1	15.4	13.1
Level of Service	D	C	B	C	C	B	D	B	B	D	B	B
Approach Delay (s)		22.4			25.8			20.9			19.6	
Approach LOS		C			C			C			B	

Intersection Summary

HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	65.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	352	11	17	426	13	13	5	34	3	4	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	7	371	12	18	448	14	14	5	36	3	4	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	462			382			896	889	376	921	888	455
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	462			382			896	889	376	921	888	455
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			95	98	95	99	98	98
cM capacity (veh/h)	1099			1176			249	276	670	230	277	605

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	389	480	55	19
Volume Left	7	18	14	3
Volume Right	12	14	36	12
cSH	1099	1176	430	394
Volume to Capacity	0.01	0.02	0.13	0.05
Queue Length 95th (ft)	1	1	11	4
Control Delay (s)	0.2	0.5	14.6	14.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.5	14.6	14.6
Approach LOS			B	B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	42	457	88	50	268	66	61	151	57	87	116	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	481	93	53	282	69	64	159	60	92	122	37
RTOR Reduction (vph)	0	0	65	0	0	48	0	0	41	0	0	24
Lane Group Flow (vph)	44	481	28	53	282	21	64	159	19	92	122	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.2	22.1	22.1	4.7	22.6	22.6	5.1	24.1	24.1	7.6	26.6	26.6
Effective Green, g (s)	4.2	22.1	22.1	4.7	22.6	22.6	5.1	24.1	24.1	7.6	26.6	26.6
Actuated g/C Ratio	0.06	0.30	0.30	0.06	0.30	0.30	0.07	0.32	0.32	0.10	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	89	553	420	100	565	430	108	603	458	161	665	506
v/s Ratio Prot	0.03	c0.26		c0.03	0.15		0.04	c0.09		c0.06	0.07	
v/s Ratio Perm			0.02			0.01			0.01			0.01
v/c Ratio	0.49	0.87	0.07	0.53	0.50	0.05	0.59	0.26	0.04	0.57	0.18	0.03
Uniform Delay, d1	34.1	24.8	18.8	33.8	21.3	18.3	33.7	18.6	17.3	31.9	16.5	15.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	13.7	0.1	5.3	0.7	0.0	8.4	1.1	0.2	4.8	0.6	0.1
Delay (s)	38.4	38.5	18.9	39.1	22.0	18.4	42.1	19.7	17.5	36.7	17.1	15.6
Level of Service	D	D	B	D	C	B	D	B	B	D	B	B
Approach Delay (s)		35.5			23.6			24.3			24.1	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	74.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	545	38	23	275	8	12	4	25	5	5	7
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	574	40	24	289	8	13	4	26	5	5	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	298			614			977	972	594	996	987	294
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	298			614			977	972	594	996	987	294
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			94	98	95	97	98	99
cM capacity (veh/h)	1263			966			217	243	505	203	238	746

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	629	322	43	18
Volume Left	16	24	13	5
Volume Right	40	8	26	7
cSH	1263	966	338	309
Volume to Capacity	0.01	0.03	0.13	0.06
Queue Length 95th (ft)	1	2	11	5
Control Delay (s)	0.3	0.9	17.2	17.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	17.2	17.4
Approach LOS			C	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	44.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix K

Existing + Project + Cumulative Level of Service Calculations

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	21	180	60	47	340	63	72	138	40	63	182	32
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	22	189	63	49	358	66	76	145	42	66	192	34
RTOR Reduction (vph)	0	0	48	0	0	48	0	0	26	0	0	21
Lane Group Flow (vph)	22	189	15	49	358	18	76	145	16	66	192	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	2.4	15.9	15.9	4.4	17.9	17.9	5.2	24.8	24.8	4.9	24.5	24.5
Effective Green, g (s)	2.4	15.9	15.9	4.4	17.9	17.9	5.2	24.8	24.8	4.9	24.5	24.5
Actuated g/C Ratio	0.04	0.24	0.24	0.07	0.27	0.27	0.08	0.38	0.38	0.07	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	58	449	341	106	505	384	125	700	532	118	692	526
v/s Ratio Prot	0.01	0.10		c0.03	c0.19		c0.05	0.08		0.04	c0.10	
v/s Ratio Perm			0.01			0.01			0.01			0.01
v/c Ratio	0.38	0.42	0.04	0.46	0.71	0.05	0.61	0.21	0.03	0.56	0.28	0.02
Uniform Delay, d1	31.1	21.2	19.2	29.7	21.7	17.8	29.4	13.9	13.0	29.5	14.5	13.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.6	0.1	3.2	4.5	0.1	8.1	0.7	0.1	5.6	1.0	0.1
Delay (s)	35.2	21.8	19.3	32.8	26.2	17.8	37.5	14.6	13.1	35.2	15.5	13.2
Level of Service	D	C	B	C	C	B	D	B	B	D	B	B
Approach Delay (s)		22.3			25.7			21.0			19.7	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	66.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	282	1	1	445	5	2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	297	1	1	468	5	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	355					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			298		768	297
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			244		750	243
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			1228		352	739

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	298	469	7
Volume Left	0	1	5
Volume Right	1	0	2
cSH	1700	1228	413
Volume to Capacity	0.18	0.00	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.0	13.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	13.9
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	7	354	11	17	427	13	13	5	34	3	4	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	7	373	12	18	449	14	14	5	36	3	4	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	463			384			899	892	378	924	891	456
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	463			384			899	892	378	924	891	456
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			98			94	98	95	99	98	98
cM capacity (veh/h)	1098			1174			248	275	668	229	275	604

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	392	481	55	19
Volume Left	7	18	14	3
Volume Right	12	14	36	12
cSH	1098	1174	428	393
Volume to Capacity	0.01	0.02	0.13	0.05
Queue Length 95th (ft)	1	1	11	4
Control Delay (s)	0.2	0.5	14.6	14.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	0.5	14.6	14.6
Approach LOS			B	B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1700	1900	1700	1700	1900	1700	1700	1900	1700	1700	1900	1700
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1583	1863	1417	1583	1863	1417	1583	1863	1417	1583	1863	1417
Volume (vph)	42	461	88	50	269	66	61	151	57	87	116	35
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	485	93	53	283	69	64	159	60	92	122	37
RTOR Reduction (vph)	0	0	65	0	0	48	0	0	41	0	0	24
Lane Group Flow (vph)	44	485	28	53	283	21	64	159	19	92	122	13
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	4.2	22.2	22.2	4.7	22.7	22.7	5.2	24.2	24.2	7.6	26.6	26.6
Effective Green, g (s)	4.2	22.2	22.2	4.7	22.7	22.7	5.2	24.2	24.2	7.6	26.6	26.6
Actuated g/C Ratio	0.06	0.30	0.30	0.06	0.30	0.30	0.07	0.32	0.32	0.10	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	89	554	421	100	566	431	110	604	459	161	663	505
v/s Ratio Prot	0.03	c0.26		c0.03	0.15		0.04	c0.09		c0.06	0.07	
v/s Ratio Perm			0.02			0.01			0.01			0.01
v/c Ratio	0.49	0.88	0.07	0.53	0.50	0.05	0.58	0.26	0.04	0.57	0.18	0.03
Uniform Delay, d1	34.2	24.9	18.8	33.9	21.3	18.4	33.7	18.7	17.3	32.0	16.6	15.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	14.4	0.1	5.3	0.7	0.0	7.6	1.1	0.2	4.8	0.6	0.1
Delay (s)	38.5	39.3	18.9	39.2	22.0	18.4	41.3	19.7	17.5	36.8	17.2	15.7
Level of Service	D	D	B	D	C	B	D	B	B	D	B	B
Approach Delay (s)		36.2			23.7			24.1			24.2	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	28.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	74.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	601	4	2	384	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	633	4	2	404	1	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)	355					
pX, platoon unblocked			0.74		0.74	0.74
vC, conflicting volume			637		1043	635
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			511		1058	509
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			783		184	420

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	637	406	2
Volume Left	0	2	1
Volume Right	4	0	1
cSH	1700	783	256
Volume to Capacity	0.37	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.1	19.2
Lane LOS		A	C
Approach Delay (s)	0.0	0.1	19.2
Approach LOS			C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	15	546	38	23	277	8	12	4	25	5	5	7
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	16	575	40	24	292	8	13	4	26	5	5	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	300			615			981	975	595	999	991	296
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	300			615			981	975	595	999	991	296
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			97			94	98	95	97	98	99
cM capacity (veh/h)	1261			965			216	242	504	202	237	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	631	324	43	18
Volume Left	16	24	13	5
Volume Right	40	8	26	7
cSH	1261	965	337	308
Volume to Capacity	0.01	0.03	0.13	0.06
Queue Length 95th (ft)	1	2	11	5
Control Delay (s)	0.3	0.9	17.2	17.4
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.9	17.2	17.4
Approach LOS			C	C

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix L

Caltrans Stopping Sight Distance Information and Calculations

CHAPTER 200
GEOMETRIC DESIGN AND STRUCTURE STANDARDS

Topic 201 - Sight Distance

Index 201.1 - General

Sight distance is the continuous length of highway ahead visible to the driver. Three types of sight distance are considered here: passing, stopping, and decision. Stopping sight distance is the minimum sight distance to be provided on multilane highways and on 2-lane roads when passing sight distance is not economically obtainable. Stopping sight distance also is to be provided for all elements of interchanges and intersections at grade, including private road connections (see Topic 504, Index 405.1, & Figure 405.7). Decision sight distance is used at major decision points (see Indexes 201.7 and 504.2).

The following table shows the standards for passing and stopping sight distance related to design speed, and these shall be the minimum values used in design.

Table 201.1
Sight Distance Standards

Design Speed(1) (km/h)	Stopping(2) (m)	Passing (m)
30	30	217
40	50	285
50	65	345
60	85	407
70	105	482
80	130	541
90	160	605
100	190	670
110	220	728
120	255	792
130	290	855

(1) See Topic 101 for selection of design speed.
(2) Increase by 20% on sustained downgrades >3% & > 2 km.

Chapter III of "A Policy on Geometric Design of Highways and Streets," AASHTO, 1994, contains a thorough discussion of the derivation of stopping sight distance.

201.2 Passing Sight Distance

Passing sight distance is the minimum sight distance required for the driver of one vehicle to pass another vehicle safely and comfortably. Passing must be accomplished assuming an oncoming vehicle comes into view and maintains the design speed, without reduction, after the overtaking maneuver is started.

Chapter III of "A Policy on Geometric Design of Highways and Streets," AASHTO, contains a thorough discussion of the derivation of passing sight distance. In brief, AASHTO states that the sight distance available for passing at any place is the longest distance at which a driver whose eyes are 1070 mm above the pavement surface can see the top of an object 1300 mm high on the road.

In general, 2-lane highways should be designed to provide for passing where possible, especially those routes with high volumes of trucks or recreational vehicles. Passing should be done on tangent horizontal alignments with constant grades or a slight sag vertical curve. Not only are drivers reluctant to pass on a long crest vertical curve, but it is impracticable to design crest vertical curves to provide for passing sight distance because of high cost where crest cuts are involved. Passing sight distance for crest vertical curves is 7 to 17 times longer than the stopping sight distance.

Ordinarily, passing sight distance is provided at locations where combinations of alignment and profile do not require the use of crest vertical curves.

Passing sight distance is considered only on 2-lane roads. At critical locations, a stretch of 3- or 4-lane passing section with stopping sight distance is sometimes more economical than two lanes with passing sight distance.

Passing on sag vertical curves can be accomplished both day and night because headlights can be seen through the entire curve.

Stopping Sight Distance
Caltrans TBL 201.1

Km/Hr	MPH	Meters	Feet
30	19	30	98
40	25	50	164
50	31	65	213
58	**36**	81	**265**
60	37	85	279
70	43	105	344
80	50	130	426
90	56	160	525
100	62	190	623
110	68	220	722
120	75	255	836