DRAFT REPORT

TRANSPORTATION IMPACT ANALYSIS

for the

GATEWAY SOUTH OFFICE BLDG & FIRE STATION
(Scotts Valley, California)

Prepared for:
EIP Associates

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EXECUTIVE SUMMARY

This report presents the results of the transportation impact analysis (TIA) conducted for the proposed 136,000 square feet (s.f.) office space and 12,000 s.f. fire station development on La Madrona Drive in Scotts Valley, California. The purpose of the analysis is to evaluate the impacts of the proposed development on the surrounding transportation system and to identify measures to reduce or eliminate any projected deficiencies.

The project site is currently vacant. The office building will be located on the west side of La Madrona Drive bounded to the north by the Hilton Hotel and to the south by Silverwood Drive. The fire station will be located directly across from the office building on the east side of La Madrona Drive in the southern portion of the "Teardrop" area. Access to both sites will be provided by two driveways each on La Madrona Drive.

Analysis Scenarios

Project impacts were estimated following the guidelines of the City of Scotts Valley and California Department of Transportation (Caltrans). The analysis focused on the operations of six (6) key intersections during the weekday morning (AM) and evening (PM) peak hours for the following scenarios: Existing, Background, Project, Cumulative No Project, and Cumulative Plus Project Conditions.

Project impacts to SR 17 were also evaluated for the scenarios described above. The peak hours represent the one-hour timeframe when traffic volumes are highest during the following two-hour periods: 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM on weekdays.

Project Traffic

The amount of traffic generated by the proposed project was estimated based on trip generation data published by the Institute of Transportation Engineers (ITE) and information provided by the Scotts Valley fire department. Standard ITE rates were applied to the square footage of the office building to estimate trips. The number of trips generated by the fire station was estimated based on a total crew of four fire fighters and an administrative staff of six people. The four crewmembers would work a 24-hour shift and have a shift change at 8:00 am. The administrative staff would work during the typical weekday work hours (approximately 8:00 am to 5:00 pm). The trip generation estimates are presented in Table 8.

The project as analyzed is estimated to generate approximately 2,385 net new weekday daily trips, 252 weekday AM peak-hour trips (219 inbound/33 outbound), 242 PM peak-hour trips (41 inbound/201 outbound).

Intersection Levels of Service

Using existing count data and lane configurations, a list of approved and pending developments, traffic volumes growth factored using the Association of Monterey Bay Area Governments (AMBAG) model, and the project-generated trips, intersection level of service (LOS) calculations were conducted for the six study scenarios using the SYNCHRO analysis program. SYNCHRO is based on the methodology described in the *2000 Highway Capacity Manual* (Transportation Research Board) for signalized intersections. Unsignalized intersections were also evaluated using methodologies presented in the *2000 Highway Capacity Manual.* The results of the intersection LOS calculations are presented in Table ES-1.

As shown in Table ES-1, all of the signalized intersections are projected to operate at LOS D or better during both peak periods under Project Conditions.

Movements on the stop sign-controlled approaches of the Mt. Hermon Road/El Rancho Drive-SR 17 Northbound ramps are projected to operate at LOS E or F during at least one peak period under Background and Project Conditions. This location does not warrant a traffic signal under any near-term scenario based on the Peak Hour Volume Warrant published by Caltrans.

Intersection Impacts and Proposed Improvements

Impacts at intersections were identified based on the operating standards of City of Scotts Valley and Caltrans. Both of these jurisdictions maintain an LOS C goal for traffic operations; however, Caltrans will accept LOS D depending on right-of-way constraints, physical constraints, and overall development intensity. According the General Plan Circulation Element, the City of Scotts Valley also excludes intersections on Mt. Hermon Road and Scotts Valley Drive from this threshold and accepts LOS D.

Intersections

A significant impact is identified for signalized intersections if the proposed project causes:

- Intersection operations to degrade from acceptable conditions (LOS D or better depending on location) under Background Conditions to unacceptable conditions (LOS D, E, or F) under Project Conditions; or

- An increase of one percent in the critical volume-to-capacity ratio between Background and Project Conditions for intersections already operating at unacceptable conditions (LOS D, E, or F) under Background Conditions.

Table ES-1

Intersection Levels of Service Summary

Intersection	Peak Hour	Existing Conditions		Background Conditions		Project Conditions		Cumulative No Project Conditions		Cumulative Plus Project Conditions	
		Delay[1]	LOS[2]	Delay	LOS[2]	Delay	LOS	Delay	LOS	Delay	LOS
Mt. Hermon Rd./Scotts Valley Dr.	AM	27.3	C	28.1	C	28.9	C	43.3	D	46.1	D
	PM	38.0	D	40.5	D	41.0	D	82.4	F	84.4	F
Mt. Hermon Rd./Glen Canyon Rd.	AM	10.2	B	12.0	B	12.1	B	18.1	B	18.4	B
	PM	12.1	B	14.1	B	14.4	B	32.7	C	37.7	D
Mt. Hermon Rd./La Madrona Dr.- SR 17 SB off-ramp	AM	28.9	C	33.0	C	37.8	D	69.5	E	75.2	E
	PM	24.8	C	26.4	C	29.2	C	57.8	E	61.5	E
La Madrona Dr./Altenitas Rd. (Unsignalized)	AM	11.8	B	15.7	C	25.0	C	76.4	F	>100	F
	PM	10.2	B	11.5	B	15.5	C	19.9	C	35.2	E
La Madrona Dr./Silverwood Rd. (Unsignalized)	AM	10.1	B	10.3	B	10.4	B	16.7	C	16.8	C
	PM	9.5	A	9.6	A	9.7	A	10.6	B	10.9	B
Mt. Hermon Rd./El Rancho Dr.- SR 17 NB ramps (Unsignalized)	AM	49.9	E	57.1	F	66.2	F	83.5	F	98.5	F
	PM	31.3	D	33.9	D	37.0	E	46.9	E	51.5	F

Notes: [1] Average control delay per vehicle in seconds. Delay and LOS at unsignalized intersections are for the worst-case movement.
[2] LOS = Level of service.

For all unsignalized intersections, the project results in a significant impact if:

- The addition of project traffic causes operations to degrade from acceptable conditions (LOS D or better depending on location) under Background Conditions to unacceptable conditions (LOS D, E, or F) under Project Conditions, and the Caltrans Peak Hour Volume Warrant is satisfied; or
- Project traffic is added to an intersection already operating at unacceptable conditions (LOS D, E, or F) under Background Conditions; and
- The Caltrans Peak Hour Volume Warrant is satisfied. Caltrans has established minimum major and minor street volume thresholds to determine if a signal may be needed.

Based on the impact criteria listed above, the proposed project would have a less than significant impact at all the study intersections.

The westbound through movement at the unsignalized intersection of Mt. Hermon Road/El Rancho Drive-SR 17 Northbound ramps is projected to degrade to LOS E during the AM peak hour from an unacceptable level of service under Background Conditions. As noted above Caltrans peak hour signal warrants were analyzed and based on the volumes under Project Conditions, this intersection does not meet the volume warrants. Therefore, this is considered a less than significant impact. Caltrans will make the final determination on the need for a signal at this intersection.

Freeway Impacts

The California Department of Transportation (Caltrans) has a goal of LOS C operations for state-maintained facilities, but accepts LOS D in more developed areas like Scotts Valley. Significant freeway impacts for this analysis were identified if the addition of project traffic is expected to degrade ramp junction operations from LOS D or better under Background Conditions to LOS E or F under Project Conditions, or if the project is expected to add more than one percent of the freeway capacity to segments where a ramp or weaving section operates at LOS E or F under Background Conditions.

The results of the freeway analysis are presented in Table ES-2 for the merge/diverge areas. This analysis shows that all the ramps operate at acceptable levels of service (LOS D or better) under all scenarios. Therefore, the impacts to the freeway are considered less than significant.

Table ES-2

State Route 17/Mt. Hermon Road Ramp Merge and Diverge Levels of Service

Location and Direction	Peak Hour	Existing Conditions		Background Conditions		Project Conditions		Cumulative No Project		Cumulative Plus Conditions	
		Density[1]	LOS[2]	Density	LOS	Density	LOS	Density	LOS	Density	LOS
Northbound Loop On-ramp	AM	26.8	C	27.7	C	27.7	C	30.2	D	30.2	D
	PM	22.5	C	23.2	C	23.6	C	26.9	C	27.4	C
Northbound Slip Off-ramp	AM	26.6	C	27.8	C	28.6	D	30.7	D	31.5	D
	PM	24.2	C	24.9	C	25.0	C	28.7	D	28.9	D
Southbound Slip On-ramp	AM	26.2	C	26.7	C	26.8	C	29.5	D	29.6	D
	PM	27.4	C	28.6	D	29.3	D	29.9	D	30.6	D
Southbound Slip Off-ramp	AM	17.6	B	18.2	B	18.7	B	21.6	C	22.2	C
	PM	22.6	C	23.7	C	23.8	C	26.7	C	26.8	C

[1] Density = passenger cars per lane mile per hour (pc/mi/hr).
[2] LOS = Level of service.

Site Access, Circulation, and Parking

Site Access

The site on the west side of La Madrona Drive that includes the office space will include two driveways. Both driveways provide full access to La Madrona Drive and will adequately serve the projected peak hour traffic volumes.

The driveway that serves the fire station parking area on the east side of La Madrona Drive is directly opposite the northern office development driveway. The main exit driveway that will serve the emergency vehicles is approximately 100 feet north of the parking area driveway. Both of these driveways are full access and will adequately serve the fire station traffic.

Signs and amber warning lights should be posted in both directions on La Madrona Drive to indicate to drivers when fire vehicles are exiting under Code 3 or emergency status. The lights would be activated by loop detectors or remotely from within the station. In addition, sight distance of 250 feet to the north should be maintained at the fire station driveway.

On-Site Circulation

The proposed site plan shows surface parking on all four sides of the office building with a main circulation aisle that extends around the perimeter of the parking area. All circulation aisles provide 90-degree single- or double-loaded spaces, except the main circulation aisles on the north and south ends of the property.

A dead end aisle is located in the northwest corner of the parking area. Dead end aisles prevent vehicles from circulating through to look for empty spaces when parking. It is recommended that this aisle be connected to an adjacent aisle to eliminate this configuration.

Parking

The site plan proposes a supply of 550 spaces. This supply provides greater than four spaces per 1,000 s.f. of office space. The City of Scotts Valley requires one space for every 250 gross square feet of floor area. Therefore, the proposed parking supply is considered adequate.

Pedestrian, Bicycle, and Transit

The number of pedestrians accessing the proposed project site is anticipated to low because of the limited transit services in the immediate area of the project site and the number of nearby homes along with few nearby retail facilities. Therefore, the current pedestrian facilities are considered adequate to accommodate pedestrian circulation. The existing

bicycle facilities should also provide adequate service to accommodate bicycles to and from the project site. The current transit system in Scotts Valley in the vicinity of the project site is limited and it is assumed that an insignificant number of new riders will use the transit system. Therefore, the project would have a less than significant impact on the transit system.

Cumulative Conditions

An analysis of cumulative traffic conditions was conducted based on future traffic volume projections from the AMBAG traffic model. Cumulative traffic volumes based on 2025 forecasts were analyzed for Cumulative No Project Conditions and Cumulative Plus Project Conditions.

The following intersections operate unacceptably under Cumulative No Project Conditions during one or both peak hours:

Mt. Hermon Road/Scotts Valley Drive (PM only)
Mt. Hermon Road/La Madrona Drive-SR 17 Southbound off-ramp (AM and PM)
La Madrona Drive/Altenitas Road (AM only)
Mt. Hermon Road/El Rancho Drive-SR 17 Northbound ramps (AM and PM)

The project generated traffic added to the Mt. Hermon Road/Scotts Valley Drive (during the PM peak hour) and Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp (during both peak hours) intersections under Cumulative Plus Project Conditions exacerbates unacceptable operations and increases the V/C ratio by one (1) percent. Therefore, this is considered a significant cumulative impact.

Volume warrants were analyzed to determine if signalization is warranted at the unsignalized intersections of La Madrona Drive/Altenitas Road and Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps under Cumulative Conditions. Based on the projected intersection volumes, signal warrants are not met at either of these intersections under both Cumulative No Project and Plus Project Conditions for either of the peak hours.

With the addition of project traffic, the La Madrona Drive/Altenitas Road intersection is projected to deteriorate to an unacceptable level of service (LOS E) under Cumulative Plus Project Conditions during the PM peak hour. However, since the intersection does not meet signal warrants, this is considered a less than significant cumulative impact at this intersection.

The operations at the Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps under Cumulative Plus Project Conditions are projected to be exacerbated with the addition of project traffic. However, because the intersection does not meet signal warrants the impact is considered less than significant.

Using the cumulative volumes, cumulative freeway operations were analyzed. All of the freeway ramp junctions are projected to operate at LOS D or above under Cumulative Conditions.

The Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp cumulative impact would be mitigated with the addition of an additional left-turn lane on the west leg of the intersection. Based on preliminary field measurements, this mitigation could fit in the existing right-of-way and provide LOS E and LOS D during the AM and PM peak hours, respectively.

The cumulative impact to the Mt. Hermon Road/ Scotts Valley Drive intersection would be mitigated by providing the west leg of the intersection with two separate left-turn lanes, one through lane, and one right-turn lane. This mitigation would provide a control delay of 73.5 seconds. However, it would still operate at LOS F. Due to the projected volumes under future scenarios, it is anticipated that additional right-of-way would be required to provide the capacity to obtain LOS D operations during the PM peak hour.

It is recommended that the project contribute a fair share percentage of the mitigation measures described under Cumulative Conditions. The percentage of project traffic at the Mt. Hermon Road/ Scotts Valley Drive intersection during the AM and PM peak hours is 1.5% and 1.2%, respectively. At the Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp intersection the percent of project traffic during the AM and PM peak hours is 6.1% and 5.8%, respectively.

1. INTRODUCTION

This report presents the results of the transportation impact analysis (TIA) conducted for the proposed office building and fire station in Scotts Valley, California. The project site is located on the west side of State Route (SR) 17 on La Madrona Drive, generally southwest of the Mt. Hermon Road interchange. The proposed project includes a total of 136,000 square feet (s.f.) of office space and a fire station located on the opposite side of the street. The site location and surrounding roadway network are presented on Figure 1. A preliminary site plan is shown on Figure 2.

The purpose of this analysis is to identify the potential impacts of the proposed development on the adjacent transportation system. Project impacts were estimated following guidelines of the City of Scotts Valley and California Department of Transportation (Caltrans). The analysis focused on the operations of the following key intersections:

1. Mt. Hermon Road/Scotts Valley Drive
2. Mt. Hermon Road/Glen Canyon Road
3. Mt. Hermon Road/La Madrona Drive-SR 17 Southbound off-ramp
4. La Madrona Drive/Altenitas Road
5. La Madrona Drive/Silverwood Road
6. Mt. Hermon Road/El Rancho Drive-SR 17 Northbound ramps

Operations of these key intersections and the Mt. Hermon interchange ramps were analyzed during the weekday morning (AM) and evening (PM) peak hours for the following scenarios:

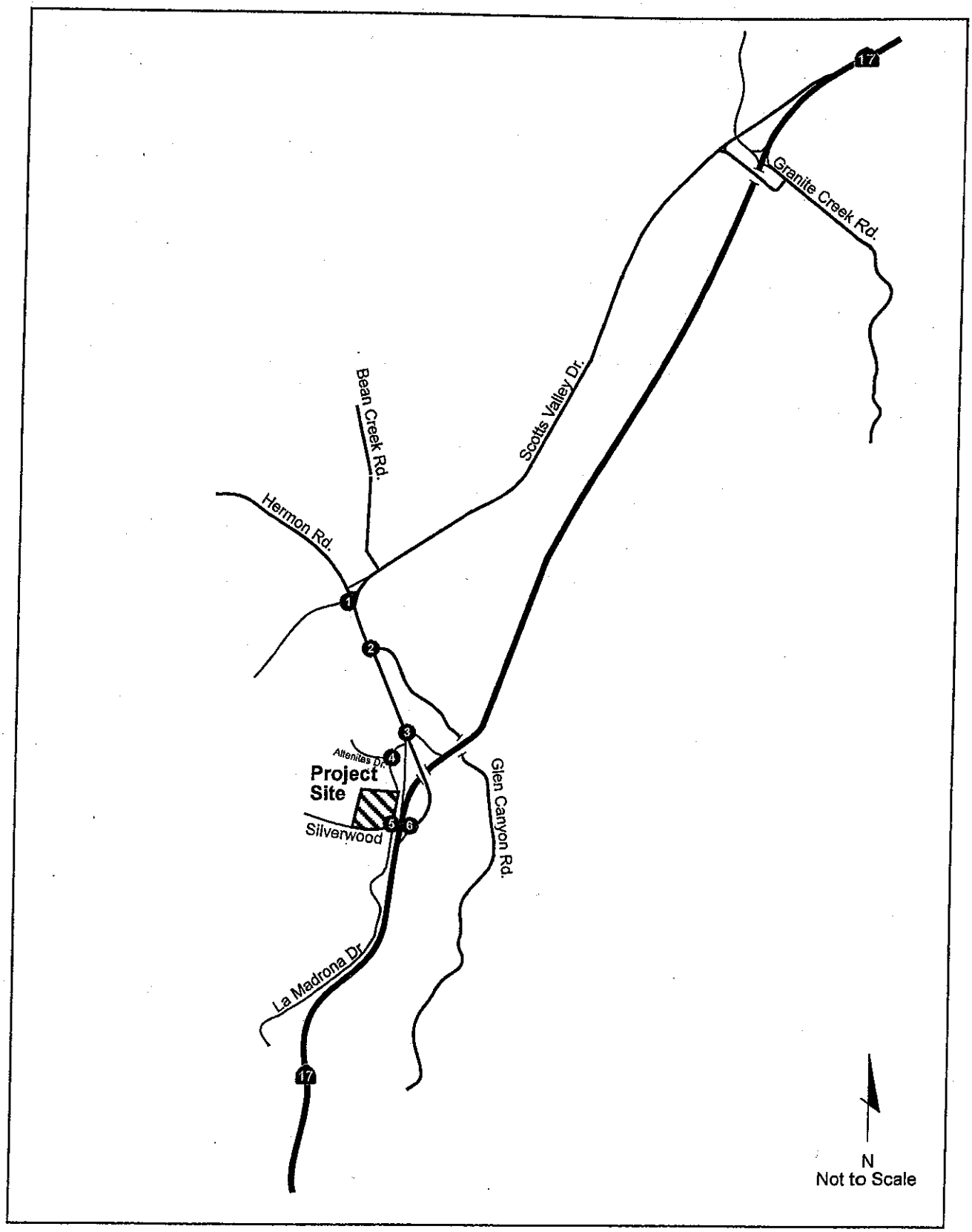
Scenario 1: *Existing Conditions*. Existing volumes obtained from counts.

Scenario 2: *Background or Baseline Conditions*. Existing peak-hour volumes plus traffic from approved but not yet constructed developments in the study area.

Scenario 3: *Project Conditions*. Background peak-hour traffic volumes plus traffic generated by the proposed shopping center expansion.

Scenario 4: *Cumulative Without Project Conditions*. Growth factored existing volumes plus traffic from approved and pending developments in the study area.

Scenario 5: *Cumulative With Project Conditions*. Cumulative peak-hour traffic volumes plus traffic generated by the proposed project.



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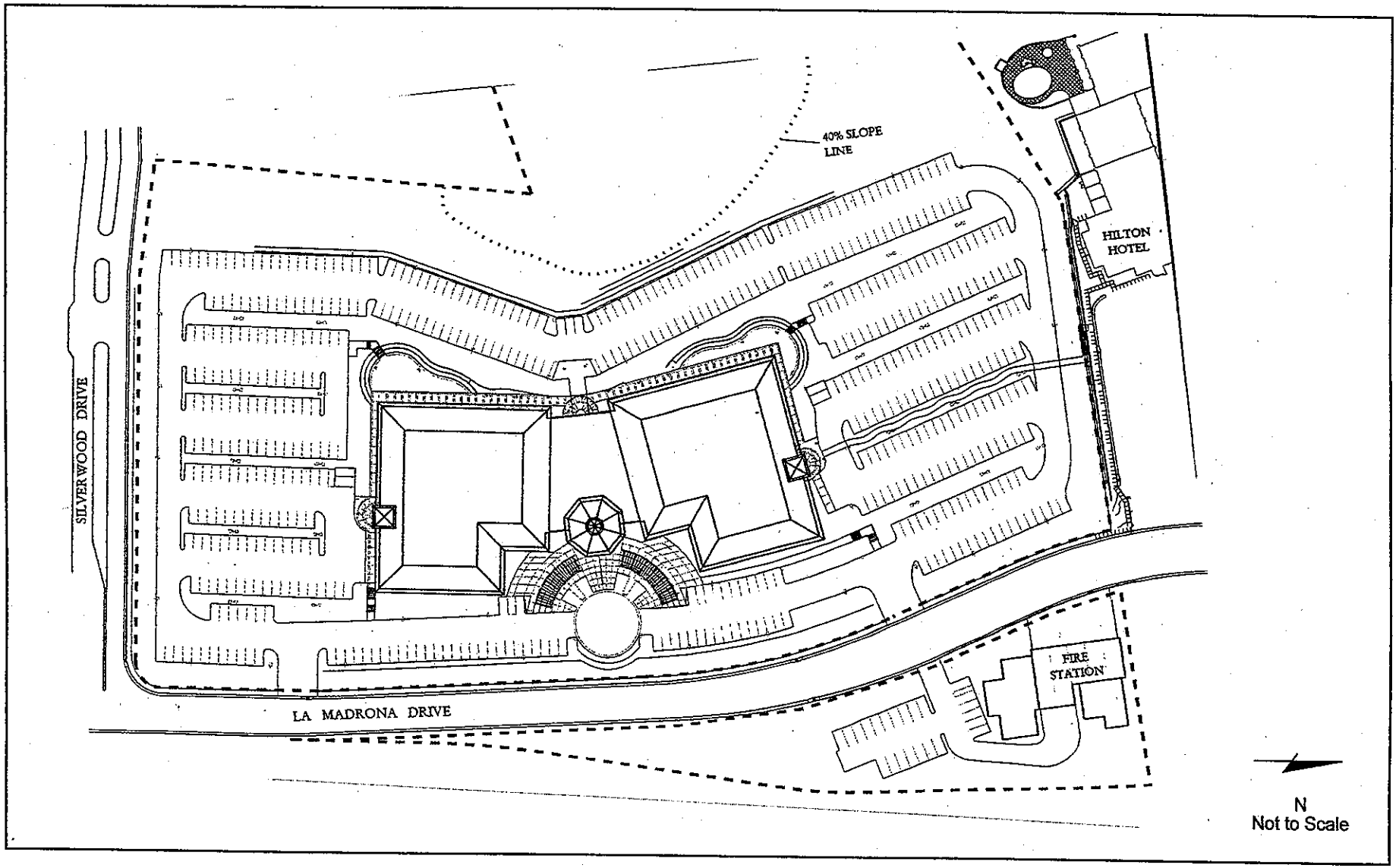
SITE LOCATION
FIGURE 1



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SITE PLAN
FIGURE 2

Project impacts to SR 17 were also evaluated. Several other issues including project site access, on-site circulation, and parking were also addressed in this study.

The remainder of this report is divided into five chapters. Chapter 2 presents Existing Conditions in terms of the existing roadway configurations, circulation patterns, and operating conditions of the key intersections and freeway segments. Operations under Background Conditions with traffic from approved but not yet constructed developments are discussed in Chapter 3. The transportation impacts of the proposed office building and fire station are presented in Chapter 4: Project Conditions. This chapter also includes a discussion of site access and on-site circulation. Cumulative Conditions with and without traffic from the project are analyzed in Chapter 5.

2. EXISTING CONDITIONS

This chapter discusses the existing roadway network and operations of the study intersections and freeway segments. First, the existing transportation system within the study area is described. Then, the existing lane configurations and traffic volumes at the study intersections and on State Route (SR) 17 are discussed. Next, the operations of the study intersections and freeway facilities under Existing Conditions are presented. Existing transit, bicycle, and pedestrian facilities are also presented in this chapter.

Existing Roadway Network

SR 17 and SR 9 provide regional access to the project site. Local access to the site is provided by Mt. Hermon Road, Scotts Valley Drive, Glen Canyon Road, and La Madrona Drive. Detailed descriptions of the key roadway facilities are presented below, and existing lane configurations and traffic control devices are illustrated on Figure 3.

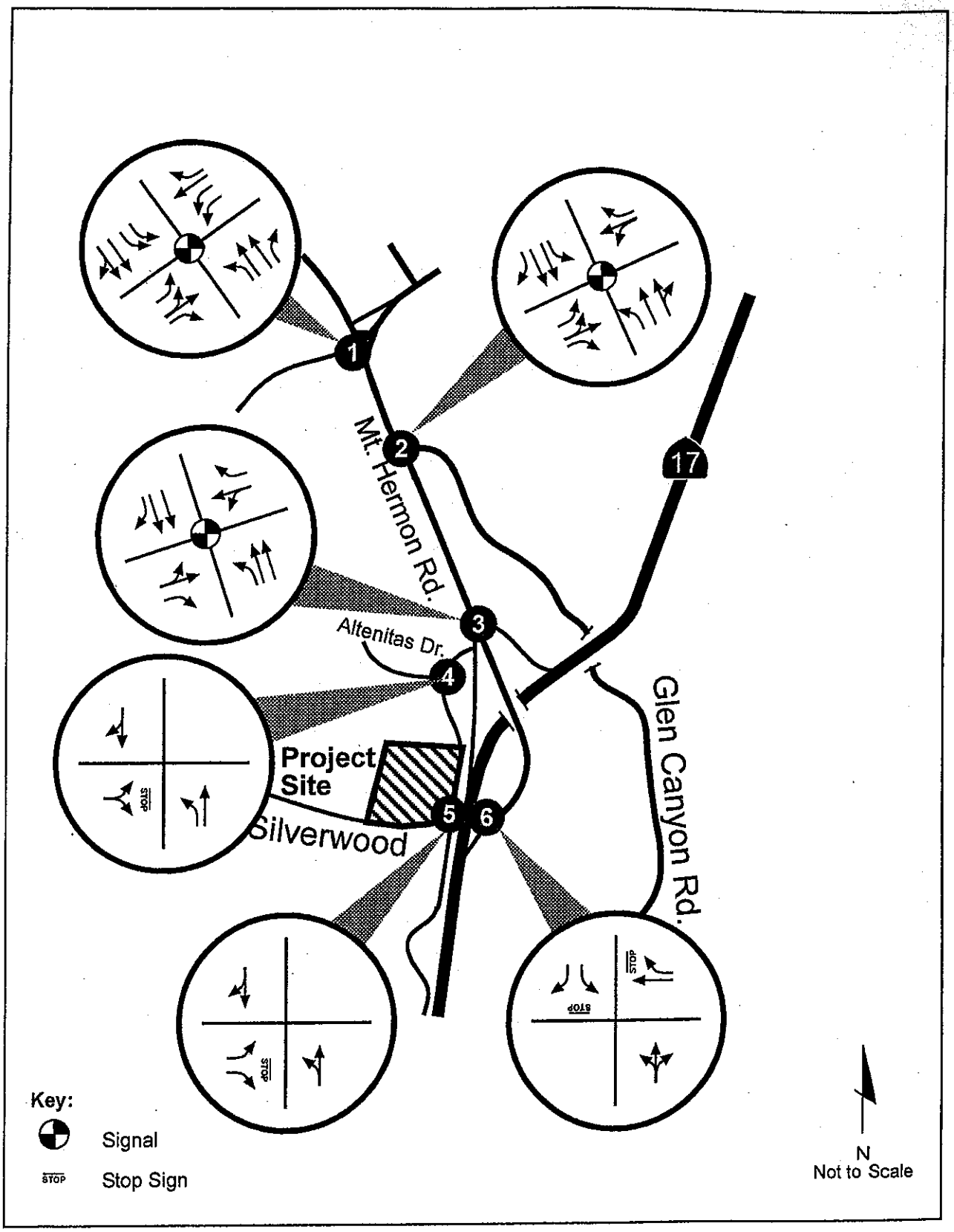
SR 17 is a four- to eight-lane, north-south facility that extends between the cities of Santa Cruz and San Jose. In the vicinity of the project site, SR 17 is a four-lane freeway with full-access interchanges at Mt. Hermon Road and Granite Creek Road.

SR 9 is a two-lane, generally north-south roadway between SR 17 in the Town of Los Gatos to SR 1 (Mission Street) in the City of Santa Cruz. SR 9 is located west of the project site and serves the communities of Boulder Creek, Ben Lomond, and Felton. The site can be accessed via Mt. Hermon Road and Graham Hill Road.

Mt. Hermon Road is an arterial roadway extending between Graham Hill Road to the west and El Rancho Drive just east of SR 17. In the vicinity of the project site, this street is oriented in a northwest to southeast direction and provides four travel lanes except for the two-lane overcrossing at SR 17. Between La Madrona Drive and Lockewood Lane, Mt. Hermon Road generally serves retail and commercial land uses.

Scotts Valley Drive is a four-lane arterial roadway extending between Mt. Hermon Road and Glenwood Drive. West of Mt. Hermon Road, Scotts Valley Drive becomes Whispering Pines Drive. Scotts Valley Drive is a collector north of Glenwood Drive and includes a cul-de-sac just east of Sawyer Circle.

Glen Canyon Road is a two-lane north-south roadway that extends from Mt. Hermon Road to Branciforte Drive in Santa Cruz. Glen Canyon Road parallels SR 17 and serves as an alternate route between Scotts Valley and Santa Cruz for vehicles to bypass congestion on SR 17.



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EXISTING LANE CONFIGURATIONS
FIGURE 3

La Madrona Drive is generally a two-lane, north-south collector roadway extending between Mt. Hermon Road and El Rancho Drive to the south. La Madrona Drive also parallels SR 17 and provides access to Santa Cruz from Scotts Valley via Sims Road and Graham Hill Road. La Madrona Drive provides direct access to the project site.

Existing Transit Service

The Santa Cruz Metropolitan Transit District operates fixed route, commuter, and paratransit bus service in the City and County of Santa Cruz, as well as in the City of Scotts Valley. Three fixed routes operate in the vicinity of the project site: Routes 31/32, 35, and 36. The Highway 17 Express Route also operates in the vicinity of the project site. Currently no bus stops are located within walking distance (1000 feet or less) of the project site. Detailed descriptions of existing transit service within the study area are presented below.

Route 31/32 operates between the Transit Centers in the cities of Santa Cruz and Scotts Valley. The Scotts Valley transit center is located off of Mt. Hermon Road north of Scotts Valley Drive on Kings Village Road. This route operates on weekdays between 7:00 am and 6:30 pm and on weekends between 7:30 am and 9:30 am and 2:00 pm and 6:30 pm. Route 31/32 operates on 60-minute headways during the weekday and weekend. Route 31/32 does not provide direct access to Mt. Hermon Road near the La Madrona intersection.

Route 35 serves as a connection between Santa Cruz and Boulder Creek through the city of Scotts Valley. Weekday operation is provided from 6:00 am to 12:00 am with 15- to 60-minute headways. Weekend service is provided from 6:30 am to 12:00 am on 30- to 60-minute headways. Route 35 operates on Mt. Hermon Road north of the project site.

Route 36 is an express bus route that provides two trips in the morning and two in the afternoon between the Santa Cruz Transit Center and the Boulder Creek area. In the morning hours, service is provided from Boulder Creek to Santa Cruz at 7:00 am and 8:00 am. Two routes are provided from the Santa Cruz Transit Center to the boulder Creek area at 5:45 pm and 6:45 pm. Route 36 operates on Mt. Hermon Road north of the project site.

Highway 17 Express serves as a connection between Santa Cruz County and Santa Clara County with stops at the Scotts Valley Transit Center. Highway 17 Express operates on weekdays between 4:30 am and 11:30 pm with headways of 15 to 60 minutes. No weekend service is provided.

Existing Pedestrian and Bicycle Facilities

Pedestrian facilities comprise sidewalks, crosswalks, and pedestrian signals. Near the site, sidewalks are located on the west side of La Madrona Drive in front of the Hilton Hotel and extend north to Mt. Hermon Road. Crosswalks and pedestrian signals are provided at all of the signalized study intersections.

Bicycle facilities comprise bike paths, lanes and routes. Bike paths are paved trails that are separated from roadways. Bike lanes are lanes on roadways designated for use by bicycles by striping, pavement legends, and signs. Bike routes are roadways that are designated for bicycle use by signs. In the vicinity of the site, a bike route is designated and bike lanes are striped on La Madrona Drive along the entire project frontage. Bike lanes are also provided on Mt. Hermon Road.

Existing Traffic Volumes

Intersection and freeway ramp operations were evaluated during weekday AM and PM peak traffic conditions. Peak conditions on weekdays usually occur during the morning and evening commute hours from 7:00 a.m. to 9:00 am and from 4:00 p.m. to 6:00 pm, respectively.

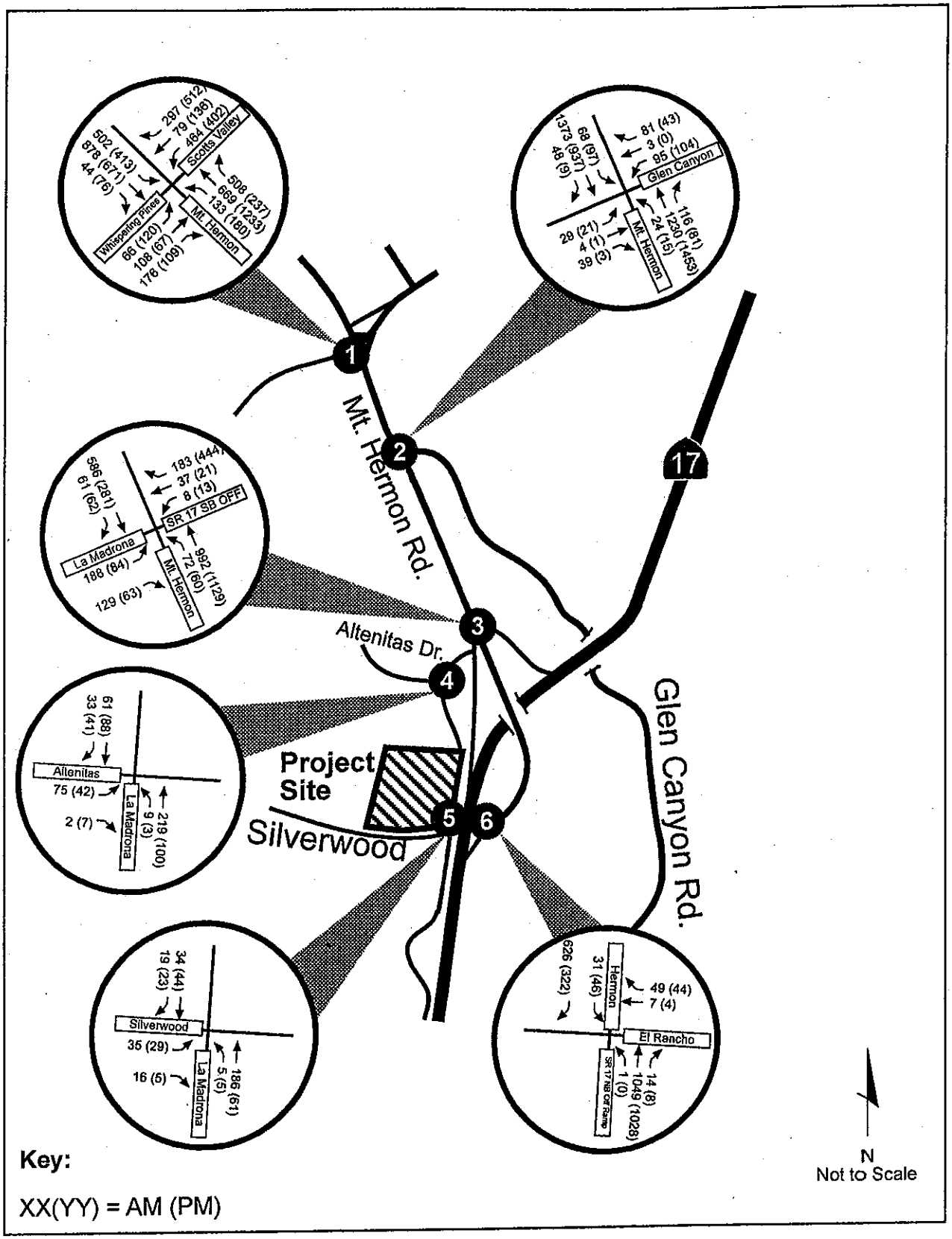
Peak period traffic counts were conducted on June 4, and 5, 2002 at the study intersections during the weekday peak periods, while public schools were still in session. The peak hour counts are contained in Appendix A. The highest one-hour total or peak-hour traffic volume at each study intersection is shown on Figure 4 for the weekday peak hours.

Intersection Level of Service Methodology

The operations of the key intersections were evaluated using Level of Service (LOS) calculations. *Level of Service* is a qualitative description of a roadway's operation, ranging from LOS A, or free-flow conditions, to LOS F, or over-saturated conditions. LOS E represents conditions that are at capacity. The level of service goal for City of Scotts Valley intersections is LOS C, except for the intersections on Mt. Hermon Road and Scotts Valley Drive where LOS D is considered acceptable.

According to the Caltrans *Traffic Impact Study Guidelines* (Final Draft, June 2001), Caltrans strives to maintain LOS C on all state-maintained facilities. However, staff recognizes that an LOS C is not feasible in areas with higher development intensities and that some roadways already operate at LOS D or below during peak periods. In addition, the maintenance of a higher level of service requires additional vehicular capacity, which can negatively impact travel for bicyclists and pedestrians. For purposes of this study, LOS D is considered acceptable.

Two methodologies were used to evaluate the key study intersections: one method for the signalized intersections and another method for the unsignalized intersections. For signalized intersections, the LOS methodology described in Chapter 9 of the 2000 *Highway Capacity Manual* (HCM) published by the Transportation Research Board was applied. This methodology evaluates a signalized intersection's operations based on the average control delay and was approved by both City of Scotts Valley and Caltrans staff. The average



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EXISTING PEAK-HOUR VOLUMES
FIGURE 4

control delay was calculated using the SYNCHRO analysis software and was correlated to a level of service as shown in Table 1.

Table 1

Signalized Intersection Level of Service Definitions Using Average Control Delay

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle length.	≤ 10
B	Operations with low delay occurring with good progression and/or short cycle lengths.	> 10 and ≤ 20
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	> 20 and ≤ 35
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	> 35 and ≤ 55
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55 and ≤ 80
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80

Source: *Highway Capacity Manual* (Transportation Research Board, 2000).

Unsignalized intersections with stop signs on the minor street approaches only were evaluated using the methodology presented in Chapter 10 of the 2000 update to the *Highway Capacity Manual*. Level of service is defined for the controlled movements at a two-way stop controlled intersection, not for the intersection as a whole. For stop sign controlled approaches composed of a single lane, the control delay is computed as the average of all movements in that lane. Table 2 presents the range of stopped delay that corresponds to each LOS designation.

Table 2

Unsignalized Intersection Level of Service Definitions Using Average Control Delay

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delays.	≤ 10
B	Short traffic delays.	> 10 and ≤ 15
C	Average traffic delays.	> 15 and ≤ 25
D	Long traffic delays.	> 25 and ≤ 35
E	Very long traffic delays	> 35 and ≤ 50
F	Extreme traffic delays with intersection capacity exceeded.	> 50

Source: *Highway Capacity Manual* (Special Report 209, Transportation Research Board, 1997).

Freeway Level of Service Methodology

Freeway ramp operations were also analyzed using LOS. Operations on SR 17 include merge/diverge areas at ramps. Merge/diverge areas were analyzed using the methodology described in *2000 Highway Capacity Manual*, which calculates the density in passenger cars per lane mile per hour (pc/mi/hr). Operations were analyzed using the Highway Capacity Software (HCS-3) package. The range of density for each level of service is presented in Table 3.

Table 3

Density Level of Service Definitions for Merge/Diverge Areas

Level of Service	Maximum Density (passenger cars/mile/hour)
A	10
B	20
C	28
D	35
E	> 35
F	[a]

[a] Demand flow exceeds theoretical limits.

Source: *Highway Capacity Manual* (Special Report 209, Transportation Research Board, 1997).

According to the Caltrans *Traffic Impact Study Guidelines* (Final Draft, June 2001), Caltrans strives to maintain LOS C on all state-maintained facilities. However, staff recognizes that an LOS C is not feasible in areas with higher development intensities and that some roadways already operate at LOS D or below during peak periods. In addition, the maintenance of a higher level of service requires additional vehicular capacity, which can negatively impact travel for bicyclists and pedestrians. Similar to intersections, LOS D is considered to be the goal for freeway ramp operations for purposes of this study. Specific criteria for project impacts are described in Chapter 4.

Existing Levels of Service

Intersections

The existing lane configurations on Figure 3 and the peak-hour turning movement volumes on Figure 5 were used to calculate the levels of service for each of the six study intersections during the AM and PM peak periods. The results of the existing LOS analysis are presented in Table 4 and the corresponding calculation sheets are contained in Appendix B.

Table 4

Existing Intersection Levels of Service

Intersection	Type of Control	Peak Hour	Delay [1]	LOS[2]
Mt. Hermon Rd./Scotts Valley Dr.	Signal	AM	27.3	C
		PM	38.0	D
Mt. Hermon Rd./Glen Canyon Rd.	Signal	AM	10.2	B
		PM	12.1	B
Mt. Hermon Rd./La Madrona Dr.-SR 17 SB off-ramp	Signal	AM	28.9	C
		PM	24.8	C
La Madrona Dr./Altenitas Rd.	Two-way stop	AM	11.8	B
		PM	10.2	B
La Madrona Dr./Silverwood Rd.	Two-way stop	AM	10.1	B
		PM	9.5	A
Mt. Hermon Rd./El Rancho Dr.-SR 17 NB ramps	Two-way stop	AM	49.9	E
		PM	31.3	D

Notes: [1]Average control delay per vehicle in seconds. Delay and LOS at unsignalized intersections are for the worst-case movement.
[2] LOS = Level of service.

The results indicate that the signalized intersections are operating at acceptable levels during both peak hours. The unsignalized intersection of Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps is currently operating at an unacceptable level of service during the AM peak hour (LOS E).

Peak hour volume warrants were analyzed for the intersection under Existing Conditions. Caltrans has established minimum major and minor street volume thresholds to determine if a signal may be needed. A review of the peak hour traffic volumes at the unsignalized Mt. Hermon Road/El Rancho Drive-SR 17 northbound ramps intersection shows that the minimum volume threshold for the Caltrans peak hour volume signal warrant (Warrant #11) is not exceeded during the AM or PM peak hours (see Appendix C). According to the Caltrans *Traffic Manual*, installation of a traffic signal should not necessarily be based solely on the satisfaction of warrant criteria. Signal installations should also be based on other factors such as delay, congestion, driver confusion, safety problems, etc. Caltrans will make the final determination on the need for the installation of a traffic signal.

Freeway Ramp Junctions

Freeway ramp merge or diverge operations on SR 17 were evaluated at the Mt. Hermon Road interchange since this will be a primary access point for project-generated traffic. The analysis evaluates ramp operations where they connect with the mainline freeway, either as a merge or a diverge section. SR 17 has two travel lanes in each direction in the vicinity of the project. Table 5 presents the existing freeway merge/diverge levels of service. All of the freeway LOS calculation worksheets are included in Appendix D. All four ramps are operating at an acceptable level of service during the peak periods under Existing Conditions.

Table 5

Existing State Route 17 Merge and Diverge Levels of Service

Location and Direction	Peak Hour	Existing Conditions	
		Density[1]	LOS[2]
Mt. Hermon Road Interchange			
Northbound Loop On-ramp	AM	26.8	C
	PM	22.5	C
Northbound Slip Off-ramp	AM	26.6	C
	PM	24.2	C
Southbound Slip On-ramp	AM	26.2	C
	PM	27.4	C
Southbound Slip Off-ramp	AM	17.6	B
	PM	22.6	C

[1] Density = passenger cars per lane mile per hour (pc/mi/hr).
[2] LOS = Level of service.

Field Observations

In addition to calculating intersection LOS based on traffic volumes, field observations were conducted at all of the study intersections and on the freeway segments during the AM and PM peak hours. These observations were used to verify the calculated levels of service and to note unusual operating conditions.

Observations showed that most of the study intersections operate at an overall acceptable level during both peak hours. Queues were observed for the through movements on Mt. Hermon Road during both peak hours. However, the queues typically cleared in one signal cycle. Although Mt. Hermon Road serves a significant volume of traffic, no substantial delays were observed during either peak hour, and traffic moved steadily between the freeway and Scotts Valley Drive.

Operations at the Mt. Hermon Road/Scotts Valley Drive intersection were acceptable during both of the study peak hours. During the PM peak hour, northbound vehicles occasionally queued back to Glen Canyon Road. However, these occurrences were sporadic and did not occur during multiple observations at this location.

The Mt. Hermon Road/La Madrona Drive-SR 17 Southbound off-ramp intersection operates at a good level of service. During the PM peak hour, right-turns from the off-ramp onto Mt. Hermon Road were observed to queue around the corner of the off-ramp from the intersection. However, the existing phasing of the intersection provides an overlap phase that minimized delay for the queued vehicles. Additionally, the gaps provided by the through northbound vehicles on Mt. Hermon Road were enough to allow some right-turns on red.

During the peak periods, traffic on SR 17 at the Mt. Hermon interchange typically moves in a uniform progression and experiences minor congestion. The primary travel directions of the freeway are northbound in AM peak period and southbound in the PM peak period as Santa Cruz County residents commute to jobs in San Jose and other cities in the south Bay Area via SR 17.

3. BACKGROUND CONDITIONS

This chapter discusses Background Conditions, which includes the addition of traffic from approved (but not yet constructed) developments and planned changes to the study roadway system. Background Conditions form the basis against which impacts of the proposed project are identified.

Background Traffic Volumes

The traffic volumes for Background Conditions were estimated by adding existing volumes and traffic estimates for approved (but not yet constructed) projects in the vicinity of the site. The City of Scotts Valley Planning Department staff provided the list of approved developments including: Scotts Valley High School expansion (300 students), Schilling office (15,000 s.f.) and restaurant (7,000 s.f.), Oak Creek Business Park (48,310 s.f.), Enterprise Technology Center (192,550 s.f.), Glenwood (53 residential units and park), and various other residential units throughout the City (see Appendix E for complete list).

Trips from each of the approved projects were assigned to the roadway network and were summarized at the study intersections. Approved project trips were added to existing traffic volumes and the resulting Background Traffic Volumes are shown on Figure 5.

Background Roadway Improvements

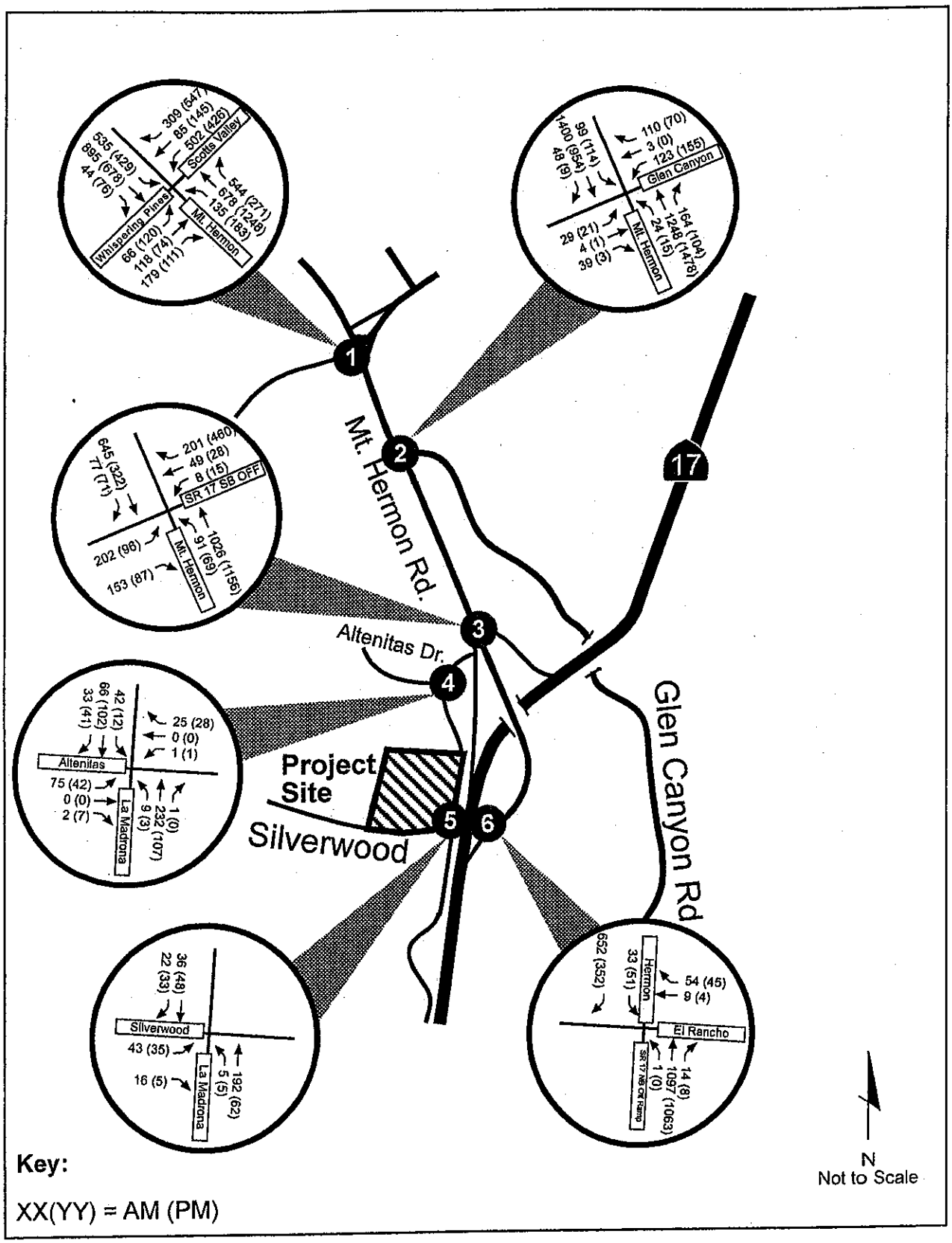
No planned or funded improvements were identified for this scenario. It was assumed that the driveway to the approved projects located within the "Teardrop" area would serve as a fourth leg of the Altenitas Road/La Madrona Drive intersection.

Background Intersection Levels of Service

Levels of service were calculated for all of the study intersections using the Background traffic volumes and the existing intersection lane configurations and traffic control devices. Table 6 presents the LOS results under Background Conditions. The corresponding LOS calculation sheets are included in Appendix B.

The unsignalized study intersection of Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps is projected to degrade to LOS F during the AM peak hour under Background Conditions. All of the remaining study intersections are projected to operate at the same levels of service with the addition of traffic from approved projects as under Existing Conditions.

A review of the peak hour traffic volumes at the unsignalized Mt. Hermon Road/El Rancho Drive-SR 17 northbound ramps intersection under Background Conditions shows that the



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BACKGROUND PEAK-HOUR VOLUMES
FIGURE 5

minimum volume threshold for the Caltrans peak hour volume signal warrant (Warrant #11) is not exceeded during either peak hour (see Appendix C). According to the Caltrans *Traffic Manual*, installation of a traffic signal should not necessarily be based solely on the satisfaction of warrant criteria. Signal installations should also be based on other factors such as delay, congestion, driver confusion, safety problems, etc.

Table 6

Background Intersection Levels of Service

Intersection	Type of Control	Peak Hour	Delay [1]	LOS[2]
Mt. Hermon Rd./Scotts Valley Dr.	Signal	AM	28.1	C
		PM	40.5	D
Mt. Hermon Rd./Glen Canyon Rd.	Signal	AM	12.0	B
		PM	14.1	B
Mt. Hermon Rd./La Madrona Dr.-SR 17 SB off-ramp	Signal	AM	33.0	C
		PM	26.4	C
La Madrona Dr./Altenitas Rd.	Two-way stop	AM	15.7	C
		PM	11.5	B
La Madrona Dr./Silverwood Rd.	Two-way stop	AM	10.3	B
		PM	9.6	A
Mt. Hermon Rd./El Rancho Dr.-SR 17 NB ramps	Two-way stop	AM	57.1	F
		PM	33.9	D

Notes: [1]Average control delay per vehicle in seconds. Delay and LOS at unsignalized intersections are for the worst-case movement.
[2] LOS = Level of service.

Freeway Ramp Junctions

Freeway ramp merge or diverge operations on SR 17 were evaluated at the Mt. Hermon Road interchange using the existing volumes plus traffic generated by the approved projects. Table 7 presents the Background freeway merge/diverge levels of service. All of the freeway LOS calculation worksheets are included in Appendix D. The southbound slip on-ramp is projected to degrade to LOS D during the PM peak hour.

Table 7

Background State Route 17 Merge and Diverge Levels of Service

Location and Direction	Peak Hour	Existing Conditions	
		Density[1]	LOS[2]
Mt. Hermon Road Interchange			
Northbound Loop On-ramp	AM	27.7	C
	PM	23.2	C
Northbound Slip Off-ramp	AM	27.8	C
	PM	24.9	C
Southbound Slip On-ramp	AM	26.7	C
	PM	28.6	D
Southbound Slip Off-ramp	AM	18.2	B
	PM	23.7	C

[1] Density = passenger cars per lane mile per hour (pc/mi/hr).
[2] LOS = Level of service.

4. PROJECT CONDITIONS

The impacts of the proposed office and fire station development on the surrounding roadway system are discussed in this chapter. First, the methodology used to estimate the amount of traffic generated by the proposed project is described. Then, the distribution of project traffic to the surrounding roadway system is discussed. The operations of the study intersections and freeway ramps were analyzed under Project Conditions (Background volumes plus project-generated traffic) with level of service (LOS) calculations. Project impacts are then identified by comparing the LOS results under Project Conditions to those under Background Conditions.

Other issues addressed in this chapter include on-site circulation, and site access.

Description of Proposed Project

The project includes the development of the 136,000 s.f. of office space plus a fire station with approximately 12,000 s.f. of space. Currently the project site is vacant. The site was originally slated to include retail commercial uses as described in the *Gateway South Specific Plan*.

Project Traffic Volumes

The amount of traffic associated with the proposed project was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. In the first step, the amounts of traffic are estimated on a daily basis and for each peak hour. In the second step, the directions the trips use to approach and depart the site are projected. The trips are assigned to specific street segments and intersection turning movements in the third step. The results of this process are described in the following sections.

Trip Generation

The amount of traffic generated by the proposed project was estimated based on trip generation data published by the Institute of Transportation Engineers (ITE) and information provided by the Scotts Valley fire department. Standard ITE rates were applied to the square footage of the office building to estimate trips. The number of trips generated by the fire station was estimated based on a total crew of four fire fighters and an administration staff of six people. The four crewmembers would work a 24-hour shift and have a shift change at 8:00 am. The administration staff would work during the typical weekday work hours (approximately 8:00 am to 5:00 pm). The trip generation estimates are presented in Table 8.

The project as analyzed is estimated to generate approximately 2,385 net new weekday daily trips, 252 weekday AM peak-hour trips (219 inbound/33 outbound), 242 PM peak-hour trips (41 inbound/201 outbound).

Table 8

Project Trip Generation Estimates

Item	Weekday Daily	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
PROPOSED PROJECT							
Office Trips[1]	1,681	210	28	238	39	193	232
Fire Station	100	9	5	14	2	8	10
Net New Project Trips	**2,385**	**219**	**33**	**252**	**41**	**201**	**242**

Notes: [1] Office trips were based on rates published in Sixth Edition of the Institute of Transportation Engineers' *Trip Generation.*

Trip Distribution

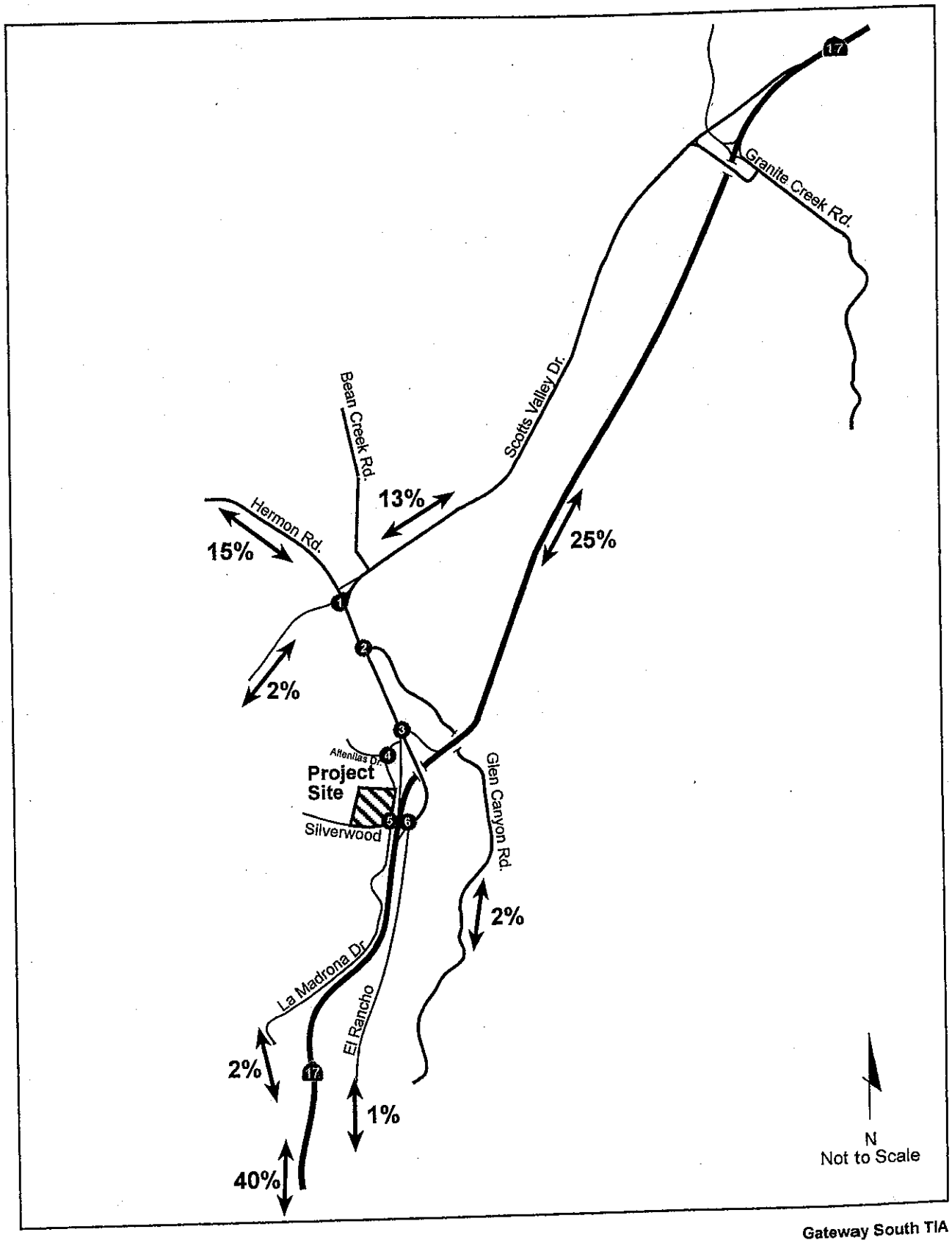
The trip distribution pattern for the proposed land uses was estimated based on the location of complementary land uses, 1990 Census journey-to-work data, and input from City of Scotts Valley Engineering staff. Journey-to-work information from the 2000 Census will not be available until Spring 2003. The major directions of approach and departure for the project are shown on Figure 7. Although some department personnel will live within Scotts Valley, the same trip distribution was used for the fire station to provide a more conservative analysis that assumes it generates regional trips.

Trip Assignment

Trips generated by the proposed project were assigned to the roadway system based on the directions of approach and departure shown on Figure 6. Project-generated trips for both peak hours are shown on Figure 7. Project trips were added to Background traffic volumes to estimate total volumes under Project Conditions as shown on Figure 8.

Project Intersection Levels of Service

Intersection level of service calculations were conducted to evaluate intersection operations under Project Conditions. The results of the LOS analysis for both Background and Project Conditions are summarized in Table 9. The corresponding LOS calculation sheets are included in Appendix B.



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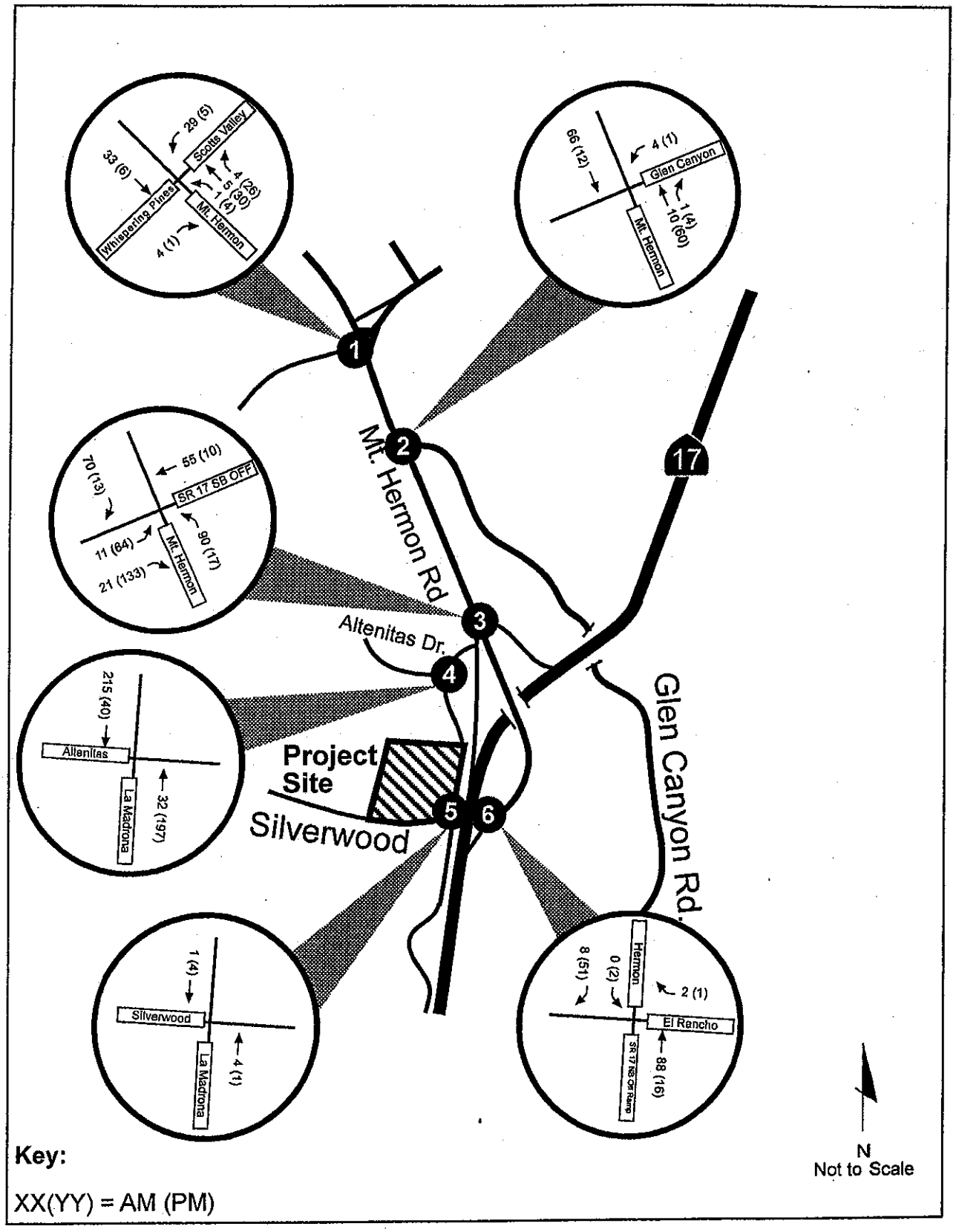
PROJECT TRIP DISTRIBUTION
FIGURE 6



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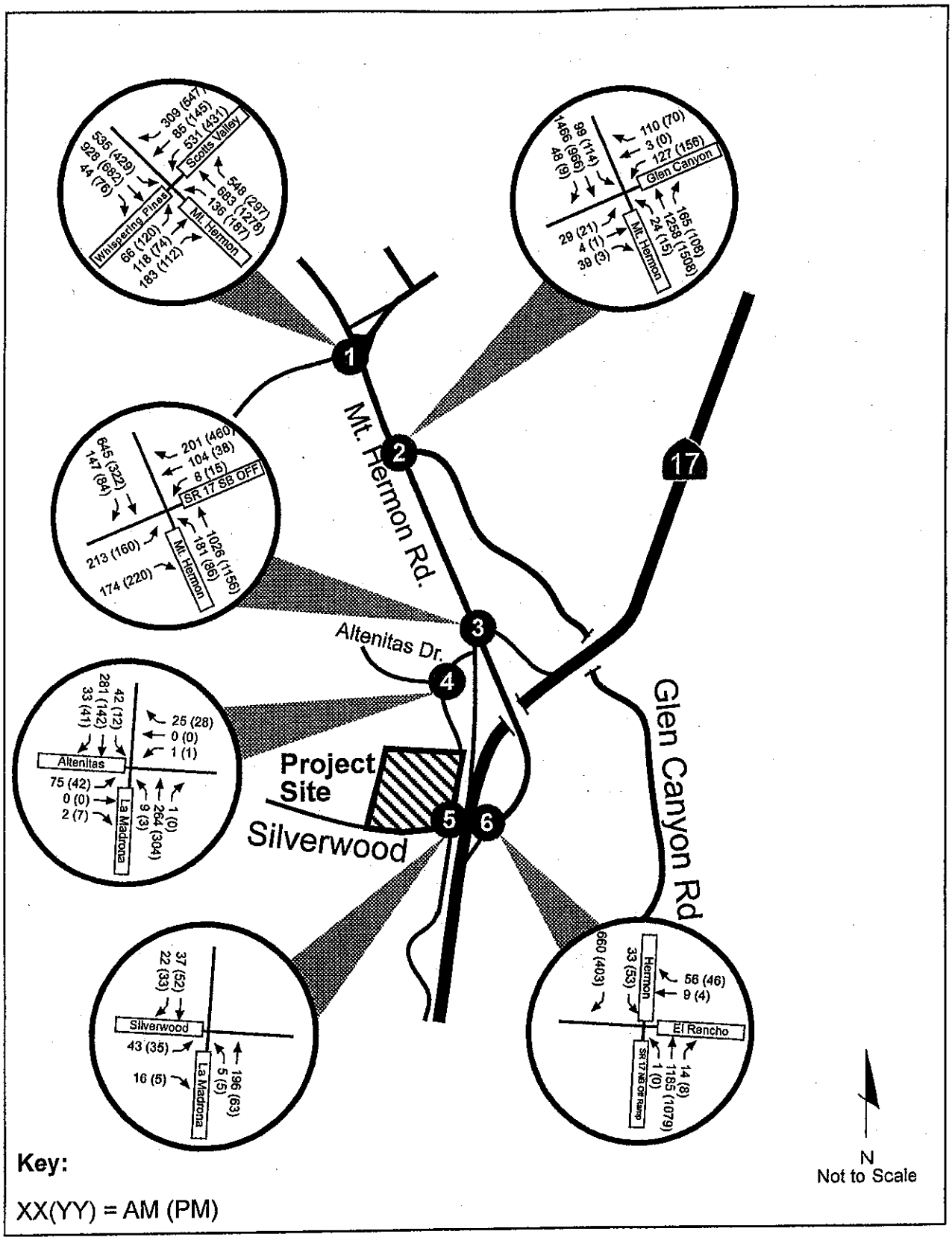
PROJECT TRIP ASSIGNMENT
FIGURE 7



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PROJECT PEAK-HOUR VOLUMES

FIGURE 8

The signalized intersection of Mt. Hermon Road/La Madrona Dr-SR 17 southbound off-ramp is projected to degrade to LOS D from LOS C during the AM peak hour. The other signalized intersections are projected to continue to operate at the same level of service as Background Conditions.

Table 9

Background and Project Intersection Levels of Service

Intersection	Peak Hour	Background Conditions		Project Conditions	
		Intersection Delay (sec.)[1]	LOS[2]	Intersection Delay (sec.)	LOS
Mt. Hermon Rd./Scotts Valley Dr.	AM	28.1	C	28.9	C
	PM	40.5	D	41.0	D
Mt. Hermon Rd./Glen Canyon Rd.	AM	12.0	B	12.1	B
	PM	14.1	B	14.4	B
Mt. Hermon Rd./La Madrona Dr.-SR 17 SB off-ramp	AM	33.0	C	37.8	D
	PM	26.4	C	29.2	C
La Madrona Dr./Altenitas Rd.	AM	15.7	C	25.0	C
	PM	11.5	B	15.5	C
La Madrona Dr./Silverwood Rd.	AM	10.3	B	10.4	B
	PM	9.6	A	9.7	A
Mt. Hermon Rd./El Rancho Dr.-SR 17 NB ramps	AM	57.1	F	66.2	F
	PM	33.9	D	37.0	E

Notes: [1] Average control delay per vehicle in seconds. Delay and LOS at unsignalized intersections are for the worst-case movement.
[2] LOS = Level of service.
Project impacts highlighted in **bold text.**

The addition of project traffic is projected to degrade operations at the unsignalized Mt. Hermon Road/El Rancho Drive-SR 17 northbound ramps intersection to LOS E during the PM peak hour. The La Madrona Drive/Altenitas Road intersection is projected to degrade to LOS C under Project Conditions during the PM peak hour.

Peak hour volume warrants were analyzed for the intersection under Project Conditions. A review of the peak hour traffic volumes at the unsignalized Mt. Hermon Road/El Rancho Drive-SR 17 northbound ramps intersection shows that the minimum volume threshold for the Caltrans peak hour volume signal warrant (Warrant #11) is not exceeded during the AM peak hour (see Appendix C). According to the Caltrans *Traffic Manual*, installation of a traffic signal should not necessarily be based solely on the satisfaction of warrant criteria. Signal installations should also be based on other factors such as delay, congestion, driver confusion, safety problems, etc. Caltrans will make the final determination on the need for a signal at this location.

Project Ramp Levels of Service

Tables 10 presents the freeway ramp section levels of service for Background and Project Conditions. The Northbound slip off-ramp is projected to degrade to LOS D under Project Conditions during the AM peak hour. All other ramps are projected to continue operating at the same level of service as under Background Conditions.

Table 10

Background and Project State Route 17 Merge and Diverge Levels of Service

Location and Direction	Peak Hour	Background Conditions		Project Conditions	
		Density[1]	LOS[2]	Density	LOS
Mt. Hermon Interchange					
Northbound Loop On-ramp	AM	27.7	C	27.7	C
	PM	23.2	C	23.6	C
Northbound Slip Off-ramp	AM	27.8	C	28.6	D
	PM	24.9	C	25.0	C
Southbound Slip On-ramp	AM	26.7	C	26.8	C
	PM	28.6	D	29.3	D
Southbound Slip Off-ramp	AM	18.2	B	18.7	B
	PM	23.7	C	23.8	C

[1] Density = passenger cars per lane mile per hour (pc/mi/hr).
[2] LOS = Level of service.

Site Access, Circulation, and Parking

This section addresses site access and the on-site circulation system. The preliminary site plan showing the locations of project driveways and the internal circulation system is shown on Figure 2.

Site Access

The site on the west side of La Madrona Drive that includes the office building will include two driveways. Both driveways provide full access to La Madrona Drive and will adequately serve the projected peak hour traffic volumes.

The driveway that serves the fire station parking area on the east side of La Madrona Drive is directly opposite the northern office development driveway. The main exit driveway that will serve the emergency vehicles is approximately 100 feet north of the parking area driveway. Both of these driveways are full access and will adequately serve the fire station traffic.

Signs and amber warning lights should be posted in both directions on La Madrona Drive to indicate to drivers when fire vehicles are exiting under Code 3 or emergency status. The lights would be activated by loop detectors or remotely from within the station. In addition, sight distance of 250 feet to the north should be maintained at the fire station driveway.

The vehicle queues on La Madrona Drive were evaluated to determine the need for a two-way left-turn lane on La Madrona Drive to access both project sites. Based on the output from the SYNCHRO file at the study intersections and the through volumes on La Madrona Drive, it is anticipated that sufficient gaps will be provided to allow left-turns into the project site.

On-Site Circulation

The proposed site plan shows surface parking on all four sides of the office building with a main circulation aisle that extends around the perimeter of the parking area. All circulation aisles provide 90-degree single- or double-loaded spaces, except the main circulation aisles on the north and south ends of the property.

A dead end aisle is located in the northwest corner of the parking area. Dead end aisles prevent vehicles from circulating through to look for empty spaces when parking. It is recommended that this aisle be connected to an adjacent aisle to eliminate this configuration.

Parking

The site plan proposes a supply of 550 spaces. This supply provides greater than four spaces per 1,000 s.f. of office space. The City of Scotts Valley requires one space for every 250 gross square feet of floor area. Therefore, the proposed parking supply is considered adequate.

Pedestrian, Bicycle, and Transit

The existing sidewalks and bike lanes on La Madrona Drive and Mt. Hermon Road encourage the use of an alternative mode of transportation and are considered adequate. The current transit system does not service La Madrona Drive and only provides a limited number of bus routes on Mt. Hermon Road. In addition, no bus stops are evident in the vicinity of the project site on Mt. Hermon Road.

Significant Impact Criteria

Impacts at intersections were identified based on the operating standards for the City of Scotts Valley and Caltrans. The City maintains a minimum level of service C for intersections except for the intersections on Mt. Hermon Road and Scotts Valley Drive where

LOS D is considered acceptable, while Caltrans maintains an LOS C goal, but accepts LOS D in urbanized areas such as Scotts Valley.

Intersections

A significant impact is identified for signalized intersections if the proposed project causes:

- Intersection operations to degrade from acceptable conditions (LOS D or better depending on location) under Background Conditions to unacceptable conditions (LOS E or F) under Project Conditions; or

- An increase of one percent in the critical volume-to-capacity ratio between Background and Project Conditions for intersections already operating at unacceptable conditions (LOS E or F) under Background Conditions.

For all unsignalized intersections, the project results in a significant impact if:

- The addition of project traffic causes operations to degrade from acceptable conditions (LOS D or better depending on location) under Background Conditions to unacceptable conditions (LOS E or F) under Project Conditions, and the Caltrans Peak Hour Volume Warrant is satisfied; or

- Project traffic is added to an intersection already operating at unacceptable conditions (LOS D, E, or F) under Background Conditions; and

- The Caltrans Peak Hour Volume Warrant is satisfied.

Based on the impact criteria listed above, the proposed project would not have a significant impact at any of the study intersections.

The impact to the Mt. Hermon Road/El Rancho Drive-SR 17 northbound ramps is considered less than significant because the peak-hour volume warrants were not satisfied under Project Conditions during the AM or PM peak hours.

Freeway Ramp Junctions and Weaving Sections

The California Department of Transportation (Caltrans) has a goal of LOS C operations for state-maintained facilities, but accepts LOS D as a goal in developed areas like the City of Scotts Valley. Significant freeway impacts for this analysis were identified if the addition of project traffic is expected to degrade ramp junction operations from LOS D or better under Background Conditions to LOS E or F under Project Conditions, or if the project is expected to add more than one percent of the freeway capacity to segments where a ramp operates at LOS E or F under Background Conditions.

The Northbound slip off-ramp is projected to degrade from LOS C under Background Conditions to LOS D under Project Conditions. However, Caltrans accepts LOS D in developed areas and the project's impacts to this freeway ramp junction is considered less than significant. The remaining freeway ramp junctions are projected to continue operating at LOS D or better under Background Conditions.

Pedestrian, Bicycle, and Transit

The number of pedestrians accessing the proposed project site is anticipated to low because of the limited transit services in the immediate area of the project site and the number of nearby homes along with few nearby retail facilities. Therefore, the current pedestrian facilities are considered adequate to accommodate pedestrian circulation. The existing bicycle facilities should also provide adequate service to accommodate bicycles to and from the project site. The current transit system in Scotts Valley in the vicinity of the project site is limited and it is assumed that an insignificant number of new riders will use the transit system. Therefore, the project would have a less than significant impact on the transit system.

5. CUMULATIVE CONDITIONS

This chapter presents an analysis of Cumulative Conditions with and without the proposed project. Cumulative Conditions are defined as existing volumes factored to estimate future regional traffic growth plus volumes from approved and pending local developments.

Cumulative Traffic Volumes

Future increases in regional traffic were estimated using forecasts from the travel demand model maintained by the Association of Monterey Bay Area Governments (AMBAG). This model includes land use and the planned roadway network for Year 2000 and Year 2025 conditions. An annual growth factor based on the projected increase in traffic on the links of the study roadway segments was applied to existing traffic volumes.

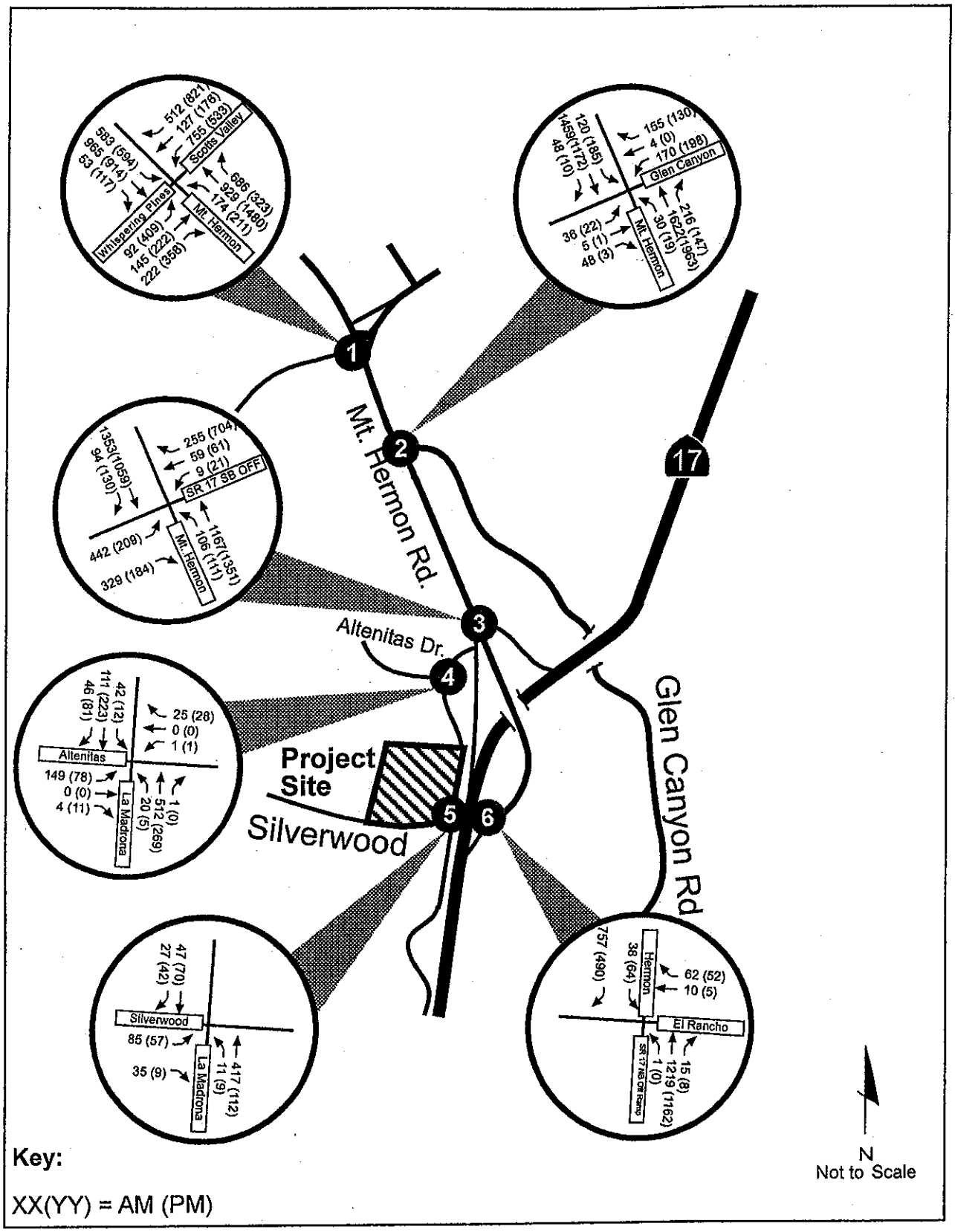
In addition, traffic from the following pending developments was added under the Cumulative Condition scenarios: Bethany College Expansion (400 students), Skypark Town Center (160,000 s.f. retail, 40,000 s.f. office, and 120 dwelling units), Polo Ranch (46 dwelling units and 2 parks), Gateway South Specific Plan (98 remaining dwelling units, 12,000 s.f. office space, and 27,000 s.f. of commercial space remaining from the originally proposed 151,000 s.f.), and various small residential developments (25 total dwelling units). The traffic volumes associated with these developments were obtained from traffic reports prepared for the developments or estimated for this analysis using standard traffic engineering practice (see Appendix E for the complete list). Because some of these developments may be included in the model forecasts, this approach is considered conservative and appropriate for environmental analysis purposes.

The traffic associated with the pending developments was added to growth factored existing volumes and volumes from approved projects to represent Cumulative No Project Conditions as shown on Figure 10. Cumulative Plus Project is represented by Cumulative No Project volumes with project-generated traffic added as shown on Figure 11.

Cumulative Intersection Levels of Service

Intersection levels of service were calculated for all of the study intersections using the traffic volumes on Figures 9 and 10. The resulting levels of service are presented in Table 17, and the corresponding LOS calculation sheets are included in Appendix B.

As shown in Table 11 under Cumulative No Project Conditions, the signalized intersection of Mt. Hermon Road/Scotts Valley Drive is projected to operate at LOS F during the PM peak hour. The Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp is also projected to deteriorate to an unacceptable level of service (LOS E) under Cumulative No Project Conditions during both peak hours.



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CUMULATIVE NO PROJECT PEAK-HOUR VOLUMES

FIGURE 9

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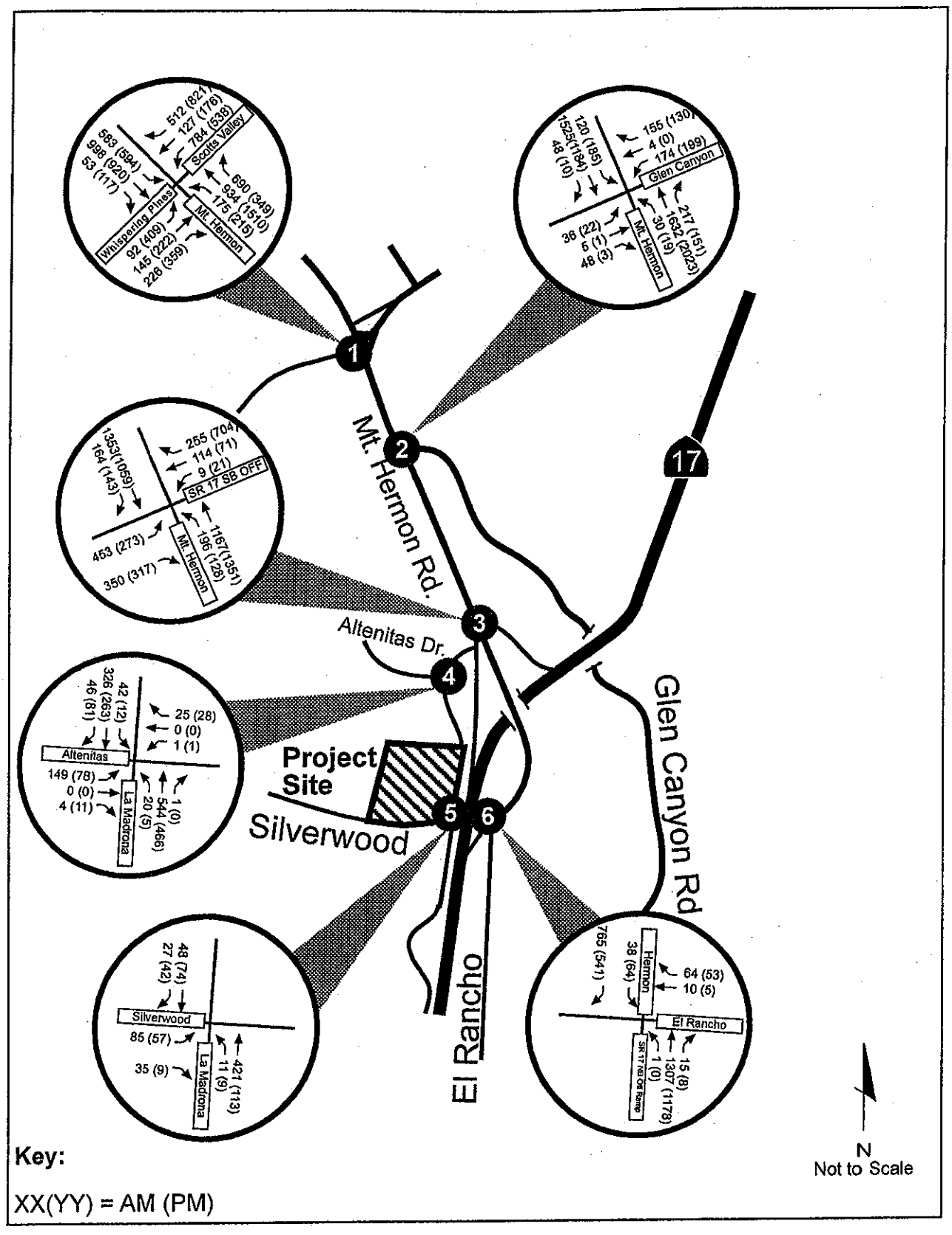

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CUMULATIVE PLUS PROJECT PEAK-HOUR VOLUMES

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FIGURE 10

Table 11

Cumulative Intersection Levels of Service

Intersection	Peak Hour	Cumulative No Project Conditions		Cumulative Plus Project Conditions	
		Intersection Delay (sec.)[1]	LOS[2]	Intersection Delay (sec.)	LOS
Mt. Hermon Rd./Scotts Valley Dr.	AM	43.3	D	46.1	D
	PM	82.4	F	84.4	F
Mt. Hermon Rd./Glen Canyon Rd.	AM	18.1	B	18.4	B
	PM	32.7	C	37.7	D
Mt. Hermon Rd./La Madrona Dr.-SR 17 SB off-ramp	AM	69.5	E	75.2	E
	PM	57.8	E	61.5	E
La Madrona Dr./Altenitas Rd.	AM	76.4	F	>100	F
	PM	19.9	C	35.2	E
La Madrona Dr./Silverwood Rd.	AM	16.7	C	16.8	C
	PM	10.6	B	10.9	B
Mt. Hermon Rd./El Rancho Dr.-SR 17 NB ramps	AM	83.5	F	98.5	F
	PM	46.9	E	51.5	F

Notes: [1] Average control delay per vehicle in seconds. Delay and LOS at unsignalized intersections are for the worst-case movement.
[2] LOS = Level of service.

Under Cumulative Plus Project Conditions, unacceptable operations at the Mt. Hermon Road/Scotts Valley Drive and the Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp intersections would be exacerbated. The Mt. Hermon Road/Glen Canyon Drive intersection is projected to degrade to LOS D during the PM peak hour with the addition of project traffic.

The project-generated traffic added to the Mt. Hermon Road/Scotts Valley Drive (during the PM peak hour) and Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp (during both peak hours) intersections under Cumulative Plus Project Conditions exacerbates unacceptable operations and increases the V/C ratio by 1 percent. Therefore, this is considered a significant cumulative impact.

Under Cumulative No Project Conditions the eastbound movement at the unsignalized intersection of La Madrona Drive/Altenitas Road is projected to operate at LOS F during the AM peak hour. The La Madrona Drive/Silverwood Road intersection is projected to operate at an acceptable level of service under Cumulative No Project Conditions. The westbound through movement at the Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps intersection is projected to continue operating at the same levels as Project Conditions for both peak hours.

The eastbound movements at the intersection of La Madrona Drive/Altenitas Road is projected to deteriorate to LOS E under Cumulative Plus Project Conditions. The eastbound movements at the La Madrona Drive/Silverwood Road intersection is projected to operate at an acceptable level of service under Cumulative Plus Project Conditions. During the PM peak hour, the westbound through movement at the Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps intersection is projected to degrade from LOS E to LOS F.

Volume warrants were analyzed to determine if signalization is warranted at the unsignalized intersections of La Madrona Drive/Altenitas Road and Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps under Cumulative Conditions. Based on the projected intersection volumes, signal warrants are not met at either of these intersections under both Cumulative No Project and Plus Project Conditions for either of the peak hours.

The project-generated traffic added to the La Madrona Drive/Altenitas Road intersection during the PM peak hour is projected to deteriorate the level of service of the eastbound movements from acceptable conditions (LOS C) under Cumulative No Project to unacceptable conditions (LOS E) under Cumulative Plus Project Conditions. However, because the intersection does not meet signal warrants the impact is considered less than significant.

The westbound through operations at the Mt. Hermon Road/El Rancho Dr-SR 17 northbound ramps under Cumulative Plus Project Conditions are projected to be exacerbated with the addition of project traffic. However, because the intersection does not meet signal warrants the impact is considered less than significant.

Cumulative Freeway Ramp Levels of Service

Similar to the intersection volumes, SR 17 freeway volumes were growth factored at between 0.57 and 0.87 (depending on direction and peak hour) percent per year based on AMBAG model forecasts. Using these volumes, cumulative freeway operations were analyzed. Table 12 presents the associated freeway ramp levels of service under this scenario without and with the proposed project. All of the ramp junctions are projected to operate at LOS D or above under Cumulative Conditions.

Table 12

Cumulative State Route 17 Merge and Diverge Levels of Service

Location and Direction	Peak Hour	Cumulative No Project Conditions		Cumulative Plus Project Conditions	
		Density[1]	LOS[2]	Density	LOS
Mt. Hermon Interchange					
Northbound Loop On-ramp	AM	30.2	D	30.2	D
	PM	26.9	C	27.4	C
Northbound Slip Off-ramp	AM	30.7	D	31.5	D
	PM	28.7	D	28.9	D
Southbound Slip On-ramp	AM	29.5	D	29.6	D
	PM	29.9	D	30.6	D
Southbound Slip Off-ramp	AM	21.6	C	22.2	C
	PM	26.7	C	26.8	C

[1] Density = passenger cars per lane mile per hour (pc/mi/hr).
[2] LOS = Level of service.

Cumulative Mitigation Measures

The cumulative impact to the Mt. Hermon Road/ Scotts Valley Drive intersection would be mitigated to a delay that is less than or equal to Cumulative No Project Conditions by providing the west leg of the intersection with two separate left-turn lanes, one through lane, and one right-turn lane. This mitigation would provide a control delay of 73.5 seconds. However, it would still operate at LOS F. Due to the projected volumes under future scenarios, it is anticipated that additional right-of-way would be required to provide the capacity to obtain LOS D operations during the PM peak hour.

The Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp cumulative impact would be mitigated with the addition of a second left-turn lane on the west leg of the intersection. Based on preliminary field measurements, this mitigation could fit in the existing right-of-way and provide LOS E and LOS D operations during the AM and PM peak hours, respectively.

The La Madrona Drive/Altenitas Road intersection would provide an acceptable level of service with the signalization of the intersection. The signalization would provide LOS B or better operations during the AM and PM peak hour. Further analysis would be required to coordinate signal timings with the Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp intersection to maximize the progression of vehicles on La Madrona Drive. However, the project and cumulative impact to this intersection is considered less than significant.

It is recommended that the project contribute a fair share percentage of the mitigation measures described under Cumulative Conditions. The percentage of project traffic at the Mt. Hermon Road/ Scotts Valley Drive intersection during the AM and PM peak hours is 1.5% and 1.2%, respectively. At the Mt. Hermon Road/La Madrona Drive-SR 17 SB off-ramp intersection the percent of project traffic during the AM and PM peak hours is 6.1% and 5.8%, respectively.