LINSCOTT LAW & GREENSPAN engineers

ISSUE SPECIFIC TRAFFIC IMPACT STUDY

# TRINITY MEADOWS

(PDS2013-MPA-13-017)

County of San Diego, California
March 1, 2016

*Prepared for the County of San Diego*

Project No. PDS2014-TM-5593; PDS2015-AD-15-036
Environmental Log No. PDS2014-ER-14-08-014

LLG Ref. 3-13-2240

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# EXECUTIVE SUMMARY

Linscott, Law & Greenspan, Engineers (LLG) has prepared the following Issue Specific Traffic Impact Analysis to evaluate the potential impacts to the local circulation system due to the proposed Trinity Meadows project (hereby referred to as the "Project"). The site is located within North County Metropolitan Subregional Plan Area (North County Metro) within the County of San Diego, in the northwest quadrant of the Bear Valley Parkway/ San Pasqual Valley Road (State Route 78) intersection.

The Project proposes to construct 22 single-family residences on a 12.5 acre parcel currently zoned within the Village Regional Category with a County of San Diego General Plan designation of Village Residential (VR-4.3) which allows 4.3 dwelling units per acre. The site is zoned Single-Family Residential (RS) and specifies minimum lots sizes of 10,000 square feet. The proposed Project is consistent with the adopted General Plan zoning. Access is proposed via a single, unsignalized intersection to Bear Valley Parkway. Left-turns in from Bear Valley Parkway are proposed via a dedicated northbound left-turn pocket; outbound left-turns would be physically restricted. These volumes would be served as U-turns by the downstream traffic signal at the Bear Valley Parkway/San Pasqual Valley Road (State Route 78) intersection.

This issue specific traffic study for Trinity Meadows is intended to provide impact analyses specific to only the residential development. The Proposed Project is calculated to generate 264 ADT, with 6 inbound and 15 outbound trips during the AM peak hour, and 18 inbound and 8 outbound trips during the PM peak hour.

The Project impacts were assessed during daily traffic conditions (ADT) along two street segments, one (1) on Bear Valley Parkway and one (1) on San Pasqual Valley Road (SR 78), both along the Project frontage. Additionally, the intersection of Bear Valley Parkway at San Pasqual Valley Road (SR 78) was selected for AM and PM peak hour analysis within the Project vicinity. Currently, Bear Valley Parkway is planned to be widened to 4.1A Major Road standards between San Pasqual Valley Road (SR 78) and Boyle Avenue. The road improvements along Bear Valley Parkway will expand the existing two (2) travel lanes of roadway to four (2) lanes. Bike lanes, sidewalks, landscaped medians and parkways, drainage improvements, waterline upgrades, and new traffic signals at realigned intersections will be installed as part of the widening project. Construction began in August 2014, with completion expected by Fall of 2016. Construction and occupancy of the proposed Project would likely occur once the widening project is complete. However, to provide a conservative analysis, Bear Valley Parkway was analyzed under both its current two-lane configuration and with the proposed widening improvements.

In addition, an unsignalized access assessment was conducted to recommend the appropriate lane configurations at the Project access and to determine if any queuing issues would be anticipated with the addition of Project traffic along Bear Valley Parkway. No operational issues were identified with the provision of a northbound dedicated left-turn into the Project access.

The analysis concludes that ***two (2) significant cumulative street segment impact***s would be calculated with the addition of Project and cumulative projects traffic, based on the County of San Diego significance criteria. Payment toward the County's Traffic Impact Fee Program would reduce these impacts to below a level of significance.

It should be noted that the impact calculated along Bear Valley Parkway assumes the two-lane configuration of the roadway. Should the widening project be completed prior to occupancy of the proposed Project, no significant impacts would occur along this segment.

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ISSUE SPECIFIC TRAFFIC IMPACT STUDY

# TRINITY MEADOWS
(PSD2013-MPA-07-013)

County of San Diego, California
March 1, 2016

## 1.0 INTRODUCTION

### 1.1 Purpose of the Report

Linscott, Law & Greenspan Engineers (LLG) has been retained to assess the traffic impacts associated with the proposed Trinity Meadows 22-unit residential development (hereby referred to as the proposed "Project"). The Project is located on approximately 12.5 acres on the northwest corner of the Bear Valley Parkway/ San Pasqual Valley Road (State Route 78) intersection in the County of San Diego.

Included in this traffic report are the following.

- Project Description
- Existing Conditions Discussion
- Analysis Approach and Methodology
- Significance Criteria
- Analysis of Existing Conditions
- Trip Generation/Distribution/Assignment
- Cumulative Projects Conditions Discussion
- Analysis of Near-Term Scenarios
- Access Assessment
- Significance of Impacts and Mitigation Measures
- References and List of Preparers and Organizations Contacted

***Figure 1–1*** shows the vicinity map. ***Figure 1–2*** shows a more detailed Project area map.

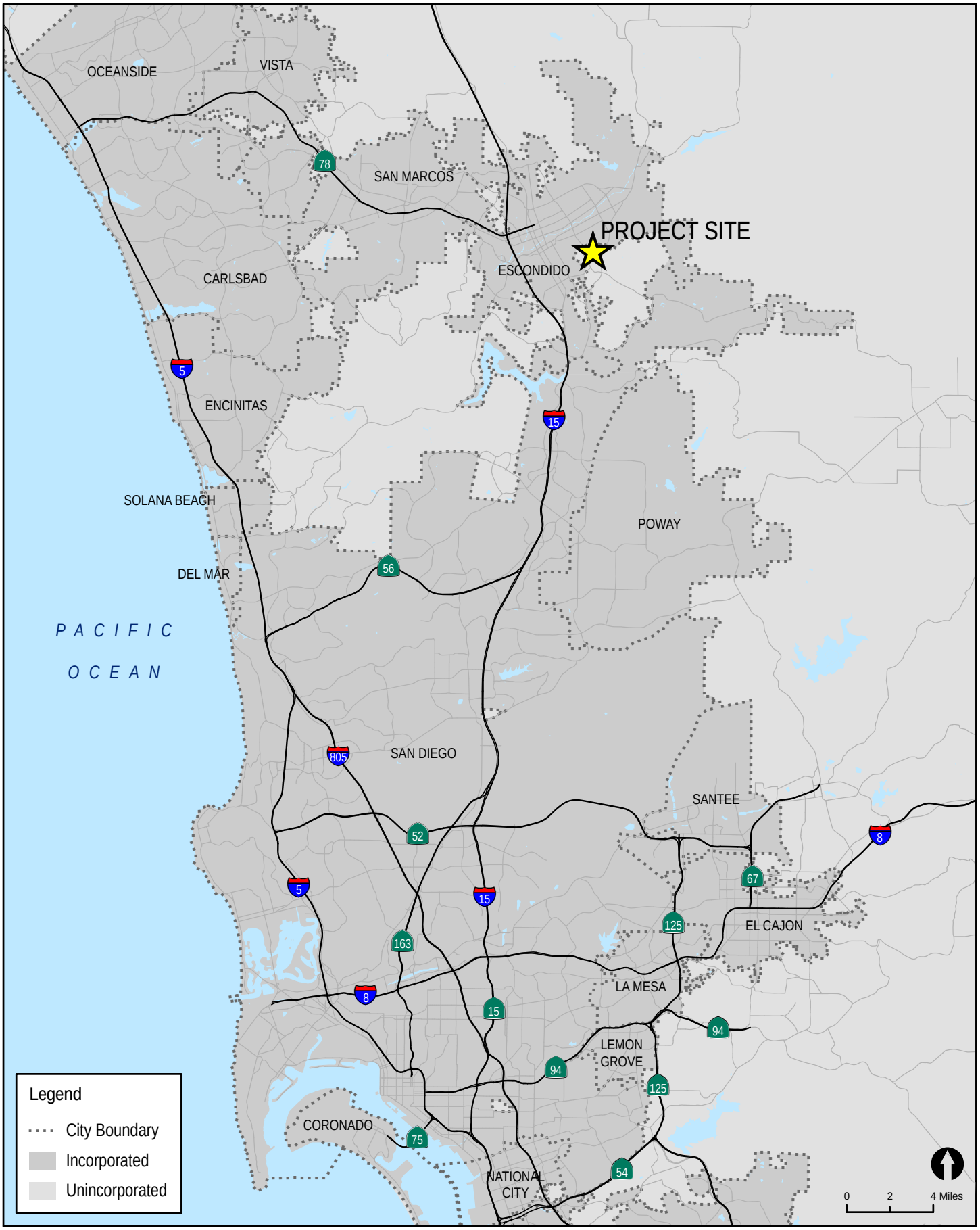


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**Figure 1-1**

# Vicinity Map

TRINITY MEADOWS

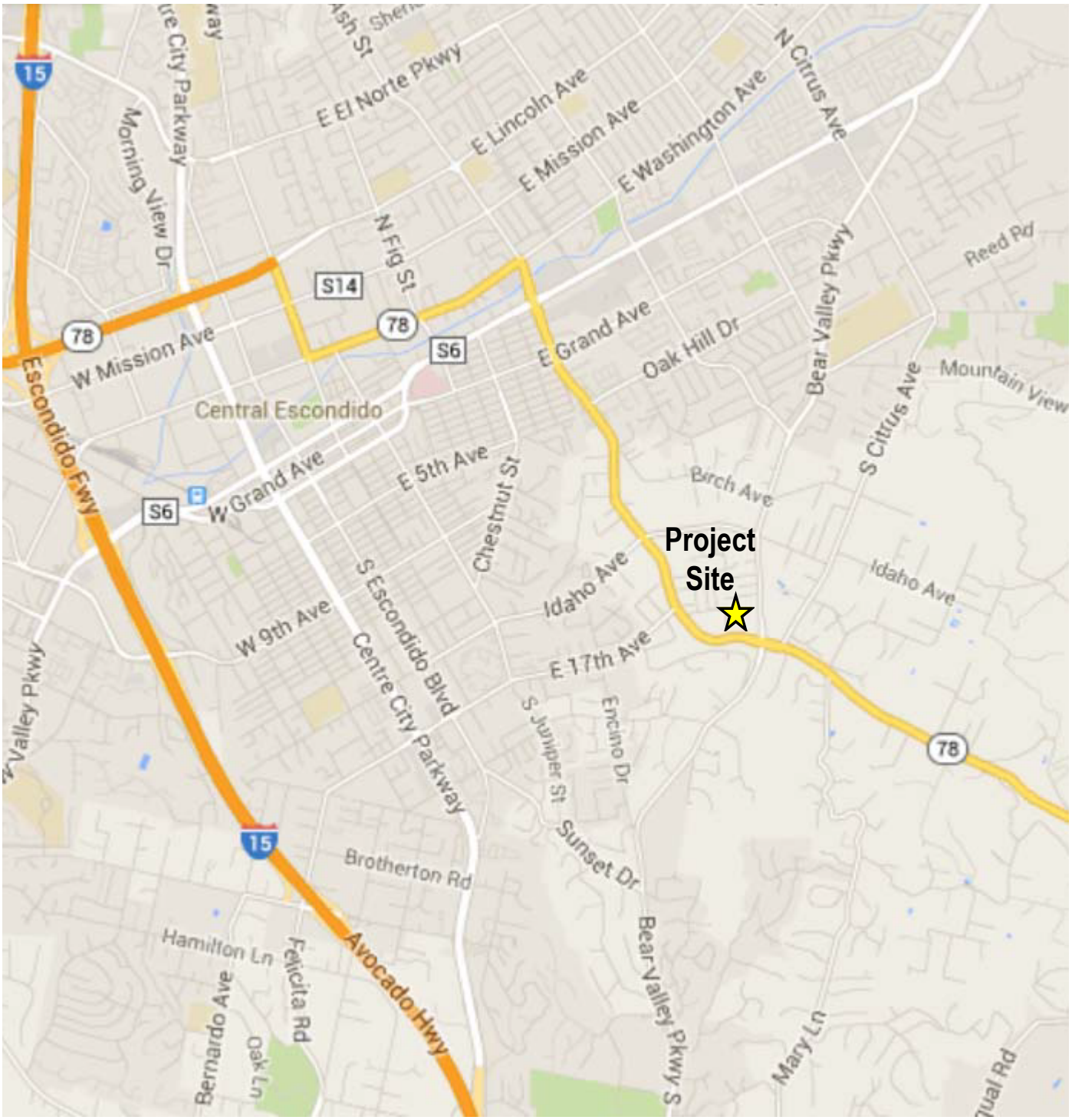


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**Figure 1-2**

## Project Area Map

TRINITY MEADOWS

# 2.0 PROJECT LOCATION AND DESCRIPTION

## 2.1 Project Location

The Trinity Meadows residential project lies within the North County Metropolitan Subregional Plan Area (North County Metro) in the County of San Diego. The Project site is situated in the northwest quadrant of the Bear Valley Parkway/ San Pasqual Valley Road (SR 78) intersection. Project access is proposed via one partial access driveway on Bear Valley Parkway. Inbound left-turns from Bear Valley Parkway would be served via a dedicated northbound left-turn lane to be provided by the Project. Outbound left-turns to Bear Valley Parkway would be restricted, and would be served as U-turns at the adjacent signalized intersection at Bear Valley Parkway/ San Pasqual Valley Road (SR 78).

## 2.2 Project Description

The Trinity Meadows development proposes to construct 22 single-family residential units on a 12.5 acre parcel currently zoned within the Village Regional Category with a County of San Diego General Plan designation of Village Residential (VR-4.3) which allows 4.3 dwelling units per acre. The site is zoned Single-Family Residential (RS) and specifies minimum lots sizes of 10,000 square feet. The proposed Project is consistent with the adopted General Plan zoning.

***Figure 2–1*** depicts the conceptual site plan.

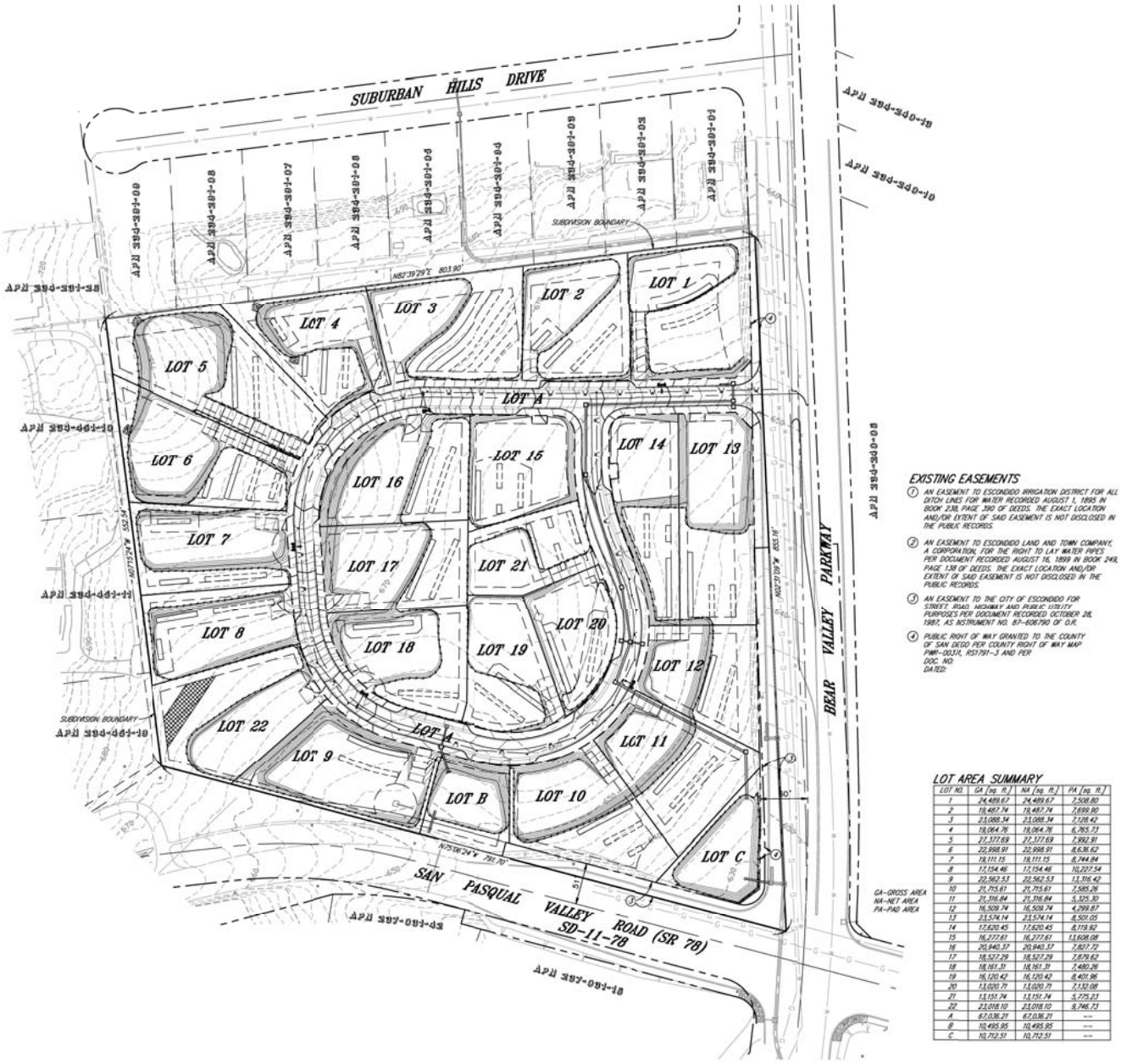


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**Figure 2-1**

# Site Plan

TRINITY MEADOWS

# 3.0 EXISTING CONDITIONS

## 3.1 Study Area

The study area locations were selected based on the direction of County staff and professional engineering judgment.

***Intersections***

1. Bear Valley Parkway/ San Pasqual Valley Road (State Route 78) – *signalized*

***Street Segments***

**Bear Valley Parkway**

1. North of the Project Driveway

**San Pasqual Valley Road (State Route 78)**

2. West of Bear Valley Parkway

## 3.2 Existing Street Network

**Bear Valley Parkway** is classified as a 4.1A Major Road with a raised median and Class I bike path on the County of San Diego General Plan Mobility Element within the County's jurisdiction. It is currently constructed as a two-lane undivided roadway from the Project access north to Boyle Avenue where it widens to four lanes within the City of Escondido's jurisdiction. South of the Project access, it is currently constructed as a two-lane undivided roadway for approximately 500 feet where it then widens to four lanes just north of its intersection with San Pasqual Valley Road (SR 78). A Class I bike path is provided and parking is restricted along both sides of the roadway. Sidewalks, curbs and gutters are not provided. The posted speed limit varies between 40-50 miles per hour (mph).

Since the segment of Bear Valley Parkway from the Project access south to the signalized intersection at San Pasqual Valley Road (SR 78) is only a short 500-foot section, operations along this segment of the roadway are more effectively measured by the intersection operations. Therefore, this report analyzes the greater segment of Bear Valley Parkway north of the Project access.

Due to the high speed limit along this roadway, the increased shoulder width along the east side of the roadway, and a paved road surfacing that varies upwards to 40-feet, the study area segment of Bear Valley Parkway currently functions as a 2.1E Community Collector with an LOS E capacity of 16,200 average daily trips (ADT).

*Bear Valley Parkway Widening Project*

According the City of Escondido Five-Year Capital Improvement Program and Budget, Fiscal Years 2010/2011-2014/15 as well as the County of San Diego Top Capital Improvement Projects, Bear Valley Parkway is proposed to be widened to four lanes. Per the County of San Diego Department of Public Works website as of February 2016, right-of-way acquisition for this improvement has

been completed and construction commenced in August 2014. The Bear Valley Parkway North Widening Project will widen Bear Valley Parkway from a two-lane road to a four-lane road from San Pasqual Valley Road (SR 78) to just north of Boyle Avenue connecting to the existing four-lane road within the City of Escondido's jurisdiction. Bike lanes, sidewalks, landscaped medians and parkways, drainage improvements, waterline upgrades, and new traffic signals at realigned intersection will be installed as part of the project. Funding sources for this project include TransNet, Proposition 1B bonds, and a contribution from the City of Escondido for work within their jurisdiction. Construction completion is estimated for Fall 2016.

It is possible that construction and occupancy of the proposed Project could occur following the completion of the road widening. However, the estimated Fall 2016 schedule only serves as a guideline for the completion of the project and an exact construction schedule has yet to be determined. Therefore, the analysis provided in this report uses both the existing two-lane configuration on the ground today, and the four-lane improved capacity in the street segment analysis for Bear Valley Parkway. See *Section 4.1* for further details. ***Appendix A*** provides more detailed information on the Bear Valley Parkway widening project.

**San Pasqual Valley Road (State Route 78)** is a state-owned facility maintained by Caltrans. It is classified as a 4.1B Major Road with intermittent turn lanes and Class II bike lanes on the County of San Diego General Plan Mobility Element from Birch Road to Bear Valley Parkway within the County's jurisdiction. It is currently constructed as a two-lane undivided roadway east of E. 17th Avenue for approximately 0.40 miles where it widens to four lanes just west of its intersection with Bear Valley Parkway. A Class III bike route is provided and parking is restricted along both sides of the roadway. Sidewalks, curbs and gutters are not provided. The posted speed limit is 45 mph.

Due to the high speed limit along this roadway and the 40-foot paved road surfacing width, this portion of San Pasqual Valley Parkway (SR 78) currently functions as a 2.1E Community Collector with an LOS E capacity of 16,200 average daily trips (ADT).

***Figure 3–1*** depicts the existing traffic conditions and the study area intersection and street segments graphically.

## 3.3 Existing Traffic Volumes

Weekday AM/PM peak hour intersection turning movement and bi-directional daily traffic counts were conducted in June of 2013 and February and March of 2014. The peak hour counts were conducted between the hours of 7:00-9:00 AM and 4:00-6:00 PM and daily segment counts were collected over a 24-hour period.

***Table 3–1*** is a summary of the average daily traffic volumes (ADTs). ***Appendix B*** contains manual count sheets.

TABLE 3–1
EXISTING TRAFFIC VOLUMES

| Street Segment | ADT [a] | Date | Source |
|---|---|---|---|
| **Bear Valley Parkway** | | | |
| 1. North of the Project Access | 14,780 | June 2013 | LLG |
| **San Pasqual Valley Road (SR 78)** | | | |
| 2. West of Bear Valley Parkway | 14,880 | March 2014 | LLG |

***Footnotes:***

a. Average Daily Traffic Volumes.

***Figure 3–2*** depicts the peak hour intersection turning movement and 24-hour segment volumes at the study area intersection and segments.

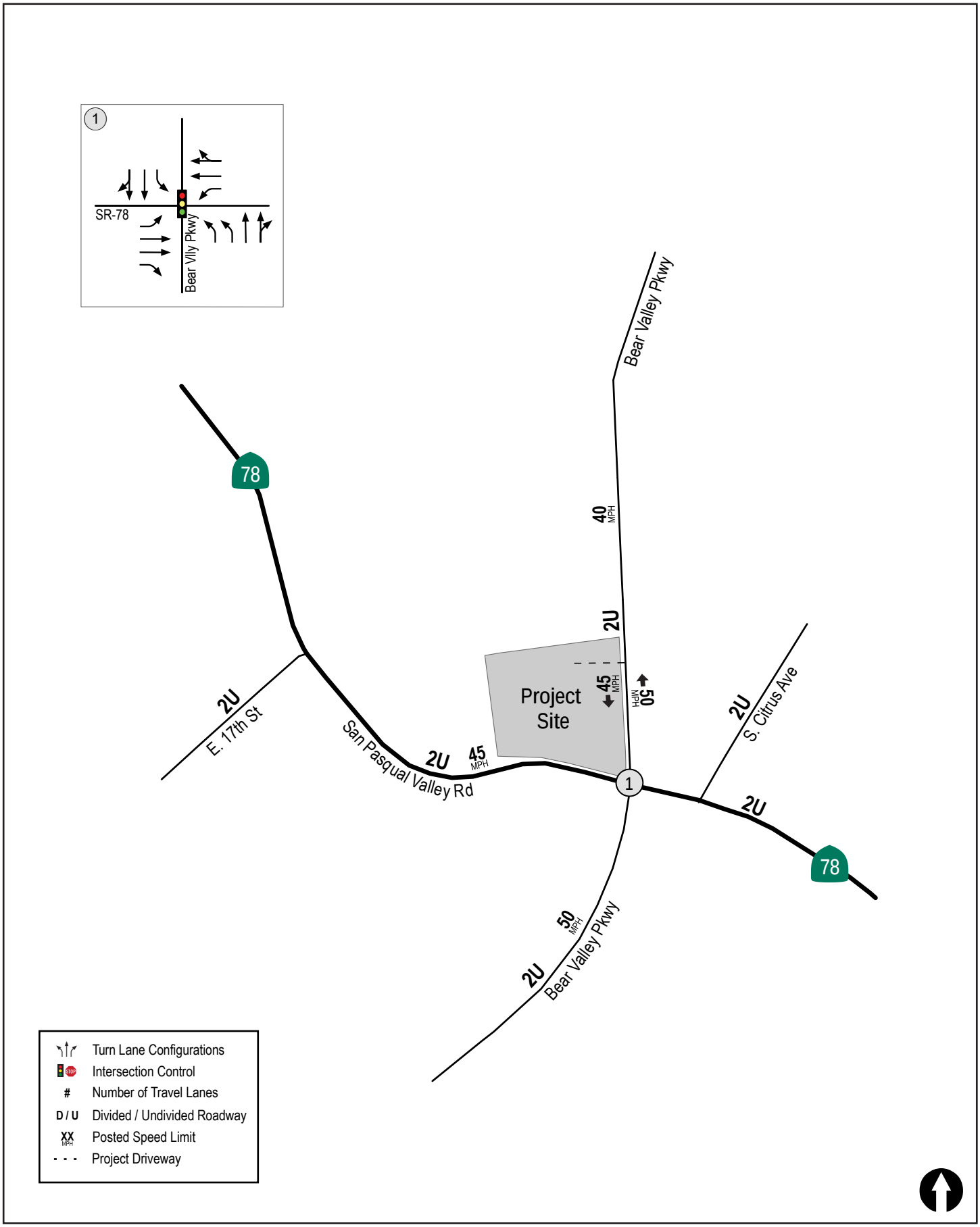


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**Figure 3-1**

## Existing Conditions Diagram

TRINITY MEADOWS

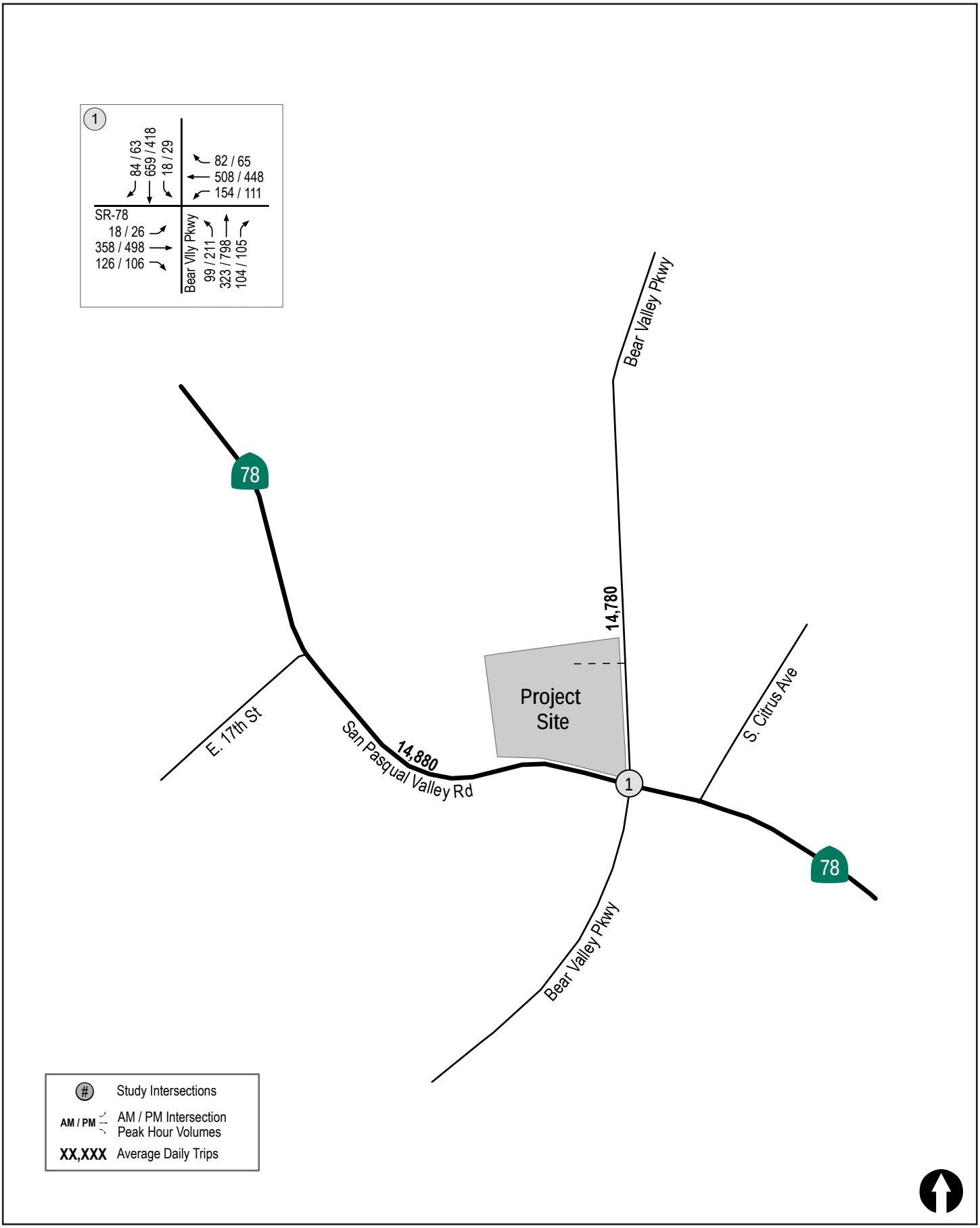


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**Figure 3-2**

## Existing Traffic Volumes

TRINITY MEADOWS

# 4.0 ANALYSIS APPROACH AND METHODOLOGY

## 4.1 Analysis Approach

The peak hour intersection and daily street segment analyses presented in this report was conducted for *Existing, Existing + Project, and Existing + Project + Cumulative Projects* conditions. The proposed Project conforms to the designated General Plan land uses for the subject site. Therefore, an analysis of the Year 2030 Buildout conditions was not included. ***Table 4–1*** lists the scenarios analyzed in this report.

TABLE 4–1
ANALYSIS SCENARIOS

| Scenario |
|---|
| ***Existing & Near-Term Conditions*** |
| ▪ Existing<br>▪ Existing + Project<br>▪ Existing + Project + Cumulative Projects |

***Existing*** conditions represents the existing on-the-ground network and traffic volume conditions.

***Existing + Project*** conditions represents the operations of the existing street network with the addition of the total traffic generated by 22 single-family residences.

***Existing + Project + Cumulative Projects*** conditions represents the time period in which the Project would be expected to be built and fully occupied. Under such conditions, it would be expected that other nearby development or infrastructure projects would contribute to growth in the area which would increase the overall traffic volumes in the area. The time period for the cumulative condition was assumed to be five (5) years into the future. *Section 8.0* discusses cumulative conditions in greater detail.

As mentioned earlier in *Section 3.2*, the Bear Valley Parkway Widening Project is fully funded and proposes a construction completion date for Fall 2016. It is possible that the projected completion date for the widening project could occur prior to the completion of the proposed Project. It was therefore decided to provide two (2) analyses the Bear Valley Parkway. Both the existing two-lane 16,200 ADT capacity configuration and the four-lane 37,000 ADT capacity configuration were included in the segment analysis provided in this report.

## 4.2 Methodology

Level of service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads. It is a qualitative measure used to describe a quantitative analysis taking into account factors such as roadway geometries, signal phasing, speed, travel delay, freedom to maneuver, and safety. LOS provides an index to the

operational qualities of a roadway segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. LOS designation is reported differently for signalized intersections, unsignalized intersections, and roadway segments.

### 4.2.1 *Intersections*

***Signalized intersections*** were analyzed under AM and PM peak hour conditions. Average vehicle delay was determined utilizing the methodology found in Chapter 18 of the *2010 Highway Capacity Manual (HCM),* with the assistance of the *Synchro* computer software. The delay values (represented in seconds) were qualified with a corresponding intersection Level of Service (LOS).

***Unsignalized intersections*** were analyzed under AM and PM peak hour conditions. Average vehicle delay and Levels of Service (LOS) was determined based upon the procedures found in Chapter 19 of the *2010 Highway Capacity Manual (HCM),* with the assistance of the *Synchro* computer software.

### 4.2.2 *Street Segments*

Street segment analysis is based upon the comparison of average daily traffic volumes (ADTs) to the County of San Diego *Roadway Classification, Level of Service, and ADT Table*. This table provides segment capacities for different street classifications based on traffic volumes and roadway characteristics. A copy of the County of San Diego capacity table is attached in ***Appendix C.***

# 5.0 SIGNIFICANCE CRITERIA

The following criterion was utilized to evaluate potential significant impacts based on the County's document, *Guidelines for Determining Significance*, February 19, 2010.

## 5.1 County of San Diego

### 5.1.1 *Intersections*

This section provides guidance for evaluating adverse environmental effects a project may have on signalized and unsignalized intersections. ***Table 5–1*** summarizes significant project impacts for signalized and unsignalized intersections.

TABLE 5–1
ALLOWABLE INCREASES ON CONGESTED INTERSECTIONS

| Level of service | Signalized | Unsignalized |
|---|---|---|
| LOS E | Delay of 2 seconds or less | 20 or less peak hour trips on a critical movement |
| LOS F | Either a Delay of 1 second, or 5 peak hour trips or less on a critical movement | 5 or less peak hour trips on a critical movement |

***General Notes:***

1. A critical movement is an intersection movement (right-turn, left-turn, through-movement) that experiences excessive queues, which typically operate at LOS F.
2. By adding proposed project trips to all other 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 is responsible for mitigating its share of the cumulative impact.
3. 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.
4. For determining significance at signalized intersections with LOS F conditions, the analysis must evaluate both the delay ***and*** the number of trips on a critical movement, exceedance of either criteria result in a significant impact.

***Signalized Intersections—***Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant traffic volume or LOS traffic impact on a signalized intersection:

- The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a signalized intersection currently operating at LOS E or LOS F, or will cause a signalized intersection to operate at a LOS E or LOS F as identified in *Table 5–1*.
- Based upon an evaluation of existing accident rates, the signal priority list, intersection geometrics, proximity of adjacent driveways, sight distance, or other factors, the project would significantly impact the operations of the intersection.

***Unsignalized Intersections—***The operating parameters and conditions for unsignalized intersections differ dramatically from those of signalized intersections. Very small volume increases on one leg or turn and/or through movement of an unsignalized intersection can substantially affect the calculated delay for the entire intersection. Significance criteria for unsignalized intersections are based upon a minimum number of trips added to a critical movement at an unsignalized intersection.

Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant traffic impact on an unsignalized intersection as listed in *Table 5–1* and described as text below:

- The additional or redistributed ADT generated by the proposed project will add 21 or more peak hour trips to a critical movement of an unsignalized intersection, and cause an unsignalized intersection to operate below LOS D, or
- The additional or redistributed ADT generated by the proposed project will add 21 or more peak hour trips to a critical movement of an unsignalized intersection currently operating at LOS E, or
- The additional or redistributed ADT generated by the proposed project will add 6 or more peak hour trips to a critical movement of an unsignalized intersection, and cause the unsignalized intersection to operate at LOS F, or
- The additional or redistributed ADT generated by the proposed project will add 6 or more peak hour trips to a critical movement of an unsignalized intersection currently operating at LOS F, or
- Based upon an evaluation of existing accident rates, the signal priority list, intersection geometrics, proximity of adjacent driveways, sight distance, or other factors, the project would significantly impact the operations of the intersection.

### 5.1.2 *Street Segments*

Pursuant to the County's General Plan Mobility Element, new development must provide improvements or other measures to mitigate traffic impacts to avoid:

- Reduction in LOS below "C" for on-site Mobility Element roads;
- Reduction in LOS below "D" for off-site and on-site abutting Mobility Element roads; and
- "Significantly impacting congestion" on roads that operate at LOS "E" or "F". If impacts cannot be mitigated, the project cannot be approved unless a statement of overriding findings is made pursuant to the State CEQA Guidelines. The Mobility Element, however, does not include specific guidelines for determining the amount of additional traffic that would "significantly impact congestion" on such roads.

The County has created the following guidelines to evaluate likely traffic impacts of a proposed project for road segments and intersections serving that project site, for purposes of determining whether the development would "significantly impact congestion" on the referenced LOS E and F roads. The guidelines are summarized in ***Table 5–2***. The thresholds in *Table 5–2* are based upon average operating conditions on County roadways. It should be noted that these thresholds only establish general guidelines, and that the specific project location must be taken into account in conducting an analysis of traffic impact from new development.

TABLE 5–2
ALLOWABLE INCREASES ON CONGESTED ROAD SEGMENTS
(MOBILITY ELEMENT ROAD SEGMENTS)

| Level of Service | Two-Lane Road | Four-Lane Road | Six-Lane Road |
|---|---|---|---|
| LOS E | 200 ADT | 400 ADT | 600 ADT |
| LOS F | 100 ADT | 200 ADT | 300 ADT |

***General Notes:***

1. By adding proposed project trips to all other trips from a list of projects, this same table must be used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project that contributes additional trips must mitigate a share of the cumulative impacts.
2. 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.

***On-site Mobility Element Roads—***The General Plan Mobility Element Policy 2.1 (ME Policy 2.1) states that "new development shall provide needed roadway expansion and improvements on-site to meet demand created by the development, and to maintain LOS C on Mobility Element Roads during peak traffic hours". Pursuant to this policy, a significant traffic impact would result if:

- The additional or redistributed ADT generated by the proposed land development project will cause on-site Mobility Element Roads to operate below LOS C during peak traffic hours except within the Otay Ranch and Harmony Grove Village plans as specified in the previously adopted general plan's PFE, Implementation Measure 1.1.2.

***Off-Site Circulation Element Roads—*** ME Policy 2.1 also addresses offsite *Mobility Element* roads. It states that "new development shall provide off-site improvements designed to contribute to the overall achievement of LOS D on Mobility Element Roads." ME Policy 2.1 addressed projects that would significantly impact congestion on roads operating at LOS E or F. It states, "new development that would significantly impact congestion on roads operating at LOS E or F, either currently or as a result of the project, will be denied unless improvements are scheduled to attain a LOS to D or better or appropriate mitigation is provided." In circumstances in which appropriate mitigation is not feasible, the project can only be approved if "a specific statement of overriding findings is made pursuant to" the State CEQA Guidelines. The following significance guidelines define a method for evaluating whether or not increased traffic volumes generated or redistributed from a proposed project will "significantly impact congestion" on County roads, operating at LOS E or F, either currently or as a result of the project.

Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant traffic volume or LOS impact on a road segment:

- The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a Mobility Element Road or State Highway currently operating at LOS E or LOS F, or will cause a Mobility Element Road or State Highway to operate at a LOS E or LOS F as a result of the proposed project as identified in Table 5–1, or
- The additional or redistributed ADT generated by the proposed project will cause a residential street to exceed its design capacity.

# 6.0 ANALYSIS OF EXISTING CONDITIONS

The analysis of existing conditions includes the assessment of the study area intersection and street segments. As previously mentioned, the widening of Bear Valley Parkway to 4.1A Major Road standards is fully funded and began construction in August 2014 with a completion date of Fall 2016. It is possible that construction and occupancy of the proposed Project could occur following the completion of the road widening. Therefore, two (2) analyses of Bear Valley Parkway at its current two-lane configuration and improved four-lane configuration were included in this study.

## 6.1 Peak Hour Intersection Operations

***Table 6–1*** summarizes the existing intersection level of service. As seen in *Table 6–1*, the study area intersection of Bear Valley Parkway at San Pasqual Valley Road (SR 78) is calculated to currently operate at LOS D/D during the AM/PM peak hours.

***Appendix D*** contains the Existing intersection analysis worksheets.

TABLE 6–1
EXISTING INTERSECTION OPERATIONS

| Intersection | Control Type | Peak Hour | Existing | |
|---|---|---|---|---|
| | | | Delay [a] | LOS [b] |
| 1. Bear Valley Parkway/ San Pasqual Valley Road ( SR 78) | Signal | AM<br>PM | 38.8<br>43.1 | D<br>D |

***Footnotes:***
a. Average delay expressed in seconds per vehicle.
b. Level of Service.

SIGNALIZED

DELAY/LOS THRESHOLDS

| Delay | LOS |
|---|---|
| 0.0 ≤ 10.0 | A |
| 10.1 to 20.0 | B |
| 20.1 to 35.0 | C |
| 35.1 to 55.0 | D |
| 55.1 to 80.0 | E |
| ≥ 80.1 | F |

## 6.2 Daily Street Segment Operations

***Table 6–2*** summarizes the existing roadway segment operations. As seen in *Table 6–2*, LOS E operations area calculated on the study area segment of San Pasqual Valley Road (SR 78).

Bear Valley Parkway is calculated to currently operate at LOS E under its current two-lane configuration, however it improves to LOS A operations as a four-lane roadway.

TABLE 6–2
EXISTING STREET SEGMENT OPERATIONS

| Street Segment | Functional Classification | Capacity (LOS E) [a] | ADT [b] | LOS [c] |
|---|---|---|---|---|
| **Bear Valley Parkway** | | | | |
| 1. North of the Project Access | 2.1E Community Collector | 16,200 | 14,780 | E |
| | *4.1A Major Road* | *37,000* | *14,780* | *A* |
| **San Pasqual Valley Road (SR 78)** | | | | |
| 2. West of Bear Valley Pkwy | 2.1E Community Collector | 16,200 | 14,880 | E |

***Footnotes:***

a. Capacity based on County of San Diego Roadway Classification Table.
b. ADT - Average Daily Traffic Volumes.
c. LOS - Level of Service.

# 7.0 PROJECT TRIP GENERATION, DISTRIBUTION, AND ASSIGNMENT

The following is a discussion of the trip generation calculations, regional trip distribution, and assignment of project traffic throughout the study area.

## 7.1 Project Trip Generation

As previously mentioned, the Project is proposing to develop 22 single-family residences on approximately 12.5 vacant acres. Using the San Diego Association of Governments (SANDAG) published trip generation rates, the Project would be expected to generate 264 average daily trips (ADT) with 21 AM peak hour trips (6 inbound/15 outbound) and 26 PM peak hour trips (18 inbound/ 8 outbound). ***Table 7–1*** shows the trip generation calculations.

TABLE 7–1
PROJECT TRIP GENERATION

| Land Use | Size | Daily Trip Ends (ADTs) [a] | | Peak Hour | % of ADT [b] | In:Out | Volume | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Rate [b] | Volume | | | Split [b] | In | Out | Total |
| Single-Family Estate Residential | 22 DU | 12 /DU | 264 | AM | 8% | 3:7 | 6 | 15 | 21 |
| | | | | PM | 10% | 7:3 | 18 | 8 | 26 |

***Footnotes:***

a. ADT = Average Daily Traffic.
b. Rates taken from the SANDAG *(Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region*, April 2002.

***General Notes:***

1. DU = dwelling units

## 7.2 Project Trip Distribution and Assignment

Project trip distribution was based on a combination of observed traffic patterns from existing intersection counts, the location of commercial, work-related, and school land uses, and professional engineering judgment. It was determined that 15% of Project trips would generally be oriented to the north on Bear Valley Parkway and 85% to the south. From the San Pasqual Valley Road (SR 78) intersection, 15% of trips would be expected to be oriented to/from the west, 2% to/from the east, and the remaining 68% would be expected to be oriented to/from the south along Bear Valley Parkway.

***Figure 7–1*** depicts the Project Traffic Distribution, ***Figure 7–2*** depicts the Project Traffic Assignment, and ***Figure 7–3*** depicts the Existing + Project Traffic Volumes.

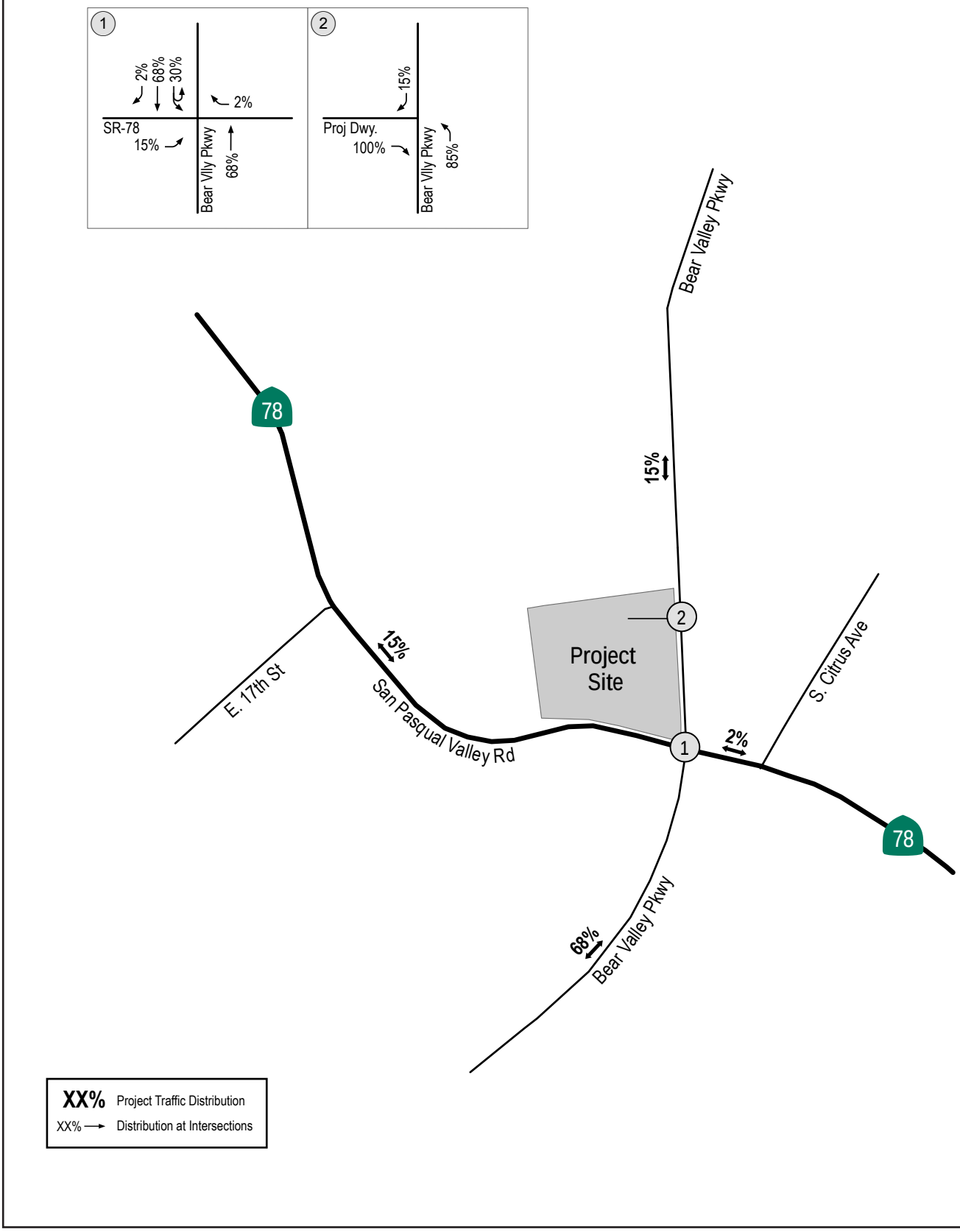


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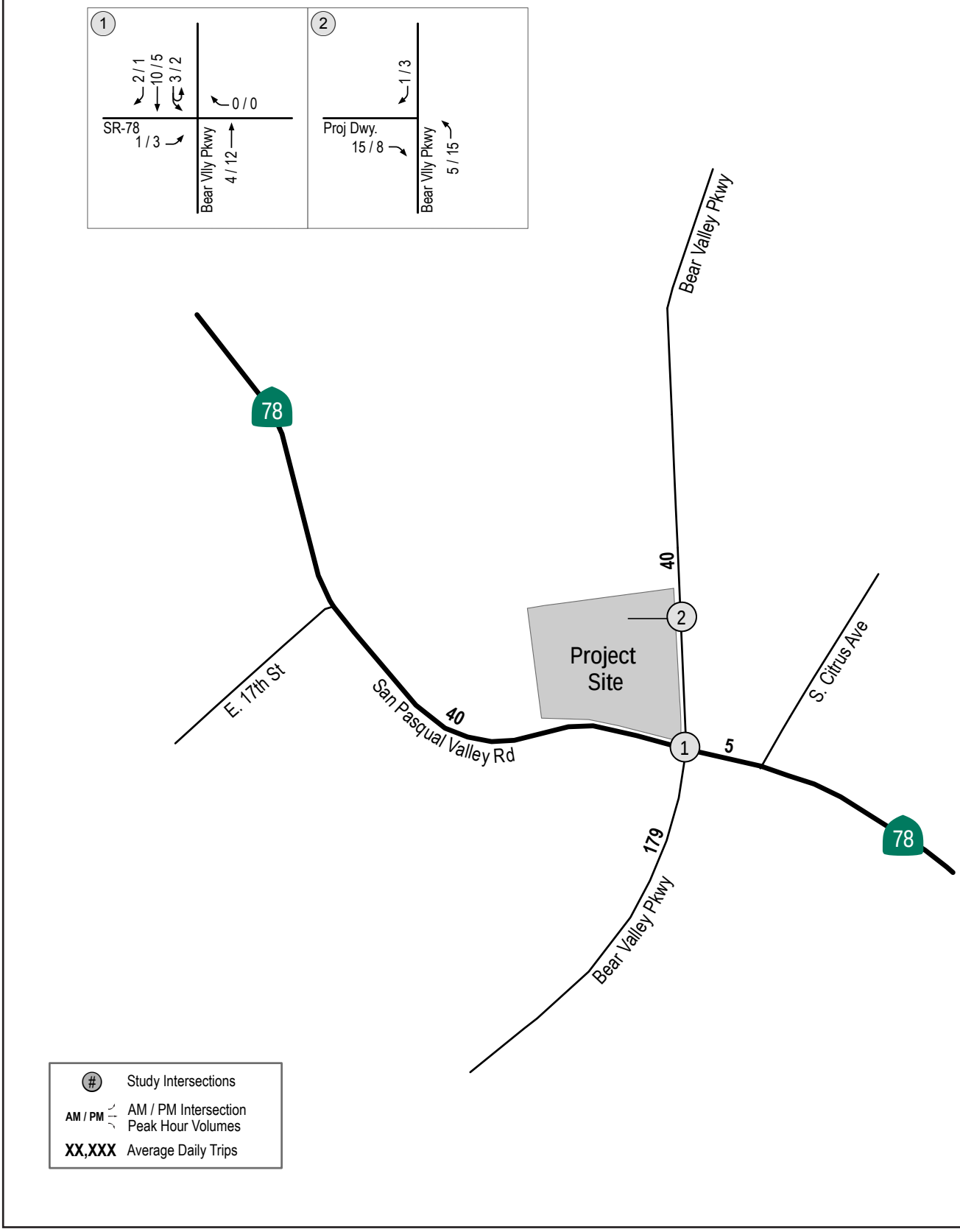
**Figure 7-1**

## Project Traffic Distribution

TRINITY MEADOWS




LINSCOTT LAW & GREENSPAN engineers

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**Figure 7-2**

## Project Traffic Volumes

TRINITY MEADOWS

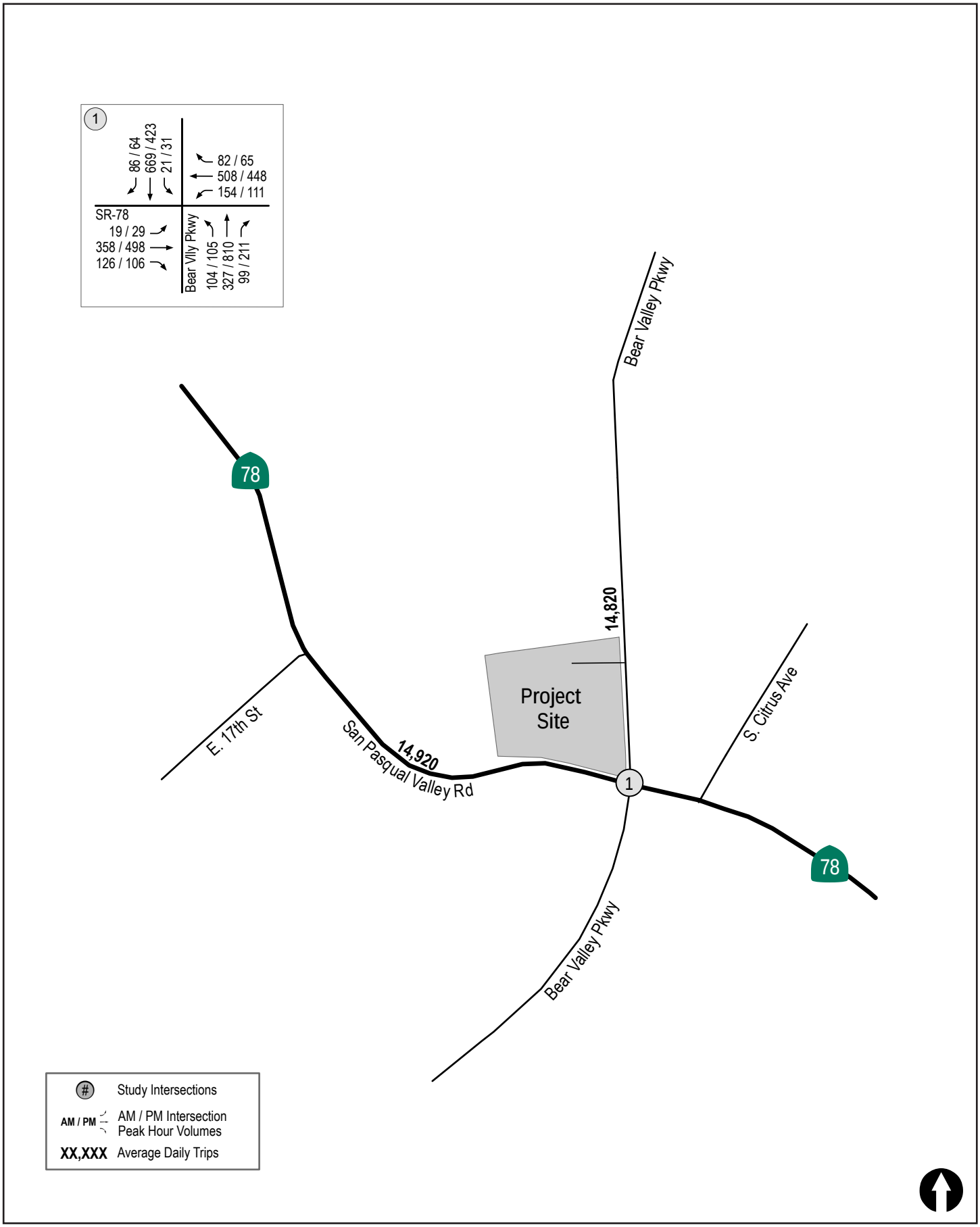


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**Figure 7-3**

## Existing + Project Traffic Volumes

TRINITY MEADOWS

# 8.0 CUMULATIVE PROJECTS CONDITIONS

There are other planned projects in the vicinity, which could potentially add traffic to the roadways and intersections in the study area. LLG coordinated with County of San Diego and City of Escondido staff to identify other development projects in the study area that may contribute cumulative traffic to local intersections and segments. Upon review, LLG determined that the one (1) known cumulative project had entered the tentative map planning stage within the area.

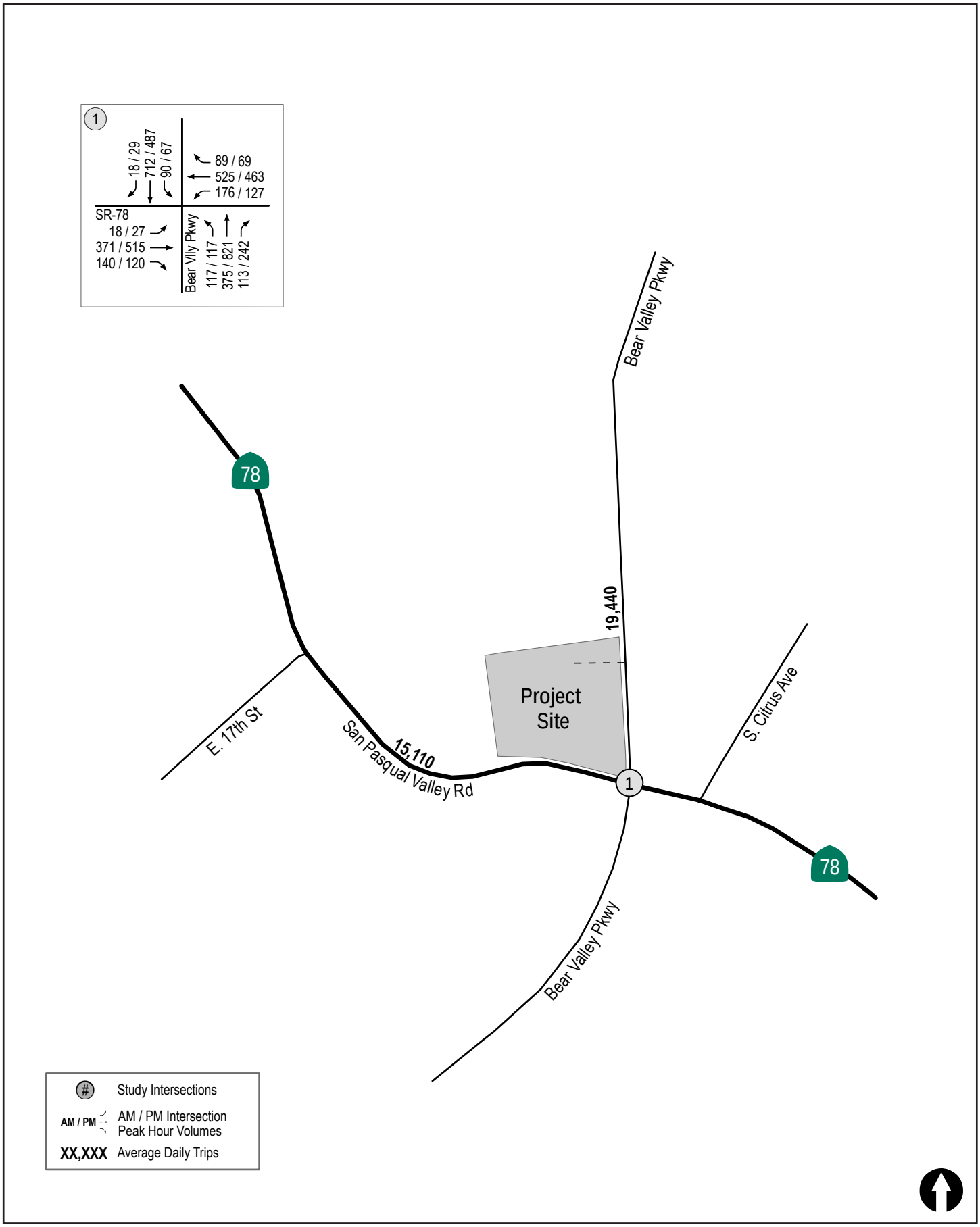
In addition to the traffic generated by the individually assigned cumulative project, for purposes of being conservative and to account for any future unforeseen projects, a growth factor was also applied to existing traffic volumes. To forecast *Existing + Cumulative Projects* traffic conditions, a review of the County General Plan Mobility Element Year 2030 traffic volumes was conducted. Based on the interpolated growth between existing Year 2014 traffic counts and Year 2030 forecast volumes, a steady annual growth rate ranging from 1-6% was observed at the study area intersection and street segments over a 16-year period. Location-specific growth factors were applied to each study area location for a period of five (5) years in combination with the cumulative project assignment to arrive at *Existing + Cumulative Projects* baseline conditions.

The following is a brief description of the one (1) cumulative project individually assigned to the street system:

1. ***661 Bear Valley Parkway:*** The proposed project would construct 62 new single-family detached residences on a 40.88 acre parcel located east of Bear Valley Road, across from Encino Drive in the City of Escondido. The residential lots would have an average lot size of approximately 9,500 square feet, with approximately 20.7 acres of the parcel devoted to open space and recreation. The site is designated for Estate II residential land uses in the City of Escondido General Plan (2012), which allows for up to two (2) dwelling units per acre (du/ac). The gross density of the Project site would be 1.5 du/ac. The project is expected to generate 620 ADT with 45 AM peak hour trips and 64 PM peak hour trips.

***Figure 8–1*** depicts the *Existing + Cumulative Projects* traffic volumes and ***Figure 8–2*** depicts the *Existing + Project + Cumulative Projects* traffic volumes.

***Appendix E*** contains the cumulative project information and traffic volume forecast worksheets.

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Date: 03/17/14

**Figure 8-1**

## Existing + Cumulative Projects Traffic Volumes

TRINITY MEADOWS

Therefore, significant cumulative impacts would be expected to occur on San Pasqual Valley Road (SR 78) and on Bear Valley Parkway under the current two-lane configuration with the addition of Project and cumulative projects traffic.

Again, with the completion of the Bear Valley Parkway Widening Project prior to occupancy of the proposed Project (c. 2016), operations would be expected to improve to LOS B and no significant cumulative impacts would occur along this segment.

TABLE 9–1
NEAR-TERM INTERSECTION OPERATIONS

| Intersection | Control Type | Peak Hour | Existing | | Existing + Project | | | Existing + Cumulative Projects + Project | | | Impact Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Delay[a] | LOS[b] | Delay | LOS | Δ[d] | Delay | LOS | Δ | |
| 1. Bear Valley Parkway/ San Pasqual Valley Road (SR 78) | Signal | AM | 38.8 | D | 39.2 | D | 0.4 | 42.9 | D | 3.7 | None |
| | | PM | 43.1 | D | 43.7 | D | 0.6 | 48.5 | D | 4.8 | None |

***Footnotes:***
a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. "Δ" denotes the Project-induced increase in delay for signalized intersections.

SIGNALIZED

DELAY/LOS THRESHOLDS

| Delay | LOS |
|---|---|
| 0.0 ≤ 10.0 | A |
| 10.1 to 20.0 | B |
| 20.1 to 35.0 | C |
| 35.1 to 55.0 | D |
| 55.1 to 80.0 | E |
| ≥ 80.1 | F |

TABLE 9–2
NEAR-TERM STREET SEGMENT OPERATIONS

| Street Segment | Functional Classification | Capacity (LOS E) [a] | Existing | | Existing + Project | | | Existing + Project + Cumulative Projects | | | Impact Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ADT [b] | LOS [c] | ADT | LOS | Δ [d] | ADT | LOS | Δ [e] | |
| **Bear Valley Parkway** | | | | | | | | | | | |
| 1. North of the Project Access | 2.1E Community Collector | 16,200 | 14,780 | E | 14,820 | E | 40 | **19,480** | **F** | **4,700** | **Cumulative** |
| | *4.1A Major Road* | *37,000* | *14,780* | *A* | *15,044* | *B* | – | *19,704* | *B* | – | *None* |
| **San Pasqual Valley Road (SR 78)** | | | | | | | | | | | |
| 1. West of Bear Valley Pkwy | 2.1E Community Collector | 16,200 | 14,880 | E | 14,920 | E | 40 | **15,150** | **E** | **270** | **Cumulative** |

***Footnotes:***

a. Capacities based on County of San Diego Roadway Classification Table.
b. ADT - Average Daily Traffic Volumes.
c. LOS - Level of Service.
d. "Δ" denotes the Project-induced increase in ADT for segments operating at LOS E or F only.
e. "Δ" denotes the Project and Cumulative Projects-induced increase in ADT for segments operating at LOS E or F only.

***General Notes:***

1. **Bold** typeface and shading indicate a significant

# 10.0 ACCESS ASSESSMENT

This section has been prepared to evaluate the proposed access configuration and provide recommendations based on the results of the assessment. The Project proposes full access to the site via Bear Valley Parkway for the development of 22 single-family residences. In order to analyze the proposed access, the following data was collected:

- Speed Data on Bear Valley Parkway
- Sight Distance Observations
- Buildout General Plan Traffic Volume Forecasts

The following is an assessment of the Project access.

## 10.1 Existing Speeds


The posted speed limit on southbound Bear Valley Parkway is 40 mph along the Project frontage. South of the San Pasqual Valley Road (SR 78) intersection, the speed increases to 50 mph. In the northbound direction, the speed limit is 50 mph up to the northern boundary of the site where it reduces to 40 mph. LLG commissioned a 24-hour speed study on Tuesday, June 25, 2013 at the location of the proposed driveway (within the 50 mph speed limit). In the southbound direction, the observed 85$^{th}$ percentile speed was 44.2 mph with an average speed of 39.4 mph. In the northbound direction, the observed 85$^{th}$ percentile speed was 42.1 mph with an average speed of 34.5 mph.

***Table 10–1*** summarizes the speeds.

TABLE 10–1
DESIGN SPEED & OBSERVED SPEEDS

| Location | Direction | Design Speed (mph) | Observed Speed [a] (mph) | |
|---|---|---|---|---|
| | | | 85$^{th}$ Percentile | Average |
| Bear Valley Parkway / Project Driveway | Northbound | 50 | 42.1 | 34.5 |
| | Southbound | 40 | 44.2 | 39.4 |

***Footnotes:***

a. Speed survey completed Tuesday June 25, 2013.

## 10.2 Existing Sight Distance

A field review was conducted to assess existing conditions at the proposed Project access driveway. At the proposed access, Bear Valley Parkway is constructed as a two-lane undivided roadway with a double-yellow striped median. Comparable residential driveways and feeder roads north of San Pasqual Valley Road (SR 78) are able to complete all turning movements on and off Bear Valley Parkway with similar intersection geometry as the proposed. With the existing geometry configuration, left-turns would be allowed in and out of the site. ***Photographs 1*** and ***2*** indicate the existing conditions.

- **Photo 1** depicts a view of the proposed Project access driveway from southbound Bear Valley Parkway looking south. The proposed driveway would be located south of the observed telephone pole.


- **Photo 2** depicts a view of the proposed Project access driveway from northbound Bear Valley Parkway looking north. The proposed driveway would be located south of the observed telephone pole.

LLG reviewed the corner sight distance at the subject driveway. Corner sight distance is provided at intersections to allow drivers (at the Project driveway) a sufficient view of the intersecting roadway to decide when to proceed. Corner sight distance standards published in the Caltrans Highway Design Manual (HDM) are slightly more conservative than those of the County. Therefore, Table 405.1A, Corner Sight Distance (7½ Second Criteria) of the HDM, was used to evaluate the corner sight distance. The HDM guidelines are included in ***Appendix H.***

The HDM standards indicate that for a speed limit of 40 and 50 mph, the required corner sight distance is 440 and 550 feet, respectively. Bear Valley Parkway is constructed with relatively no vertical or horizontal curves along the Project frontage. As observed in the field, sight distance in excess of 550' is available at the Project driveway in both the northbound and southbound directions. Therefore, the required corner sight distance is met at the proposed Project access driveway location.

***Table 10–2*** shows a summary of the corner sight distance review.

TABLE 10–2
CORNER SIGHT DISTANCE REVIEW – PROJECT ACCESS DRIVEWAY

| Location | Direction | Design Speed (mph) | Minimum Required Sight Distance [a] (ft) | Observed Sight Distance | Requirement Met? |
|---|---|---|---|---|---|
| Bear Valley Parkway / Project Driveway | Northbound | 50 | 550' | >550' | Yes |
| | Southbound | 40 | 440' | >440' | Yes |

***Footnotes:***

a. Speed survey completed Tuesday June 25, 2013.
b. Although the observed 85th percentile speed on southbound Bear Valley Parkway was more than 40 mph, thus indicating an increased minimum sight distance closer to 495', since there is an observed sight distance in excess of 440', adequate sight distance is provided.

## 10.3 Mobility Element Roads – Supplemental Information Conformance

Section 4.4-A.3 of the County of San Diego's Mobility Element ("*Mobility Element Roads – Supplemental Information"*) states that for a Major Road such as Bear Valley Parkway, *"Access is controlled with new development required to provide access roads, common driveways and signalized intersections. Residential lots are required to be served from interior residential roads."* The proposed design is consistent with this supplemental information. The proposed homes do not front on Bear Valley Parkway, but instead abut an interior residential road which collects traffic and provides a single intersection to the Major Road. This interior residential road will not be restricted to residents only, and will be open to the public. As such, a median opening is warranted (section 5.10-E.1 of the County's Mobility Element), however this median opening will be restricted to prohibit outbound left-turns to northbound Bear Valley Parkway.

No median break at the Project access road would cause the higher inbound left-turning trips from Bear Valley Parkway to utilize downstream public intersections such as Suburban Hills Drive to make northbound to southbound U-turns. U-turns take longer to execute than left-turns, thereby

exposing drivers to on-coming vehicles for a longer duration of time. Suburban Hills Drive is further disadvantaged by the fact that there currently is not a northbound left-turn pocket. The safest and most efficient access is via a median break allowing northbound left-turns into the Project site.

Restricted inbound left-turns would also have an effect on fire/EMS response. The Project team has discussed the proposed partial access with fire department representatives, and they concur with the proposed design allowing inbound left-turns. Were the median break not provided, it was stated that first responders arriving from south of the site (San Pasqual station) would actually drive northbound on Bear Valley Parkway on the southbound shoulder, which is not desirable. Year 2030 General Plan Traffic Volumes & Conditions

## 10.4 Year 2030 General Plan Traffic Volumes & Conditions

The Project site is designated in the County of San Diego General Plan Land Use Element as Village Residential: VR-4.3. This allows for a maximum of 4.3 dwelling units (DU) per gross acre. The Project is proposing about 1.6 DU per acre. Therefore, the Project is consistent with the General Plan.

The future regional traffic volumes were taken from the County of San Diego General Plan Update EIR Year 2030 Planning Commission Recommended LOS and Volume Plot, North County Metro B Area, September 3, 2010. The traffic volumes from this model were used in the classification of Mobility Element roadways and include all County General Plan land use and network conditions. Since the Project is consistent with the General Plan land use, traffic volumes generated by the Project would be included in the baseline Year 2030 traffic volumes.

In order to forecast the Year 2030 peak hour volumes at the Project driveway, peak hour turning movement volumes were forecasted at the Bear Valley Parkway/ San Pasqual Valley Road (SR 78) intersection. These volumes were estimated from future ADT volumes using the relationship between existing peak hour turning movements and the existing ADT volumes. This same relationship can be assumed to generally continue in the future. The north/south through volumes arrive at and departing from the Bear Valley Parkway/ San Pasqual Valley Road (SR 78) intersection were assigned to the north/south movements at the Project driveway.

***Figure 10–1*** displays the Year 2030 traffic volumes.

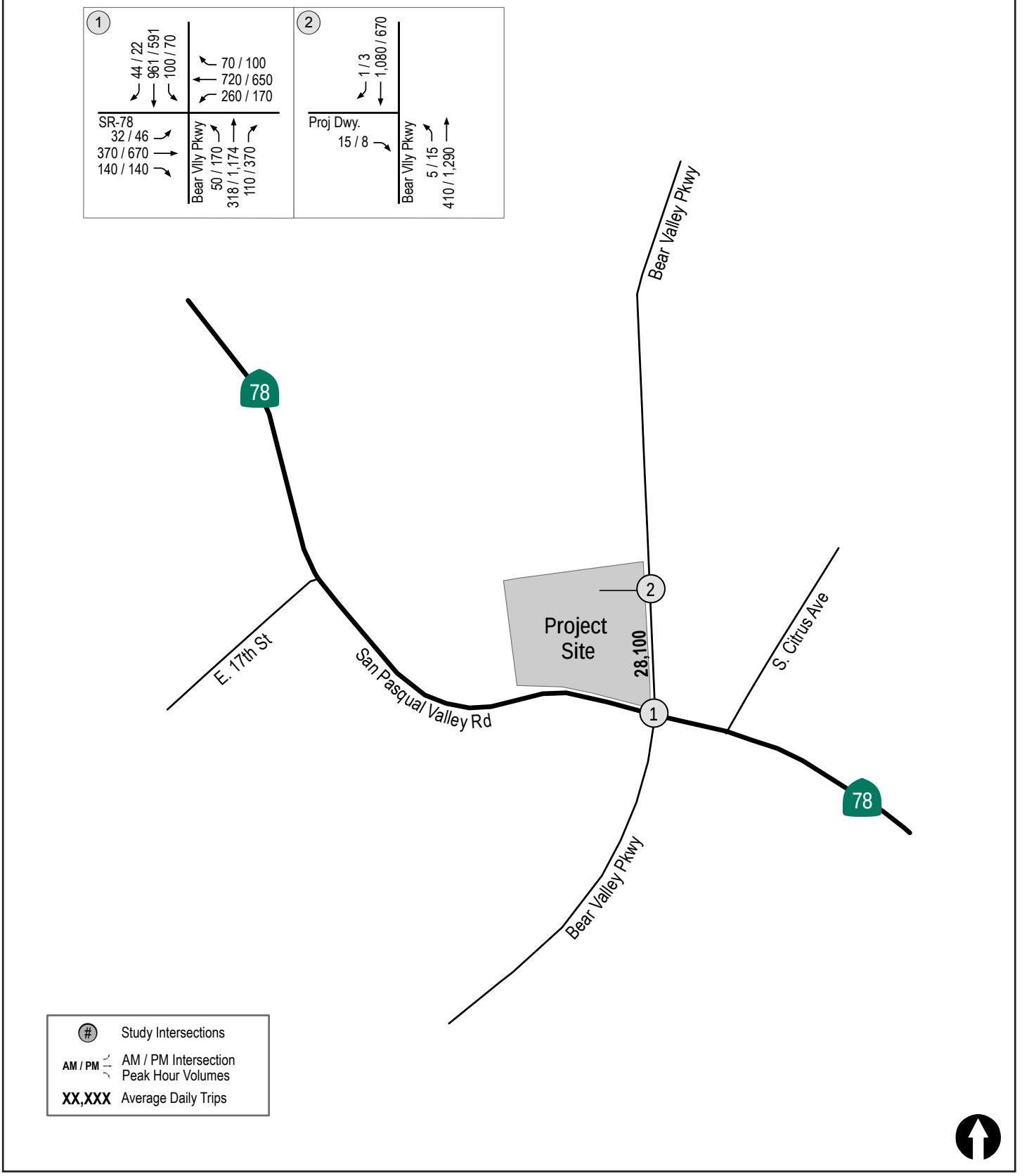


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**Figure 10-1**

# Year 2030 Traffic Volumes

TRINITY MEADOWS

## 10.5 Capacity Analysis

### 10.5.1 *Peak Hour Intersection Analysis*

The Project proposes to provide a partial access driveway on Bear Valley Parkway near the northern site border. The Project driveway was analyzed under Year 2030 General Plan AM and PM peak hour conditions using the proposed four-lane configuration along Bear Valley Parkway which is anticipated to be completed prior to Year 2030. Northbound left-turning movements were assumed to complete their maneuver from a dedicated northbound left-turn lane while waiting for a gap in southbound oncoming traffic; removed from the flow of northbound thru traffic. Left-turning traffic exiting the site would travel southbound to the signalized intersection of Bear Valley Parkway/ San Pasqual Valley Road (SR 78), where they would make a southbound to northbound U-turn. The peak hour demand for this movement is a very low (2 AM/ 1 PM peak hour trips).

Based on the results of the analysis, the free northbound left-turn movement is calculated to operate at acceptable LOS B/A conditions during the AM/PM peak hours. The adjacent signalized intersection will continue to operate at acceptable LOS D or better. ***Table 10–3*** shows the results of the analysis. ***Appendix I*** contains the unsignalized intersection analysis worksheets.

TABLE 10–3
INTERSECTION OPERATIONS

| Intersection | Movement | Control Type | Peak Hour | GP Year 2030 | |
|---|---|---|---|---|---|
| | | | | Delay [a] | LOS [b] |
| Bear Valley Parkway/ Project Access | NBL | Uncontrolled | AM<br>PM | 10.3<br>9.2 | B<br>A |
| Bear Valley Parkway/ San Pasqual Valley Road (SR 78) | – | Signal | AM<br>PM | 29.3<br>51.1 | C<br>D |

***Footnotes:***

a. Average delay expressed in seconds per vehicle.
b. Level of Service. See table at right for delay thresholds.

***General Notes***

1. GP = General Plan
2. EB = Eastbound shared left/right-turn movement.
3. NBL = Northbound left-turn movement.

| SIGNALIZED | | UNSIGNALIZED | |
|---|---|---|---|
| DELAY/LOS THRESHOLDS | | DELAY/LOS THRESHOLDS | |
| Delay | LOS | Delay | LOS |
| 0.0 ≤ 10.0 | A | 0.0 ≤ 10.0 | A |
| 10.1 to 20.0 | B | 10.1 to 15.0 | B |
| 20.1 to 35.0 | C | 15.1 to 25.0 | C |
| 35.1 to 55.0 | D | 25.1 to 35.0 | D |
| 55.1 to 80.0 | E | 35.1 to 50.0 | E |
| ≥ 80.1 | F | ≥ 50.1 | F |

### 10.5.2 *Peak Hour Queuing Assessment*

As shown above in *Table 10–3*, the northbound left-turn movement experiences little to no delay in completing the turn movement into the Project site. The *Synchro* software does not report queue lengths for free movements such as the northbound left-turn lane in question. However, it should be noted that the same parameters utilized in a gap analysis, which quantifies queue lengths, are

factored into the LOS results of the intersection analysis. For example, the northbound left-turn delay of at most 10.3 seconds (LOS B), shown in *Table 10–3* above, included gap analysis factors such as "available critical gap time" and "follow-up time". Thus, there is congruency expected between the *HCM* analysis and the gap analysis.

According to Chapter 19 of the *HCM* 2010, the amount of time needed for the left-turn movement to cross two lanes of southbound traffic is 6.3 seconds (4.1 seconds "critical gap time" + 2.2 seconds "follow-up time"). Based on the Project trip generation, the maximum number of northbound left-turning vehicles would be 16 inbound trips in the PM peak hour. Over the course of the hour, this equates to approximately 1 vehicle every 4 minutes. It can therefore be concluded that no queuing issues would be expected given the sufficient amount of time (4 minutes = 240 seconds) for vehicles to complete this movement.

### 10.5.3 *Daily Street Segment Analysis*

Street segment analysis is based upon the comparison of average daily traffic volumes (ADTs) to the County of San Diego *Roadway Classification, Level of Service, and ADT Table*. This table provides segment capacities for different street classifications, based on traffic volumes and roadway characteristics. Bear Valley Parkway is classified as a 4.1A Major Road on the General Plan Mobility Element. Under Year 2030 conditions, this roadway would have an increased capacity from 16,200 ADT to 37,000 ADT.

Based on the results of the capacity analysis, Bear Valley Parkway along the Project frontage is calculated to operate at acceptable LOS C conditions on a daily basis. ***Table 10–4*** shows the results of the analysis.

TABLE 10–4
STREET SEGMENT OPERATIONS

| Street Segment | GP Classification | GP Capacity (LOS E) [a] | GP Year 2030 (With Project) | |
|---|---|---|---|---|
| | | | ADT [b] | LOS [c] |
| Bear Valley Pkwy along the Project Frontage | 4.1A Major Road w/ Raised Median | 37,000 | 28,100 | C |

***Footnotes:***

a. Capacity based on County of San Diego Roadway Classification Table.
b. ADT - Average Daily Traffic Volumes.
c. LOS - Level of Service.

***General Notes***

1. GP = General Plan

## 10.6 Access Summary

Based on a review of the existing prevailing speeds and existing and required sight distance for the proposed driveway, adequate sight distance would be provided in both the northbound and southbound directions.

The proposed Project is consistent with the General Plan land use designation, conforms to Mobility Element recommendations, and has been included in the forecast traffic volumes modeled for the future classification of Mobility Element roadways. As shown in the peak hour intersection and daily street segment analyses, adequate LOS operations are calculated under Year 2030 General Plan buildout conditions along Bear Valley Parkway and at the Project access. In addition, no excessive queues would be expected for the northbound left-turn movement into the Project site.

## 10.7 Recommendations

Although no significant operational deficiencies were calculated with the addition of Project traffic, the following access-related improvements are recommended:

1. The eastbound approach should be placed under stop-sign control, with outbound left-turning vehicles physically restricted.
2. County of San Diego sight distance standards for outbound vehicles turning onto northbound and southbound Bear Valley Parkway should be met at the Project driveway. (Minimum 440' looking southbound and 550' looking northbound).
3. The location of the Project driveway centerline should be a minimum of 300' from the centerline of adjacent intersections.
4. Since the proposed driveway location is near a utility pole, the nearest edge of the driveway or curb opening should be at least three (3) feet from the utility pole.
5. Although no capacity-related deficiencies or queuing issues were calculated at the Project driveway under Year 2030 conditions in both the AM and PM peak hours, it is recommended that a dedicated northbound left-turn lane be provided on Bear Valley Parkway at the Project driveway. This will require the widening of this portion of Bear Valley Parkway by approximately 12 feet to accommodate a left-turn pocket 50' in length with a 90' bay taper.

   With the increase in traffic volumes expected along Bear Valley Parkway under Year 2030 General Plan buildout conditions, the provision of this left-turn pocket would provide a refuge lane for left-turning vehicles, thus improving the flow of northbound thru traffic and reducing the potential for vehicular conflict due to the slowing of northbound traffic.

# 11.0 SUMMARY OF SIGNIFICANT IMPACTS, MITIGATION MEASURES, AND PROJECT DESIGN FEATURES

Per the County's significance thresholds and the analysis methodology presented in this report, ***two (2) significant cumulative street segment impacts*** were calculated within the study area. The following section lists the significant cumulative impacts and provides recommendations for mitigation measures to address operating deficiencies. No direct impacts are calculated with the proposed Project.

## 11.1 Street Segments

### 11.1.1 *Significant Impacts Prior to Mitigation*

Based on the County of San Diego significance criteria, ***two (2) cumulative street segment impacts*** are calculated on study area roadways.

***Street Segments***

1. Bear Valley Parkway North of the Project Access
2. San Pasqual Valley Road (SR 78) West of Bear Valley Parkway

### 11.1.2 *Mitigation Measures and Design Considerations*

The County Board of Supervisors adopted a Transportation Impact Fee (TIF) ordinance, which provides a mechanism for the County to obtain funding to mitigate anticipated cumulative transportation/circulation impacts, by requiring payment of an impact fee designated in the ordinance. The County updated the TIF Program in December 2012. The TIF Program identifies transportation facilities needed to address cumulative impacts within designate areas of the County (TIF Areas) and then provides for payment of fees to cover a project's "fair share" of the cost. TIF fees are segregated by TIF Area and are used to help fund transportation improvements within that Area. The Project is located within the North County Metropolitan Subregional TIF Area. The Project should pay the appropriate TIF for impacted locations identified in the TIF Program.

***Street Segments***

1. **Bear Valley Parkway North of the Project Access** – Payment toward the County's TIF Program would mitigate this cumulative impact to below a level of significance.
2. **San Pasqual Valley Road (SR 78) West of Bear Valley Parkway** – Payment toward the County's TIF Program would mitigate this cumulative impact to below a level of significance.

As mentioned throughout this report, with the completion of the Bear Valley Parkway Widening Project prior to occupancy of the proposed Project (c. 2016), operations along this segment would improve to LOS B conditions in the near-term and LOS C conditions in the Year 2030. Therefore, no significant impacts would occur along this segment.

# 12.0 REFERENCES AND LIST OF PREPARERS AND ORGANIZATIONS CONTACTED

## 12.1 References

The following references were utilized in preparing this Traffic Impact Study.


- *Highway Capacity Manual (HCM)* 2010
- *SANDAG (Not So) Brief Guide of Vehicular Traffic Generation Rates for the San Diego Region,* April 2002.
- *County of San Diego Guidelines for Determining Significance—Transportation and Traffic*, modified August 24, 2011.
- *County of San Diego Traffic Report Format & Content Requirements*, modified August 24, 2011.
- County of San Diego Transportation Impact Fee, TIF Program Update December 31, 2012


## 12.2 List of Preparers

John Keating, P.E., Principal—Linscott, Law & Greenspan, Engineers

Chris Mendiara, Associate Principal—Linscott, Law & Greenspan, Engineers

Amy Downing, P.E., Transportation Engineer II—Linscott, Law & Greenspan, Engineers

José Nuñez, Transportation Planner II —Linscott, Law & Greenspan, Engineers

## 12.3 Organizations Contacted

County of San Diego, Department of Public Works Environmental Services

City of Escondido, Department of Public Works

City of Escondido, Planning Division

# APPENDIX A

## BEAR VALLEY PARKWAY WIDENING PROJECT
## FACT SHEET

LINSCOTT LAW & GREENSPAN engineers

TECHNICAL APPENDICES

# TRINITY MEADOWS

(PDS2013-MPA-13-017)

County of San Diego, California
March 1, 2016

*Prepared for the County of San Diego*

LLG Ref. 3-13-2240

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# Department of Public Works

## Bear Valley Parkway North Widening Project

## Entering Hard Hat Zone

"Safety First" is not just a slogan used in meetings, but it is implemented in every phase of project construction. For instance, crews are currently digging trenches to remove the old gas pipeline and place new storm drain pipes along the west side of the roadway, and are incorporating safety practices while they excavate soil and remove heavy infrastructure.

Crews have worked in open trenches, lifted and moved pipelines weighing many tons, and delivered large amounts of soil and asphalt onto and off of the project site. All of these activities require advanced planning, coordination, and communication to safely complete on the project site. Crews maintain safety on and off the project site with these efforts...

**Read More**

## Project Description & Purpose

The Bear Valley Parkway North Widening Project will widen the current two-lane road to a four-lane from San Pasqual Valley Road (SR-78) to just north of Boyle Avenue, and connect to the existing four-lane road within the City of Escondido to the north. Bike lanes, sidewalks, landscaped medians and parkways, drainage improvements, waterline upgrades, and new traffic signals at realigned intersections

## Project Benefits

- Reduce traffic congestion and improve traffic flow for commuters, which can reduce air pollution.
- Intersection enhancements will improve safety for motorists.
- Pedestrians will benefit from the addition of new sidewalks and safe crossings and bicyclist safety will be improved with new designated bike lanes.
- Undergrounding overhead utilities and new water-efficient landscaping will enhance the aesthetics of the roadway.

## Project Questions / Concerns

Mark Perrett, CIP Project Manager Project

**Mark.Perrett@sdcounty.ca.gov**

Hotline: (760) 630-ROAD (7623)

**Project Information Links**

**Project Traffic Switch Advisory Updates October 2015**

**Project Updates**

**October 2015 |**

will also be installed. Overhead utilities will be undergrounded. The new roadway will conform to the County's General Plan Mobility Element classification as a Major Road and Bicycle Route.

## Project Funding

Funding sources include Transnet, Proposition 1B bonds, and a contribution from the City of Escondido for work within their jurisdiction.

## Construction Schedule

| | |
|---|---|
| Right-of-Way acquisition | Complete |
| Construction Start | August 2014 |
| Construction Complete | Fall 2016 |

**July 2015 | June 2015 | May 2015 | April 2015 | March 2015 | February 2015 | January 2015 | December 2014 | November 2014 | September 2014**

# APPENDIX B

## INTERSECTION AND SEGMENT MANUAL COUNT SHEETS

# Turn Count Summary

Accurate Video Counts Inc
info@accuratevideocounts.com
(619) 987-5136

***Location:*** SR 78 @ Bear Valley Parkway

***Date of Count:*** *Tuesday, June 25, 2013*

***Analysts:*** *LV/CD*

***Weather:*** *Sunny*

***AVC Proj No:*** *13-0080*

LINSCOTT LAW & GREENSPAN engineers

# Vehicular Count

**Accurate Video Counts Inc**
**info@accuratevideocounts.com**
**(619) 987-5136**

AVC

***Location:*** SR 78 @ Bear Valley Parkway

| AM Period (7:00 AM - 9:00 AM) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Southbound | | | Westbound | | | Northbound | | | Eastbound | | | |
| | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | TOTAL |
| 7:00 AM | 4 | 181 | 1 | 29 | 107 | 5 | 8 | 34 | 9 | 2 | 58 | 26 | 464 |
| 7:15 AM | 15 | 174 | 7 | 33 | 117 | 8 | 2 | 52 | 15 | 5 | 57 | 25 | 510 |
| 7:30 AM | 8 | 196 | 7 | 50 | 122 | 6 | 7 | 55 | 16 | 8 | 60 | 22 | 557 |
| 7:45 AM | 24 | 195 | 7 | 26 | 138 | 19 | 16 | 55 | 15 | 5 | 60 | 22 | 582 |
| 8:00 AM | 15 | 135 | 8 | 35 | 109 | 9 | 6 | 38 | 13 | 2 | 73 | 24 | 467 |
| 8:15 AM | 11 | 129 | 7 | 33 | 106 | 4 | 16 | 62 | 13 | 3 | 67 | 15 | 466 |
| 8:30 AM | 12 | 148 | 8 | 34 | 115 | 10 | 13 | 63 | 9 | 4 | 96 | 21 | 533 |
| 8:45 AM | 19 | 125 | 6 | 31 | 129 | 9 | 15 | 71 | 16 | 5 | 89 | 29 | 544 |
| Total | 108 | 1,283 | 51 | 271 | 943 | 70 | 83 | 430 | 106 | 34 | 560 | 184 | 4,123 |

AM Intersection Peak Hour : **7:15 AM - 8:15 AM** Intersection PHF : **0.91**

| | Southbound | | | Westbound | | | Northbound | | | Eastbound | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | |
| Volume | 62 | 700 | 29 | 144 | 486 | 42 | 31 | 200 | 59 | 20 | 250 | 93 | 2,116 |
| PHF | 0.65 | 0.89 | 0.91 | 0.72 | 0.88 | 0.55 | 0.48 | 0.91 | 0.92 | 0.63 | 0.86 | 0.93 | 0.91 |
| Movement PHF | | 0.88 | | | 0.92 | | | 0.84 | | | 0.92 | | 0.91 |

| PM Period (4:00 PM - 6:00 PM) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Southbound | | | Westbound | | | Northbound | | | Eastbound | | | |
| | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | TOTAL |
| 4:00 PM | 10 | 100 | 6 | 20 | 105 | 12 | 31 | 192 | 48 | 3 | 110 | 25 | 662 |
| 4:15 PM | 18 | 106 | 7 | 22 | 115 | 18 | 31 | 183 | 46 | 5 | 129 | 13 | 693 |
| 4:30 PM | 15 | 112 | 7 | 15 | 129 | 12 | 27 | 183 | 44 | 9 | 104 | 33 | 690 |
| 4:45 PM | 7 | 96 | 4 | 25 | 99 | 12 | 30 | 225 | 48 | 2 | 126 | 20 | 694 |
| 5:00 PM | 11 | 91 | 3 | 25 | 117 | 16 | 21 | 215 | 57 | 8 | 119 | 16 | 699 |
| 5:15 PM | 15 | 121 | 3 | 22 | 117 | 17 | 26 | 201 | 45 | 8 | 104 | 23 | 702 |
| 5:30 PM | 11 | 109 | 6 | 24 | 108 | 17 | 41 | 198 | 55 | 11 | 104 | 33 | 717 |
| 5:45 PM | 12 | 75 | 4 | 27 | 88 | 10 | 22 | 210 | 62 | 5 | 126 | 19 | 660 |
| Total | 99 | 810 | 40 | 180 | 878 | 114 | 229 | 1,607 | 405 | 51 | 922 | 182 | 5,517 |

PM Intersection Peak Hour : **4:45 PM - 5:45 PM** Intersection PHF : **0.98**

| | Southbound | | | Westbound | | | Northbound | | | Eastbound | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | |
| Volume | 44 | 417 | 16 | 96 | 441 | 62 | 118 | 839 | 205 | 29 | 453 | 92 | 2812 |
| PHF | 0.73 | 0.862 | 0.667 | 0.96 | 0.942 | 0.912 | 0.72 | 0.932 | 0.899 | 0.659 | 0.899 | 0.697 | 0.98 |
| Movement PHF | | 0.86 | | | 0.95 | | | 0.96 | | | 0.97 | | 0.98 |

LINSCOTT LAW & GREENSPAN engineers

# 24 Hour Segment Count

**Accurate Video Counts Inc**
**info@accuratevideocounts.com**
**(619) 987-5136**

AVC

***Location:*** 2. Bear Valley Parkway: Suburban Hills Dr to SR 78

***Orientation:*** *North-South*

***Date of Count:*** *Tuesday, June 25, 2013*

***Analysts:*** *DASH*

***Weather:*** *Sunny*

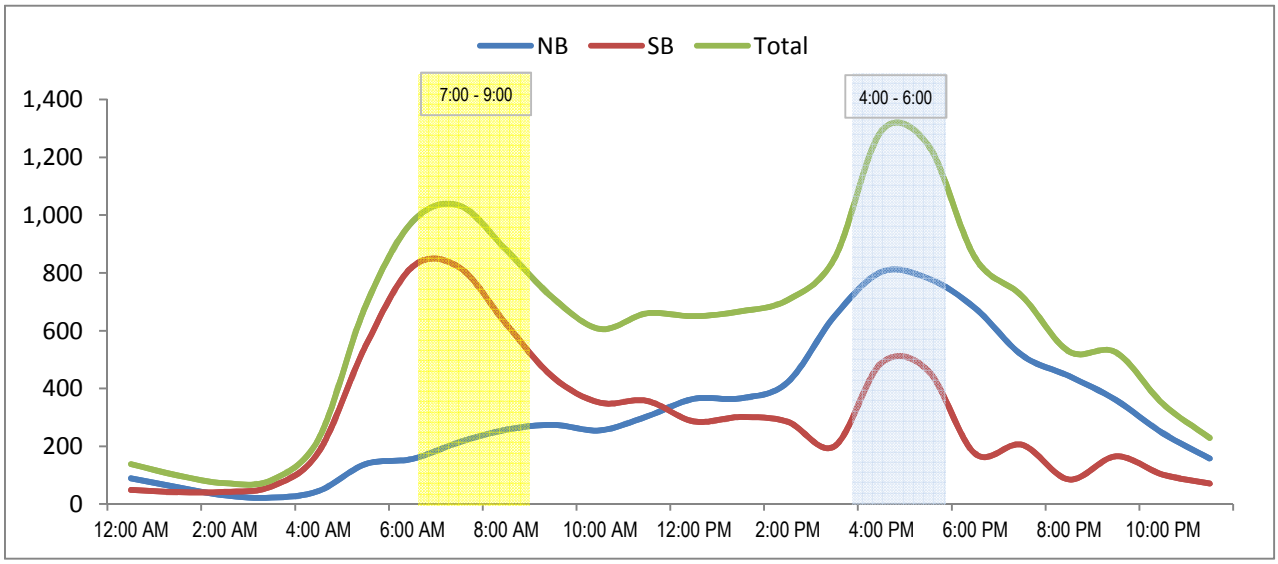
***AVC Proj. No:*** *13-0080*

| *24 Hour Segment Volume* | | | *14,777* |
|---|---|---|---|

| Time | Hourly Volume | | |
|---|---|---|---|
| | NB | SB | Total |
| 12:00 AM - 1:00 AM | 89 | 49 | 138 |
| 1:00 AM - 2:00 AM | 58 | 41 | 99 |
| 2:00 AM - 3:00 AM | 30 | 42 | 72 |
| 3:00 AM - 4:00 AM | 22 | 61 | 83 |
| 4:00 AM - 5:00 AM | 45 | 180 | 225 |
| 5:00 AM - 6:00 AM | 138 | 546 | 684 |
| 6:00 AM - 7:00 AM | 156 | 821 | 977 |
| 7:00 AM - 8:00 AM | 214 | 819 | 1,033 |
| 8:00 AM - 9:00 AM | 257 | 623 | 880 |
| 9:00 AM - 10:00 AM | 274 | 439 | 713 |
| 10:00 AM - 11:00 AM | 255 | 351 | 606 |
| 11:00 AM - 12:00 PM | 303 | 357 | 660 |
| **Total** | **1,841** | **4,329** | **6,170** |

| Time | Hourly Volume | | |
|---|---|---|---|
| | NB | SB | Total |
| 12:00 PM - 1:00 PM | 364 | 286 | 650 |
| 1:00 PM - 2:00 PM | 366 | 301 | 667 |
| 2:00 PM - 3:00 PM | 421 | 285 | 706 |
| 3:00 PM - 4:00 PM | 650 | 200 | 850 |
| 4:00 PM - 5:00 PM | 803 | 488 | 1,291 |
| 5:00 PM - 6:00 PM | 781 | 461 | 1,242 |
| 6:00 PM - 7:00 PM | 678 | 174 | 852 |
| 7:00 PM - 8:00 PM | 515 | 205 | 720 |
| 8:00 PM - 9:00 PM | 443 | 85 | 528 |
| 9:00 PM - 10:00 PM | 360 | 165 | 525 |
| 10:00 PM - 11:00 PM | 245 | 102 | 347 |
| 11:00 PM - 12:00 AM | 158 | 71 | 229 |
| **Total** | **5,784** | **2,823** | **8,607** |

| *24-Hour* | *NB* | *Volume* | *7,625* | *24-Hour* | *SB* | *Volume* | *7,152* |
|---|---|---|---|---|---|---|---|



LINSCOTT LAW & GREENSPAN engineers

# 24 Hour Segment Count

**Accurate Video Counts Inc**
**info@accuratevideocounts.com**
**(619) 987-5136**

AVC

***Location:*** San Pasqual Valley Road from 17th Avenue to Bear Valley Parkway

***Orientation:*** *East-West*

***Date of Count:*** *Tuesday, March 11, 2014*

***Analysts:*** *DASH*

***Weather:*** *Sunny*

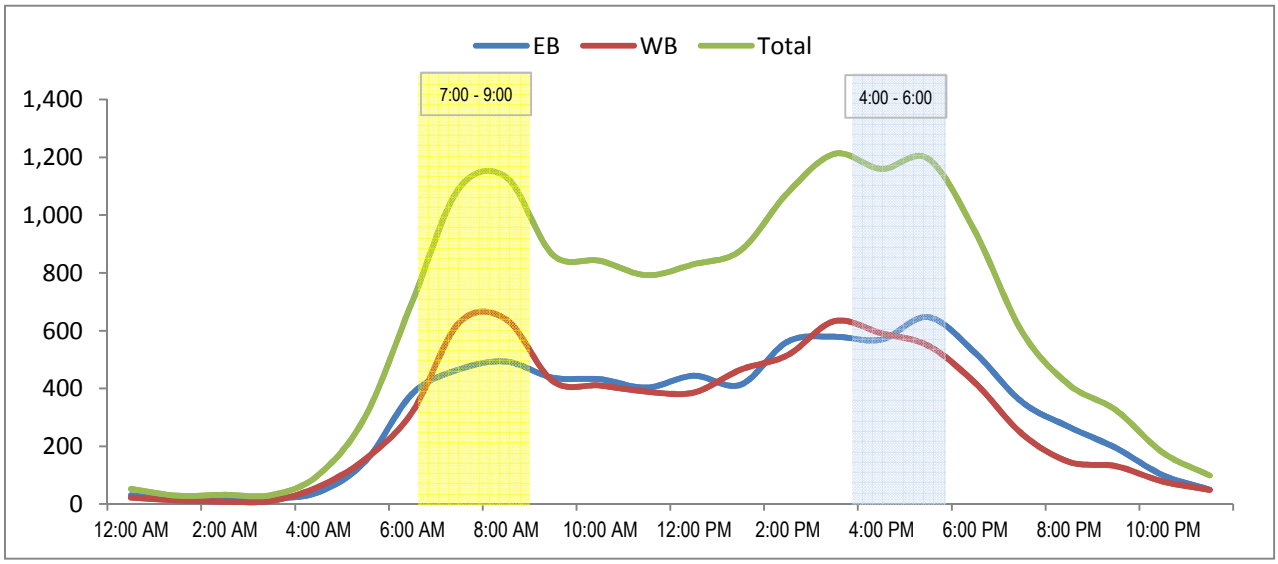
***AVC Proj. No:*** *14-0175*

| *24 Hour Segment Volume* | | | *14,877* |
|---|---|---|---|

| Time | Hourly Volume | | |
|---|---|---|---|
| | EB | WB | Total |
| 12:00 AM - 1:00 AM | 30 | 22 | 52 |
| 1:00 AM - 2:00 AM | 16 | 13 | 29 |
| 2:00 AM - 3:00 AM | 24 | 8 | 32 |
| 3:00 AM - 4:00 AM | 20 | 11 | 31 |
| 4:00 AM - 5:00 AM | 41 | 60 | 101 |
| 5:00 AM - 6:00 AM | 148 | 156 | 304 |
| 6:00 AM - 7:00 AM | 382 | 319 | 701 |
| 7:00 AM - 8:00 AM | 466 | 628 | 1,094 |
| 8:00 AM - 9:00 AM | 493 | 639 | 1,132 |
| 9:00 AM - 10:00 AM | 437 | 425 | 862 |
| 10:00 AM - 11:00 AM | 432 | 410 | 842 |
| 11:00 AM - 12:00 PM | 403 | 389 | 792 |
| **Total** | **2,892** | **3,080** | **5,972** |

| Time | Hourly Volume | | |
|---|---|---|---|
| | EB | WB | Total |
| 12:00 PM - 1:00 PM | 444 | 386 | 830 |
| 1:00 PM - 2:00 PM | 413 | 465 | 878 |
| 2:00 PM - 3:00 PM | 562 | 515 | 1,077 |
| 3:00 PM - 4:00 PM | 579 | 633 | 1,212 |
| 4:00 PM - 5:00 PM | 569 | 591 | 1,160 |
| 5:00 PM - 6:00 PM | 647 | 548 | 1,195 |
| 6:00 PM - 7:00 PM | 523 | 419 | 942 |
| 7:00 PM - 8:00 PM | 353 | 243 | 596 |
| 8:00 PM - 9:00 PM | 267 | 146 | 413 |
| 9:00 PM - 10:00 PM | 194 | 131 | 325 |
| 10:00 PM - 11:00 PM | 100 | 78 | 178 |
| 11:00 PM - 12:00 AM | 50 | 49 | 99 |
| **Total** | **4,701** | **4,204** | **8,905** |

| *24-Hour* | *EB* | *Volume* | *7,593* | *24-Hour* | *WB* | *Volume* | *7,284* |
|---|---|---|---|---|---|---|---|



# APPENDIX C

## COUNTY OF SAN DIEGO
## ROADWAY CLASSIFICATION TABLE

# TABLE 1
# AVERAGE DAILY VEHICLE TRIPS*

| CIRCULATION ELEMENT ROADS | | | LEVELS OF SERVICE | | | | |
|---|---|---|---|---|---|---|---|
| Road Classification | | # of Travel Lanes | A | B | C | D | E |
| **Expressway** (6.1) | | 6 | <36,000 | <54,000 | <70,000 | <86,000 | <108,000 |
| **Prime Arterial** (6.2) | | 6 | <22,200 | <37,000 | <44,600 | <50,000 | <57,000 |
| **Major Road** | (4.1A) | 4 | <14,800 | <24,700 | <29,600 | <33,400 | <37,000 |
| | w/ Intermittent Turn Lanes (4.1B) | 4 | <13,700 | <22,800 | <27,400 | <30,800 | <34,200 |
| **Collector** | | 4 | <13,700 | <22,800 | <27,400 | <30,800 | <34,200 |
| **Boulevard** | w/ Raised Median (4.2A) | 4 | <18,000 | <21,000 | <24,000 | <27,000 | <30,000 |
| | w/ Intermittent Turn Lanes (4.2B) | 4 | <16,800 | <19,600 | <22,500 | <25,000 | <28,000 |
| **Town Collector** | | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| **Community Collector** | w/ Raised Median (2.1A) | 2 | <10,000 | <11,700 | <13,400 | <15,000 | <19,000 |
| | w/ Continuous Left Turn Lane (2.1B) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | w/ Intermittent Turn Lane (2.1C) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | w/ Passing Lane (2.1D) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | No Median (2.1E) | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| **Light Collector** | w/ Raised Median (2.2A) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | w/ Continuous Left Turn Lane (2.2B) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | w/ Intermittent Turn Lane (2.2C) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | w/ Passing Lane (2.2D) | 2 | <3,000 | <6,000 | <9,500 | <13,500 | <19,000 |
| | No Median (2.2E) | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| | | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| | w/ Reduced Shoulder (2.2F) | 2 | <5,800 | <6,800 | <7,800 | <8,700 | <9,700 |
| **Rural Collector** | | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| **Rural Light Collector** | | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| **Rural Mountain** | | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| **Recreational Parkway** | | 2 | <1,900 | <4,100 | <7,100 | <10,900 | <16,200 |
| **Minor Collector** | w/ Raised Median (2.3A) | 2 | <3,000 | <6,000 | <7,000 | <8,000 | <9,000 |
| | w/ Intermittent Turn Lane (2.3B) | 2 | <3,000 | <6,000 | <7,000 | <8,000 | <9,000 |
| | No Median (2.3C) | 2 | <1,900 | <4,100 | <6,000 | <7,000 | <8,000 |
| **NON-CIRCULATION ELEMENT ROADS**** | | | LEVELS OF SERVICE | | | | |
| Residential Collector | | 2 | - | - | <4,500 | - | - |
| Rural Residential Collector*** | | 2 | - | - | <4,500 | - | - |
| Residential Road | | 2 | - | - | <1,500 | - | - |
| Rural Residential Road*** | | 2 | - | - | <1,500 | - | - |
| Residential Cul-de-Sac or Loop Road | | 2 | - | - | <200 | - | - |

* The values shown are subject to adjustment based on the geometry of the roadway, side frictions, and other relevant factors as determined by the Director, Department of Public Works.

** Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

*** Rural Residential Collectors and Rural Residential Roads are intended to serve areas with lot sizes of 2 acres or more which do not have a demand for on-street parking. On-street parking is not assured for these cross sections. Additional right-of-way is needed if on-street parking is in paved area.

**** See Tables 2A and 2B for roadway surfacing and right-of-way widths.

# APPENDIX D

## PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS
## EXISTING

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 18 | 358 | 126 | 154 | 508 | 82 | 104 | 323 | 99 | 84 | 659 | 18 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 19 | 381 | 134 | 181 | 598 | 96 | 114 | 355 | 109 | 98 | 766 | 21 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.85 | 0.85 | 0.85 | 0.91 | 0.91 | 0.91 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 65 | 977 | 437 | 212 | 1097 | 176 | 346 | 775 | 235 | 159 | 978 | 27 |
| Arrive On Green | 0.04 | 0.28 | 0.28 | 0.12 | 0.36 | 0.36 | 0.10 | 0.29 | 0.29 | 0.09 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3056 | 490 | 3442 | 2678 | 811 | 1774 | 3519 | 96 |
| Grp Volume(v), veh/h | 19 | 381 | 134 | 181 | 346 | 348 | 114 | 233 | 231 | 98 | 385 | 402 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1776 | 1721 | 1770 | 1720 | 1774 | 1770 | 1846 |
| Q Serve(g_s), s | 1.1 | 9.2 | 7.1 | 10.5 | 16.4 | 16.5 | 3.2 | 11.3 | 11.6 | 5.6 | 21.2 | 21.2 |
| Cycle Q Clear(g_c), s | 1.1 | 9.2 | 7.1 | 10.5 | 16.4 | 16.5 | 3.2 | 11.3 | 11.6 | 5.6 | 21.2 | 21.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.28 | 1.00 | | 0.47 | 1.00 | | 0.05 |
| Lane Grp Cap(c), veh/h | 65 | 977 | 437 | 212 | 635 | 638 | 346 | 512 | 497 | 159 | 492 | 513 |
| V/C Ratio(X) | 0.29 | 0.39 | 0.31 | 0.86 | 0.54 | 0.55 | 0.33 | 0.45 | 0.46 | 0.62 | 0.78 | 0.78 |
| Avail Cap(c_a), veh/h | 152 | 977 | 437 | 283 | 635 | 638 | 359 | 512 | 497 | 212 | 492 | 513 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.5 | 30.9 | 30.2 | 45.5 | 26.9 | 26.9 | 44.1 | 30.7 | 30.8 | 46.2 | 35.1 | 35.1 |
| Incr Delay (d2), s/veh | 0.9 | 1.2 | 1.8 | 14.0 | 3.3 | 3.3 | 0.2 | 2.9 | 3.1 | 1.5 | 11.8 | 11.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 4.7 | 3.3 | 6.0 | 8.6 | 8.6 | 1.6 | 6.0 | 6.0 | 2.8 | 11.9 | 12.4 |
| LnGrp Delay(d),s/veh | 50.4 | 32.1 | 32.0 | 59.5 | 30.2 | 30.3 | 44.3 | 33.6 | 33.9 | 47.7 | 46.9 | 46.4 |
| LnGrp LOS | D | C | C | E | C | C | D | C | C | D | D | D |
| Approach Vol, veh/h | | 534 | | | 875 | | | 578 | | | 885 | |
| Approach Delay, s/veh | | 32.7 | | | 36.3 | | | 35.8 | | | 46.8 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 17.8 | 35.8 | 15.8 | 36.0 | 9.0 | 44.5 | 14.6 | 37.2 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 17 | 29.1 | * 11 | 29.3 | * 9 | 36.9 | * 13 | 27.7 |
| Max Q Clear Time (g_c+I1), s | 12.5 | 11.2 | 5.2 | 23.2 | 3.1 | 18.5 | 7.6 | 13.6 |
| Green Ext Time (p_c), s | 0.1 | 12.7 | 0.1 | 5.1 | 0.0 | 12.9 | 0.0 | 10.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 38.8 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 26 | 498 | 106 | 111 | 448 | 65 | 105 | 798 | 211 | 63 | 418 | 29 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 30 | 566 | 120 | 118 | 477 | 69 | 117 | 887 | 234 | 73 | 486 | 34 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.94 | 0.94 | 0.94 | 0.90 | 0.90 | 0.90 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 88 | 911 | 408 | 159 | 925 | 133 | 339 | 974 | 257 | 146 | 1124 | 78 |
| Arrive On Green | 0.05 | 0.26 | 0.26 | 0.09 | 0.30 | 0.30 | 0.10 | 0.35 | 0.35 | 0.08 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3106 | 447 | 3442 | 2773 | 731 | 1774 | 3357 | 234 |
| Grp Volume(v), veh/h | 30 | 566 | 120 | 118 | 271 | 275 | 117 | 566 | 555 | 73 | 256 | 264 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1784 | 1721 | 1770 | 1734 | 1774 | 1770 | 1821 |
| Q Serve(g_s), s | 1.8 | 15.3 | 6.6 | 7.0 | 13.8 | 13.9 | 3.4 | 33.0 | 33.1 | 4.3 | 12.2 | 12.2 |
| Cycle Q Clear(g_c), s | 1.8 | 15.3 | 6.6 | 7.0 | 13.8 | 13.9 | 3.4 | 33.0 | 33.1 | 4.3 | 12.2 | 12.2 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.25 | 1.00 | | 0.42 | 1.00 | | 0.13 |
| Lane Grp Cap(c), veh/h | 88 | 911 | 408 | 159 | 527 | 531 | 339 | 622 | 609 | 146 | 593 | 610 |
| V/C Ratio(X) | 0.34 | 0.62 | 0.29 | 0.74 | 0.51 | 0.52 | 0.35 | 0.91 | 0.91 | 0.50 | 0.43 | 0.43 |
| Avail Cap(c_a), veh/h | 147 | 911 | 408 | 180 | 527 | 531 | 349 | 622 | 609 | 164 | 593 | 610 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.8 | 35.6 | 32.3 | 48.1 | 31.6 | 31.6 | 45.6 | 33.5 | 33.5 | 47.6 | 28.0 | 28.0 |
| Incr Delay (d2), s/veh | 0.9 | 3.2 | 1.8 | 10.9 | 3.6 | 3.6 | 0.2 | 19.7 | 20.2 | 1.0 | 2.3 | 2.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.9 | 7.9 | 3.1 | 3.9 | 7.2 | 7.3 | 1.7 | 19.6 | 19.3 | 2.1 | 6.3 | 6.5 |
| LnGrp Delay(d),s/veh | 50.7 | 38.8 | 34.2 | 59.0 | 35.1 | 35.2 | 45.8 | 53.2 | 53.7 | 48.6 | 30.3 | 30.3 |
| LnGrp LOS | D | D | C | E | D | D | D | D | D | D | C | C |
| Approach Vol, veh/h | | 716 | | | 664 | | | 1238 | | | 593 | |
| Approach Delay, s/veh | | 38.5 | | | 39.4 | | | 52.7 | | | 32.5 | |
| Approach LOS | | D | | | D | | | D | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.9 | 34.6 | 15.9 | 43.0 | 10.6 | 39.0 | 14.1 | 44.8 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 11 | 27.9 | * 11 | 36.3 | * 9 | 29.9 | * 10 | 37.3 |
| Max Q Clear Time (g_c+I1), s | 9.0 | 17.3 | 5.4 | 14.2 | 3.8 | 15.9 | 6.3 | 35.1 |
| Green Ext Time (p_c), s | 0.0 | 8.3 | 0.1 | 18.6 | 0.0 | 10.5 | 0.0 | 2.1 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 43.1 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

# APPENDIX E

## CUMULATIVE PROJECTS DATA

| INTERSECTION | DIRECTION | CUMULATIVE ONLY | | | | | |
|---|---|---|---|---|---|---|---|
| | | Ram | Rpm | Tam | Tpm | Lam | Lpm |
| 1. Bear Valley Parkway/ San Pasqual Valley Road | Sb | 0 | 0 | 53 | 69 | 6 | 4 |
| | Wb | 7 | 4 | 17 | 15 | 22 | 16 |
| | Nb | 14 | 31 | 52 | 23 | 13 | 12 |
| | Eb | 14 | 14 | 13 | 17 | 0 | 1 |
| | | | | | | | |
| 2. Bear Valley Parkway/ Access | Sb | 0 | 0 | 59 | 73 | 0 | 0 |
| | Wb | 0 | 0 | 0 | 0 | 0 | 0 |
| | Nb | 0 | 0 | 59 | 28 | 0 | 0 |
| | Eb | 0 | 0 | 0 | 0 | 0 | 0 |

| STREET SEGMENT | CUMULATIVE ONLY |
|---|---|
| | |
| **Bear Valley Parkway** | |
| Suburban Hills Dr to San Pasqual Valley Rd | 4,660 |
| **San Pasqual Valley Road** | |
| 17th Street to Bear Valley Pkwy | 230 |

# APPENDIX F

## PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS
## EXISTING + PROJECT

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 19 | 358 | 126 | 154 | 508 | 82 | 104 | 327 | 99 | 84 | 670 | 20 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 20 | 381 | 134 | 181 | 598 | 96 | 114 | 359 | 109 | 98 | 779 | 23 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.85 | 0.85 | 0.85 | 0.91 | 0.91 | 0.91 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 67 | 977 | 437 | 212 | 1093 | 175 | 346 | 777 | 233 | 159 | 976 | 29 |
| Arrive On Green | 0.04 | 0.28 | 0.28 | 0.12 | 0.36 | 0.36 | 0.10 | 0.29 | 0.29 | 0.09 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3056 | 490 | 3442 | 2686 | 804 | 1774 | 3510 | 104 |
| Grp Volume(v), veh/h | 20 | 381 | 134 | 181 | 346 | 348 | 114 | 235 | 233 | 98 | 393 | 409 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1776 | 1721 | 1770 | 1721 | 1774 | 1770 | 1844 |
| Q Serve(g_s), s | 1.2 | 9.2 | 7.1 | 10.5 | 16.4 | 16.5 | 3.2 | 11.5 | 11.7 | 5.6 | 21.7 | 21.7 |
| Cycle Q Clear(g_c), s | 1.2 | 9.2 | 7.1 | 10.5 | 16.4 | 16.5 | 3.2 | 11.5 | 11.7 | 5.6 | 21.7 | 21.7 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.28 | 1.00 | | 0.47 | 1.00 | | 0.06 |
| Lane Grp Cap(c), veh/h | 67 | 977 | 437 | 212 | 633 | 635 | 346 | 512 | 498 | 159 | 492 | 513 |
| V/C Ratio(X) | 0.30 | 0.39 | 0.31 | 0.86 | 0.55 | 0.55 | 0.33 | 0.46 | 0.47 | 0.62 | 0.80 | 0.80 |
| Avail Cap(c_a), veh/h | 152 | 977 | 437 | 283 | 633 | 635 | 359 | 512 | 498 | 212 | 492 | 513 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.3 | 30.9 | 30.2 | 45.5 | 27.0 | 27.0 | 44.1 | 30.7 | 30.8 | 46.2 | 35.3 | 35.3 |
| Incr Delay (d2), s/veh | 0.9 | 1.2 | 1.8 | 14.0 | 3.4 | 3.4 | 0.2 | 2.9 | 3.1 | 1.5 | 12.7 | 12.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 4.7 | 3.3 | 6.0 | 8.6 | 8.6 | 1.6 | 6.0 | 6.0 | 2.8 | 12.3 | 12.8 |
| LnGrp Delay(d),s/veh | 50.2 | 32.1 | 32.0 | 59.5 | 30.4 | 30.4 | 44.3 | 33.6 | 33.9 | 47.7 | 48.0 | 47.5 |
| LnGrp LOS | D | C | C | E | C | C | D | C | C | D | D | D |
| Approach Vol, veh/h | | 535 | | | 875 | | | 582 | | | 900 | |
| Approach Delay, s/veh | | 32.8 | | | 36.4 | | | 35.8 | | | 47.7 | |
| Approach LOS | | C | | | D | | | D | | | D | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 17.8 | 35.8 | 15.8 | 36.0 | 9.2 | 44.4 | 14.6 | 37.2 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 17 | 29.1 | * 11 | 29.3 | * 9 | 36.9 | * 13 | 27.7 |
| Max Q Clear Time (g_c+I1), s | 12.5 | 11.2 | 5.2 | 23.7 | 3.2 | 18.5 | 7.6 | 13.7 |
| Green Ext Time (p_c), s | 0.1 | 12.7 | 0.1 | 4.7 | 0.0 | 12.9 | 0.0 | 10.7 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 39.2 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 29 | 498 | 106 | 111 | 448 | 65 | 105 | 810 | 211 | 63 | 424 | 30 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 33 | 566 | 120 | 118 | 477 | 69 | 117 | 900 | 234 | 73 | 493 | 35 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.94 | 0.94 | 0.94 | 0.90 | 0.90 | 0.90 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 93 | 911 | 408 | 159 | 915 | 132 | 339 | 978 | 254 | 146 | 1123 | 80 |
| Arrive On Green | 0.05 | 0.26 | 0.26 | 0.09 | 0.29 | 0.29 | 0.10 | 0.35 | 0.35 | 0.08 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3106 | 447 | 3442 | 2782 | 723 | 1774 | 3353 | 237 |
| Grp Volume(v), veh/h | 33 | 566 | 120 | 118 | 271 | 275 | 117 | 572 | 562 | 73 | 260 | 268 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1784 | 1721 | 1770 | 1735 | 1774 | 1770 | 1821 |
| Q Serve(g_s), s | 1.9 | 15.3 | 6.6 | 7.0 | 13.8 | 13.9 | 3.4 | 33.6 | 33.7 | 4.3 | 12.4 | 12.5 |
| Cycle Q Clear(g_c), s | 1.9 | 15.3 | 6.6 | 7.0 | 13.8 | 13.9 | 3.4 | 33.6 | 33.7 | 4.3 | 12.4 | 12.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.25 | 1.00 | | 0.42 | 1.00 | | 0.13 |
| Lane Grp Cap(c), veh/h | 93 | 911 | 408 | 159 | 522 | 526 | 339 | 622 | 610 | 146 | 593 | 610 |
| V/C Ratio(X) | 0.36 | 0.62 | 0.29 | 0.74 | 0.52 | 0.52 | 0.35 | 0.92 | 0.92 | 0.50 | 0.44 | 0.44 |
| Avail Cap(c_a), veh/h | 147 | 911 | 408 | 180 | 522 | 526 | 349 | 622 | 610 | 164 | 593 | 610 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.6 | 35.6 | 32.3 | 48.1 | 31.8 | 31.9 | 45.6 | 33.7 | 33.7 | 47.6 | 28.1 | 28.1 |
| Incr Delay (d2), s/veh | 0.9 | 3.2 | 1.8 | 10.9 | 3.7 | 3.7 | 0.2 | 21.0 | 21.6 | 1.0 | 2.3 | 2.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 7.9 | 3.1 | 3.9 | 7.3 | 7.4 | 1.7 | 20.0 | 19.7 | 2.1 | 6.4 | 6.7 |
| LnGrp Delay(d),s/veh | 50.5 | 38.8 | 34.2 | 59.0 | 35.5 | 35.6 | 45.8 | 54.7 | 55.3 | 48.6 | 30.4 | 30.4 |
| LnGrp LOS | D | D | C | E | D | D | D | D | E | D | C | C |
| Approach Vol, veh/h | | 719 | | | 664 | | | 1251 | | | 601 | |
| Approach Delay, s/veh | | 38.5 | | | 39.7 | | | 54.1 | | | 32.6 | |
| Approach LOS | | D | | | D | | | D | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 14.9 | 34.6 | 15.9 | 43.0 | 10.9 | 38.6 | 14.1 | 44.8 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 11 | 27.9 | * 11 | 36.3 | * 9 | 29.9 | * 10 | 37.3 |
| Max Q Clear Time (g_c+I1), s | 9.0 | 17.3 | 5.4 | 14.5 | 3.9 | 15.9 | 6.3 | 35.7 |
| Green Ext Time (p_c), s | 0.0 | 8.3 | 0.1 | 18.5 | 0.0 | 10.5 | 0.0 | 1.5 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 43.7 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

# APPENDIX G

## PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS
## EXISTING + PROJECT + CUMULATIVE PROJECTS

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 19 | 371 | 140 | 176 | 525 | 89 | 117 | 379 | 113 | 90 | 723 | 20 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 20 | 395 | 149 | 207 | 618 | 105 | 129 | 416 | 124 | 105 | 841 | 23 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.85 | 0.85 | 0.85 | 0.91 | 0.91 | 0.91 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 67 | 960 | 429 | 237 | 1112 | 188 | 345 | 767 | 226 | 158 | 961 | 26 |
| Arrive On Green | 0.04 | 0.27 | 0.27 | 0.13 | 0.37 | 0.37 | 0.10 | 0.28 | 0.28 | 0.09 | 0.27 | 0.27 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3028 | 514 | 3442 | 2696 | 796 | 1774 | 3519 | 96 |
| Grp Volume(v), veh/h | 20 | 395 | 149 | 207 | 361 | 362 | 129 | 272 | 268 | 105 | 423 | 441 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1772 | 1721 | 1770 | 1722 | 1774 | 1770 | 1846 |
| Q Serve(g_s), s | 1.2 | 9.8 | 8.1 | 12.3 | 17.4 | 17.5 | 3.8 | 13.9 | 14.2 | 6.1 | 24.5 | 24.5 |
| Cycle Q Clear(g_c), s | 1.2 | 9.8 | 8.1 | 12.3 | 17.4 | 17.5 | 3.8 | 13.9 | 14.2 | 6.1 | 24.5 | 24.5 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.29 | 1.00 | | 0.46 | 1.00 | | 0.05 |
| Lane Grp Cap(c), veh/h | 67 | 960 | 429 | 237 | 650 | 650 | 345 | 503 | 490 | 158 | 483 | 504 |
| V/C Ratio(X) | 0.30 | 0.41 | 0.35 | 0.87 | 0.56 | 0.56 | 0.37 | 0.54 | 0.55 | 0.66 | 0.88 | 0.88 |
| Avail Cap(c_a), veh/h | 149 | 960 | 429 | 278 | 650 | 650 | 353 | 503 | 490 | 208 | 483 | 504 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 50.2 | 32.1 | 31.4 | 45.6 | 27.0 | 27.0 | 45.1 | 32.5 | 32.5 | 47.3 | 37.2 | 37.2 |
| Incr Delay (d2), s/veh | 0.9 | 1.3 | 2.2 | 20.6 | 3.4 | 3.4 | 0.2 | 4.1 | 4.4 | 1.9 | 19.4 | 18.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.6 | 4.9 | 3.8 | 7.4 | 9.1 | 9.2 | 1.8 | 7.4 | 7.3 | 3.1 | 14.6 | 15.1 |
| LnGrp Delay(d),s/veh | 51.2 | 33.4 | 33.7 | 66.2 | 30.4 | 30.4 | 45.4 | 36.6 | 36.9 | 49.3 | 56.6 | 56.0 |
| LnGrp LOS | D | C | C | E | C | C | D | D | D | D | E | E |
| Approach Vol, veh/h | | 564 | | | 930 | | | 669 | | | 969 | |
| Approach Delay, s/veh | | 34.1 | | | 38.4 | | | 38.4 | | | 55.5 | |
| Approach LOS | | C | | | D | | | D | | | E | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 19.5 | 35.8 | 16.0 | 36.0 | 9.2 | 46.1 | 14.8 | 37.2 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 17 | 29.1 | * 11 | 29.3 | * 9 | 36.9 | * 13 | 27.7 |
| Max Q Clear Time (g_c+I1), s | 14.3 | 11.8 | 5.8 | 26.5 | 3.2 | 19.5 | 8.1 | 16.2 |
| Green Ext Time (p_c), s | 0.1 | 12.7 | 0.1 | 2.5 | 0.0 | 12.8 | 0.0 | 9.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 42.9 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 30 | 515 | 120 | 127 | 463 | 69 | 117 | 833 | 242 | 67 | 493 | 30 |
| Number | 5 | 2 | 12 | 1 | 6 | 16 | 3 | 8 | 18 | 7 | 4 | 14 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow, veh/h/ln | 1863 | 1863 | 1863 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 | 1863 | 1863 | 1900 |
| Adj Flow Rate, veh/h | 34 | 585 | 136 | 135 | 493 | 73 | 130 | 926 | 269 | 78 | 573 | 35 |
| Adj No. of Lanes | 1 | 2 | 1 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 0 |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.94 | 0.94 | 0.94 | 0.90 | 0.90 | 0.90 | 0.86 | 0.86 | 0.86 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 94 | 908 | 406 | 163 | 914 | 135 | 341 | 947 | 274 | 148 | 1131 | 69 |
| Arrive On Green | 0.05 | 0.26 | 0.26 | 0.09 | 0.30 | 0.30 | 0.10 | 0.35 | 0.35 | 0.08 | 0.33 | 0.33 |
| Sat Flow, veh/h | 1774 | 3539 | 1583 | 1774 | 3095 | 456 | 3442 | 2709 | 785 | 1774 | 3389 | 207 |
| Grp Volume(v), veh/h | 34 | 585 | 136 | 135 | 281 | 285 | 130 | 604 | 591 | 78 | 299 | 309 |
| Grp Sat Flow(s),veh/h/ln | 1774 | 1770 | 1583 | 1774 | 1770 | 1782 | 1721 | 1770 | 1724 | 1774 | 1770 | 1826 |
| Q Serve(g_s), s | 2.0 | 16.0 | 7.6 | 8.1 | 14.5 | 14.6 | 3.8 | 36.7 | 36.9 | 4.6 | 14.7 | 14.8 |
| Cycle Q Clear(g_c), s | 2.0 | 16.0 | 7.6 | 8.1 | 14.5 | 14.6 | 3.8 | 36.7 | 36.9 | 4.6 | 14.7 | 14.8 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.26 | 1.00 | | 0.46 | 1.00 | | 0.11 |
| Lane Grp Cap(c), veh/h | 94 | 908 | 406 | 163 | 522 | 526 | 341 | 619 | 603 | 148 | 591 | 610 |
| V/C Ratio(X) | 0.36 | 0.64 | 0.33 | 0.83 | 0.54 | 0.54 | 0.38 | 0.98 | 0.98 | 0.53 | 0.51 | 0.51 |
| Avail Cap(c_a), veh/h | 147 | 908 | 406 | 179 | 522 | 526 | 348 | 619 | 603 | 163 | 591 | 610 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 49.7 | 36.0 | 32.9 | 48.6 | 32.1 | 32.2 | 45.9 | 34.9 | 35.0 | 47.8 | 29.0 | 29.1 |
| Incr Delay (d2), s/veh | 0.9 | 3.5 | 2.2 | 22.6 | 3.9 | 4.0 | 0.3 | 30.8 | 32.1 | 1.1 | 3.1 | 3.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.0 | 8.2 | 3.6 | 5.0 | 7.6 | 7.8 | 1.8 | 23.1 | 22.9 | 2.3 | 7.7 | 8.0 |
| LnGrp Delay(d),s/veh | 50.6 | 39.5 | 35.1 | 71.2 | 36.1 | 36.1 | 46.1 | 65.7 | 67.1 | 48.9 | 32.1 | 32.1 |
| LnGrp LOS | D | D | D | E | D | D | D | E | E | D | C | C |
| Approach Vol, veh/h | | 755 | | | 701 | | | 1325 | | | 686 | |
| Approach Delay, s/veh | | 39.2 | | | 42.9 | | | 64.4 | | | 34.0 | |
| Approach LOS | | D | | | D | | | E | | | C | |

| Timer | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Phs Duration (G+Y+Rc), s | 15.2 | 34.6 | 16.0 | 43.0 | 11.0 | 38.8 | 14.3 | 44.7 |
| Change Period (Y+Rc), s | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 | * 5.2 | 6.7 |
| Max Green Setting (Gmax), s | * 11 | 27.9 | * 11 | 36.3 | * 9 | 29.9 | * 10 | 37.3 |
| Max Q Clear Time (g_c+I1), s | 10.1 | 18.0 | 5.8 | 16.8 | 4.0 | 16.6 | 6.6 | 38.9 |
| Green Ext Time (p_c), s | 0.0 | 8.0 | 0.1 | 17.4 | 0.0 | 10.3 | 0.0 | 0.0 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 48.5 |
| HCM 2010 LOS | D |

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

# APPENDIX H

## HIGHWAY DESIGN MANUAL TABLE 405.1A
## CORNER SIGHT DISTANCE

may be excessive. High costs may be attributable to right of way acquisition, building removal, extensive excavation, or immitigable environmental impacts. In such cases a lesser value of corner sight distance, as described under the following headings, may be used.

(b) Public Road Intersections (Refer to Topic 205)--At unsignalized public road intersections (see Index 405.7) corner sight distance values given in Table 405.1A should be provided.

At signalized intersections the values for corner sight distances given in Table 405.1A should also be applied whenever possible. Even though traffic flows are designed to move at separate times, unanticipated conflicts can occur due to violation of signal, right turns on red, malfunction of the signal, or use of flashing red/yellow mode.

## Table 405.1A
## Corner Sight Distance
## (7-1/2 Second Criteria)

| Design Speed (mph) | Corner Sight Distance (ft) |
|---|---|
| 25 | 275 |
| 30 | 330 |
| 35 | 385 |
| 40 | 440 |
| 45 | 495 |
| 50 | 550 |
| 55 | 605 |
| 60 | 660 |
| 65 | 715 |
| 70 | 770 |

**Where restrictive conditions exist, similar to those listed in Index 405.1(2)(a), the minimum value for corner sight distance at both signalized and unsignalized intersections shall be equal to the stopping sight distance as given in Table 201.1, measured as previously described.**

(c) Private Road Intersections (Refer to Index 205.2) and Rural Driveways (Refer to Index 205.4)--**The minimum corner sight distance shall be equal to the stopping sight distance as given in Table 201.1, measured as previously described.**

(d) Urban Driveways (Refer to Index 205.3)--Corner sight distance requirements as described above are not applied to urban driveways.

*(3) Decision Sight Distance.* At intersections where the State route turns or crosses another State route, the decision sight distance values given in Table 201.7 should be used. In computing and measuring decision sight distance, the 3.5-foot eye height and the 0.5-foot object height should be used, the object being located on the side of the intersection nearest the approaching driver.

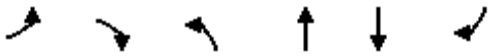
The application of the various sight distance requirements for the different types of intersections is summarized in Table 405.1B.

*(4) Acceleration Lanes for Turning Moves onto State Highways.* At rural intersections, with "STOP" control on the local cross road, acceleration lanes for left and right turns onto the State facility should be considered. At a minimum, the following features should be evaluated for both the major highway and the cross road:

- divided versus undivided
- number of lanes
- design speed
- gradient
- lane, shoulder and median width
- traffic volume and composition of highway users, including trucks and transit vehicles
- turning volumes
- horizontal curve radii
- sight distance
- proximity of adjacent intersections
- types of adjacent intersections

# APPENDIX I

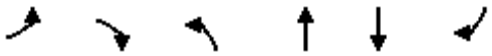
## PEAK HOUR INTERSECTION ANALYSIS WORKSHEETS
## PROJECT ACCESS



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 2 | 13 | 5 | 410 | 1080 | 1 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 2 | 14 | 5 | 446 | 1174 | 1 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | 780 | 1220 | |
| pX, platoon unblocked | 0.84 | 0.82 | 0.82 | | | |
| vC, conflicting volume | 1408 | 588 | 1175 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 945 | 65 | 780 | | | |
| tC, single (s) | 6.8 | 6.9 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 99 | 98 | 99 | | | |
| cM capacity (veh/h) | 216 | 810 | 685 | | | |

| Direction, Lane # | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|---|---|---|---|---|---|---|
| Volume Total | 16 | 5 | 223 | 223 | 783 | 392 |
| Volume Left | 2 | 5 | 0 | 0 | 0 | 0 |
| Volume Right | 14 | 0 | 0 | 0 | 0 | 1 |
| cSH | 592 | 685 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.03 | 0.01 | 0.13 | 0.13 | 0.46 | 0.23 |
| Queue Length 95th (ft) | 2 | 1 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 11.2 | 10.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | B | B | | | | |
| Approach Delay (s) | 11.2 | 0.1 | | | 0.0 | |
| Approach LOS | B | | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 0.1 | | |
| Intersection Capacity Utilization | 39.9% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Volume (veh/h) | 1 | 7 | 15 | 1290 | 670 | 3 |
| Sign Control | Stop | | | Free | Free | |
| Grade | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 1 | 8 | 16 | 1402 | 728 | 3 |
| Pedestrians | | | | | | |
| Lane Width (ft) | | | | | | |
| Walking Speed (ft/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | | None | None | |
| Median storage veh) | | | | | | |
| Upstream signal (ft) | | | | 780 | 1220 | |
| pX, platoon unblocked | 0.69 | | | | | |
| vC, conflicting volume | 1464 | 366 | 732 | | | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 773 | 366 | 732 | | | |
| tC, single (s) | 6.8 | 6.9 | 4.1 | | | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | 2.2 | | | |
| p0 queue free % | 100 | 99 | 98 | | | |
| cM capacity (veh/h) | 227 | 631 | 869 | | | |

| Direction, Lane # | EB 1 | NB 1 | NB 2 | NB 3 | SB 1 | SB 2 |
|---|---|---|---|---|---|---|
| Volume Total | 9 | 16 | 701 | 701 | 486 | 246 |
| Volume Left | 1 | 16 | 0 | 0 | 0 | 0 |
| Volume Right | 8 | 0 | 0 | 0 | 0 | 3 |
| cSH | 516 | 869 | 1700 | 1700 | 1700 | 1700 |
| Volume to Capacity | 0.02 | 0.02 | 0.41 | 0.41 | 0.29 | 0.14 |
| Queue Length 95th (ft) | 1 | 1 | 0 | 0 | 0 | 0 |
| Control Delay (s) | 12.1 | 9.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lane LOS | B | A | | | | |
| Approach Delay (s) | 12.1 | 0.1 | | | 0.0 | |
| Approach LOS | B | | | | | |

| Intersection Summary | | | |
|---|---|---|---|
| Average Delay | 0.1 | | |
| Intersection Capacity Utilization | 45.7% | ICU Level of Service | A |
| Analysis Period (min) | 15 | | |